

Syllabus of 33 courses offered during the session 2018-19

BSc Honours Program

1. Botany Honours Course
2. Chemistry Honours Course
3. Geography Honours Course
4. Mathematics Honours Course
5. Physics Honours Course
6. Zoology Honours Course

BSc General Program

1. Botany General Course
2. Chemistry General Course
3. Computer Science General Course
4. Geography General Course
5. Mathematics General Course
6. Physics General Course
7. Zoology General Course

BA Honours Program

1. Economics Honours Course
2. Education Honours Course
3. English Honours Course
4. Geography Honours Course
5. History Honours Course
6. Mathematics Honours Course
7. Philosophy Honours Course
8. Political Science Honours Course
9. Sociology Honours Course

BA General Program

1. Ao (MIL) Course
2. Economics General Course
3. Education General Course
4. English General Course
5. Functional English (Voc) Course
6. Geography General Course
7. History General Course
8. Mathematics General Course
9. Philosophy General Course
10. Political Science General Course
11. Sociology General Course

Syllabus of
BSc Honours Course
in
Botany
for 2018-19 Session

Semester-wise Syllabus for Undergraduate Programme

Botany

To be introduced from July 2012



DEPARTMENT OF BOTANY
NAGALAND UNIVERSITY
LUMAMI

INTRODUCTION

The Syllabus is designed to suit the semester pattern and credit system adopted by the University. The remodeling of the syllabus have been made with an inter-disciplinary approach and is therefore worked out trying to maintain an evolutionary link throughout the subject beginning with the origin and evolution of biodiversity through ecology and conservation. Attempts have been made to restructure the syllabus to meet the emerging concepts of twenty first century. It has been designed as to incorporate the new advances and trends in the disciplines within the limitations of the UG syllabus. Thus the latest concepts in Cell Biology, Biotechnology and Molecular Biology have been incorporated.

The syllabus has been also been developed envisaging the teacher, learner and the application of the synergetic interaction between the two. It aims to progressively enhance the students' knowledge over the subject and inculcate in them a sense of spirit, wonder and appreciation to the dynamics of nature. The syllabus has been drafted clearly and concisely so that the students have the knowledge to acknowledge and owe responsibility to the environment, ecology and biodiversity of plants.

Ethnobotany and traditional knowledge has been drafted to enrich the students with the treasures of our state and society. The study of Medicinal Botany and Economic botany enriches the Systematic Botany which can be of potential botanical, pharmacological and economic usage. This study will be useful in identifying medicinal taxa; since the students are aware of systematic botany (Morphology and Taxonomy of Flowering Plants).

The curriculum for B.Sc. programme in Botany which is of six semester duration contains in 6 Pass papers with 3 credit points each and 5 Honours papers with 2 credit points each. Each of the theory paper for both Pass and Honours course will have a corresponding practical with 1 credit point each. In the sixth semester, students can opt for a CBCS paper (Choice Based Credit System) from the options offered by the College which carries 3 credit point and a corresponding project work with 1 credit point of the CBCS.

While retaining the basic concepts of the subject, the practical components are designed in correspondence with the theory courses to impart the skills and techniques required in these areas. Seminars, tutorials, quiz, assignments, field survey, project, study tour and other such activities will supplement the programme of instruction relating to a unit. The

syllabus will give a solid foundation for the post-graduate courses like Molecular Biology, Microbiology, Medical Genetics, Horticulture and Plant Biotechnology besides Botany itself.

REFERENCES:

1. Present Nagaland University syllabus as template
2. Banaras Hindu University syllabus, U.P.
3. Bharathidasan University syllabus, Tiruchirappalli
4. Calcutta University syllabus, West Bengal
5. Calicut University syllabus, Kerela
6. Delhi University syllabus, Delhi
7. Guwahati University syllabus, Assam
8. Jamia Millia Islamia University syllabus.
9. Kannur University syllabus, Kerela
10. Madras University syllabus, Tamil Nadu
11. North Eastern Hill University syllabus, Meghalaya

**NAGALAND UNIVERSITY
CURRICULUM FOR B.Sc PROGRAMME IN BOTANY**

Semester		Course Number	Course Name	Credits	Total Credits
I	Pass	BOT-101 BOT-102	Biodiversity I Practical	4 1	8
	Honours	BOT-103 BOT-104	Microbiology and Plant Pathology Practical	2 1	
II	Pass	BOT-201 BOT-202	Biodiversity II and Plant Pathology Practical	4 1	8
	Honours	BOT-203 BOT-204	Embryology and Palynology Practical	2 1	
III	Pass	BOT-301 BOT-302	Morphology, Anatomy and Angiosperm Taxonomy Practical	4 1	8
	Honours	BOT-303 BOT-304	Ethnobotany, Economic Botany and Biometric Practical	2 1	
IV	Pass	BOT-401 BOT-402	Plant Physiology and Ecology Practical	4 1	8
	Honours	BOT-403 BOT-404	Environmental Biology and Phytogeography Practical	2 1	
V	Pass	BOT-501 BOT-502	Biochemistry and plant breeding Practical	4 1	8
	Honours	BOT-503 BOT-504	Molecular Biology and Biotechnology Practical	2 1	
VI	Pass	BOT-601 BOT-602	Cell Biology and Genetics Practical	4 1	10
	Honours	BOT-603	<u>Choice Based Credit System</u> a) Angiosperm Taxonomy b) Methodology and Perspective of Science c) Plant Biotechnology d) Forestry e) Mushroom Cultivation f) Horticulture	3	
		BOT-604	Project Work	2	

Highlights of the Curriculum

- *Choice Based Credit Paper will be offered depending on the availability of specialized teachers in respective colleges.
- * The Practical Examination will be conducted internally which will be of 50 marks. It will be a Continuous evaluation.
- * All theory papers are of 100 marks (70% external and 30% internal).
- * Each Theory Paper will have five units.
- * Project work will be assigned to students by the faculties of the department depending upon the availability of facilities and infrastructure of the department. Evaluation will be assessed jointly by internal and external examiners. In the absence of external examiner, the examination committee of the college may appoint a faculty member as an examiner.
- *Credits: - Theory: 1 Credit = 15 hrs
 Practical: 1 Credit = 30 hrs

SEMESTER I

Course No: **BOT-101** **BIODIVERSITY I (Bacteria, Algae, Fungi and Viruses)**

UNIT 1: **Origin and Evolution of Biodiversity**

General account on Darwin's theory of evolution; The evolution of populations; Concepts of species; Mechanism of speciation.

Three Domains of life—Archaea, Bacteria and Eukaryota;

Evolutionary relationship among the three domains.

11 HOURS

UNIT II: **Bacteriology**

Ultra structure of bacterial cell

Comparison of Archaeobacteria and Eubacteria

Gram positive and Gram negative Bacteria

Bergey's Classification of Bacteria

Shapes of bacteria

Reproduction- vegetative, asexual, sexual (conjugation, transformation and transduction)

Bacterial genome and plasmid

Economic importance of Bacteria

12 HOURS

UNIT III: **Phycology**

Cyanobacteria: Cell structure, thallus organization,

Structure and life history of *Nostoc* and *Anabaena*.

Outlines of Fritsch's classification of algae

Types of alternation of generation

Range of vegetative and reproductions in Chlorophyceae, Xanthophyceae, Phaeophyceae and Rhodophyceae

Important features of life cycle of *Oedogonium*, *Vaucheria*, *Ectocarpus*, and *Polysiphonia*

Economic importance of Algae

13 HOURS

UNIT IV: **Mycology**

General characters and classification of Fungi

Range of vegetative structure and reproduction in fungi

Important features of life cycle of *Pythium*, *Erysiphe*, *Aspergillus*, *Puccinia*, *Agaricus*, and *Alternaria*.

General account of Lichens

Mycorrhizae,

13 HOURS

UNIT V: **Virology**

Discovery of Virus

Replication, lytic (T4 phage) and Lysogenic cycle (Lambda phage);

Types-DNA virus (coliphage T32), RNA virus (TMV), Retro virus (HIV);

Viriods and Prions

11 HOURS

Suggested Readings:

- 1) Alexopoulos C.J and MIMS C.V 1988. **Introductory Mycology**, John Wiley and Sons.
- 2) Bold, H.C. and Wayne, M.J. 1996 **Introduction to Algae (2nd Edition)**. Prentice Hall, Inc. Englewood Cliffs, New Jersey.
- 3) Campbell, N.A. and Reece, J. B. (2008) **Biology 8th edition**, Pearson Benjamin Cummings, San Francisco.
- 4) Dubey R C and D K Maheswary : **A Text Book of Microbiology** : S Chand and Co New Delhi,
- 5) Lee, R.E. 2008. **Phycology, Fourth Edition**, Cambridge University Press, USA.
- 6) Pandey and Trivedi - **A text book of Fungi, Bacteria and Virus** Vikas Publishing House, New Delhi.
- 7) Pelczar, M.J. (2001) **Microbiology, 5th edition**, Tata Mc Graw-Hill Co, New Delhi.
- 8) Prescott, L. Harley, J. and Klein, D. (2005) **Microbiology, 6th edition**, Tata Mc Graw-Hill Co. New Delhi.
- 9) Raven, P.H *et al* (2006) **Biology 7th edition** Tata McGrawHill Publications, New Delhi
- 10) Sambamurthy, AVSS. 2006. **A Textbook of Algae**. I. K. International Pvt. Ltd., New Delhi.
- 11) Thakur Anil K, Bassi Susheel K, **Diversity of microbes and Cryptogams**. S. Chand and Company, New Delhi
- 12) Van den Hoek, C.; Mann, D.J. and Jahns, H.M. 1995. **Algae: An introduction to Phycology**. Cambridge Univ. Press.
- 13) Webster, J. and Weber, R. 2007 **Introduction to Fungi. 3rd edition**, Cambridge University Press, Cambridge.

PRACTICALS

Course No: **BOT-102** **BIODIVERSITY I (Bacteria, Algae, Fungi and Viruses)**

Section A

30 HOURS

1. Introduction on handling and maintenance of laboratory equipments
2. Types of bacteria from temporary/permanent slides.
3. Gram staining of bacteria from root nodules and curd.
4. Models of viruses and virus infected plants.

Section B

1. Introduction on techniques of slide preparation, stain preparation and staining.
2. Study of vegetative and reproductive structure of
 - i. *Chlamydomas*
 - ii. *Oedogonium*
 - iii. *Chara*
 - iv. *Ectocapus*
 - v. *Puccinia*
 - vi. *Pythium* ,
 - vii. *Erysiphe*,
 - viii. *Pezizia/Agaricus*
3. Study of types of lichens
4. Study of Mycorrhizae

Corse No: **BOT-103**

MICROBIOLOGY AND PLANT PATHOLOGY

UNIT 1: Introduction to Microbiology

History and Development of Microbiology; the microscope, spontaneous generation, biogenesis, fermentation, germ theory of diseases

Culture technique;

Microbial Nutrition

Growth Curve

Measurement of growth

Scope of microbiology

6 HOURS

UNIT II: Soil and water Microbiology

Soil microbiology: Role of microbes in decomposition of organic matter,

Nitrogen cycle (Symbiotic and non-symbiotic biological nitrogen fixation)

Role of microbes in Agriculture (biofertilizer and biopesticide).

Water microbiology;

Sewage treatment and Purification of water

6 HOURS

UNIT III: Application of Microbiology

Industrial application of microbes

Antibiotics (History, types, Mode of action and Production),

Microbiology of fermented food (Dairy products, alcoholic beverages), Probiotics.

Basic concept of food spoilage and food preservation.

6 HOURS

UNIT IV: Plant Pathology

History of Plant pathology

Classification of plant diseases (Koch's Postulate)

Host Parasite interaction and defense mechanisms (Histological, Physiological, Biochemical)

Mechanism of infection; transmission and dissemination of disease

Control of plant diseases (Physical, Chemical and Biological)

6 HOURS

UNIT V: Plant diseases

Disease symptoms; disease cycle and control measures of

- i. Late and Early Blight of Potato.
- ii. Blast disease of Rice,
- iii. Citrus canker,
- iv. Bacterial leaf spots
- v. Tea Rust, and
- vi. Wheat Rust.

6 HOURS

Suggested Readings:

- 1) Agrios, G.N. 1997 ***Plant Pathology***, 4th edition, Academic Press, U.K.
 - 2) Dubay R.C. and D.K. Maheswari 2000. ***A Textbook of Microbiology***, Chand and Co, New Delhi.
 - 3) Frazier W.C. 1998. ***Food Microbiology***, Prentice Hall of India, Pvt. Ltd.
 - 4) Kumar H.D. and S. Kumar. 1998. ***Modern Concepts of Microbiology*** Tata McGraw Hill, Delhi.
 - 5) Mckane, L. and K. Judy. 1996. ***Microbiology: Essentials and Applications***. McGraw Hill, New York.
 - 6) Mehotra RS 1995 ***Plant Pathology 12th Edition*** Tata Mc Graw-Hill Co, New Delhi
 - 7) Mishra RR 1996 ***Soil Microbiology*** CBS Publication.
 - 8) Pelczar, M.J. (2001) ***Microbiology***, 5th edition, Tata Mc Graw-Hill Co, New Delhi.
 - 9) Presscott, L. Harley, J. and Klein, D. (2005) ***Microbiology***, 6th edition, Tata Mc Graw-Hill Co. New Delhi.
 - 10) Rangaswami, R and C.K.J. Paniker. 1998. *Textbook of Microbiology*, Orient Longman.
 - 11) Sharma P.D., 2004. ***Microbiology and Plant Pathology*** Rastogi Publication.
 - 12) Singh, R.S. 1998 ***Plant Diseases***. 7th edition, Oxford and IBH, New Delhi
 - 13) Wheeler B.E J 1992, *An Introduction to Plant Diseases*, Oxford and IBH.
- Rengasamy G. *Diseases of Crop Plants of India*, Prentice Hall.

PRACTICALS

Course No: **BOT-104**

MICROBIOLOGY AND PLANT PATHOLOGY

SECTION A

30 HOURS

1. Techniques on cleaning and Sterilization of equipments.
2. Preparation of media (Potato-dextrose- Agar and Rose Bengal Agar Media)
3. Preparation of Slant and pour plates
4. Inoculation of microbes from soil and water by serial dilution.
5. Determination of microbial population by haemocytometer.
6. Study of Gram positive and Gram negative bacteria.

Section B

1. Preparation of stains and staining technique.
2. Technique on microscopy
3. Technique on permanent slide preparation.
4. Study of diseased specimens prescribed in the theory paper by temporary and permanent slide preparation.
5. Collection, identification and submission of atleast 5 diseased specimen.

SEMESTER II

Course No: **BOT-201** **BIODIVERSITY II (Archegoniatae) AND PALAEOBOTANY**

UNIT 1: BRYOLOGY

General characteristic of Bryophytes
Classification of Bryophytes (Proskauer, 1957)
Distribution, Structure (Morphological and anatomical), reproduction, life cycle and affinities of following: *Marchantia* (Hepaticopsida), *Anthoceros* (Anthocerotopsida), *Funaria* (Bryopsida)
Economic importance of Bryophytes

12 HOURS

UNIT II: PTERIDOLOGY

General account of Pteridophytes
Origin, Telome theory
General Classification
Evolution of stele,
Heterospory and Seeds habit
Life cycle of *Psilotum*, *Selaginella*, *Equisetum* and *Marsilea*.

12 HOURS

UNIT III: GYMNOSPERM

General account,
Classification of Gymnosperms (Sporne's, 1965)
Morphology and Anatomy of *Cycas*, *Pinus* and *Gnetum*.
Economic importance of Gymnosperms

12 HOURS

UNIT IV: REPRODUCTION IN GYMNOSPERM

Reproduction of *Cycas*, *Pinus* and *Gnetum*.
Affinities of Gymnosperms with Pteridophytes and Angiosperms

12 HOURS

UNIT V: PALAEOBOTANY

Geological time scale
Fossil types and their formation,
General account of dominant fossil flora of different ages,
Palaeobotany in relation to exploration of fossil fuels

12 HOURS

Suggested Readings:

BRYOPHYTES

- 1) Campbell H.D, 1940, *The Evolution of land plants (Embryophyta)*, Univ. Press, Stanford.
- 2) Chopra R.N. and P.K. Kumar, 1988, *Biology of Bryophytes*. Wiley Eastern Ltd. New Delhi.
- 3) Parihar, N.S. *An Introduction to Bryophyta* Central Book Depot, Allhabad, 1965.
- 4) Shaw.J.A. and Goffinet B., 2000, *Bryophyte Biology*, Cambridge University Press.
- 5) Smith G.M. 1938, Cryptogramic Botany Vol.II. *Bryophytes and Pteridophytes*. Mc Graw Hill Book Company, London.
- 6) Sporne K.R.,1967, *The Morphology of Bryophytes*. Hutchinson University Library, London.

- 7) Vasishta B.R. **Bryophyta**. S. Chand and Co. New Delhi.
- 8) Watson E.V. 1971, **The structure and life of Bryophytes**. Hutchinson University Library, London.

PTERIDOPHYTES

- 1) Bierhorst, D.W 1971 **Morphology of Vascular Plants** MacMillan Co., N.Y. & Collier-MacMillan Ltd., London.
- 2) Parihar, N.S. 1996. **The Biology and Morphology of Pteridophytes**. Central Book Depot, Allahabad.
- 3) Sharma, O.P 1990 **Textbook of Pteridophyta** MacMillan India Ltd., Delhi
- 4) Sporne, K.R. 1970 **The Morphology of Pteridophytes** (The Structure of Ferns and Allied Plants) Hutchinson University Library, London
- 5) Sundara Rajan, S. 1994 **Introduction to Pteridophyta** New Age International Publishers Ltd., Wiley Eastern Ltd., New Delhi,
- 6) Vashista, P.C. 1997 **Botany for Degree Students-Pteridophyta**. S. Chand & Co., New Delhi,
- 7) Zashhed, A 1999 **An Introduction to Pteridophyta** Vikas publishing Co., New Delhi,

GYMNOSPERMS

- 1) Bhatnagar, S.P and Alok Moitra 1997 **Gymnosperms** New Age International (P)Ltd., Publisher, New Delhi,
- 2) Sharma, O.P. 1997 **Gymnosperms** Pragati Prakashan, Meerut, India.
- 3) Sporne K.R. 1967, **The Morphology of Gymnosperms**, Hutchinson and Co. Ltd. London.
- 4) Sreevastava H.N. 1980, **A Text Book of Gymnosperms**. S. Chand and Co. Ltd., New Delhi.
- 5) Srivastava, H.N.1998 **Gymnosperms** Pradeep Publications, Jalandhar, India-
- 6) Vashista, P.C. 1996 **Botany for Degree Students – Gymnosperms (2nd Edition)** S. Chand & Co., New Delhi
- 7) Vasishta P.C. 1980, **Gymnosperms**. S. Chand and Co., Ltd., New Delhi.

PALAEOBOTANY

- 1) Clark DL 1976 **Fossils, Palaeobotany and Evolution** W.M.C. Brown Company New York.
- 2) Meyen SV., 1978 **Fundamentals of Palaeobotany** Chapman and Hall London
- 3) Misra SP and Shukla AC 1982 **Essentials of Palaeobotany** Vikas Publishing House, New Delhi
- 4) Steward WN and Rothwell GW 1993 **Palaeobotany and the Evolution of Plants** Publ. Cambridge University Press, London
- 5) Surnage KR 1966 **Indian Fossil Pteridophytes** C.S.I.R. New Delhi
- 6) Thomas BA and Spice RA 1986 **The Evolution and Palaeobotany of land Plants** Publ Crom Helm London & Sydney

PRACTICALS

Course No: **BOT-202** **BIODIVERSITY II (Archegoniatae) AND PALAEOBOTANY**
30 HOURS

Preparation of stain

Single and Double staining technique

Technique on preparation of permanent slide

Study of habit, Vegetative thallus organization and structure, reproductive structures of the following taxa through temporary mounts and permanent slides

Bryophytes: *Riccia*, *Marchantia*, *Anthoceros*.

Pteridophytes: *Psilotum*, *Selaginella*, *Equisetum*, *Marsilea*,

Gymnosperm: *Cycas* (coralloid root, T.S. of coralloid root, T.S. of leaflet, petiole, male cone and L.S. of male cone, microsporophyll, megasporophyll, T.S. of microsporophyll, ovule, L.S. of ovule and seed.)

Pinus (T.S. of stem and needle, male cone and female cone, L.S. of male cone and female cone, seed)

Gnetum (Stem T.S., leaf T.S., male and female cones, L.S. of ovule, seed)

Study of fossil specimens

Course No: BOT-203

REPRODUCTIVE BOTANY (Embryology and Palynology)

UNIT 1: INTRODUCTION AND ANTHER

History and Scope of embryology
Typical Angiosperm Flower
Structure of stamen
Microsporogenesis
Microgametogenesis
Dehiscence

6 HOURS

UNIT II: OVULE AND EMBRYOGENY

Structure of carpel
Types of Ovule
Megasporesogenesis,
Megagametogenesis (monosporic, bisporic and tetrasporic types).
Structure of typical embryo sac, (Polygonum, Allium and Adoxa type)

6 HOURS

UNIT III: POLLINATION AND FERTILIZATION

Pollination,
Pollen tube entry (Types)
Syngamy and triple fusion,
Double fertilization
Development of Endosperm

6 HOURS

UNIT IV: POST-FERTILIZATION

Types of endosperm
Haustoria
Functions of suspensors and synergids,
Apomixis
Polyembryony.
Fruit-development and maturation

6 HOURS

UNIT V: PALYNOLOGY

Pollen- pistil interaction,
Compatibility and incompatibility
Types of Pollen production and dispersion in time and space,
Pollen/spore morphology and its role in taxonomy
Pollen allergy.

6 HOURS

Suggested Readings

- 1) Bhojwani, S.S. and Bhatnagar SP 2004 *The Embryology of Angiosperms*, Vikas Publishing House
- 2) Davis C.L. 1965. *Systematic Embryology of Angiosperms*. John Wiley, New York.
- 3) Eames M.S 1960. *Morphology of Angiosperms* Mc Graw Hill New York.

- 4) Erdtman G 1952. **Pollen Morphology and plant Taxonomy Part I.** Almquist & Wicksell Stockholm
- 5) Erdtman G 1969. **Hand Book of Palynology.** National Botanical Gardens Publication, Lucknow
- 6) Johri BD 1984 (ed.) **Embryology of Angiosperms** Springer Verlag, Berlin.
- 7) Johri, B.M. 1984 **Embryology of Angiosperms**, Springer-Verlag, Netherlands.
- 8) Maheswari P. 1985. **Introduction to Embryology of Angiosperms** Mac Graw Hill, New York. House (P) Ltd.
- 9) Nair P .K .K **Pollen Morphology of Angiosperms** Scholar Pub: House, Lucknow
- 10) Raghavan, V. 1997 **Molecular embryology of flowering plants.** Cambridge, University Press.
- 11) Raghavan, V. 2000 **Developmental Biology of Flowering plants**, Springer, Netherlands.
- 12) Shivanna, K.R. 2003 **Pollen Biology and Biotechnology**, Science Publishers.

PRACTICALS

Course No: **BOT-204** **REPRODUCTIVE BOTANY (Embryology and Palynology)**

30 HOURS

1. Study the types of ovules
2. Study female gametophyte through permanent slides/ photographs: types and ultrastructure of mature embryo sac.
3. Study of dicot and monocot embryo of Angiosperms
4. Study of the different stages of anther development.
5. Study the pollen morphology of available plants by acetolytic method.
6. Pollen germination test.
 - a. in vitro germination using sugar solution. (cavity slide method)
 - b. Tetrazolium test
7. Dissect and display different stages of embryo development
8. Dissections of developing seeds for endosperm with haustoria types (temporary slides).

SEMESTER III

Course No: **BOT-301 MORPHOLOGY, ANATOMY AND ANGIOSPERMIC TAXONOMY**

UNIT 1: VEGETATIVE MORPHOLOGY

Plant Habit

Root: Types, Modification for Storage, physiological and mechanical purposes.

Stem: Habit, types modification of stem for food, mechanical and underground modification of stem.

Leaves: Types, phyllotaxy, Venation, lamina; parts, shapes and modifications, leaf surface features and appendages.

Fruits: Structure, types and classification with examples

Detail Seed structure: dicot and monocot, albuminous and exalbuminous.

11 HOURS

UNIT II: FLORAL MORPHOLOGY

Types of inflorescence and specialized inflorescence

Flower: Flower as a modified shoot

Detailed structure of flowers

Floral parts, arrangement, relative position, numeric plan, cohesion and adhesion of floral parts,

Types of aestivation and placentation

Floral diagram and floral formulae

10 HOURS

UNIT III: PLANT ANATOMY-TISSUES

Classification and structure of tissues;

Simple tissue: Structure occurrence and function (parenchyma, collenchyma, sclerenchyma)

Complex tissues Definition Structure, Origin and function (Xylem & Phloem, tracheary elements and Sieve elements)

Secretory tissues: (glands, glandular hairs, nectaries, hydathodes, schizogenous and lysigenous ducts, resin ducts, mucilage ducts, kinoveins, laticifers)

Vascular bundle: Types (conjoint, collateral, bi-collateral, open closed, radial, concentric amphicribal and amphivasal.)

Stomatal complex

13 HOURS

UNIT IV: PLANT ANATOMY-STEMS AND ROOTS

Shoots: Theories on apical organisation (Apical cell theory, Histogen theory, Tunica-corpus theory)

Shoot chimeras

Arrangement of primary tissues in the Dicots and Monocots stem and leaves

Secondary growth and anomalous secondary growth (Amaranthus, Mirabilis and Dracaena.)

Roots: Organization of root apex (apical cell theory, Korper-kappe theory)

Root cap;

Arrangement of primary tissues in the Dicots and Monocots roots

Secondary growth in roots

12 HOURS

UNIT V: ANGIOSPERMIC TAXONOMY

Principles of systematic

Concept of species, genus and family

Nomenclature

Overview on types of classification; Sexual, natural, phylogenetical and modern system of classification

Comparative study of classification systems of

- i. Bentham and Hooker,
- ii. Engler and Prantle
- iii. and Hutchinson.

Taxonomic studies of the following families (Bentham and Hooker)

Dicots: Rununculaceae, Malvaceae, Leguminaceae, Compositaceae, Solanaceae, Cucurbitaceae

Monocots: Orchidaceae, Gramminae

14 HOURS

Suggested Readings:

1. Cronquist, A. (1981). *An Integrated System of Classification of Flowering Plants*. Columbia University Press, New York.
2. Datta S C., 1988 *Systematic Botany*, 4th Ed, Wiley Estern Ltd., New Delhi
3. Eames A. J. 1981 *Morphology of Angiosperms* - McGraw Hill, New York.
4. George, H.M. Lawrence. 1951. *Introduction to Plant Taxonomy*. Mac Millan comp. Ltd., New York.
5. Gifford EM. And Foster AS., 1989 *Morphology and Evolution of Vascular Plants* W.H.Freeman, New York
6. Naik V.N., 1991 *Taxonomy of Angiosperms* Tata McGraw-Hill Pub. Co. Ltd., New Delhi.
7. Pandey, S. N, and S.P. Misra (2008) *Taxonomy of Angiosperms* Ane Books India, New Delhi.
8. Prithipalsingh (2007), *An introduction to Biodiversity*, Ane books India, Delhi.
9. Simpson, M.G. 2006. *Plant Systematics*. Elsevier Academic Press, London
10. Singh G.1999. *Plant systematics: Theory and Practice*. Oxford and IBH Pvt.Ltd.New Delhi.
11. Sivarajan V. V - *Introduction to Principles of taxonomy* Oxford &I B H New Delhi.
12. Stussy, T.F. 1990. *Plant Taxonomy*, Columbia University Press, USA.
13. Takhtajan *Flowering Plants* Edinburg, Oliver & Boyd.
14. Vashishta P. C *Taxonomy of Angiosperms* Chand & Co, Meerut.
15. Vasudevan Nair, R *Taxonomy of Angiosperms* APH Pub. New Delhi
16. Cuttler, E.G. 1971. *Plant Anatomy, Part III Organs* Edward Arnold Ltd., London.
17. Cuttler, EG. 1969. *Plant Anatomy Part I Cells & Tissue*. Edward Arnold Ltd., London.
18. Eames, AJ and LH MacDaniels 1987 *An Introduction to Plant Anatomy*. Tata MacGraw-Hill Publishing company Ltd. New Delhi.
19. Esau k 1985 *Plant Anatomy 2nd Edition* Wiley Eastern, New Delhi.
20. Fahn A 1997 *Plant Anatomy* Aditya Books (P) Ltd. New Delhi.
21. Fahn A 2000. *Plant Anatomy*. Permagon Press.
22. Sen DN 1974. *Anatomy of Angiosperms*. S. Nagini & Co.
23. Vasishta P.C. 1974. *Plant Anatomy*, Pradeep Publication, Jalandhar.

PRACTICALS

Course No: **BOT-302 MORPHOLOGY, ANATOMY AND ANGIOSPERMIC TAXONOMY**
30 HOURS

Study of vegetative and floral characters of species of the families studied in theory.

Identification of selected taxa upto Genus using taxonomic keys.

Herbarium technique

Familiarity with local flora and preparation of herbarium sheet

Microscopic studies on: types of stomata, (Monocot and dicot)

Anatomical study of stem and root (Dicots and Monocots) by making double stained temporary/permanent slides

Anatomical studies of anomalous secondary structure in stem of *Mirabilis*, *Bignonia*, *Bougainvillea* and *Dracaena* by making double stained permanent slides

Course No: **BOT-303 ETHNOBOTANY, ECONOMIC BOTANY AND BIOMETRIC**

UNIT 1: ETHNOBOTANY

Ethnobotany and its significance,

Study and Classification of some plants used by tribals of North-Eastern India as

- i. food,
- ii. clothing
- iii. shelter, and
- iv. medicines.

6 HOURS

UNIT II: ECONOMIC BOTANY I

Plants for man –

- i. Cereals
- ii. Pulses
- iii. Fibres
- iv. fats and
- v. oils
- vi. spices and condiments,
- vii. beverages

6 HOURS

UNIT III: ECONOMIC BOTANY II

Origin and cultivation of

- i. Rice
- ii. Jute
- iii. Sugarcane
- iv. Mustard
- v. Potato.

History, cultivation and processing of

- i. Tea and
- ii. Rubber.

6 HOURS

UNIT IV: ECONOMIC BOTANY III

Characteristics and uses of timber yielding plants

- i. Teak
- ii. Sal
- iii. Bamboo

A general account and identification of locally available plants used as

- i. Spices
- ii. fruits and
- iii. ornamentals.

6 HOURS

UNIT V: BIOMETRICS

Collection of data,

Sampling theory and methods; mean, mode, median.

Standard deviation and standard error

Coefficient of variation, probability, addition, and multiplication laws, normal and binomial distribution

t- test and chi-square test

6 HOURS

Suggested Readings

- 1) Arora PN and PK Malhan, 2002 **Biostatistics** Himalaya Publishing House
- 2) Ashok Bendre and Ashok Kumar 1998-99 **Economic Botany** Rastogi Publications, Meerut, India
- 3) Edmondson A and D. Druce 1996 **Advanced Biology Statistics** Oxford University Press
- 4) Govinda Praksh and Sharma SK 1975 **Introductory Economic Botany** Jai Prakash Nath & Cosec Meerut, India
- 5) Gupta, S.K. and Kaushik MP 1973 **An Introduction to Economic Botany** K. Nath & Co., Meerut, India
- 6) Hill AW 1952 **Economic Botany** McGraw Hill Book Co., New York
- 7) Jain SK 1981 **Glimpses of Indian Ethnobotany** Oxford & IBH, New Delhi
- 8) Jain SK 1987 **A Manual on Ethnobotany** Scientific Publisher Jodhpur
- 9) Jain SK and Mundgal 1999 **Handbook of Ethnobotany** London
- 10) Mandal and Nambiar **Agricultural Statistics**, Agrobios Publications, Jodhpur
- 11) Palanichamy S and Manoharan M **Statistical methods for Biologists**, Palani Paramount publications, New Delhi
- 12) Pandey BP 2000 **Economic Botany** S. Chand & Co., New Delhi
- 13) Parihar P **Biostatistics & Biometry**, Agrobios Publications, Jodhpur
- 14) Ramakrishnan N. **Fundamentals of Biostatistics**, Sarao Publications, Naaagercoil
- 15) Sambamurthy, AVVS and Subrahmanyam, NS 1989 **A Text Book of Economic Botany** Wiley Eastern Ltd., New Delhi,
- 16) Sen. S 1992 **Economic botany** New Central Book Agency, Calcutta
- 17) Verma, V 1974 **A Text Book of Economic Botany** Emkay Publications, New Delhi

PRACTICALS

Corse No: **BOT-304** **ETHNOBOTANY, ECONOMIC BOTANY AND BIOMETRIC**

30 HOURS

- 1) Submission of economically important plants and plants products (Cereals, Pulses, Spices, Fibers and Condiments)
- 2) Field trip to important place
- 3) Collection, description and Submission of at least 5 plants of ethnobotanical Importance
- 4) Work out problems on measures of central tendencies, measures of dispersion.

SEMESTER IV

Course No: **BOT-401** **PLANT PHYSIOLOGY AND ECOLOGY**

UNIT 1: UNIT 1: PLANT WATER RELATIONS AND MINERAL NUTRITION

Structure and properties of water

Absorption of water (active and passive),

Ascent of sap; Pathway of water movement; concepts of symplast and apoplast,

Guttation and transpiration, Significance of transpiration

Physiology role of stomata

Macro and Micro nutrients; Role of essential nutrients in plant metabolism and their deficiency symptoms.

Absorption of mineral elements-

- i. Active and passive absorption
- ii. Simple and facilitated diffusion
- iii. Donnan equilibrium
- iv. Role of ATP,
- v. Carrier systems, proton pump and ion flux

Outline of Nitrogen fixation and Nitrogen Assimilation,

Transamination and deamination,

12 HOURS

UNIT II: PHOTOSYNTHESIS AND RESPIRATION

Definition and Significance

Site of photosynthesis,

Photochemical phase

- i. Electron transport chain.
- ii. Photophosphorylation- (cyclic and non cyclic)
- iii. Z Scheme of Photosynthetic Electron Transfer

Biosynthetic phase,

- i. Benson and Calvin cycle
- ii. Hatch and Slack pathway
- iii. Crassulacean acid metabolism
- iv. Photorespiration

Law of limiting factors.

Source sink relationship. Mechanism of phloem transport. Phloem loading and unloading

Glycolysis

Oxidative decarboxylation of pyruvate into acetyl CoA

TCA cycle

Oxidative phosphorylation, and factors affecting oxidative processes

14 HOURS

UNIT III: PLANT GROWTH AND DEVELOPMENT

Physiological effect of Auxin. Cytokinins, Gibberellins and Ethylene and their role in plant development.

Physiology of senescence and abscission

Brief outlines on

- i. Photoperiodism
- ii. Vernalization.
- iii. Phytochrome,

10 HOURS

UNIT IV: **ECOLOGY**

Basic concept of Ecology

Ecological factors, (Light, Temperature, Moisture, Edaphic, Physiographic and Biotic,)

Ecological adaptations of Hydrophytes, Xerophytes, Epiphytes and Halophytes.

Community structure (Qualitative analytic and synthetic characters) and development (Primary and secondary succession)

Productivity (Primary and secondary productivity)

Trophic structure, trophic levels and ecological pyramid.

12 HOURS

UNIT V: **BIODIVERSITY**

Biodiversity, Hotspots, keystone species, flagship species

Values of biodiversity, equitability

Attributes of population,

Population growth and interaction.

Air and water pollution and their abatement.

Phytogeographic regions of India with special reference to North East India.

12 HOURS

Suggested Readings:

- 1) Daubenmier, R.F. 1970, *Plant Communities*, Wiley Eastern Private Limited
- 2) Daubenmier, RF.1970. *Plants and Environment: A text book of Plant Autoecology*, Wiley Eastern Private Limited
- 3) Dennis, D.T., Layzell, D.B., Lefebvre, D.D. and Turpin, D.H. (1997) *Plant Metabolism*. Addison Wesley Longman.
- 4) Hopkins, W.G. and Huner, P.A. (2008) *Introduction to Plant Physiology*. John Wiley and Sons.
- 5) Kandya AK and Gupta A 2007 *Advancing frontiers of Ecological Researches in India*
- 6) Kaul RP (2009) *Plant Metabolism*. Swastik Publishers and Distributors.
- 7) Koromondy EJ 1996 *Concepts of Ecology 4th Edition* Prentice-Hall of India Pvt. Ltd. New Delhi
- 8) Misra KC 1988 *Manuals of Plant Ecology (3rd Edition)* Oxford and IBH Publishing Co., New Delhi.
- 9) Mukherjee S., Ghosh AK., 2006 *Plant Physiology* New Central Book Agency Calcutta
- 10) Nelson, D.L., Cox, M.M. (2004) Lehninger *Principles of Biochemistry, 4th Edition*, WH Freeman and Company, New York, USA.
- 11) Odum EP 1983 *Basic Ecology 5th Edition* Thomson Business International Waldis Pvt Ltd. Baricahd
- 12) Odum, EP. (2008) *Ecology*. Oxford and IBH Publisher.

- 13) Salisbury, F.B. and Ross, C.W. (1991) **Plant Physiology**, Wadsworth Publishing Co. Ltd.
- 14) Sharma, P.D. (2010) **Ecology and Environment, (8th Edition)** Rastogi Publications, Meerut.
- 15) Singh, JS., Singh, SP. and Gupta, S. 2006 **Ecology Environment and Resource Conservation** Anamaya Publications, New Delhi
- 16) Sinha RK., 2007 **Modern Plant Physiology** 2nd Edition Tata McGraw, New Delhi.
- 17) Taiz, L. and Zeiger, E. (2006) **Plant Physiology**, 4th Edition Sinauer Associates Inc. Publishers, Massachusetts, USA
- 18) Wilkinson, D.M. 2007. **Fundamental Processes in Ecology. An Earth System Approach.** Oxford.

PRACTICALS

Course No: **BOT-402** **PLANT PHYSIOLOGY AND ECOLOGY** **30 HOURS**

PHYSIOLOGY

1. Preparation of solutions of various concentrations of a few selected solutes.
2. Study of transpiration rate in dorsiventral and isobilateral leaves by Blackman's apparatus.
3. Separation of plant pigments by paper chromatography.
4. Determination of photosynthetic activity by Wrinkler's method.
5. Calculation of the stomatal index, stomatal frequency and percentage of leaf area open through stomata in a mesophyte and a xerophytes.
6. Study of the mechanism of stomatal opening and closing
7. Rate of photosynthesis under varying HCO_3^- concentration in an aquatic plant using bicarbonate and to find out the optimum and toxic concentration.

ECOLOGY

1. Study of adaptive anatomical and morphological features of Hydrophyte, Epiphytes and Xerophytes
2. Study of Soil pH
3. Estimation of soil carbonate content by qualitative method
4. Determination of requisite size and number of quadrat for the study of plant community
5. Study of structure of plant community by determining frequency, density and abundance of quadrat method.

,

Course No: **BOT-403 ENVIRONMENTAL BIOLOGY AND PHYTOGEOGRAPHY**

UNIT 1: INTRODUCTION

Environmental Biology

Dynamics of environment and interaction among various environmental factors.

Concept on carrying capacity, biological diversity and ecological stability.

General idea of natural resources

- v. forest,
- vi. grassland
- vii. water and
- viii. energy

Productivity of natural and agro-ecosystem,

6 HOURS

UNIT II: MAN AND ENVIRONMENT

Man in the environment: utilization of resources and its effect on environment

- i. Greenhouse effect and global warming;
- ii. climate change;
- iii. ozone layer
- iv. Depletion of forests;
- v. Loss of biodiversity and extinction of species, Red data book

Efforts to control these effects (Vienna Convention, Montreal Protocol, Earth summit, Kyoto Protocol, World Summit on sustainable development, 2002 Carbon trade);
IPCC

6 HOURS

UNIT III: ENVIRONMENTAL MANAGEMENT

Concept and principles of environmental management

Principle of optimized use and sustainable development,

Threats to sustainable development

Ecological footprint,

National Environmental Policy

Management of

- i. Forest and
- ii. degraded lands

6 HOURS

UNIT IV: CONSERVATION BIOLOGY

Concepts and Principles of Environmental Management

Social forestry and Joint forestry Management

Convention on Biological diversity

National Parks

Wildlife Sanctuaries

Biosphere Reserves

6 HOURS

UNIT V: PHYTOGEOGRAPHY

Definition, scope and importance of Phytogeography

Dispersal of plants (Wind, water, Ice, Animals, Mechanical and Human factors)

Barriers to plants dispersal

Floristic regions of India, Endemism

6 HOURS

Suggested Readings

- 1) Chapman, J.L., Reiss, M.J. 1999. **Ecology: Principles and applications (2nd edition)** Cambridge University Press.
- 2) Cunningham W.P. and M.A. Cunningham 2003. **Principles of Environmental Science: Inquiry and Applications.** Tata McGraw Hill Pub. New Delhi
- 3) Divan Rosencraz, **Environmental laws and policies in India**, Oxford Publication.
- 4) Dix J.H. 1989 **Environmental Pollution Atmosphere, Land, Water and Noise.** Wiley Chichester.
- 5) Ghosh, S.K., Singh, R. 2003. **Social forestry and forest management.** Global Vision Publishing House.
- 6) Good, R 1997 **The Geography of flowering Plants (2nd Edition)** Allied Science Publishers, New Delhi
- 7) Joseph, B., **Environmental studies** Tata McGraw Hill.
- 8) Khitoliya R.K. 2007. **Environmental Pollution – Management and Control for Sustainable development** S. Chand and Company Ltd., New Delhi.
- 9) Mathur HS 2003 **Essentials of Biogeography** Pointer Publisher, Jaipur.
- 10) Michael Allabay **Basics of environmental science**, Routledge Press.
- 11) Miller, G.T. 2002. **Sustaining the earth, an integrated approach. (5th Edition)** Books/Cole, Thompson Learning, Inc.
- 12) Mishra DD 2008. **Fundamental Concepts in Environmental Studies.** S. Chand & Co.,
- 13) Mishra SP and S.N. Pandey 2008. **Essential Environmental Studies.** Ane Books Pvt. Ltd. Thiruvananthapuram.
- 14) Rana SVS, **Environmental Pollution – health and toxicology**, Narosa Publication.
- 15) Ronald Good, 1947. **The Geography of Flowering Plants.** Longmans, Green and Co, New York
- 16) Sharma PD, 2009, **Ecology and Environment**, Rastogi Publications, Meerut
- 17) Singh, J.S., Singh, S.P. and Gupta, S. 2006 **Ecology Environment and Resource Conservation** Anamaya Publications, New Delhi
- 18) Sinha, S. 2010. **Handbook on Wildlife Law Enforcement in India.** TRAFFIC, India.
- 19) Thakur IS, **Environmental Biotechnology**, I K Publication.

PRACTICALS

Course No: **BOT-404 ENVIRONMENTAL BIOLOGY AND PHYTOGEOGRAPHY**
30 HOURS

- 1) Study of the spatial and temporal variation in climatic factors; Light, temperature and relative humidity.
- 2) Determine the B.O.D of pond or stream water sample
- 3) Field trip to a National Park/Biosphere reserve/Wild life Sanctuary (Student should submit a detailed project report based on the field trip. Evaluation of the project will be based on the detailed report and presentation)
- 4) Project work on a particular ecosystem/Polluted Site/ Level of Pollution in the City or Town/Land use site.

SEMESTER V

Course No: **BOT-501** **BIOCHEMISTRY AND PLANT BREEDING**

UNIT 1: CONCEPT OF BIOCHEMISTRY

Biomolecules (The primordial biomolecules, the origin of biomolecules, the fitness of biomolecules, Hierarchy of Biomolecules)

The laws of thermodynamics

Bioenergetics (Entropy, Free energy change and equilibrium constant Activation energy)

Redox potential

Discovery and structure of ATP

Hydrolysis of ATP and role of ATP in Biological reactions **10 HOURS**

UNIT II: BIOMOLECULES (Carbohydrate)

Carbohydrates- Simple sugars, reducing and non-reducing sugars.

Classification into monosaccharides, oligosaccharides and polysaccharides.

Mutarotation and inversion.

Derivatisation in glycoprotein and Glycolipids

Biosynthesis and degradation of sucrose and starch. **12 HOURS**

UNIT III: BIOMOLECULES (Lipids and Nucleic acids)

Lipids- Classification and structure of lipids

Fatty acids- saturated and unsaturated, triacyl glycerols, phospholipids and sphingolipids

Fatty acids biosynthesis

Oxidation of fatty acids

Storage and mobilization of fatty acids and lipids.

Nucleic acid- Bases, Nucleoside and Nucleotide

Phosphodiester bonds, Hydrogen bonding.

DNA structure: DNA double helix (Watson and Crick model),

Super-coiling, Properties of DNA

Denaturation

Structure of t-RNA **15 HOURS**

UNIT IV: BIOMOLECULES (Proteins)

Proteins- Structure and classification of amino acids based on polarity

Zwitter ion nature; properties of amino acids

Peptide bond formation

Classification and Structure of proteins (Primary, secondary, tertiary and quaternary)

Conformation and Denaturation **11 HOURS**

UNIT V: PLANT BREEDING

Principles of plant breeding

Plant introduction and acclimatization

Hybridization: Technique and Significance

Heterosis

Brief account of

- i. mass selection,
- ii. pure line selection and

- iii. clonal selection.
- iv. Mutation breeding,
- v. Polyploidy breeding.

12 HOURS

Suggested Readings:

1. Berg, J.M., Tymoczko, J.L., Stryer, L. 2006, **Biochemistry 6th Edition**, W.H. Freeman and Company, New York.
2. Buchanan, B., Gruissem, W. and Jones, R. 2000 **Biochemistry and Molecular Biology of Plants** American Society of Plant Biologists.
3. Conn, E.E., Stumpf, P.K. and Bruening, G. 2006 **Outlines of Biochemistry 4th Edition**, John Wiley and Sons Inc.
4. Donald Voet, Judith.G. Voet and Charlotte W. Pratt (2006) **Fundamentals of Biochemistry**, 2nd Edition, John Wiley and Sons Inc.
5. Elliot 2009 **Biochemistry and Molecular Biology** Oxford Publishers.
6. Harper, 2003, **Biochemistry**, McGrawHill.
7. Keith Wilson and John Walker 2005 **Principles and Techniques of Biochemistry and Molecular Biology(6th Edition)**, Cambridge University Press, USA
8. Nelson, D.L., Cox, M.M. 2004 **Lehninger Principles of Biochemistry, 4th edition**, W.H. Freeman and Company, New York, USA.
9. Stryer, L., 2002, **Biochemistry**, W.H. Freeman.
10. Voet & Voet, 2000, **Biochemistry**, John Wiley, New York
11. Wilson K and Walker J., 2008 **Principles and techniques of Biochemistry and Molecular Biology**. Cambridge University Press.
12. Zubay, 1995, **Biochemistry**, Brown Publishers
13. Allard. R.W. 1960 **Principles of Plant breeding**, John Wiley & Sons, Inc, New York.
14. Chaudhari HK. **Elementary Principles of Plant breeding**, Oxford & IBH Publishers.
15. Singh,BD 2005 **Plant Breeding Principles & methods**, Kalyani Publishers, New Delhi.
16. Sinha U. and Sunitha S 2000 **Cytogenetics, Plant breeding & Evolution**, Vikas Publishing House.

PRACTICALS

Course No: **BOT-502**

BIOCHEMISTRY AND PLANT BREEDING

30 HOURS

- 1) Preparation of Molar, Normal and percent solutions
- 2) Preparation of Phosphate buffer.
- 3) Separation of amino acids by paper chromatography
- 4) Identification tests for carbohydrates (Fehling's test, Benedicts test) and proteins (Ninhydrin test, Xanthoproteic test).
- 5) Chemical separation of chloroplast pigments and determination of their absorption spectra.
- 6) Preparation of standard curve for estimation of soluble proteins in plant materials by Bradford method
- 7) To study the effect of various factors (temperature and substrate concentration) on the activity of amylase enzyme
- 8) Separation and identification of amino acids by thin layer chromatography.
- 9) Emasculation, bagging, tagging and pollination in self-pollinated plants.

Course No: **BOT-503 MOLECULAR BIOLOGY AND BIOTECHNOLOGY**

UNIT 1: INTRODUCTION

One Gene one polypeptide concept, The Central Dogma, Semi-conservative replication, DNA double helix (Watson and Crick model), Salient features of double helix, Types of DNA, denaturation and renaturation, Structure of RNA, Mitochondria and chloroplast DNA

5 HOURS

UNIT II: CHROMOSOME

Genome Sequence and Chromosome Diversity, Chromatin structure; Euchromatin, Heterochromatin (Constitutive and Facultative heterochromatin)
Regulation of Chromatin Structure and Nucleosome Assembly.
Organization of Chromosomes, Genetic Code,

4 HOURS

UNIT III: DNA REPLICATION, TRANSCRIPTION AND TRANSLATION

The Replication of DNA (Prokaryotes and Eukaryotes), Mechanism of Transcription in Prokaryotes and Eukaryotes, RNA processing (concept of introns and exons, removal of Introns, spliceosome machinery, splicing pathways, alternative splicing, RNA editing, and mRNA transport)
Various steps in protein synthesis. (aminoacylation of tRNA, translation, Fidelity of translation. Inhibitors of protein synthesis)
Operon Concept (Regulation of gene expression in prokaryotes)

9 HOURS

UNIT IV: BIOTECHNOLOGY

Plant biotechnology; cellular differentiation and totipotency, callus, organogenesis and embryogenesis, artificial seeds. Haploids and its importance. Protoplast isolation and culture, somatic hybridization, clonal propagation, genetic engineering of plant. Vectors for gene delivery, selectable markers and reporter genes, method of gene delivery, *Agrobacterium*-the natural genetic engineering, salient achievements in crop biotechnology(with suitable examples) and prospect.

7 HOURS

UNIT V: MOLECULAR TECHNIQUES

Recombinant DNA technology; restriction endonucleases, Genomic and cDNA libraries Southern and northern blotting, DNA fingerprinting (RFLP, RAPD, AFLP), Polymerase chain reaction, DNA sequencing.

5 HOURS

Suggested Readings

- 1) Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009. *The World of the Cell. 7th Edition*. Pearson Benjamin Cummings Publishing, San Francisco.
- 2) Brown, T. A. *Gene cloning and DNA analysis: An Introduction*. Blackwell Publication.
- 3) Buchanan, B., Gruissem, W. and Jones, R. 2000 *Biochemistry and Molecular Biology of Plants*. American Society of Plant Biologists.
- 4) Chrispeel, M.J. and Sadava, D.E. 1994 *Plants, Genes and Agriculture*. Jones and Barlett Publishers.
- 5) Cooper, G.M. and Hausman, R.E. 2009 *The Cell: A Molecular Approach. 5th edition*. ASM Press & Sunderland, WashinPTon, D.C.; Sinauer Associates, MA.

- 6) De Robertis, E.D.P. and De Robertis, E.M.F. 2006. **Cell and Molecular Biology 8th edition**, Lippincott Williams and Wilkins, Philadelphia.
- 7) Elliot 2009 **Biochemistry and Molecular Biology**. Oxford Publishers.
- 8) Glick, B.R., Pasternak, J.J. 2003. **Molecular Biotechnology: Principles and Applications of recombinant DNA**. ASM Press, WashinPTon.
- 9) Karp, G. 2010. **Cell and Molecular Biology: Concepts and Experiments. 6th edition**. John Wiley & Sons. Inc.
- 10) Lewin 2008, **Genes IX** Jones & Bartlett
- 11) Lodish *et al* 2008 **Molecular Cell Biology** Freeman & Company
- 12) Rastogi. VB 2008. **Fundamentals of Molecular Biology**, Ane Books India.
- 13) Reinert, J. and Bajaj, Y.P.S. 1997 **Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture**. Narosa Publishing House.
- 14) Russell, P.J. 2009 **Genetics – A Molecular Approach**. 3rd Edition. Benjamin Co.
- 15) Sambrook and Russel. **Molecular Cloning: A laboratory manual**. (3rd edition)
- 16) Slater, A., Scott, N.W. & Fowler, M.R. 2008 **Plant Biotechnology: The Genetic Manipulation of Plants**, Oxford University Press.
- 17) Smith, R. 2000 **Plant Tissue Culture: Techniques and Experiments, 2nd edition**, Academic Press
- 18) Upadhyaya A. and K Upadhayayo 2005, **Basic Molecular Biology** Himalaya Publishers.
- 19) Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 **Molecular Biology of the Gene 6th Edition**. Cold Spring Harbour Lab. Press, Pearson Pub.
- 20) Wilson K and J Walker 2005, **Principles and Techniques of Biochemistry and Molecular Biology 6th edition**, Cambridge University Press, USA

PRACTICALS

Course No: **BOT-504 MOLECULAR BIOLOGY AND BIOTECHNOLOGY**

30 HOURS

1. Micropropagation of orchid seeds using MS media.
2. Preparation of artificial seeds
3. Estimation of soluble protein from a selected plant and separation by SDS-PAGE
4. Estimation of RNA by orcinol method
5. Isolation of plasmid DNA and genomic DNA together from E.coli.
6. Estimation of size of a DNA fragment after electrophoresis using DNA markers.

SEMESTER VI

Course No: **BOT-601** **CELL BIOLOGY AND GENETICS**

UNIT 1: INTRODUCTION IN CELL BIOLOGY

Introduction to cell theory
Comparison of a generalized prokaryotic and eukaryotic cell
Elementary idea on Microscopy
Elementary idea on micrometry and Cell fractionation

8 HOURS

UNIT II: ORGANIZATION OF A CELL

Extranuclear

- i. Elementary knowledge of structure and function of plasma membrane
- ii. Introduction to endomembrane system; endoplasmic reticulum, Golgi complex, lysosome, peroxisome
- iii. Introduction to cytoskeleton
- iv. Structure and functions of mitochondria
- v. Structure and function of plastids

Nuclear

- i. Nuclear envelope, nucleolus and Ribosome
- ii. Interphase chromatin and metaphase chromosome
- iii. Introduction to polytene and lampbrush chromosomes

16 HOURS

UNIT III: CELL CYCLE

Basic features of the cell cycle
Process and phases of Mitosis, mitotic spindle and chromosome movement
Process and phases of meiosis and its significance
Programmed Cell Death, Stem Cells

11 HOURS

UNIT IV: INTRODUCTION TO GENETICS

Mendel's laws of inheritance-Law of dominance, law of segregation, law of independent assortment, deviations from Mendel's laws (Neo-Mendelism)

Interaction of genes- Intragenic and intergenic interactions, incomplete dominance, lethal genes, complementary genes, supplementary genes, inhibitory genes, duplicate genes, epistatic genes

Linkage and crossing over- Interrelationships and importance, crossing over and meiosis, cytological basis of crossing over (Holliday's Model), crossing over and linkage maps, linkage groups, interference

Sex determination: Chromosome theory of sex determination, sex determination in plants

13 HOURS

UNIT V: CHROMOSOMAL ABBERATIONS

Mutations- Point mutation-Transition, Transversion and Frame shift mutation.

Molecular mechanism (tautomerisation, alkylation, deamination, base analogue incorporation, dimerisation),

Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation,;

Gene mutations

Physical and chemical mutagens,

DNA repair mechanisms.

Chromosome theory of heredity, Chromosomal aberrations
Aneuploidy and Polyploidy
Extrachromosomal Inheritance: (Chloroplastic and Mitochondrial) Maternal Effect
12 HOURS

Suggested Readings:

- 1) Alberts *et al* 1998 **Essential Cell Biology** Garland Publishers
- 2) Alberts *et al* 2008 **Molecular Biology of the Cell** Garland Publishers
- 3) Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. **The World of the Cell. 7th edition.** Pearson Benjamin Cummings Publishing, San Francisco.
- 4) Brooker 1999 **Genetics : Analysis and Principles** Addison-Wesley
- 5) Cooper, G.M. and Hausman, R.E. 2009. **The Cell: A Molecular Approach. 5th edition.** ASM Press & Sunderland, WashinPTon, D.C.; Sinauer Associates, MA.
- 6) De Robertis, E.D.P. and De Robertis, E.M.F. 2006. **Cell and Molecular Biology. 8th edition.** Lippincott Williams and Wilkins, Philadelphia.
- 7) Gardner, E.J., Simmons, M.J., Snustad, D.P. 2008. **Principles of Genetics.8th Edition** Wiley India.
- 8) Griffiths, AJF., Wessler, SR., Lewontin, RC. and Carroll, SB.. **Introduction to Genetic Analysis. IX Edition** W.H. Freeman and Co.
- 9) Hartl & Jones 2002 **Essential Genetics: A Genomic Perspective** Jones & Bartlett
- 10) Karp, G. 2010. **Cell and Molecular Biology: Concepts and Experiments. 6th Edition.** John Wiley & Sons. Inc.
- 11) Klug, WS., Cummings, MR, Spencer, CA. 2009. **Concepts of Genetics. XI Edition.** Benjamin Cummings.
- 12) Lewin 2008, **Genes IX** Jones & Bartlett
- 13) Lodish *et al* 2008 **Molecular Cell Biology** Freeman
- 14) Russell, PJ.2009. **Genetics: A Molecular Approach. III Edition.** Benjamin Cummings.
- 15) Snustad, D.P., Simmons, M.J. 2009. **Principles of Genetics. V Edition.** John Wiley and Sons Inc.

PRACTICALS

Course No: **BOT-602** **CELL BIOLOGY AND GENETICS** **30 HOURS**

- 1) Study of meiosis through temporary smear of flower buds.
- 2) Study of mitosis and meiosis through permanent slides
- 3) Genetic problems on dihybrid inheritance
- 4) Allelic and Non allelic gene interactions.
- 5) Mendelian laws and gene interaction using *Drosophila* crosses.
- 6) Study of Hardy-Weinberg Law using simulations (seeds).
- 7) Chi square analysis and probability factor of Genetics

Course No: **BOT-603 CHOICE BASED CREDIT PAPER (PAPERS OFFERED)**

- a) TAXONOMY
- b) METHODOLOGY AND PERSPECTIVES OF SCIENCE
- c) PLANT BIOTECHNOLOGY
- d) FORESTRY
- e) MUSHROOM CULTIVATION
- f) HORTICULTURE

Course No: **BOT-603 (a)**

TAXONOMY

UNIT 1: INTRODUCTION

Scope and importance of Taxonomy. Brief account on pre-Darwinian and post - Darwinian theories of classification - Essentialism, Nominalism, Empiricism, Evolutionary and Phylogenetic Systematic.

Field inventory, Herbarium preparation and management; important herbaria and botanical gardens of the world and India

Concept of taxa; categories and hierarchy; species concept (taxonomic, biological, evolutionary).

Definition and use of terms - Primitive and Advanced; Homology and Analogy; Parallelism and Convergence; Monophyly and Polyphyly

8 HOURS

UNIT II: BOTANICAL NOMENCLATURE

History of nomenclature - Polynomial and binomial systems, Brief outline of ICBN, Classification by Bentham and Hooker, Engler and Prantl & Takhtajan; brief reference of Angiosperm Phylogeny Group (APG) Classification.

Principles and rules of nomenclature; ranks and names; type method, author citation, valid publication; rejection of names, principle of priority and its limitation; names of hybrids and cultivars.

9 HOURS

UNIT III: SOURCES OF TAXONOMIC EVIDENCES

Cytology, Biochemistry and Embryology as sources of taxonomic characters. Other sources of taxonomically useful information - Ecology, Plant geography, co- evolution of parasites and pathogens. Comparative study of traditional and biosystematic approaches in plant taxonomy - Traditional and Biosystematic categories

8 HOURS

UNIT IV: PHYLOGENY OF ANGIOSPERMS

Terms and concepts (homology, analogy, parallelism, convergence, monophyly, polyphyly, clades); origin & evolution of angiosperms; co-evolution of angiosperms and animals; methods of illustrating evolutionary relationship (phylogenetic tree, cladogram)

7 HOURS

UNIT V: TAXONOMIC REVIEW OF SELECTED FAMILIES

Critical study of the following families with emphasis on identification of local members using flora, economic importance, inter relationships and evolutionary trends

Ranunculaceae, Capparidaceae, Sterculiaceae, Rutaceae, Meliaceae, Combretaceae, Myrtaceae, Lythraceae, Apocynaceae, Scrophulariaceae, Convolvulaceae, Bignoniaceae, Acanthaceae, Verbenaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Urticaceae, Amaryllidaceae, Arecaceae, Araceae, Poaceae

13 HOURS

SUGGESTED READINGS

1. Angiosperm Phylogeny Group (2003). *An update of the Angiosperm Phylogeny Group classification for the orders and families of the flowering plants: APG II*. Botanical Journal of the Linnean Society 141: 399-436.
2. Crawford, D.J. (2003). *Plant Molecular Systematics*. Cambridge University Press, Cambridge, UK.
3. Cronquist, A. (1981). *An Integrated System of Classification of Flowering Plants*. Columbia University Press, New York.
4. Hollingsworth, P.M., Bateman, R.M. and Gornall, R.J. (1999). *Molecular Systematics of Plant Evolution* Taylor and Francis, London.
5. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. and Donoghue, M.J. (2008). *Plant Systematics- A Phylogenetic Approach*. Sinauer Associates Inc, Massachusetts, USA.
6. Simpson, M.C. (2006). *Plant Systematics*. Elsevier, Amsterdam.
7. Stussy, T.F. 1990. *Plant Taxonomy*, Columbia University Press, USA.
8. Forman, L. & D. Bridson. 1989. *The herbarium Hand Book*. Royal Botanic Gardens, Kew
9. Sivaraman, V.V. 1991. *Introduction to Principles of Plant Taxonomy*. Oxford & IBH, New Delhi.
10. Sporne, K.R. 1974. *Morphology of Angiosperms*. Hutchinson University Press London.
11. Radford, A.E. 1986. *Fundamentals of plant systematics*. Harper & Row Publishers, New York.
12. Naik, V.N. *Taxonomy of Angiosperms*. TATA McGraw Hill, New Delhi
13. Burkill, I.H. 1965. *Chapters on the History of Botany in India*, Delhi.
14. Gurucharan Singh, 2001. *Plant systematics Theory and Practice*. Oxford & IBH, New Delhi.
15. Davis, P.H. & V.H. Heywood, 1963. *Principles of Angiosperm Taxonomy*. Oliver & Boyd Ltd., London.
16. Henry, A.N. & Chandrabose *An aid to International Code of Botanic Nomenclature*.
17. Jeffrey, C. 1968. *An introduction to Plant Taxonomy*, London.
18. Simpson, M.G. 2006. *Plant Systematics*. Elsevier Academic Press, London
19. Stressy, T.F. 1990. *Plant Taxonomy – The systematic evaluation of Comparative data*. Columbia University Press, New York.
20. Sharma, B.D. et al. (Eds.) *Flora of India vol. I*. Botanical Survey of India, Calcutta.
21. Pandey, S.N. & S.P. Misra. 2008. *Taxonomy of Angiosperms*. Ane Books India, New Delhi.
22. Sharma, O.P. 1996. *Plant Taxonomy*. TATA McGraw Hill, New Delhi

Course No: **BOT- 603(b) METHODOLOGY AND PERSPECTIVES OF SCIENCE**

Unit - I: Science and scientific studies

What is science? What is not science?

Science as a human activity, Scientific temper, Empiricism, Vocabulary of science, Science disciplines; Revolutions in science, Science and technology. Types of knowledge:- Practical, Theoretical and Scientific knowledge, Information. **(9 hrs.)**

Unit - II: Experimentation in science

Design of an experiment; Experimentation:- Selection of controls, Observational requirements, Instrumental requirements.

Types of experiments:- Experiment to test a hypothesis, to measure a variable or to gather data by preliminary and explorative experiments. Observations:- Direct and indirect observations, Controlled and uncontrolled observations, Human and machine observations. Data collection and representations:- Graphs, Tables, Histograms and Pie diagrams (both manual and using computer).

Interpretation and deduction of data, Significance of statistical tools in data interpretation, Errors and inaccuracies.

Necessity of units and dimensions; Repeatability and replication of experiments.

Documentation of experiments, Record keeping. **(9 hrs)**

Unit - III: Methods in Biological Science

Solutions:- Types of solutions. Representation of concentrations: Molarity, Normality, Percentage and ppm.

Acids and bases:- Buffers and pH, Measurement of pH. Preparation and applications of buffers in biological studies.

Photometry:- Colorimetry and Spectrophotometry, Principle, Working and uses.

Autoradiography:- Principle, mechanism, and significance Centrifugation:- Principle, types of centrifuges and their applications

Chromatography: - Principle, types:- Adsorption chromatography, Partition chromatography, Ion exchange chromatography, Molecular sieving. **(9 hrs)**

Unit -IV: Statistical methods

Measures of central tendency:- Mean, Median and Mode

Measures of dispersion:- Range, Mean Deviation, Variance, Standard Deviation, Coefficient of variation.

Correlation and regression (brief account).

Probability:-Laws of probability. Addition theorem and Multiplication theorem. Probability

Distribution:- Binomial Distribution, Normal Distribution and Poisson distribution Test of hypothesis:- Null hypothesis, Alternate hypothesis Chi-square test and t-test **(9 hrs)**

Unit- V: Application of Information and Communication Technology in lifescience

Internet as a knowledge repository, data and metadata.

Searching the internet: Browsers, search engines, Meta search engines, Boolean searching.

IT in teaching, learning and research: Web page designing and web hoisting. Academic web sites, e-journals, Open access initiatives and open access publishing, education software, academic services - INFLIBNET, NICNET, BRNET. Networking- LAN and WAN; Intranet and Internet. Internet protocols-IP address, and Domain Name System, URL.

Health issues: etiquettes/ guidelines for proper usage of computers and internet. **(9 hrs)**

Course No: **BOT-603(c)**

PLANT BIOTECHNOLOGY

UNIT 1: INTRODUCTION TO PLANT TISSUE CULTURE

Introduction to Biotechnology - History, Definition, scope, significance

Plant Tissue Culture - History, Principle - Totipotency, differentiation, dedifferentiation, redifferentiation. Facilities of Tissue culture laboratory,

Media - MS medium composition, Preparation, Sterilization techniques, Explant selection, sterilization and Inoculation.

Types of culture - Meristem culture, Organ culture; Callus culture; Cell suspension culture; Protoplast culture

Isolation of protoplasts, somatic hybridization and its significance; Somatic embryogenesis and synthetic seeds.

Haploid production - Anther and pollen culture, its significance; Embryo culture and Embryo rescue

Micropropagation - Multiple shoot culture and large scale propagation of crop plants, Somaclonal variation - Disease free plants; Production of secondary metabolites in Bioreactors Application of tissue culture in Biodiversity and conservation

9 HOURS

UNIT II: RECOMBINANT DNA TECHNOLOGY

Tools: Enzymes- Exonucleases; Endonucleases; Restriction endonucleases Type I,II&III;

Ligases; Reverse Transcriptase, Terminal transferase, Polymerase, Alkaline phosphatase

Vectors- General account of plasmids, cosmids, bacteriophages, Phasmids - Advantages and disadvantages; Structure of pBR 322; Artificial chromosome vectors - BAC, YAC, Shuttle vectors

Artificial gene synthesis; cDNA library - cDNA synthesis, genomic DNA library- identification and isolation of the gene from cDNA, Genomic DNA or Libraries using probes, PCR, RACE. DNA Ligation - Linkers, adaptors, Homopolymer tailing **9 HOURS**

UNIT III: GENE MANIPULATION

Transformation, selection of transformed bacteria - antibiotic selection, reporter genes - GUS, GFP, colony hybridization and immunological tests Heterologous protein expression, purification and characterization

Direct methods of gene transfer - Biolistics, Lipofection, Electroporation, microinjection - Advantages and disadvantages

Vector mediated gene transfer-Agrobacterium mediated gene transfer - T DNA, Ti plasmid and Ri plasmid derived vector systems

Process of transfer - Bacterial colonization, Induction of virulence, generation of TDNA transfer complex, T-DNA transfer, Integration of TDNA into plant genome

9 HOURS

UNIT IV: BIOTECHNOLOGICAL TECHNIQUES

Polymerase chain reaction - Principle, types of primers, Taq polymerase, protocol, Application and problems, Reverse Transcriptase PCR and Real Time PCR

DNA sequencing - Maxam Gilbert's method, Sanger's method, Automated DNA sequencing

Molecular Analysis of gene and gene products - Southern, Northern and Western blotting, ELISA, RIA

Molecular markers - RAPD, RFLP, AFLP, Brief account of DNA Finger printing and Bar coding of plants

Brief account of: Antisense RNA technology - FLAVR SAVR Tomato; Gene Silencing; RNA interference; miRNA.

9 HOURS

UNIT V: APPLICATIONS OF BIOTECHNOLOGY

Medical Biotechnology: Disease diagnosis - Infectious diseases and genetic diseases; Therapeutics-Antisense oligonucleotides, RNAi as therapeutics; Endogenous therapeutics - Insulin, somatostatin, Interferons, Antibiotics, Vaccines, Biopolymers, Designer drugs, Gene therapy, Stem cells and their relevance

Agricultural Biotechnology: Applications of plant tissue culture, Application of transgenic plants Bt cotton, Golden rice; Biosafety concern

Environmental Biotechnology: Biodiversity and conservation; Waste management and Bioremediation

Industrial Biotechnology: Large scale production of beverages, pharmaceuticals, hormones.

Food biotechnology: SCP, Improved food and food products

9 HOURS

Suggested Readings

1. Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. *The World of the Cell. 7th Edition*. Pearson Benjamin Cummings Publishing, San Francisco.
2. Brown, T. A. *Gene cloning and DNA analysis: An Introduction*. Blackwell Publication.
3. Buchanan, B., Gruissem, W. and Jones, R. 2000 *Biochemistry and Molecular Biology of Plants*. American Society of Plant Biologists.
4. Chrispeel, M.J. and Sadava, D.E. 1994 *Plants, Genes and Agriculture*. Jones and Bartlett Publishers.
5. Cooper, G.M. and Hausman, R.E. 2009 *The Cell: A Molecular Approach. 5th edition*. ASM Press & Sunderland, WashinPTon, D.C.; Sinauer Associates, MA.
6. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. *Cell and Molecular Biology 8th edition*, Lippincott Williams and Wilkins, Philadelphia.
7. Elliot 2009 *Biochemistry and Molecular Biology*. Oxford Publishers.
8. Glick, B.R., Pasternak, J.J. 2003. *Molecular Biotechnology: Principles and Applications of recombinant DNA*. ASM Press, WashinPTon.
9. Karp, G. 2010. *Cell and Molecular Biology: Concepts and Experiments. 6th edition*. John Wiley & Sons. Inc.
10. Lewin 2008, *Genes IX* Jones & Bartlett
11. Lodish *et al* 2008 *Molecular Cell Biology* Freeman & Company
12. Rastogi. VB 2008. *Fundamentals of Molecular Biology*, Ane Books India.
13. Reinert, J. and Bajaj, Y.P.S. 1997 *Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture*. Narosa Publishing House.
14. Russell, P.J. 2009 *Genetics – A Molecular Approach. 3rd Edition*. Benjamin Co.
15. Sambrook and Russel. *Molecular Cloning: A laboratory manual. (3rd edition)*

16. Slater, A., Scott, N.W. & Fowler, M.R. 2008 ***Plant Biotechnology: The Genetic Manipulation of Plants***, Oxford University Press.
17. Smith, R. 2000 ***Plant Tissue Culture: Techniques and Experiments, 2nd edition***, Academic Press
18. Upadhyaya A. and K Upadhyayo 2005, ***Basic Molecular Biology*** Himalaya Publishers.
19. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 ***Molecular Biology of the Gene 6th Edition***. Cold Spring Harbour Lab. Press, Pearson Pub.
20. Wilson K and J Walker 2005, ***Principles and Techniques of Biochemistry and Molecular Biology 6th edition***, Cambridge University Press, USA

Course No: **BOT-603(d)**

FORESTRY

UNIT 1: GENERAL INTRODUCTION

Types of forest; Natural and Manmade; Tropical, temperate, evergreen semi-evergreen, deciduous; Monoculture, multipurpose, social and industrial. Forest and gene conservation.

7 HOURS

UNIT II: SILVICULTURE

Concept and scope of study of natural and artificial regeneration of forests. Clear felling, uniform shelter, wood selection, coppice and conservation systems. Silviculture of some of the economically important species in India such as *Azadirachta indica*, *Tectona grandis*, *Mahagoni*, *Dalbergia sisso* and *Havea brasilensis*.

8 HOURS

Wood: Homogenous and heterogenous- spring and autumn wood- Porous and non porous wood- Heart and sap wood. Identification of wood- preparation of key and their uses

3 HOURS

UNIT III: SOCIAL AND AGRO FORESTRY

Selection of species and role of multipurpose trees. Food, fodder and energy. Social forest- Avenue plantation. Sacred plants- definition, importance of sacred trees like *Ficus religiosa*, *Embllica officinalis*, *Aegle marmelous*.

9 HOURS

UNIT IV: SEEDS

Seed orchards, seed dormancy- Types of dormancy, physical and chemical methods to overcome seed dormancy. Forest laws- necessity, General principles, Indian forest act 1927 and their amendment.

9 HOURS

UNIT V: FOREST RESOURCES AND UTILIZATION

Forest products- timber, pulp wood, secondary timbers, non timber forest products (NTFPs). Definition and scope (brief outline) - Gums, resins, fibers, oil seeds, nuts, rubber, canes and bamboos, medicinal plants, charcoal.

9 HOURS

Suggested Readings

1. Anil Kumar Dhiman. 2003. *Sacred plants and their medicinal uses*. Daya publishing house, New Delhi.
2. B.S. Chundawat and S.K.Gautham. 1996. *Text book of Agroforestry*. Oxford and IBH Publishing house, New Delhi.
3. Kollmann and Cote 1988. *Wood science and Technology*. Vol.I & II Springer verlag.
4. Sagreiya, K.P. 1994. *Forests and Forestry (Revised by S.S. Negi)*. National book trust. New Delhi.
5. Sharma P.D. 2004. *Ecology and Environment*. Rastogi publications, Meerut
6. Singh M.P. and Vinita Vishwakarma. 1997. *Forest environment nd Biodiversity*. Daya publishing house, New Delhi.
7. Tiwari K.M. 1983. *Social forestry in India*.
8. Tribhawan Mehta, 1981. *A handbook of forest utilization*. Periodical Expert Book Agency, New Delhi.

Course No: **Bot-604 (e)**

MUSHROOM CULTIVATION

UNIT 1: INTRODUCTION

History and introduction. Importance, Nutritional value, medicinal value .Edible mushrooms and Poisonous mushrooms.

7 HOURS

UNIT II: CLASSIFICATION

Systematic position, morphology, distribution, structure and life cycle of Agaricus and Pleurotus
Types of Mushroom

7 HOURS

UNIT III: CULTIVATION

Equipments for Mushroom spawn, Laboratory, culture room, spawn production Mushroom farm layout and mushroom shed.

Paddy straw mushroom – substrate, spawn making. Methods – bed method, polythene bag method, field cultivation.

Oyster mushroom cultivation –Substrate, spawning, pre-treatment of substrate. Maintenance of mushroom.

Cultivation of white button mushroom – Spawn, composting, spawning, harvesting.

12 HOURS

UNIT IV: DISEASE MANAGEMENT

Diseases- Common pests, disease prevention and control measures.

Processing - Blanching, steeping, sun drying, canning, pickling, freeze drying.

Storage – short term and long term storage.

10 HOURS

UNIT V: MARKETING

Common Indian mushrooms. Production level, economic return, Foreign exchange from Mushroom cultivating countries and international trade.

9 HOURS

Suggested Reading

1. Pandey B P 1996. *A textbook of fungi*. Chand and company N Delhi.
2. Kaul T N 2001. *Biology and conservation of mushrooms*. Oxford and IBH publishing company N.Delhi
3. Gupta P.K. *Elements of Biotechnology*.
4. Harander Singh. 1991. *Mushrooms- The Art of Cultivation*- Sterling Publishers.
5. Indian Journal of Mushrooms. Published by I.M.G.A. *Mushroom Research Laboratory*. College Agriculture, Solan
6. Peter Oei 2000 *Mushroom Cultivation III Edition*, Backhuyes Publisher USA
7. Tripathi DP., 2005 *Mushroom Cultivation* Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi
8. Krishnamoorthy AS., Marimuthu T and Nakkern S 2005 *Mushroom Biotechnology* TNAU Press, Coimbatore, India
9. Nita Bahl 1988 *Handbook of Mushroom* Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi

Course No: **Bot-604 (f)**

HORTICULTURE

UNIT 1: INTRODUCTION

Origin of Horticulture, definitions, scope and impact of horticulture.

Classification of horticultural crops – pomology, olericulture, spices and planting, ornamental horticulture

Methods of propagation-Seeds and Vegetative (cutting, layering and grafting). Propagation by specialized stem and roots- bulbs, corms, tubers, rhizomes and pseudo bulbs).

Micro and Macro nutrient,

common media for propagation- soil, sand, peat, sphagnum moss, vermiculite. Soil mixture and nursery beds, Manures: Organic and inorganic; Irrigation methods.

9 HOURS

UNIT II: GARDENING AND PEST MANAGEMENT

Types of gardens-Indoor garden, Kitchen garden and public garden

Arboriculture and role of trees in landscaping. Green house.

Importance and Scope of medicinal plants; Current status; Herbal trade; Role of MNCs in herbal product; Organic production and certification;

Identification of major insect pests and diseases of vegetables, fruit crops and other horticultural crops.

Identification of different classes of pesticides including bio-pesticides. Identification of bio-control agents. Preparation and application spray solution and dusts.

10 HOURS

UNIT III: OLERICULTURE AND POMOLOGY

Olericulture- Definition- Importance of vegetables- Production technology- Cultivation, harvesting and storage of vegetables- Bhindi, Brijal, Bitter gourd, Snakegourd, Cucumber, Pumpkin, Colocasia, Tapioca and Tomato.

Pomology- Definition and Importance-Cultivation, harvesting and storage of fruits- Banana, Pineapple and mango. Sapota, apple, orange & jackfruit.

Growth regulators in horticulture. Plant protection measures for horticultural crops.

9 HOURS

UNIT IV: FLORICULTURE

Floriculture- Definition and Importance- Soil and Climate; Varieties; Propagation; Nursery practices; Planting methods

Cultivation, harvesting and storage of flowers- Rose, Lilium, and Anthurium. Identification and control of diseases associated with the plants studied

Cut flowers- Flower arrangement and Bonsai.

9 HOURS

UNIT V: HARVESTING AND POST HARVEST HANDLING

Crop loading, Maturity indices, Harvesting method for Climacteric and non- Climacteric fruits, Grading and sorting, Preservation of fruits and vegetables; Quarantine and regulatory measures.

8 HOURS

Suggested Readings

1. Adams, C.R. and M. P. Early. 2004. **Principles of horticulture**. Butterworth – Heinemann, Oxford University Press.
2. Allan M. Armitage and Judy M. Laushman “**Speciality Cut Flowers**”, **Second Edition**, Published by Timber press 2003, ISBN - 0881925799
3. Bhattacharjee, S.K and De L.C (2003) *Advanced Commercial Floriculture Vol. (1)* Aavishkar publishers, Distributors, Jaipur.
4. Bhattacharjee, S.K and De L.C (2005) **Medicinal Herbs & Flowers**, Aarishkar, Jaipur.
5. Bhattacharjee, S.K., 2004. **Hand book of medicinal plants**, Pointer publications, Jaipur.
6. Bose, T.K., Yadav, L.P., Pal. P., Parthasarathy, V.A., Das. P., 2003. **Commercial flowers. Vol. I and II**. Naya udyog, Kolkata-6.
7. Chadha, K.L. 2001, **Handbook of Horticulture**, ICAR, New Delhi.
8. Chandra, R. and M. Mishra. 2003. **Micropropagation of horticultural crops**. International Book Distributing Co., Lucknow.
9. Chattopadhyaya, P.K.2001. **A text book on Pomology (Fundamentals of fruit growing)** Kalyani Publication, New Delhi
10. Christopher, E.P. 2001. **Introductory Horticulture**, Biotech Books, New Delhi
11. Edmond, J.B. T.L.Senn, F.S. Andrews and P.G.Halfacre, 1975. **Fundamentals of Horticulture**, Tata MC. Graw Hill Publishing Co.New Delhi
12. George Acquaah, 2002, **Horticulture-principles and practices**. Prentice-Hall of India pvt. Ltd., New Delhi.
13. Hartman, H.T. and Kester, D.E. 1986. **Plant propagation – Principles and Practices –** Prentice Hall of India Ltd., New Delhi.
14. Jain S K.1996. **Ethnobotany in human welfare**. Deep publishers. New Delhi
15. Jitendra Singh. 2006. **Basic Horticulture**. Kalyani Publishers, New Delhi.
16. Jyothi prakash E J 2006. *Medicinal botany and pharmacognosy*. Emkay Publishers New Delhi
17. Kumar, N.1997. **Introduction to Horticulture**, Rajalakshmi Publication, Nagercoil.
18. Rajan, S. and B.L. Markose. 2007. **Propagation of horticultural crops**. New India Publishing, New Delhi.
19. Ravindrasharma (2004) **Agro techniques of Medicinal plants**. Daya publishing, New Delhi.
20. Shanmugavelu, K.G., N. Kumar and K.V. Peter. 2005. **Production technology of spices and plantation crops**. Agrobios, Jodhpur.
21. Singh, N.P. 2005. **Basic concepts of fruit science**. International Book Distributing Co., Lucknow.
22. Surendra Prasad and U. Kumar. 1999. **Principles of horticulture**, Agro-botanica, Bikaner, India.
23. Trivedi PC. (2004) **Medicinal Plants: Utilization and Conservation**, Aavishkar Publisher, Distributors, Jaipur.

Course No: BOT-604 PROJECT WORK

**The following project works may be taken up which are corresponding to the CBCP
A brief outline for the project works is given below;**

BOT – 604 (a) TAXONOMY

Students are expected to do field study @ 1hr/week and the observations must be recorded in the field note. Each student shall submit a minimum of 15 properly identified herbarium specimens in the standard format (cultivars and ornamentals should be avoided)

They are also expected to visit at least one research station and should submit a duly certified study tour report along with herbarium sheets and field notes for external evaluation.

BOT- 604 (b) METHODOLOGY AND PERSPECTIVES OF SCIENCE

1. Preparation of solutions of known concentrations using pure samples and stock solutions
2. Preparation of buffers (phosphate/ acetate buffer)
3. Measurement of pH using pH meter.
4. Paper chromatographic separation of aminoacids
5. Demonstration of the working of different kinds of centrifuges
6. Preparation of standard graph and determination of the concentration using colorimetry.
7. Work out the problems related to mean, median, mode, standard deviation, probability, Chi-square test, t-test and correlation.
8. Technique of data representation (tables, bar-diagram, histogram, pie-diagram and frequency curve (manual and using computer).

BOT- 604 (c)

PLANT BIOTECHNOLOGY

1. Preparation of plant tissue culture medium
 2. Demonstration of the technique of organ culture
 3. DNA isolation
 4. Restriction mapping - problem
 5. Sequence reading - Sanger method/Maxam Gilbert method - problem
 6. Demonstration of preparation of synthetic seeds
 7. Visit to a leading biotechnology institute - submission of report
-

BOT - 604 (d)

FORESTRY

Visit to a plywood factory to have knowledge of wood based industry. Prepare project report on the visit.

Determination of seed viability and rate of germination of economically important trees by maintaining a nursery. Submit a project report on the experiments conducted.

BOT- 604 (e)

MUSHROOM CULTIVATION

1. Study of Mushroom Morphology and identification of edible and poisonous mushrooms.
2. Practical method of mushroom cultivation.

BOT-604 (f)

HORTICULTURE

Cultivation of an important horticultural crop or a flower or a medicinal plant and prepare a project report on the same.

Syllabus of
BSc Honours Course
in
Chemistry
for 2018-19 Session

B.Sc. Course Structure
Subject : Chemistry

Semester		Course Number	Course Name	Credits	Total Credits
I	Pass	CHEM-101	Inorganic (Theory)	4	8
		CHEM-102	Inorganic (Practical)	1	
	Honours	CHEM-103	Inorganic (Theory)	2	
		CHEM-104	Inorganic (Practical)	1	
II	Pass	CHEM-201	Organic (Theory)	4	8
		CHEM-202	Organic (Practical)	1	
	Honours	CHEM-203	Organic (Theory)	2	
		CHEM-204	Organic (Practical)	1	
III	Pass	CHEM-301	Physical (Theory)	4	8
		CHEM-302	Physical (Practical)	1	
	Honours	CHEM-303	Physical (Theory)	2	
		CHEM-304	Physical (Practical)	1	
IV	Pass	CHEM-401	Inorganic (Theory)	4	8
		CHEM-402	Inorganic (Practical)	1	
	Honours	CHEM-403	Quantum Chemistry & Molecular Spectroscopy	2	
		CHEM-404	Advanced Practical-1 (Physical, Inorganic and Organic)	1	
V	Pass	CHEM-501	Organic (Theory)	4	8
		CHEM-502	Organic (Practical)	1	
	Honours	CHEM-503	Analytical Chem & Applications of Spectroscopy.	2	
		CHEM-504	Advanced Practical-II (Physical, Inorganic and Organic)	1	
VI	Pass	CHEM-601	Physical (Theory)	4	10
		CHEM-602	Physical (Practical)	1	
	Honours	CHEM-603	Choice Based Credit Paper a. Biological Chemistry b. Nano Chemistry c. Medicinal Chemistry d. Environmental and Green Chemistry	3	
		CHEM-604	Project Work	2	

*** Choice based credit paper will be offered depending on the availability of specialized teacher in the respective colleges**

Salient Features of the Syllabus

1. For all theory papers, there will be five units irrespective of the credit of the paper. The total numbers of lectures/ contact hours against the credits are as follows:

Total credit	Total credit hours	Total no. of lectures	Total no. of units	No. of lectures per unit
4	60	80	5	16
2	30	40	5	8

* considering that one semester has around 15 working weeks, total credit hours are calculated. Since the class lectures are of 45 minutes, accordingly contact hours is converted into number of class lectures

2. The possible combinations for Chemistry Honours are as follows:

CHEMISTRY	BOTANY	ZOOLOGY
CHEMISTRY	PHYSICS	MATHEMATICS
CHEMISTRY	MATHEMATICS	COMPUTER SCIENCE
CHEMISTRY	GEOGRAPHY	ZOOLOGY
CHEMISTRY	GEOGRAPHY	BOTANY
CHEMISTRY	GEOLOGY	GEOGRAPHY
CHEMISTRY	ANTHROPOLOGY	BOTANY
CHEMISTRY	ANTHROPOLOGY	ZOOLOGY

*First two subject combinations are the preferred one

- 3 Students without Mathematics can also take admission into Honours Course in Chemistry, provided they have studied and cleared the subject Mathematics up to 12th standard.
- 4 The Choice Based Credit Course paper in the sixth semester needs to be selected by the respective Department, subject to availability of specialized Teacher.
- 5 The Practical Examination will be internal
- 6 All the theory papers are of 100 marks and out of that 30% is internal

SEMESTER-1

CHEM-101: Inorganic Chemistry (Pass Course - Theory)

Total Credits 4

Unit 1

a) Atomic Structure (16 L)

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of ψ and ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, and d orbitals. Aufbau and Pauli's exclusion principles, Hund's multiplicity rules. Electronic configurations of the elements, effective nuclear charge and shielding or screening effect.

b) Chemical periodicity:

Periodic classification of elements, salient characteristics of s, p, d and f- block elements. Periodic trends of atomic radii, ionic radii, ionization potential, electron affinity and Electronegativity in the periodic table, variation of metallic and non-metallic properties in different periods and groups, and diagonal relationship.

Unit II

a) Chemical bonding (16 L)

i) Covalent bonding

Basic idea of valence bond theory and its limitations; LCAO-MO theory and its application to homonuclear diatomic molecules (H_2 , N_2 , O_2 , O_2^{-2} , O_2^- , O_2^+ ,), concept of hybridization of orbitals; valence shell electron pair repulsion (VSEPR) theory and shapes of molecules and ions: BeF_2 , BF_3 , H_3O^+ , NH_3 , H_2O , H_2S , O_3 , CO_2 , BO_3^{3-} , PCl_3 , PCl_5 , SF_4 , SF_6 ;

(ii) Ionic Bonding: Ionic structures; radius ratio effect; limitation of radius ratio rule; concept of lattice energy and Born-Haber cycle; polarizing power; polarizability of ions and Fajan's rule, results of polarization on melting and boiling points.

.

Unit III

a) s and p Block Elements (16 L)

Electronic configuration, atomic and ionic radii, ionization enthalpy, electron gain enthalpy, Electronegativity, oxidation states, variation of acidic and basic properties of their oxides and oxy-acids, inert pair effect and catenation. Preparation, important reactions, structure and use of following compounds: Boric acid, borates, boron nitride, diborane and oxyacids of nitrogen, phosphorous, sulphur and chlorine. Basic properties of halogens and interhalogens, pseudo halides.

b) Chemistry of Noble Gases

Position in the periodic table, separation and isolation of helium, neon and argon from liquid air, study of the following compounds (preparation, structure and properties of XeF_2 , XeF_4 , and XeO_3 and $XeOF_4$).

Unit -IV

a) Oxidation and reduction

(16 L)

General concepts, Electrochemical series and its applications, redox stability in water – Frost (nitrogen), Latimer (chlorine in acidic and basic medium, disproportionation of H_2O_2 into O_2 and H_2O under acid conditions) and Pourbaix (iron species in natural water) diagrams.

b) Nuclear Chemistry-I

Fundamental particles (electron, proton, neutron, positron, neutrino and mesons); nuclear binding energy, mass defect and packing fraction; half-life and average life period; important applications of radioactive isotopes; unit of radioactivity; group displacement law; balancing of nuclear reactions; artificial radioactivity; elementary ideas of fission, fusion, controlled fission reactions, atomic energy & Nuclear reactors.

Unit –V

a) Acid-Base Concepts

(16 L)

Arrhenius concept; Bronsted-Lowry concept, the solvent-system (Franklin) concept and its limitations; Lewis concept; effect of substituent's and solvent on strengths of acids and bases – leveling effect; Relative strengths of acids and bases (pK_a , pK_b , and pH concepts). Hard and Soft Acid and Bases (HSAB): Classification of acids and bases as hard and soft, Pearson's HSAB principle and its applications, symbiosis, basis of hard-hard and soft-soft interactions.

b) Principles of Qualitative and Quantitative Analysis-I

Solubility product and its applications in the Group separations of cations, Volumetric analysis – standard solutions, primary standards, expressing concentrations of standard solutions, redox titrations (potassium permanganate, potassium dichromate, sodium thiosulphate and iodine), iodometric and iodimetric titrations, acid-base indicators and its theory.

Recommended Books

1. Comprehensive Inorganic Chemistry Vol – I & II: **Sulekh Chandra** (New Age Publication, New Delhi)
2. Advanced Inorganic Chemistry Vol I & II: **Satya Prakash, G.D.Tuli, R.D.Madan & S.K Basu**, S.Chand & Co. New Delhi
3. Selected topics in Inorganic Chemistry: **U.Malik, G.D.Tuli, R.D.Madan**, S.Chand & Co. New Delhi
4. Principles of Inorganic Chemistry: **Puri, Sharma & Kalia**, Vishal Publications, Jalandhar
5. Modern Inorganic Chemistry: **R.C. Aggarwal**, Kitab Mahal
6. Advanced Inorganic Chemistry Vol. I, II: **Gurdeep Raj**, Goel Publishing House, Meerut
7. Essentials of Nuclear Chemistry: **H.J. Arnikaar**, New Age Publication New Delhi
8. Basic Inorganic Chemistry: **Cotton, Wilkinson & Gaus**, Wiley
9. Concise Inorganic Chemistry: **J.D.Lee** (Blackwell Science)
10. Inorganic Chemistry: **Sharpe** (Pearson Education)
11. Inorganic Chemistry: Shriver & Atkins (Oxford University Press)
12. Inorganic Chemistry: **J.E. Huheey, E.A. Keiter & R.L Keiter**
13. Inorganic Chemistry: **R.Gopalan**, Universities Press (India) Pvt. Ltd. Hyderabad (A.P.)

CHEM-102 : Inorganic Chemistry
(Pass Course- Practical)

Total Credit : 1

Part I Qualitative Analysis

Inorganic mixtures containing five radicals/ions to be prepared from the following list: Ag^+ , Pb^{2+} , Hg_2^{2+} , Hg^{2+} , Bi^{3+} , Cu^{2+} , Cd^{2+} , As^{3+} , Sb^{3+} , Sn^{2+} , Sn^{4+} , Fe^{3+} , Al^{3+} , Ba^{2+} , Cr^{3+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Ca^{2+} , Sr^{2+} , Mg^{2+} ; Cl^- , Br^- , I^- , SO_4^{2-} , SO_3^{2-} , S^{2-} , CrO_4^{2-} , PO_4^{3-} , NO_3^- , NO_2^- , BO_3^{3-} , AsO_4^{3-} ,

Every mixture contains at least one interfering radical. Presence of Na^+ , NH_4^+ , K^+ , CO_3^{2-} , must be ignored and not to be reported. At least 5 salt mixtures have to be done by each student in the practical classes keeping records carefully.

Part 2: Volumetric Analysis

- (a) Estimation of ferrous ion by KMnO_4 method
- (b) Estimation of ferric ion by $\text{K}_2\text{Cr}_2\text{O}_7$ method.
- (c) Estimation of copper by iodometric method.
- (d) Determination of Acetic acid in Commercial Vinegar using NaOH .
- (e) Determination of alkali content – Antacid tablet using HCl .

(Standardization of solution will have to be done by each candidate by using his prepared standard solution and he will have to report the result)

Note: Experiments may be added/deleted subject to availability of time and facilities

CHEM-103: Inorganic Chemistry
(Honours Course - Theory)

Total Credit 2

Unit I

(a) Chemical Bonding-II

(8 L)

LCAO-MO theory and its application to heteronuclear diatomic molecules (CO, NO, NO^+ , NO^{2+} , NO^- , CN, CN^- , HF) conditions for combination of atomic orbitals; pictorial representation of various molecular orbitals; multi-center bonding in electron deficient molecules with reference to hydrides of boron (3c-2e bond); resonance and its application in NO_3^- , SO_4^{2-} , ClO_4^- , CO_3^{2-} and SO_3^{2-} .

(b) Industrial Chemistry

Water – industrial purification of drinking water and water analysis.

Fertilizers – Nitrogen fertilizers – manufacture of ammonia, and urea. Phosphatic fertilizers – calcium superphosphate, NPK fertilizers.

Glass – raw materials used for preparation; different types (varieties) of glass and their composition, optical and coloured glass, properties.

Cement – constituents, manufacture and setting process, role of gypsum.

Paints and pigments: constituents of paints; classification of pigments on the basis of their colour with examples.

Unit II

(a) Molecular Symmetry:

(8 L)

Symmetry elements and symmetry operations: symmetry planes and reflections, inversion center, proper axis and proper rotations, improper axis and improper rotations; molecular point groups; classification of molecules into point groups of H_2O , NH_3 , BCl_3 , H_2O_2 , BeCl_2 , and R_2NH ; symmetry of tetrahedron, and square planar complexes.

(b) Analyses of Experimental Data

Accuracy and precision; Methods for their expression; classification of errors; sources of errors, minimization of errors, the Normal Law of Distribution of indeterminate errors, propagation of errors, mean and standard deviations, significant figures, rejection of data- the F-test, T-test, and Q-test, the method of least-squares, correlation coefficient.

Unit III

(a) Bioinorganic Chemistry

(8 L)

Essential and trace elements in biological systems, Metalloporphyrins, chlorophyll, heme proteins (hemoglobin, myoglobin); role of cobalt in vitamin B_{12} ; Enzymes; Metalloenzymes (Zn) and their characteristics and functions; Non-complexing cations in biochemical processes (Na and K), Role of metals and non-metals in metabolism; metal and non-metal deficiency and toxicity. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+} . Nitrogen fixation.

(b) Nanomaterials

General introduction to Nanomaterials and emergence of nanotechnology, Types of nano materials, Synthesis of nanoparticles of gold, platinum and silver; properties of nanoparticles; important applications of nano-particles.

Unit IV

(8 L)

(a) Crystal Field Theory

d-orbital by electrostatic field (octahedral, tetrahedral and square planar geometry), and magnetic properties (high spin and low spin complexes); factors affecting crystal field splitting energy (10 Dq value) and spectrochemical series; Structural and thermodynamic effects of d-orbital splitting, (variation of ionic radii, Jahn-Teller effect, hydration and lattice energies of first row transition metal ions), octahedral vs. tetrahedral coordination; Adjusted Crystal Field theory and Molecular orbital theory for octahedral complexes.

(b) Magnetochemistry

Explanations of diamagnetism, paramagnetism, ferromagnetism and antiferromagnetism, origin of paramagnetic moment: electron spin moment, and orbital angular moment, magnetic susceptibility, Curie law, Curie-Weiss law, Bohr Magneton, magnetic susceptibility measurement using Gouy and Faraday methods explanation of magnetic behaviours of the following: $K_4[Fe(CN)_6]$, $K_3[Fe(CN)_6]$, $[Co(NH_3)_6]Cl_6$, $K_2[Ni(CN)_4]$, $K_3[CoF_6]$, $K_3[MnF_6]$, $Ni(CO)_4$.

Unit V

(8 L)

(a) Organometallic Chemistry: Synthesis, structure, bonding and reactivity of transition metal complexes with Olefins, Cyclopentadienyl, Cyclopentadiene, Benzenoid, π -allyl and Enyl systems. Transition metal-carbon σ -bond: metal-alkyls, metal-carbenes and metal-carbynes.

(b) Metal – Ligand Equilibria in Solution: Stepwise and overall formation constants: trends in step wise formation constants: determination of binary formation constant by spectrophotometry: factors affecting stability of metal complexes and chelate effect.

Recommended Books

1. Advanced Inorganic Chemistry Vol I & II: **Satya Prakash, G.D.Tuli, R.D.Madan & S.K Basu**, S.Chand & Co. New Delhi
2. Selected topics in Inorganic Chemistry: **U.Malik, G.D.Tuli, R.D.Madan**, S.Chand & Co. New Delhi
3. Principles of Inorganic Chemistry: **Puri, Sharma & Kalia**, Vishal Publications, Jalandhar
5. Modern Inorganic Chemistry: **R.C. Aggarwal**, Kitab Mahal
6. Advanced Inorganic Chemistry Vol. I, II: **Gurdeep Raj**, Goel Publishing House, Meerut
8. Basic Inorganic Chemistry: **Cotton, Wilkinson & Gaus**, Wiley
9. Concise Inorganic Chemistry: **J.D.Lee** (Blackwell Science)
10. Inorganic Chemistry: **Sharpe** (Pearson Education)
11. Inorganic Chemistry: **Shriver & Atkins** (Oxford University Press)
12. Inorganic Chemistry: **J.E. Huheey, E.A. Keiter & R.L. Keiter**
13. Analytical Chemistry: **G.L. David Krupadanam, D. Vijaya Prasad, K.Varaprasad Rao, K.L.N. Reddy and C. Sudhakar**. Universities Press (India).
14. Bioinorganic Chemistry: Pragati Prakashan, Meerut

CHEM-104: Inorganic Chemistry
(Honours Course - Practical)

Part I Qualitative Analysis

Inorganic mixtures containing four radicals/ions to be prepared from the following list:
 Ag^+ , Pb^{2+} , Hg_2^{2+} , Hg^{2+} , Bi^{3+} , Cu^{2+} , Cd^{2+} , As^{3+} , Sb^{3+} , Sn^{2+} , Sn^{4+} , Fe^{3+} , Al^{3+} , Ba^{2+} , Cr^{3+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Ca^{2+} , Sr^{2+} , Mg^{2+} , NH_4^+ .

Cl^- , Br^- , I^- , SO_4^{2-} , SO_3^{2-} , S^{2-} , CrO_4^{2-} , PO_4^{3-} , NO_3^- , NO_2^- , BO_3^{3-} , AsO_4^{3-} ,

Every mixture must contain at least one interfering radical. Presence of Na^+ , K^+ , CO_3^{2-} , must be ignored and not to be reported. At least 5 salt mixtures have to

be done by each student in the practical classes keeping records carefully.

The preparation of this type of combination must be avoided while preparing a mixture.

(a) Cl^- , Br^- & I^- ; (b) NO_3^- & NO_2^- (c) NO_3^- , Br^- & I^- , (d) PO_4^{3-} , AsO_4^{3-} & AsO_3^{2-} ;
(e) CO_3^{2-} & SO_3^{2-} , SO_4^{2-} , (f) Cl^- , Br^- or I^- ; (g) S^{2-} , SO_3^{2-} , SO_4^{2-} , $\text{S}_2\text{O}_3^{2-}$.

Part II Gravimetric analysis

- a) Analysis of Cu as CuSCN
- b) Ni as Ni(DMG)
- c) Zn as ZnO
- d) Cr as Cr_2O_3
- e) Fe as Fe_2O_3

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-II

CHEM-201: Organic Chemistry (Pass Course - Theory)

Total Credit : 4

Unit 1

a) Bondings and Shapes of Organic Molecules

16 L

Hybridizations of orbitals, implications of hybridization on the concept of bond length, bond energy, bond angles, shape of the molecules with the examples of molecules given below:

(i) CH_4 , H_3O^+ , $^-\text{CH}_3$, RNH_2 (ii) C_2H_4 , $^+\text{CH}_3$, carbonyl compounds and (iii) C_2H_2 , R-CN , allene, ketene.

Nature of covalent bond and its orbital representation in molecules listed above.

Conjugation, resonance, hyper-conjugation (propene and toluene), homolytic and heterolytic bond cleavage. Types of reagents – electrophiles and nucleophiles. Reactive intermediates – carbocations, carbanions, free radicals, carbenes and their stability and shape (with examples).

b) Organic Stereochemistry-I

Concepts of types of isomerism—Configuration and conformation isomerism. Fischer, Newman and Sawhorse projection formula with suitable examples ; geometrical isomerism, configuration of geometrical isomers, E and Z nomenclature, geometric isomers of oximes; configuration – optical activity, chiral carbon atom, relative and absolute configuration, optical isomerism of lactic and tartaric acids, enantiomerism and diastereoisomerism; meso compounds; racemic mixture, resolution of racemic mixtures..

Unit-2

a) Alkanes and Cycloalkanes

16 L

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reaction of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes- nomenclature, methods of formation, chemical reaction, Ring strain in small rings (Cyclopropane, cyclobutane, cyclopentane, cyclohexane), Baeyer's strain theory and its limitations and its modification.

b) Alkenes and Alkynes

Nomenclature of alkenes, methods of formation. The Saytzeff's rule, Hofmann elimination, physical properties and stabilities of alkenes. Chemical reaction of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation. Epoxidation , ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 Polymerization of alkenes.

Nomenclature, Structure and bonding in alkynes, methods of formation, chemical reactivity, electrophilic addition reactions (halogenations, hydration, HX, HOX), ozonolysis, alkynides (Cu and Ag); compare acidity of ethane, ethene and ethyne.

Unit 3

a) Arenes and Aromaticity

16 L

Nomenclature of benzene derivatives. Aromatic nucleus and side chain. Structure of benzene: Molecular formula and Kekule's structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity: Huckel rule, aromatic ions, Aromatic electrophilic substitution –Mechanism of nitration, halogenation, sulphonation, Friedel-Craft reaction. Effect of substituent groups (activating and deactivating substituents, directive influence).

b) Organic Reaction Mechanisms

Homolytic and heterolytic cleavage of bonds. Generation and stability of free radicals, carbocations and carbanions, electrophiles and nucleophiles.

Nucleophile, ambident nucleophile, SN^1 , SN^2 , factors affecting substitution reactions (structure of substrate, nature of nucleophile, solvent, role of leaving group), Mechanisms of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions, difference between nucleophiles and bases.

Elimination reactions (E1, E2), orientation in elimination reactions (Saytzeff's and Hoffmann's rule).

Unit 4

a) Alkyl and Aryl Halides

16L

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions (hydrogenolysis, aqueous and alcoholic KOH, NH_3 , KCN, AgCN, KNO_2 , $AgNO_2$, RCOOAg, RONa, Mg, Li, Na).

Polyhalogen compounds: chloroform, carbon tetrachloride.

Methods of formation of aryl halides, nuclear and side chain reaction. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Synthesis and uses of DDT.

b) Alcohols and Phenols

Classification and nomenclature : Monohydric alcohols – nomenclature, methods of preparation by reduction of Aldehydes, Ketones, carboxylic acids and esters (including hydroboration and mercuration). Hydrogen bonding. Acidic nature. Reactions of alcohols distinction between primary, secondary and tertiary alcohols (Victor Meyer's test) methods of formation, chemical reactions of ethylene glycol and glycerol.

Nomenclature, preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion, reactions of phenols – electrophilic aromatic substitution, acylation and carboxylation, Gatterman synthesis, Reimer-Tiemann reaction.

Unit 5

a) Aldehydes and Ketones

16L

Nomenclature and structure of the carbonyl group. Synthesis of Aldehydes and Ketones with particular reference to the synthesis of Aldehydes from acid chlorides, synthesis of ketones from nitriles and from carboxylic acids. Chemical reactivity of carbonyl group, general mechanism of nucleophilic additions and addition-elimination reactions. Reactions with HCN, NaSO₃H, NH₂OH, NH₂NH₂, C₆H₅NHNH₂, NH₂CONHNH₂,) and Cannizzaro reaction; acidity of α -hydrogen in carbonyl compounds and formation of enolates, Benzoin, Aldol, Perkin condensation., condensation with ammonia Oxidation of Aldehydes, oxidation of Ketones., Clemmensen, Wolf-Kishner reductions.

b)Ether And Epoxides: Nomenclature of ethers and methods of their formation, Physical properties. Chemical reactions, cleavage and auto-oxidation. Ziesel's method.

Recommended Books

1. Organic Chemistry: **Morrison and Boyd**, Prentice Hall of India Pvt. Ltd. New Delhi
2. Organic Chemistry, Arun Bahl & B.S. Bahl, S. Chand & Co. New Delhi
3. Reactions, Rearrangements and Reagents: **S.N. Sanyal**, *Bharati Bhawan Publishers and Distributors, Patna*
4. Stereochemistry: **P.S. Kalsi**, New Age International Publishers, New Delhi
5. Organic Reactions and their Mechanism: **P.S. Kalsi**, New Age International Publishers, New
6. Modern Organic Chemistry: **M.K. Jain and S.C. Sharma**: *Vishal Publishing Company, Jalandhar*
7. Undergraduate Organic Chemistry: **Jagdamba Singh & L.D.S. Yadav** Vol-I, II, III, *Pragati Prakashan, Meerut*
8. Advanced Organic Chemistry: **Jagdamba Singh & L.D.S. Yadav**, *Pragati Prakashan, Meerut*
9. Reaction Mechanism in Organic Chemistry, **S.M. Mukherji & S.P. Singh**, Macmillan India Ltd. Delhi
10. Stereochemistry of Carbon Compounds: **Ernest L. Eliel**, Tata McGraw-Hill Pub. Co. Ltd. New Delhi

CHEM-202 : Organic Chemistry
(Pass Course - Practical)

Total Credit : 1

Qualitative Analysis

Systematic qualitative analysis of organic compounds containing two functional groups.

- (a) Detection of elements (N,Cl,Br,I,S)
- (b) Detection of the following functional groups (with systematic reporting)
carbonyl, carboxyl, phenolic, amino, nitro, sulphonic, and amide group
- (c) Determination of the melting point/boiling point
- (d) separation of organic compounds by sublimation method.

Note: Experiments may be added/deleted subject to availability of time and facilities

CHEM-203 : Organic Chemistry
(Honours Course - Theory)

Total Credit : 2

Unit 1

(a) Introduction to Organic Synthesis

8L

Formation of carbon-carbon bond, electrophilic and nucleophilic carbon species, acid-assisted reaction base-assisted condensations (Knoevenagel, Michael, Wittig reaction, Reformatsky reaction, Claisen reaction, Claisen-Schmidt reaction, Mannich reaction) Formation and acid assisted cleavage of acetals and ketals, mechanisms of formation and hydrolysis of esters and amides (acyclic and cyclic).

Use of inorganic reagents in organic synthesis: LiAlH_4 , NaBH_4 , B_2H_6 , Na/ liq NH_3 , Aluminium isopropoxide, KMnO_4 , HIO_4 , Lead tetra acetate.

Unit 2

(a) Introduction to Dienes

8L

Conjugated, isolated and cumulated dienes (allenes). Structures. Preparation and reactions of conjugated dienes (1,3-butadiene and isoprene).

b) Polynuclear Aromatic Hydrocarbons

Introduction; molecular orbital structure of naphthalene; resonance; reactions, mechanism and orientation of electrophilic substitution. Preparations and reactions of α - and β -naphthols (azo-coupling, reactions with HNO_2 and FeCl_3 . Preparation and reactions of anthracene.

c) Organosulphur Compounds

Nomenclature, structural features, methods of formation and chemical reactions of Thiols, Thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

Unit-3

a) Synthetic Polymers

8L

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers.

Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.

Natural and synthetic rubbers.

b) Pericyclic Reactions

Definition of Pericyclic reactions, molecular orbitals and Pericyclic reactions

(i) Electrocyclic reactions: Introduction, stereochemistry of Electrocyclic reaction, conrotatory-disrotatory ring closure and ring opening (with simple examples like 1,4-(2E,4E)-hexatriene, (2E,4Z)-hexatriene; (2E,4Z,6Z)-Octatriene, (2E,4Z,6E)-Octatriene Woodward-Hofmann's rule for Electrocyclic reactions, Frontier Molecular Orbital Theory (no correlation diagram required)

(ii) Cycloaddition reactions: Definition of dienes and dienophiles, Supra-supra, Antara-Antara modes of cycloadditions [4+2] Diels-Alder reaction and [2+2] cycloaddition reaction by taking examples of simple dienes and dienophiles.

Unit 4

8L

a) Heterocyclic Compounds- I

Introduction: Molecular orbital picture and aromatic characteristics of Pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and Pyrrole.

b) Heterocyclic Compounds-II

Introduction to condensed five and six- membered heterocycles. Preparation and reactions of Indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit 5

8L

a) Organic Photochemistry:

Molecular energy and photochemical energy, excitation of molecules, Franck-Condon Principle, dissipation of energy and Jablonski diagram and singlet-triplet states, photosensitization and quenching, quantum yield. Introduction to the photochemical reactions of carbonyl compounds, Paterno-Buchi reaction, Norrish Type I and Type II cleavages, photo reduction

b) Molecular Rearrangements

Carbonium ion rearrangement (Pinacol-Pinacolone; Wagner-Meerwein and dienone-phenol rearrangements, Beckmann, Wolff, Hofmann, Curtius, Benzil-Benzilic acid, Fries rearrangement

Recommended Books

1. Organic Chemistry: Mukherji, Singh and Kapoor. Vol : I, II and III, New Age Publications
2. Heterocyclic Chemistry: Raj K. Bansal: New Age International Publishers, New Delhi
3. Polymer Science: V.R.Gowariker, N.V.Vishwanathan, Jayadev Sreedhar, New Age International Publishers,
4. Organic Chemistry: Morrison and Boyd, Prentice Hall of India Pvt. Ltd. New Delhi
5. Reactions, Rearrangements and Reagents: S.N.Sanyal, Bharati Bhawan Publishers
6. Advanced Organic Chemistry: Jagdamba Singh & L.D.S.Yadav, Pragati Prakashan.Meerut
7. Reaction Mechanism in Organic Chemistry, S.M.Mukherji & S.P.Singh, Macmillan India Ltd. Delhi
8. Organic Chemistry, Paula Y. Bruice, Prentice Hall.
9. Reactive Intermediates, Christopher J Moody and Gordon H. Whitham, Oxford University Press.

CHEM-204 : Organic Chemistry
(Honours Course - Practical)

Qualitative Analysis

Systematic qualitative analysis of organic compounds containing two functional Groups.

- (a) Detection of elements (N,Cl,Br,I,S)
- (b) Detection of the following functional groups (with systematic reporting)
Carbonyl, carboxyl, phenolic, amino, nitro, sulphonic, and amide group
- (c) Determination of the melting point/boiling point
- (d) Identification of the compound with the help of a reference book.
- (e) Preparation of the derivative and determination of its melting point.

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-III

CHEM-301 : Physical Chemistry (Pass Course - Theory)

Total Credit : 4

Unit-I

a) Thermodynamics-I

16L

Types of systems, Thermodynamic process. First Law of thermodynamics Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule Thomson Effect and coefficient, inversion temperature. Thermochemistry : Standard state, standard enthalpy of formation - Hess's Law of heat summation and its applications. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy: Kirchhoff's equation (derivation and application). (Numerical problem based on the topic)

a) Chemical Mathematics:-

Logarithm: - Rules of logarithm, Characteristic and mantissa, Change of sign and base. Graphical representation of equations: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems. Derivative:- Rules of differentiation and partial differentiation. Logarithmic and exponential functions and problems. Integration: - Rules of integration.

Unit-II

a) Gaseous state-I:

16 L

Postulates of kinetic theory of gases, deviation of real gases from ideal behaviour, van der Waals and Virial equation of state, critical phenomena, principle of corresponding states, equation for reduced state. Liquefaction of gases, distribution of molecular speeds, collisions between molecules in a gas: - collision diameter, collision number, collision frequency, mean free path, specific heat of solids.

b) Liquid state-I:

Intermolecular forces: - dipole-dipole forces, dipole-induced dipole force, London forces, hydrogen bonding (inter, and intra bonding), structure of liquids (a qualitative description). Liquid crystals: - classification, structure and properties of smectic, nematic and cholestric liquid crystals, Thermography,

Unit -III

a) Colloids

16 L

Definition, classification of colloids, solid in liquid colloids (sols), preparation of sols, properties- Kinetic, optical and electrical properties, stability of colloids, protective actions, Hardy-Schulze rule, gold number.

Liquids in liquids (Emulsions)- classification and properties, gel, surfactants and micelles, inhibition, general application of colloids.

b) Adsorption and Catalysis,

Theories of adsorption- Freundlich and Langmuir adsorption isotherm (derivation and limiting cases), Ion-exchange adsorption and its applications.

Catalysis: characteristic of catalyzed reactions, types of catalysis with examples, Theories of catalysis, Acid-Base catalysis, mechanism of enzyme catalysed reaction- Michaelis Menten equation.

Unit-IV

16 L

a) Phase rule and its application:

Definition of the following terms:- phase, component, degrees of freedom, derivation of the phase rule, phase equilibrium and metastable equilibrium phase diagram involving one component system (water and sulphur).

Phase equilibria of two component systems, solid-liquid equilibria, simple eutectic Pb-Ag systems and desilverization of lead.

b) Electrochemistry-I:

Electrical transport- conduction in metals and in solutions; specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. and Kohlrausch law, Migrations of ions, Transport number.

Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations,

Unit-V

a) Chemical kinetics-I

16 L

Rate of reaction and rate constant, molecularity and order of reaction, zero order reaction, differential and integrated forms of first and second order reactions, pseudo-unimolecular reactions, experimental determination of order of reaction:- differential method, integral method, method of half life and isolation method, effect of temperature on reaction rates and activation energy, effect of catalyst. Temperature dependence on rate constant - The Arrhenius equation, Radioactive decay as a first order phenomenon

b) Macromolecules:

Characteristic of macromolecules, concept of number average and mass average molecular weight. Determination of molecular weight of macromolecules.

Recommended Books

1. Principles of Physical Chemistry: **Puri, Sharma and Pathania**, Vishal Publishing Co.
2. Advanced Physical Chemistry: **D.N. Bajpai**, S.Chand & company Ltd, New Delhi.
3. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.
4. Chemical Kinetics: **Laidler, Harper and Row**.
5. Physical Chemistry, **T.W. Atkins**, Oxford University Press

CHEM-302: Physical Chemistry
(Pass Course - Practical)

Total Credit : 1

List of Experiments:

- (1) Determination of the heat of neutralization of a strong acid by a strong base.
- (2) Determination of the molecular weight by Rast's method.
- (3) Study of the heat of dilution of H_2SO_4 and then to determine the strength of an unknown acid.
- (4) Determination of the velocity constant of the reaction between hydrogen peroxide and potassium permanganate, using ferric chloride as catalyst.
- (5) Determination of the solubility of a salt (BaCl_2 / Benzoic acid) at two different temperatures and to determine the heat of solution.
- (6) Study of the adsorption of oxalic acid on charcoal and verification of Freundlich's adsorption isotherm.
- (7) Verification of Hardy-Schulze law: Preparation and coagulation of arsenic sulphide (As_2S_3) sol using NaCl , BaCl_2 and AlCl_3 solutions.

(Only one experiment will be selected from the list by a candidate by lot during the examination.)

Note: Experiments may be added/deleted subject to availability of time and facilities

CHEM-303: Physical Chemistry **(Honours Course -Theory)**

Total Credit: 2

Unit-I

Gaseous state –II

8L

Maxwell's distribution law of molecular speeds, molecular speeds and energy distribution as a function of temperature, calculation of most probable velocity, root mean square velocity, average velocity from Maxwell's distribution law. Maxwell-Boltzmann law of distribution of molecular velocities, degrees of motion, principle of equipartition of energy, viscosity of gases, Boyle temperature, critical phenomena-critical constants, p-v isotherm of CO₂, continuity of state, law of corresponding states and reduced equation of state, methods of liquefaction of gases

Unit-II

8L

Phase Equilibria-II :

Ideal liquid mixtures, azeotropes (ethanol – water systems.) Partially miscible liquids-- Lower and upper critical solution temperature (Phenol-water, trimethylamine-water systems).steam distillation (aniline-water system) Solid solutions – compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (FeCl₃-H₂O) and (CuSO₄-H₂O) system, freezing mixture, acetone-dry ice. Nernst distribution law – thermodynamic derivation, applications.

Unit-III

8L

(a) Physical properties and Molecular structure

Optical activity polarization- Clausius-Mossatti equation, orientation of dipoles in electric field, dipole moment, induced dipole moment, measurement of dipole moment-Temperature and refractivity method, Dipole moment and structure of molecules, Magnetic properties-paramagnetism, diamagnetism, and ferromagnetism.

b) Solid state

Space lattice, Laws of crystallography - Law of constancy of interfacial, angles , Law of rationality of indices, Millers and weises indices, Laws of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg.s equation. Measurement of diffraction angle by powder method

Unit-IV

8L

Chemical Kinetics-II

Kinetic equations for complex reactions: Chain, parallel, opposing and consecutive reactions; Experimental methods of chemical kinetics-Potentiometric, Spectrophotometric and optical methods. Rate constant for simple bimolecular reactions; Collision theory; Activated complex theory Reactions in solutions: Diffusion controlled & activation controlled reactions; Thermodynamic formulation of rate constant, expression for rate constant based on equilibrium constant.

Unit-V

8L

Statistical Thermodynamics

Limitation of classical thermodynamics, concepts of distribution of energy, thermodynamic probability, Boltzmann distribution law, partition function and thermodynamic parameters; relation between molecular and molar partition functions, translational partition function, rotational partition function for linear and non-linear molecules; vibrational partition function, electronic partition function, reference state of zero energy for evaluating partition function, equilibrium constant in terms of partition function.

Heat capacity of solids.

Recommended Books

1. Principles of Physical Chemistry: **Puri, Sharma and Pathania**, Vishal Publishing Co.
2. Advanced Physical Chemistry: **D.N. Bajpai**, S.Chand & company Ltd, New Delhi.
3. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.
4. Chemical Kinetics: **Laidler, Harper and Row**.
5. Physical Chemistry, **T.W. Atkins**, Oxford University Press

CHEM-304: Physical Chemistry
(Honours Course - Practical)

Total Credit : 1

- (a) Determination of surface tension of a liquid/solution by drop-weight method.
- (b) Determination of viscosity – composition (v/v) curve of ethanol-water system and to determine the composition (v/v) of a given mixture.
- (c) Determination of partition coefficient of a solute between two immiscible solvents (e.g. iodine in water/organic solvent; benzoic acid in water/benzene).
- (d) Determination of the velocity constant of the hydrolysis of methyl acetate catalysed by an acid.
- (e) Conductometric titrations of an acid by a base. Acid-base titration using potentiometer.
- (d) Determination of the heat of solution of solid calcium chloride by the Born-Haber cycle.
- (e) Determination of the critical solution temperature of the phenol-water system.
- (f) Study on the kinetics of the reaction between potassium persulfate and potassium iodide at two temperatures.

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-IV
CHEM-401: Inorganic Chemistry
(Pass Course - Theory)

Total Credits :4

Unit 1

16 L

a) Comparative study of d-Block Elements (Group 3-12)

Group discussion of transition elements with respect to position in the periodic table, electronic configuration, density, melting and boiling points, atomic volume, atomic and ionic radii, ionization potentials, electron affinity, Electronegativity, oxidation states, complexes and the relative stability of their oxidation states, oxides halides, hydrides and catalytic properties. Difference between first, second and third transition series.

Chemistry of Ti, V, Cr, Mn, Fe and Co in various oxidation states (excluding their metallurgy). Preparation, important reactions, structures and uses of potassium dichromate, potassium permanganate.

b) Nuclear Chemistry-II

Detection and measurement of radioactivity (G.M. Counter method); Decay kinetics-first order rate equation for radioactive disintegration; Theory of Radioactive disintegration; Radioactive series-Uranium; magic number concept; uses of radioactive and non-radioactive isotopes; transmutation of elements; purity and strength of radio isotopes, Radio chemical principle in the use of Tracers. Size of Nucleus; nuclear forces; nuclear binding energy; the possible forces between n-n, p-p, and n-p; nuclear reactions spallation. Basic principles and types of nuclear reactors; atomic energy and Q values of nuclear reactions (MeV).

Unit I1

16 L

a) Coordination Compounds

Werner's Coordination theory, coordination number, ligands and their classification, chelation, applications of chelate formation; nomenclature of coordination compounds, effective atomic number rule, Isomerism in coordination compounds, geometrical and optical isomerism in - and 6- coordinate complexes; Sidgwick's effective atomic number rule; stereochemistry of complexes with coordination numbers 4 and 6. Bonding in transition metal complexes: Valence Bond Theory and elementary idea of Crystal Field Theory for octahedral and tetrahedral complexes, their role in nature and medicine.

b) Environmental Chemistry

Composition of the atmosphere, photochemical reactions in the atmosphere, rain carbon monoxide and its effects, -- suspended particulate matter – size and effects on health, dual role of ozone in the atmosphere tropospheric ozone and stratospheric ozone, ozone hole, carbon dioxide and other gases responsible for global warming. Measures to control air pollution. Quality of water drinking and other purposes. Permissible limits. Common water pollutants—organic and inorganic. Heavy metals and their toxic effects. Pollution of water through use of chemical fertilizers. Fluoride contamination and fluorosis. Pollution due to mining. Measures taken to control water pollution.

Unit III

16 L

a) Chemistry of Lanthanide and Actinide Elements

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. General features and chemistry of Actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides. Preparation, reactions, structure and uses of uranium hexafluoride.

b) Separation Methods

Solvent extraction: Principles and process of solvent extraction; distribution law and partition coefficient; Batch extraction, continuous extraction and counter-current distribution.

Chromatography: Classification of chromatographic methods; principles of differential migration; adsorption phenomenon; nature of the adsorbents; solvent systems and R_f values.

Unit IV

16 L

a) Study of the following:

Active nitrogen, activated charcoal, allotropy, isomorphism, alloy and amalgams, principles of Iodometry and Iodimetry, resins-cationic and anionic resins, molecular sieves, Carborandum.

b) Inorganic Polymers:

Types of inorganic polymers: Comparison with organic polymers: Important synthesis, structural aspects and application of silicones. Phosphazenes: Uses, structure and bonding in Tri- and Tetra- Phosphonitrilic halides.

Unit V

16 L

a) Metal carbonyls

Preparation, properties, structure and bonding of mono nuclear carbonyls, π -acceptor behavior of carbon monoxide, synergic effect (MO diagram of CO be refer for synergic effect refer to IR frequencies) Carbonylate anions, Ferrocene and its Reactions.

b) Non – Aqueous solvents

Physical properties of a solvent for functioning as an effective reaction medium, types of solvents and their general characteristics. Liquid NH_3 as a non – aqueous solvent

Recommended Books

1. Advanced Inorganic Chemistry Vol I & II: **Satya Prakash, G.D.Tuli, R.D.Madan & S.K Basu**, S.Chand& Co.
2. Selected topics in Inorganic Chemistry: **U.Malik, G.D.Tuli, R.D.Madan**, S.Chand& Co. New Delhi
3. Principles of Inorganic Chemistry: **Puri, Sharma & Kalia**, Vishal Publications, Jalandhar
4. Advanced Inorganic Chemistry Vol. I, II: **Gurdeep Raj**, Goel Publishing House, Meerut
5. Essentials of Nuclear Chemistry: **H.J. Arnika**, New Age Publication New Delhi
6. Basic Inorganic Chemistry: **Cotton, Wilkinson & Gaus**, Wiley
7. Concise Inorganic Chemistry: **J.D.Lee** (Blackwell Science)
8. Inorganic Chemistry: **Sharpe**, Pearson Education
9. Inorganic Chemistry: **Shriver & Atkins**, Oxford University Press
10. Inorganic Chemistry: **J.E. Huheey, E.A. Keiter & R.L Keiter**
11. Separation Chemistry: **R.P.Budhiraja**; New Age international (P) Ltd. Publishers.

CHEM-402 : Inorganic Chemistry
(Pass Course - Practical)

Total Credit : 1

Part I Volumetric Analysis

- (a) Estimation of Ca^{2+} by KMnO_4 method and by $\text{K}_2\text{Cr}_2\text{O}_7$ method
- (b) Cl^- by Mohr's and Volhard's method
- (c) Cu^{2+} and Cl^- from CuCl_2
- (d) Zn^{2+} and Cl^- from ZnCl_2
- (e) To determine volumetrically the number of molecules of water of crystallization of BaCl_2 crystals.
- (f) To determine volumetrically the percentage purity of a sample of Potassium Chloride
- (g) To estimate Copper as Cupric Oxide in a solution of CuSO_4

Part II Oxidation - Reduction Titrations

- a. To estimate the amount of Zinc present in the whole of the given ZnSO_4 solution being provided decinormal Potassium ferrocyanide solution of ZnSO_4 crystals.
- b. To estimate H_2O_2 by Iodometric method.

Part III Gravimetric Estimations of Two Constituents

- a. To estimate Copper and Zinc in the given solution.
- b. To estimate Silver and Zinc in the given solution.
- c. To estimate Copper and Magnesium in the given solution.

Note: Experiments may be added/deleted subject to availability of time and facilities

CHEM-403: Quantum Chemistry and Molecular Spectroscopy
(Honours Course - Theory)

Total Credit: 2

Unit –I

8L

Quantum Mechanics-I

Construction of Hamilton (H) operator, Schrödinger wave equation and solution of $H\Psi=E\Psi$ for particle in 1-D box, normalization and orthogonality of Ψ , Postulates of quantum mechanics, nodes in excited state and calculation of average value $\langle x \rangle$, $\langle x^2 \rangle$, $\langle p \rangle$ and $\langle p^2 \rangle$. Schrödinger wave equation for H-atom, Hydrogen like wave function, radial wave function, angular wave function.

Unit-II

8L

Quantum Mechanics – II

Molecular orbital theory, basic ideas- criteria for forming M.O from A.O, construction of M.O's by LCAO- H_2^+ ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ , σ^* , π , π^* orbitals and their characteristics. Hybrid orbitals-sp, sp^2 , sp^3 calculation of coefficients of A.O.'s used in these hybrid orbitals. Introduction to valence bond model of H_2 , comparison of M.O. and V.B. models.

Unit-III

8L

Introduction to Spectroscopy

Introduction: electromagnetic radiation, region of the spectrum, basic features of different spectrometer, statement of Born-Oppenheimer approximation, degrees of freedom. Rotational (rigid rotor model) and Vibrational (harmonic oscillator model) spectra of diatomic molecules, frequency expressions, selections rules, spectral intensity, determination of bond length, isotope effect.

Unit-IV

8L

a) Vibrational spectrum

Infrared spectrum: energy level of simple harmonic oscillator, selection rules, pure Vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of an harmonic motion and isotope on the spectrum, idea of Vibrational frequencies of different functional groups.

b) Raman spectroscopy

Concept of polarizability, pure rotational and Vibrational Raman spectra of diatomic molecules, selection rules, qualitative description of π , σ , and n molecular orbitals, their energy levels and their respective transitions. Selections rules. Concept of potential energy curves,

Unit-V

8L

a) Rotational spectroscopy

Diatomic molecules, energy levels of a rigid rotator (semi-classical principles) selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotator. Isotope effect.

Recommended Books

1. Principles of Physical Chemistry: **Puri, Sharma and Pathania**, Vishal Publishing Co.
2. Physical Chemistry, **T.W. Atkins**, Oxford University Press
3. Introductory Quantum Chemistry, **A.K. Chandra**, Tata McGraw Hill
4. Quantum Chemistry, **I. Levine**, Tata McGraw Hill
5. Fundamental of Molecular Spectroscopy, **Collin N. Banwell and Elaine M. Mccash**, Tata McGraw Hill
6. Quantum Chemistry: **R.K.Prasad**, New Age International Publishers, New Delhi

CHEM-404 : Advance Practical-1
(Honours Course - Practical)

Total Credit : 1

On the basis of the result of the draw of lot before the practical examination, a student will have to perform two experiments among the following three sections.

Part I Physical

- (a) Determination of the strength of a given ferrous sulfate solution potentiometrically.
- (b) Verification of Beer-Lambert's law using copper sulfate or $K_2Cr_2O_7$ solution colorimetrically and determination of the concentration of the above solution.
- (c) Decomposition of hydrogen peroxide using ferric chloride as catalyst and to determine the activation energy.

Part II Organic

- (i) Preparation of acetanilide from aniline (ii) Preparation of aspirin from Salicylic acid (iii) Preparation of benzanilide from aniline (iv) Preparation of 2,4,6- tribromophenol from Phenol.
- (v) Preparation of Methyl orange

Yield and quality of the compound
Recrystallisation and melting point

Part III Inorganic

A. Inorganic Preparations

Preparation of the following

- (a) Tetrammine Cu(II) sulphate
- (b) Hexammine Ni(II) chloride
- (c) Potassium trioxalato ferrate (III)
- (d) Potassium trioxalato chromate (III)
- (e) Cu (Thiourea) complex
- (f) Ammonium ferric sulphate
- (g) Nitro pentammine cobalt(III) chloride
- (h) Reineck Salt (i) Potassium trioxalato chromate (III)
- (j) Potassium chlorochromate

Characterization of the compound prepared, students should recrystallize the product and verify the presence of anion and cations by qualitative analysis.

Yield and quality of the compound

Detection of anion and cations

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-V

CHEM-501: Organic Chemistry (Pass Course - Theory)

Total Credit :4

Unit 1

16L

a) Carboxylic Acids and its derivatives

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure, nomenclature and preparation of esters, amides (urea), acid anhydride. Physical properties and chemical properties of esters, amides acid anhydrides. Methods of formation and chemical reactions of Malic acid.

b) Active methylene compounds

Tautomerism (keto-enol), difference between tautomerism and resonance, synthetic application of Diethyl malonate, Ethyl acetoacetate, Ethyl cyanoacetate.

Unit 2

16L

a) Nitro compounds

General methods of preparation, chemical reactions of nitroalkanes, reductions in acidic, neutral and alkaline media, hydrolysis, reaction with nitrous acid, acidic nature, Picric acid.

b) Amines

Structure and nomenclature of amines, Preparation of amines, physical properties, Structural features effecting basicity of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds nitriles), reductive amination of aldehydic and ketonic compounds. Chemical reactivity, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Gabriel-Phthalimide reaction, Hofmann bromide reaction. Distinction between primary, secondary and tertiary amines and their separation.

Unit 3

16L

a) Organometallic Compounds

Organomagnesium compounds: Formation of Grignard Reagent, synthesis of alkanes, alcohols, carboxylic acids, aldehydes, ketones, amines with Grignard Reagent.

Organolithium compounds: Preparation and synthetic use of alkyl Lithium.

b) Amino Acids, Peptides and Proteins

Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins.

Unit 4

16L

a) Carbohydrates-I

Classification and nomenclature. Monosaccharides. Mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Cyclic structure of D(+)- glucose. Mechanism of mutarotation.

b) Carbohydrates –II

Determination of ring size of D-Glucose. Structures of ribose and deoxy-ribose. An introduction to disaccharides maltose, sucrose and their reactions and structure. Structure of starch and cellulose, Preparation of Cellulose nitrate, cellulose acetate, rayon and cellophane.

Unit 5

a) Synthetic Dyes

16L

Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, crystal violet, Phenolphthalein, Fluorescein, Alizarin and indigo

b) Fats, Oils and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

c) Diazo compounds

Preparation and stability of diazo compounds (aliphatic and aromatic). Reactions of benzene diazonium chloride. Preparation and reaction of diazomethane

Recommended Books

1. Organic Chemistry: **Morrison and Boyd**, Prentice Hall of India Pvt. Ltd. New Delhi
2. Organic Chemistry: Mukherji, Singh and Kapoor. Vol: 1, II and III, New Age Publications
3. Organic Chemistry: Jagdamba Singh & L.D.S.Yadav Vol-I, II, III, Pragati Prakashan, Meerut.
4. A Text Book of Organic Chemistry, A. Bahl and B.S. Bahl, S. Chand & Co. New Delhi
5. Organic Chemistry, Paula Y. Bruice, Prentice Hall.
6. Organic Chemistry, S.H. Pine, Mc-Graw Hill

CHEM-502 : Organic Chemistry
(Pass Course - practical)

Total Credit : 1

- a) Identification of the compound with the help of a reference book.
- b) Determination of pH Of given aerated drinks, fruit juices,shampoos and soaps.

Note: Experiments may be added/deleted subject to availability of time and facilities

**CHEM-503 : Analytical Chemistry & Application of Spectroscopy
(Honours Course -Theory)**

Total Credit : 2

Part-I Analytical Chemistry

UNIT-1

8L

a) *Thermal method of analysis:* Theory of thermogravimetry (TG), basic principle of instrumentation. Techniques for quantitative estimation of Ca and Mg from their mixture.

b) *Precipitation:* Desirable properties of gravimetric precipitates. Formation of gravimetric precipitates. Conditions for quantitative precipitation. Contamination in precipitates. Methods for removing impurities in precipitates. Organic precipitants (oxine, dithiozone, α -nitroso, β -naphthol, cupferron, dimethyl glyoxime) in chemical analysis.

c) *Analytical Reagents :* Theoretical and practical aspects of the use of E.D.T.A., cerate, iodate, bromate, chloramine T, Karl Fischer reagent and periodate in chemical analysis.

UNIT-2

8L

a) *Electro analytical methods:* Classification of electro analytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence point. Techniques used for the determination of pK_a values. Theory of thermogravimetry (TG), basic principle of instrumentation.

b) *Development of chromatograms:* Frontal, elution and displacement methods. Qualitative and quantitative aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC and HPLC.

c) *Radio analytical Methods :*

Elementary theory, isotope dilution and Neutron activation methods and applications.

UNIT-3

8L

a) *Spectrophotometry:* Beer's law and its limitations, nomenclature and units. General instrumentation for spectrophotometry, spectrophotometric determination of one component (iron, chromium, manganese, nickel, titanium and phosphorus) and two components (overlapping and non-overlapping) systems, spectrophotometric determinations of dissociation constants of an indicator, photometric errors and RINGBOM-AYRES plots.

b) *Stereo isomeric separation and analysis:* Measurement of optical rotation, calculation of Enantiomeric excess (ee) / diastereomeric excess (de) ratios and determination of Enantiomeric composition using NMR, Chiral solvents and chiral shift reagents.

Part-II Application of Spectroscopy

UNIT-4

8L

Organic spectroscopy: General Principles, IR Spectroscopy: Fundamental and Non-fundamental molecular vibrations; IR absorption positions of O, N and S containing functional groups; Effect of H- bonding on IR absorptions; Fingerprint region and its significance; application in functional group analysis. UV Spectroscopy: Types of electronic transitions, λ_{max} , Chromophores and Auxochromes, Bathochromic and Hypsochromic Shifts, Intensity of Absorption; Application of Woodward Rules for calculation of λ_{max} for the following systems: α , β unsaturated Aldehydes, Ketones, carboxylic acids and esters; Conjugated dienes: alicyclic, homoannular and heteroannular; Extended conjugated systems (Aldehydes, ketones and dienes); Cis and trans isomers.

UNIT-5

8L

NMR Spectroscopy: Basic principles of Proton Magnetic Resonance, Chemical Shift and factors influencing it; Spin – Spin Coupling and Coupling constant; Anisotropic Effects in Alkene, alkyne, Cycloalkane, Carbonyl compounds and benzene; Study of AX, AX₂, AX₃, A₂X₃ and AMX Patterns of NMR spectra. Applications of IR, NMR and UV in Structural Identification of Simple Organic Molecules.

Recommended Books

1. Instrumental Methods of Analysis, **H.H. Willard, L.L.Meritt, J.A.Dean, F.A.Settle**. CBS Publications
2. Vogel's Text Book of Quantitative Chemical Analysis, **J.Mendham, R.C. Denney, J.D.Barnes and M.J.Thomas**. Pearson Education
3. Essentials of Nuclear Chemistry, **H.J.Arnika**r, Wiley Eastern
4. Basic Concept of Analytical Chemistry, **S.M. Khopkar**, New Age International Publishers
5. Spectroscopy of Organic Compounds, **P.S.Kalsi**, New Age International Publishers
6. Elementary Organic Spectroscopy, **Y.R. Sharma**, S. Chand & Co. New Delhi
7. Separation Chemistry: **R.P.Budhiraja**, New Age Publications, New Delhi

CHEM-504 : Advance Practical -II **(Honours Course - Practical)**

On the basis of the result of the draw of lot before the practical examination, a student will have to perform two experiments among the following three sections.

Part I Inorganic

Quantitative Analysis

Gravimetric Estimation of (a) Ag^+ (b) Zn^{2+} (c) Ba^{2+}

Estimation (volumetrically or gravimetrically) of the following constituents from the mixtures of:

a) Iron-Calcium (b) Iron-Copper (c) Copper-Zinc (d) Calcium-Barium (e) Copper-Nickel .
Complexometric titration using EDTA for estimation of (i) Mg^{2+} and (ii) Zn^{2+} .

(Only one experiment will be selected from each part by a candidate by drawing lot during the examination.)

Part II Organic

Chromatography

- a) Separation of mixtures
- b) Separate and identify the monosaccharide's present in the given mixture (glucose and fructose) by paper chromatography. Report the R_f values
- c) Chromatographic separation of the active ingredients of plant, flower and juices by TLC.

Part III Physical

- a) Determination of order of reaction, rate constant and energy of activation for saponification of an ester by NaOH, conductometrically.
- b) Determination of strength of strong and weak acids in a mixture, conductometrically.
- c) Determination of critical micellar concentration (CMC) of sodium lauryl sulphate from the measurement of conductivities at different concentrations.
- d) Determination of strengths of halides in a mixture, potentiometrically.

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-VI

CHEM-601: Physical Chemistry (Pass Course- Theory)

Total Credit : 04

Unit-1

16L

a) Thermodynamics-II

Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature (statement and it's derivation). Concept of Entropy: entropy as a state function, entropy as a function of V & T, Entropy as a function of P & T, entropy change for a spontaneous process in a physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium, Entropy change in ideal gases and mixing of gases.

b) Solid State

Definition of space lattice, unit cell. Laws of crystallography-(i) law of constancy of interfacial angles (ii) law of rationality of indices (iii) law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals, derivation of Bragg equation, determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Imperfections in a crystal:- point defects (Schottky defect, Frenkel defect, colour centres)

Unit-II

16L

a) Gaseous state –II

Real gases- deviation from ideality, compressibility factor, Maxwell's distribution law of molecular speeds, molecular speeds and energy distribution as a function of temperature, calculation of most probable velocity, root mean square velocity, average velocity from Maxwell's distribution law. Maxwell-Boltzmann law of distribution of molecular velocities, degrees of motion, principle of equipartition of energy, viscosity of gases, Boyle temperature, critical phenomena-critical constants, p-v isotherm of CO₂, continuity of state, law of corresponding states and reduced equation of state, methods of liquefaction of gases

Unit-III

16L

(a) Chemical equilibria

Law of mass action, equilibrium constant (K_c) from thermodynamic derivation of law of mass action, temp. and pressure dependence of equilibrium constant (K_p and K_c)- van't Hoff equation, relation between K_p and K_c , equilibria in homogeneous and heterogeneous system, le Chatelier's principle, Clausius-Clapeyron equation and its applications.

(b) Ionic Equilibria

Dissociation equilibria of weak electrolytes, dissociation constant of weak acids (K_a), ionic product of water (K_w), hydrogen ion concentration and pH scale, Common ion effects, Buffer solution and buffer activity, calculation of pH values of buffer's mixtures. Henderson-Hasselbalch equation, hydrolysis constant of a base (K_b), relation between K_a , K_w and K_b .

Derivation of hydrolysis constant for salts of – i) strong acids and weak base, ii) weak acids and strong base and iii) weak acids and weak bases. Solubility product and its application.

Unit-IV

16L

(a) Photochemistry

Introduction, difference between thermal and photochemical process, Beer-Lambert law, Laws of photochemistry- Grothus- Draper's law, Stark-Einstein law, Quantum efficiency and quantum yield, Jablonski diagram depicting various process occurring in the excited state, Fluorescence, Phosphorescence , non-radiative processes (internal conversion, intersystem crossing), Photosensitized reactions- energy transferred processes (simple examples).

b)Liquid State –II

Qualitative description of the structure of liquids, physical properties of liquids-vapour pressure, surface tension, viscosity, refractive index (definitions and descriptions), determination of surface tension, viscosity and refractive index of liquids. Physical properties and chemical constitution-additive and constitutive properties, molar volume, parachor, specific and molar refraction. Polar and non-polar liquids, dielectric constant, dipole moment, structure of molecules, polarization, Clausius-Mossotti equation

Unit-V

16L

a) Thermodynamics-III

Third law of thermodynamics, Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz equation; Gibbs function (G) and Helmholtz (A) as thermodynamic quantities, ΔG as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change variation of Gibbs function (G) and Helmholtz function (A) with P,V &T. Trouton's rule, Clausius-Clapeyron equation, Maxwell's equation, concept of chemical potential, equilibrium between different phases, derivation of the phase rule for the concept of chemical potential, partial molar quantities, variation of chemical potential with temperature and pressure, chemical potential of an ideal gas, Gibbs-Duhem equation; application of chemical potential.

Recommended Books

1. Principles of Physical Chemistry: **Puri, Sharma and Pathania**, Vishal Publishing Co.
2. Advanced Physical Chemistry: **D.N. Bajpai**, S.Chand & company Ltd, New Delhi.
3. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.
4. Chemical Kinetics: **Laidler, Harper and Row**.
5. Physical Chemistry, **T.W. Atkins**, Oxford University Press
6. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.

CHEM-602 : Physical Chemistry
(Pass Course - Practical)

Total Credit : 1

List of Experiments:

- 1) To study the kinetics of iodination of acetone.
- 2) To study the kinetics of a second order reaction (saponification of ethyl acetate).
- 3) Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it.
- 4) Determination of enthalpy of hydration of copper sulphate.
- 5) pH metric titrations of
 - i) Strong acid and strong base
 - ii) Weak acid and strong base

Note: Experiments may be added/deleted subject to availability of time and facilities

**CHEM -603 Choice Based Credit Paper
(Honours Course –Theory)**

The Elective papers selected are:

1. Biological Chemistry
2. Nano Chemistry
3. Environmental and Green Chemistry
4. Medicinal Chemistry

CHEM-603 (D): Choice Based Credit Paper (Honours Course – Theory)

Environmental and Green Chemistry

Credits: 3

Section A

(Environmental Chemistry)

Unit I:

12 L

Concept and scope of environmental chemistry; Environmental Segments; Biogeochemical Cycles of Carbon, Nitrogen, Oxygen and Sulphur; Particles, Ions and Radicals in the Atmosphere; Greenhouse Effect; Physical Chemistry of Sea water; Complexation in Natural Water and Waste Water.

Unit II:

12 L

Toxic chemicals in the environment; Biochemical effects of Arsenic, Lead and Mercury; Waste classification: Solid waste Disposal; Waste water treatment; Sludge treatment; Water reuse and recycling. Some instrumental techniques in environmental analysis – Atomic absorption spectrophotometry (AAS), ion-selective electrodes.

Section B

(Green Chemistry)

Unit III:

12 L

Introduction to green chemistry: Definition, need, goals, limitations and progress of green chemistry; Twelve (12) principles of green chemistry with explanation and examples. Designing a green synthesis: choice of starting materials, choice of reagents, choice of catalysts and choice of solvents. Green solvents: supercritical carbon dioxide fluid, supercritical water and water as a reaction solvent.

Unit IV:

12 L

Chemical toxicity, some common laboratory toxic chemicals and their effects (acetaldehyde, acetone, benzene, chloroform, carbon tetrachloride, ethanol, formaldehyde, methanol, phenols, xylene, toluene); some worst chemical disasters of the world. Importance of green chemistry in day to day life; Future trends in green chemistry - oxidation, reagents and catalyst, biomimetic, multifunctional reagents., combinatorial green chemistry, proliferation of solventless reactions, non-covalent derivatization and green chemistry in sustainable development.

Unit V:

12 L

Application of green chemistry using green reagents: selective methylation of active methylene and solid state polymerization of amorphous polymers using diphenyl carbonate. Preparation and application of green reagents: Tetrabutyl ammonium tribromide (TBATB) and ionic liquids ([pmIm]⁺ Br⁻). Microwave assisted reactions in water: Hofmann elimination, hydrolysis of benzyl chloride to benzyl alcohol, oxidation of toluene to benzoic acid and oxidation of alcohols. Microwave assisted reactions in organic solvents: Fries rearrangement, Diels - Alder reaction and decarboxylation. Microwave assisted solvent free reactions (solid state reactions): Deprotection, saponification, synthesis of pyridines and synthesis of benzimidazoles. Ultra assisted reactions: Esterification, Cannizzaro reaction, Strecker synthesis and Reformatsky reaction.

Reference Books:

1. Environmental chemistry 7th edition by A.K. De, New age International publishers
2. Environmental chemistry by Manahan S.E., CRC Press
3. Environmental studies: selective and scientific books by A. Mishra, New age International publishers
4. An introduction to Green Chemistry by V. Kumar, Vishal publishing Co.
5. Aspects of Green Chemistry by Upasana Bora Sinha. MRB Publishers
6. Introductory green chemistry by J.N. Gurtu and Amit Gurtu, Pragati Prakashan
7. New trends in Green chemistry by V.K. Ahluwalia & M.R. Kidwal, Anamalya publishers

Syllabus of
BSc Honours Course
in
Geography
for 2018-19 Session

**DEGREE SYLLABUS
FOR SEMESTER SYSTEM**

GEOGRAPHY

B.A./B.Sc. (*PASS & HONOURS*)

ACADEMIC SESSION 2016-



**DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY
LUMAMI**

PROPOSED COURSE OUTLINE FOR B.A./ B.Sc. SEMESTER SYSTEM
DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY

Semester	I (Code/Paper)	II (Code/Paper)	III (Code/Paper)	IV (Code/Paper)	V (Code/Paper)	VI (Code/Paper)	Total Credit
Theory (P & H)	GEOG-101/ (Physical basis of Geography)	GEOG-201/ (Climatology & Oceanography)	GEOG-301/ Human Geography	GEOG-401/ Economic Geography	GEOG-501/ Regional Geography of India	GEOG-601/ Regional Geography of North East India	
Credit/CH*	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	24
Practical (P & H)	GEOG-102/ Practical	GEOG-202/ Practical	GEOG-302/ Practical	GEOG-402/ Practical	GEOG-502/ Practical	GEOG-602/ Practical	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6
Theory (H)	GEOG-103/ Geographical Thought	GEOG-203/ Regional Geography of World	GEOG-303/ Political Geography	GEOG-403/ Advanced Geomorphology	GEOG-503/ Applied and Resource Management	GEOG-603/ Environment and Disaster Management	
Credit/CH*	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	18
Practical (H)	GEOG-104/ Practical	GEOG-204/ Practical	GEOG-304/ Practical	GEOG-404/ Practical	GEOG-504/ Practical	GEOG-604/ Project	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6

*Abbreviation: P & H = Pass & Honours, H= Honours

*CH = Contact Hours

Each semester would be of 90 working days

Credit=Contact Hours per week (double for practical)

SEMESTER -I
(Pass and Honours)
GEOG-101/ PAPER –I
Physical basis of Geography -I

Contact Hours: 60

Objectives:

The objective of this course is to introduce students to physical geography, in a brief but adequate manner, and to enlighten the students on career opportunities for geographers.

- Unit –I Nature and scope of Physical Geography, Branches of Physical Geography and their interrelations; Linkages of geography with physical sciences and social sciences like geology, biology, economics and sociology.
- Unit –II Origin of Solar System and Earth (Tidal Hypothesis of Jeans and Jeffrey, Gaseous Theory by Kant, Nebular Hypothesis of Laplace and Big-Bang Theory).
- Unit –III Major landforms: Mountains, Plateau and Plains;
Forces affecting earth's crust (endogenetic and exogenetic forces).
- Unit –IV Origin, composition and types of rocks, Soil profile: Processes of soil formation and soil types.
- Unit –V Meaning and Scope of Biogeography,
Ecosystem: Components and functioning, factors influencing plant growth
Major Biomes of the world.

Books Recommended

1. Bryant, H. Richard (2001): Physical Geography Made Simple, Rupa and Company. New Delhi
2. Bunnett, R.B. (2003): Physical Geography in Diagrams, Fourth GCSE edition, Pearson Education (Singapore) Private Ltd.
3. Garrison, T. (1998): Oceanography, Wordsworth Company, Belmont.
4. Lake, P. (1979): Physical Geography, Cambridge University Press, Cambridge.
5. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
6. Monkhouse, F.J. (1979): Physical Geography. Methuen, London
7. Singh, S. (2003): Physical Geography. Prayag Pustak Bhawan, Allahabad;
8. Strahler, A.N. and Stahler, A.M. (1992): Modern Physical Geography. John Wiley and Sons, New York.

SEMESTER -I
(Pass and Honours)
GEOG-102/ Practical

Contact Hours: 30

- Unit –I a) Types of scale; preparation of scale: simple, comparative and diagonal;
 b) Enlargement and Reduction of map by graphical method.
- Unit –II Interpretation of Toposheet: Topography (relief, plain, plateau, mountain etc.),
 Drainage (pattern)
- Unit –III Representation of different landforms and their profile (Cliff, Oxbow lake,
 Waterfall, Ria Coast, Fjord Coast, Cirque, Meander, River terrace)
- Unit –IV Viva voce and Practical Note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -I
(Honours)
GEOG-103/ Geographical Thought

Contact Hours: 45

Objectives:

To introduce the students to the philosophical and methodological foundations of the subject and to its place in the world of knowledge. To familiarize them with the major landmarks in development of geographic thought at different periods of time.

- Unit –I Classical geography –contributions of Greeks (Herodotus, Eratosthenes), Romans (Strabo, Ptolemy) and Indian geographers.
Medieval geography –Arab Geographers (Al-Masudi, Ibn-Batuta)
- Unit –II Impact of Exploration and Inventions.
Geography in the classification of science –Immanuel Kant.
- Unit –III Dichotomies in geography: Determinism vs. Possibilism.
Physical vs. Human Geography
- Unit –IV Founders of modern geographical thought: Alexander Von Humboldt and Carl Ritter.
Contribution of geographers: Vidal de Lablache and Elisee Reclus
- Unit –V Concept of geography:
(a) Geography as an earth science
(b) Geography as the study of Landscape both physical and cultural
(c) Geography as a science of distribution

Books Recommended

1. Ali, S.M. (1960): Arab Geography, Institute of Islamic Studies, Aligarh Muslim University, Aligarh, First Edition.
2. Ali, S.M. (1983): The Geography of Puranas, People's Publishing House, New Delhi, Third Edition
3. Diddee, J. (ed.) (1990): Indian Geography, Institute of Indian Geographers, Pune, first edition.
4. Dikshit, R. D. (2003): Geographical Thought. A Critical History of Ideas. Prentice-Hall of India, New Delhi.
5. Husain, M. (2002): Evolution of Geographical Thought, Rawat Publications, Jaipur.

SEMESTER -I
(Honours)
GEOG-104/ Practical

Contact Hours: 30

- Unit –I a) The nature and scope of cartography, development trend, traditional versus modern Cartography.
 b) The Earth: shape, size, area, coordinate system: latitude and longitude; concept of Great circle and Small circle; direction and distance; concept of scale and spatial resolution;
- Unit –II Combination of Maps from different scales.
- Unit –III Preparation of profiles from Toposheet: Serial, Superimposed, Projected and composite profiles.
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -II
(Pass and Honours)
GEOG-201/Physical Geography –II

Contact Hours: 60

Objectives:

This paper on physical geography is structured into components of climatology and oceanography as these are closely interrelated. Course content leads to the identification of climatic differentiation on the earth, and the consequences of human activities on the atmospheric processes.

Section –I (Climatology)

- Unit –I Definition and significance of climatology; elements of weather and climate; Composition and structure of atmosphere; Insolation and Heat budget.
- Unit -II Vertical and Horizontal distribution of temperature; Pressure and Pressure belts; Winds: Planetary periodic and Local winds; jet streams; Air masses and fronts; temperate and tropical Cyclones.
- Unit –III Major climatic types (Koppen’s and Thornthwaite’s classification of world climate); Global Climate change; role and response of man in climatic changes.

Section –II (Oceanography)

- Unit –IV Surface configuration of the ocean floor, continental shelf, continental slope, abyssal plain, mid-oceanic and oceanic trenches
Movement of Ocean Water: waves, tides and currents
- Unit –V Coral reefs: factors affecting formation of coral reefs, types; Types of marine deposits; Distribution of temperature and salinity of oceans and seas.

Books Recommended

1. Chorley, R.J. (2001): Atmosphere, Weather and Climate. Methuen, London.
2. Critchfield, H.J. (2002): General Climatology. Prentice-Hall of India, New Delhi.
3. Finch, J. C. and Trewartha, G. T.: Elements of Weather and Climate. Prentice-Hall, London.
4. Lal, D.S.(1986): Climatology. Chaitanya Publications, Allahabad.
5. Oliver, J.E. and Hidore, J.J. (2003): Climatology: An Atmospheric Science, Pearson Education Private Ltd, Delhi.
6. Singh, S. (2005): Climatology. Prayag Pustak Bhawan, Allahabad.

SEMESTER -II
(Pass and Honours)
GEOG-202/ Practical

Contact Hours: 30

- Unit –I a) Handling and use of weather instruments (Max-Min thermometer, Hygrometer, Barometer, Rain gauge, Anemometer).
 b) Interpretation of weather maps published by the Indian Meteorological Department.
- Unit –II Representation of weather data: Temperature, rainfall and humidity data by line and bar graph. Construction and significance of Hythergraph and Climograph.
- Unit –III Hypsometric and Bathymetric curve.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Monkhouse, F. J. and Wilkinson, F.J. (1985): Maps and Diagrams. Methuen, London.
2. Raisz, E. (1962): Principles of Cartography, McGraw Hill, New York.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi,.

* * *

SEMESTER -II
(Honours)
GEOG-203/ Regional Geography of the World

Contact Hours: 45

Objectives:

To have general knowledge about the world and Asia, and to have comparisons between developed and developing nations.

- Unit –I World Regional Geography: An overview; Concepts, bases and characteristics of developed and developing countries.
- Unit –II Population growth, Density and distribution, major population density zones.
- Unit –III Brief regional account of Asia: Physiography, Climate, Power and mineral resources.
- Unit –IV China: Agricultural and industrial regions.
- Unit –V USA: Physiography, agricultural and industrial regions.

Books Recommended

1. di Blij, H. and Muller, O. (1993): Geography: Regions and Concepts. John Wiley and Sons, New York..
2. Jackson, R. H. and Husman, L. E. (1991): World Regional Geography: Issues for Today. John Wiley and Sons, New York.
3. Jones, P. and Bryan, P. (1954): North America: An Historical, Economic and Regional Geography, Methuen and Company. Ltd, London.
4. Kolb, A. (1971): East Asia, China, Japan, Korea, Vietnam, Methuen, London.
5. Sharma, P. R. (ed.) (1991): Perspectives on Third World Development. Rishi Publication, Varanasi.
6. Stamp, L. D. (1976): Asia: A Regional and Economic Geography, Methuen, London.

SEMESTER -II
(Honours)
GEOG-204/ Practical

Contact Hours: 30

- Unit –I a) Concept of base map and types of map; Map design and layout.
 b) Base maps of World, Asia, USA, China and India.
- Unit –II Thematic mapping showing (world population, climate and resources)
- Unit –III Exercise on time calculation from given locations (longitude).
- Unit –IV Practical notebook and viva voce.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -III
(Pass and Honours)
GEOG-301/ Human Geography

Contact Hours: 60

Objectives:

To acquaint the students with the nature of man-environment relationship and to make them understand human capability to adopt and modify the environment in its varied conditions from primitive lifestyle to modern living.

- Unit –I Meaning, nature and scope of Human geography; development and branches of Human geography
- Unit –II Man-environment dynamic relationships; determinism and Possibilism
- Unit –III Evolution of man; classification of races; characteristics of races and their broad distribution. Human adaptation to environment; Eskimos, Masai Bushman, Gujjars.
- Unit –IV Physical, economic and social factors influencing spatial distribution of world population, distribution and density of population; Concept of over population, under population and optimum population; Migration: types and consequences;
- Unit –V Settlement: Geographical factors influencing human settlement. Origin and growth of rural and urban settlement. Types and patterns of rural settlement. Urban settlement: morphology and functional classification.

Books Recommended

1. Husain, M. (1994): Human Geography, Rawat Publications, Jaipur.
2. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
3. Norton, W. (1995): Human Geography, Oxford University Press, New York.
4. Singh, L.R. (2005): Fundamentals of Human Geography, Sharda Pustak Bhawan, Allahabad
5. Stoddard, R.H., Wishart, D.J. and Blouet, B.W. : Human Geography. Prentice-Hall, Englewood Cliffs, New Jersey.

SEMESTER –III
(Pass and Honours)
GEOG-302/ Practical

Contact Hours: 30

- Unit –I a) Representation of population data: Distribution, density and growth by: Point (dots, proportionate circles and spheres), Line (isopleths and flow lines) and area (choropleth), line and bar graphs; Age-sex pyramid.
 b) Toposheet interpretation (settlement, transport and land use)
- Unit –II a) Definition and classification of map projection;
 b) Map Projection: Cylindrical (Simple and Equal area) with outline maps drawn.
- Unit –III Surveying: Chain and tape to plot a part of college building.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.
2. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -III
(Honours)
GEOG-303/ Political Geography

Contact Hours: 45

Objectives:

To familiarize the students with the geographical factors which have a bearing on the political/ administrative organization of space, and to enhance awareness of the multi-dimensional nature of geo-political space.

- Unit –I Nature, approach and significance of political geography
Historical development of political geography
- Unit –II Development of Geopolitik (nature and approaches)
Concept of Organic state: Ratzel
- Unit –III Concepts: nation, state; Frontiers and boundary, core and periphery region
- Unit –IV Global strategic models: The Heartland theory;
Mahan Sea Power concept
- Unit –V World organisation –United Nations
Regional Associations: EU and SAARC

Books Recommended

1. Dikshit, R.D. (1987): Political Geography and Geopolitics. Tata McGraw Hill, New Delhi.
2. Dikshit, R.D. (2000): Political Geography: A Contemporary Perspective. Prentice-Hall, New Delhi.
3. Siddiq, M. (1997): Indian in the Indian Ocean: A Geopolitical Study, Rawat Publications, Jaipur
4. Pounds, N.J.G. (1972): Political Geography. McGraw Hill Publication., New York.
5. Short, John R. (1982): An Introduction to Political Geography. Routledge, London
6. Sukhwai. B.L. (1987): Modern Political Geography of India. Sterling Publication, New Delhi.

SEMESTER -III
(Honours)
GEOG-304/ Practical

Contact Hours: 30

- Unit –I a) Importance of surveying in geography; Instrument handling and care.
 b) Prismatic compass survey to plot a part of a college building.
- Unit –II Triangulation Survey by Theodolite to plot a part of the college building.
- Unit –III Contouring by Theodolite or Dumpy level
- Unit –IV Practical Note-Book and Viva-voce

Books Recommended

1. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.
2. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.

SEMESTER –IV
(Pass and Honours)
GEOG-401/ Economic Geography

Contact Hours: 60

Objectives:

To acquaint the students with the dynamic aspect of economic geography, transformation of economic activities from primary to secondary and tertiary stage and with various factors responsible for economic development.

- Unit –I Meaning, scope and approaches to study economic geography. Concept and classification of economic activity.
- Unit –II Primary activities: Agriculture- factors influencing agriculture, types of agriculture, forestry, fishing and mining.
- Unit –III Secondary activities: Basis of world industrial location; distribution and production of iron and steel, cotton textile industries.
- Unit –IV Tertiary activities: Transport and communication services; geographical factors in the development of water, land and air transport.
- Unit –V Bases of international trade; major trade blocs: EEC and ASEAN; Effects of globalisation on developing countries.

Books Recommended

1. Bryson, J., Henry, N., Keeble, D. and Martin, R. (eds.) (1999): The Economic Geography Reader: Producing and Consuming Global Capitalism. John Wiley and Sons, Inc, New York.
2. Coe, N. (2007): Economic Geography: A Contemporary Introduction. Blackwell Publishers, Inc., Massachusetts.
3. Guha, J. S. and Chattoraj, P.R.(2002): A New Approach to Economic Geography: A Study of Resources. The World Press Private Limited, Kolkata.
4. Hanink, D. M. (1997): Principles and Applications of Economic Geography: Economy, Policy, Environment. John Wiley and Sons, Inc, New York.
5. Leong, G. C. and Morgan, G. C.(1982): Human and Economic Geography, Oxford University Press, Singapore .
6. Roy, P.K. (2005): Economic Geography, A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.

SEMESTER -IV
(Pass and Honours)
GEOG-402/ Practical

Contact Hours: 30

- Unit –I a) Statistical methods: Measures of central tendency (Mean, Median and Mode);
 b) Measures of dispersion (Mean deviation, Quartile deviation and Standard deviation).
- Unit –II a) Representation of data by Line, Bar, Pie, and Block Pile diagram.
 b) Time series analysis of temporal data.
- Unit –III Map projection: Polar Zenithal (Stereographic, Orthographic and Equidistant) with outline maps drawn
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Bhagwathi, V. and Pillai, R.S.N. (2003): Practical Statistics, Sultan Chand and Company, New Delhi
2. Gupta, S.P. (1998): Advanced Practical Statistics, Sultan Chand and Company, New Delhi
3. Mahmood, A. (1986): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
4. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Zamir, A. (2002): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur.
7. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -IV
(Honours)
GEOG-403/ Advanced Geomorphology

Contact Hours: 45

Objective:

The primary objective is to introduce the latest concepts in geomorphology.

- Unit –I Nature and scope of Geomorphology
- Unit –II Development of geomorphology: Geomorphological school in USA, Europe and India.
- Unit –III Earth's interior; Wegner's theory of continental drift, plate tectonics.
- Unit –IV Weathering: meaning and types; Concept and classification of mass wasting; Types and patterns of drainage.
- Unit –V Concept of cycle of erosion. Fluvial, Arid, Glacial, Karst and Coastal landscapes.

Books Recommended

1. Bloom, A. L. (1992): Geomorphology-A Systematic Analysis. Prentice-Hall India, New Delhi.
2. Stoddard, D. R. (ed.)(1996): Process and Form in Geomorphology. Routledge, London,.
3. Kale, V. and Gupta, A. (2001): Elements of Geomorphology. Oxford University Press, Delhi.
4. Thornbury, W. D. (1990): Principles of Geomorphology. Wiley Eastern Edition, New York,.
5. Singh, S. (2004): Geomorphology, Prayag Pustak Bhawan, Allahabad
6. Skinner, B. J. and Porter, S.C. (1996): The Dynamic Earth. John Wiley and Sons, New York,.

SEMESTER -IV
(Honours)
GEOG-404/ Practical

Contact Hours: 30

- Unit –I a) Sampling- Types and their Uses;
 b) Correlation and Regression analysis: Karl Pearson method.
- Unit –II Average slope map and Block diagram (from same area)
- Unit –III a) Cylindrical Map Projection (Gall’s and Mercator’s) with outline maps drawn.
 b) Conventional Projection (Mollweid’s and Sinusoidal) outline maps drawn.
- Unit –IV Practical Note-Book and Viva-voce

Books Recommended

1. Bhagwathi, V. and Pillai, R.S.N. (2003): Practical Statistics, Sultan Chand and Company, New Delhi
2. Gupta, S.P. (1998): Advanced Practical Statistics, Sultan Chand and Company, New Delhi
3. Mahmood, A. (1986): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
4. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
5. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
6. Zamir, A. (2002): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur.
7. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -V
(Pass and Honours)
GEOG-501/ Regional Geography of India

Contact Hours: 60

Objectives:

Aims at presenting a comprehensive, integrated and empirically based profile of India so as to understand its geopolitical personality and its relations with other countries.

- Unit –I Locational significance, unity and diversity. Physical environment: physiographic characteristics –Climate, soil and natural vegetation.
- Unit –II Population characteristics: population growth, distribution, density, structure and composition.
- Unit –III Agriculture: agricultural development and Indian economy, modernization of Indian agriculture, agro-climatic regions and special characteristics, agricultural trade.
- Unit –IV Transport: Roads and railways, air transport and pipe transport.
- Unit –V Industry: industrial development and Indian economy, distribution of major industries (iron and steel, cotton textile, petrochemicals, sugar, paper and cement industries) industrial policies and industrial trade.

Books Recommended

1. Gautam, A. (2006): Advanced Geography of India, Sharda Pustak Bhawan, Allahabad
2. Khullar, D.R. (2007): India: A Comprehensive Geography, Kalyani Publishers, New Delhi
3. Nag, P. and Gupta, S. S. (1992): Geography of India, Concept Publishing Company, New Delhi.
4. Singh , J. (2003): India: A Comprehensive Systematic Geography. Gyanodaya Prakashan, Gorakhpur
5. Singh, R.L. (ed.) (1971): India: A Regional Geography. National Geographical Society of India, Varanasi,.
6. Tiwari, R.C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad.

SEMESTER –V
(Pass and Honours)
GEOG-502/ Practical

Contact Hours: 30

- Unit –I Thematic mapping: Population, Resources and Industries of India.
Unit –II Conical projection (One and Two Standard parallel) with outline maps drawn.
Unit –III Polyconic Projection and Bonne’s Projection with outline maps drawn.
Unit –IV Viva voce and Practical note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
3. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
4. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -V
(Honours)
GEOG-503/ Applied and Resource Geography

Contact Hours: 45

Objectives:

To understand the prevalent issues relating to environment, society and economy and to provide a geographical interpretation with special reference to Nagaland. Further, it aims at sensitising the students to the concept of sustainable development.

- Unit –I Definition, nature and scope of resource geography: types of resources.
Evaluation and exploration of resources through Remote Sensing technique.
- Unit –II Spatial distribution of resources: Water, Energy and Forest.
- Unit –III Number, density, growth and distribution of population pressure and resource utilization.
- Unit –IV Nature, scope and content of applied geography: identification of problems of interdisciplinary nature (like environment resource base, resource use, development and disparity)
- Unit –V Issues Related to Human resources: Social and demographic issues; Carrying capacity of the land; Human resource use; Sustainable development with focus on man environment relationship.

Books Recommended

1. Bryson, J., Henry, N., Keeble, D. and Martin, R. (eds.) (1999): The Economic Geography Reader: Producing and Consuming Global Capitalism. John Wiley and Sons, Inc, New York.
2. Coe, N. (2007): Economic Geography: A Contemporary Introduction. Blackwell Publishers, Inc., Massachusetts.
3. Guha, J. S. and Chattoraj, P.R.(2002): A New Approach to Economic Geography: A Study of Resources. The World Press Private Limited, Kolkata.
4. Hanink, D. M. (1997): Principles and Applications of Economic Geography: Economy, Policy, Environment. John Wiley and Sons, Inc, New York.
5. Leong, G. C. and Morgan, G. C.(1982): Human and Economic Geography, Oxford University Press, Singapore .
6. Roy, P.K. (2005): Economic Geography, A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.

SEMESTER -V
(Honours)
GEOG-504/ Practical

Contact Hours: 30

- Unit –I Remote Sensing: Visual Interpretation of aerial photographs and/or satellite imagery by using photo/image interpretation keys. Delineation and mapping of various physical and cultural features from photographs/ images.
- Unit -II Basics of Computer application and Geographical Information System (GIS):
Data types of for GIS:
a) Non-spatial data: entry, tabulation, and charting bar graph, pie graph) etc. using any Spreadsheet programme.
b) Spatial data: Raster and Vector data entry and creation of layers for point, line and area into system using open source GIS software (i.e. ILWIS).
- Unit –III a) Road profile by Dumpy level;
b) Determination of height: accessible and inaccessible objects by using Theodolite or Telescopic alidade.
- Unit -IV Practical Notebook and Viva-voce.

Books Recommended

1. Campell, J. B. (2003): Introduction to Remote Sensing. 4th edition. Taylor and Francis, London.
2. Curran, P.J. (1985): Principles of Remote Sensing. Longman, London.
3. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
4. Nag, P. (ed.) (1992): Thematic Cartography and Remote Sensing. Concept Publishing Company, New Delhi.
5. Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation. Concept Publishing. Company, New Delhi.
6. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.

SEMESTER -VI
(Pass and Honours)
GEOG-601/ Regional Geography -II
(Northeast India with Special Focus on Nagaland)

Contact Hours: 60

Objectives:

To focus on the regional study of Northeast India and Nagaland, and to prospect the region's potentiality for sustainable development.

- Unit –I Northeast India: Locational significance;
Physical characteristics: Physiography, drainage, climate, Soil and natural vegetation.
- Unit –II Population of Northeast India: Growth, Distribution and Density, Age-sex composition, Rural-urban composition and Religious composition.
- Unit –III Economic basis of Northeast India: Agriculture, Industries, Transport and communication system
- Unit -IV Disparity in socio-economic development; Socio-economic problems.
Demographic characteristics- Population distribution, Growth, Density
- Unit –V a) Nagaland - Physiography, Climate and Natural vegetation
b) Biodiversity and its conservation issues

Books Recommended

1. Bhagabati, A..K., Bora, A. K. and Kar, B.K. (2011): Geography of Assam, Rajesh Publications, New Delhi.
2. Bhagabati, A.K. (ed) : Biodiversity of Assam, Eastern Book House, Guwahati
3. Bhattacharya, P.(2006) : Trend in Tourism Potentiality, Bani Mandir, Guwahati
4. Bhattacharyya, N.N. (2005): North East India: A Systematic Geography, Rajesh Publication, New Delhi
5. Gopal Krishnan, R : Geography of North East India
6. Srivastava, S.C., : Demographic Profile of N.E. India, Mittal Publications
7. Taher, M. and Ahmed, P. (1998): Geography of North East India, Mani Manik Prakash, Guwahati.

SEMESTER -VI
(Pass and Honours)
GEOG-602/ Practical: Data based on North East India

Contact Hours: 30

- Unit –I Cartographic representation of economic data of Northeast India in spatial and temporal contexts: Histogram, Pie-graph, Age-sex pyramid.
- Unit –II Use of cartographic symbols and their uses: Iso-chronic cartograms, traffic flow diagrams and Choropleth mapping.
- Unit –III a) Survey: Plane Table (Radiation and Intersection)
 b) Use of Global Positioning System (GPS) for identifying a location (only demonstration of GPS device).
 c) Study of landscape by “Google Earth” through Internet enabled PCs.
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Monkhouse, F. J. (1985): Maps and Diagrams. Methuen, London.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.

SEMESTER –VI
(Honours)
GEOG-603/ Environmental Geography

Contact Hours: 45

Objectives:

Aims to provide understanding and awareness of environmental issues at global and regional level and to educate the students on the management of disasters and hazards.

- Unit –I Definition, nature and scope of Environmental Geography; Approach to Environmental development.
- Unit-II Emerging environmental problems: Deforestation, agriculture, population growth, Science and technology
- Unit –III Disaster- Meaning, concept and types; Case study of flood problems- Brahmaputra Valley; drought; Volcano- Pacific ring of fire
- Unit –IV Earthquake zoning in India: Himalayan region and N-E region of India; local storms- typhoons, hurricanes, tornadoes.
- Unit –V Response to disaster- Community, Non- governmental organizations, National and International organizations.

Books Recommended

1. Cantledge, B. (ed.), 1992: Monitoring the Environment, Oxford University Press, Oxford
2. Newson, M., 1992: Land, Water and Development, Routledge, London
3. Singh, S., 1991: Environmental Geography, Prayag Pustak Bhawan, Allahabad
4. Strahler, A.N. & A.H. Strahler, 1976: Geography and Man's Environment, John Wiley, New York

SEMESTER -VI
(Honours)
GEOG-604/ Project: Field Study and Report Writing

Contact Hours: 30

Objective:

Geography being a field oriented subject it has been designed to let the students acquire firsthand knowledge of the surroundings on various aspects.

Field works:

Meaning, types and objectives of fieldwork; field methods and techniques; importance of field work in geography, Fieldwork based report writing.

Field Study in local environment: Preparation of field report through fieldwork on any one of the following areas:

- A locality of the city/ town
- A village near the city/ town

Field trip: to any nearby region for comparative study with the study area.

Report Writing:

Books Recommended

1. Archer, J.E. and Dalton, T.H. (1968): FieldWork in Geography, William Clowes and Sons Ltd. London and Beccles
2. Bolton, T. and Newbury, P.A. (1968): Geography through Fieldwork, Blandford Press, London.
3. Jones, P. A. (1968): FieldWork in Geography, Longmans, Green and Company Ltd., London and Harlow.
4. Lousenbury, J. F. and Aldrich, F.T. (1986): Introduction to Geographic Field Methods and Techniques, Charles E. Merrill Publishing. Company, Columbus.

Syllabus of
BSc Honours Course
in
Mathematics
for 2018-19 Session

B.Sc. (PASS & HONOURS) SYLLABUS IN MATHEMATICS.

Pass & Honours

	PASS		Credits	HONOURS		Credits
Semester I	MAT 101	Calculus I	5	MAT 102	Analysis	3
		Algebra I				
Semester II	MAT 201	Calculus II	5	MAT 202	Advanced Algebra I	3
		Algebra II			Elementary Number Theory	
Semester III	MAT 301	Advanced Calculus I	5	MAT 302	Advanced Algebra II	3
		Higher Trigonometry			Advanced Differential Equations	
Semester IV	MAT 401	Advanced Calculus II	5	MAT 402	Complex Analysis	3
		Analytical Geometry				
Semester V	MAT 501	Mechanics I (Dynamics)	5	MAT 502	Differential Geometry	3
		Numerical Methods				
Semester VI	MAT 601	Mechanics II (Statics)	5	MAT 602	CHOICE BASED (any one) a.Programming in C b.Mathematical Methods c.Special Theory of Relativity d.Advanced Mechanics	3
		Vector Analysis			PROJECT	2

MAT 101(P&H) (Calculus-I & Algebra-I)

CALCULUS I

Unit 1: Real variables. Continuous and discrete. Interval. Function. Domain of definition. Monotone functions. Inverse functions. Geometrical representations. Limit of a function on the real line. One-sided limits– right hand and left hand limits. Different types of limits. Theorems on limits. Continuous functions. Definitions. Discontinuous functions. Theorems. Properties. Uniform continuity (definition only).

Unit 2: Derivatives. Definition. Continuity of a derivable function. Algebraic and transcendental functions. General rules of differentiation. Function of a function. Chain rule. Inverse function. Logarithmic differentiation. Implicit functions. Parametric equations. Derivative as a rate measurer. Time rate of change. Rectilinear motion. Related rates. Geometric interpretation. Meaning of the sign of the derivative. Determination of multiple roots. Newton's method of approximating a root. Approximate calculations.

Unit 3: Basic methods of integration. Integration by substitution. Integration by parts. Integration of trigonometric and hyperbolic functions. Rational function of sine and cosine. Standard integrals. Integrals of the forms $1/(a + b\sin x + c \cos x)$, $1/(a \cos x + b\sin x)$, $(a + b\sin x + c \cos x) / (a' + b' \sin x + c' \cos x)$, $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$. Trigonometric substitutions.

ALGEBRA I

Unit 4: Theory of Equations

Division algorithm. Remainder theorem. Factor theorem. Fundamental theorem of algebra. Nature of the roots of an equation. Complex roots. Surd roots. Relation between roots and coefficients. Symmetric functions of roots. Transformation of equations. Cardan's method of solution of a cubic equation. Descartes' rule of signs.

Unit 5: Matrix Algebra

Matrices of real numbers. Operations on matrices. The transpose of a matrix. Properties of transposes. Special types of matrices. Rank of a matrix. Its determination. Determination of rank by considering minors. Determination of rank by elementary transformations. Consistency and solution of system of linear equations with not more than three variables.

Recommended Books:

1. Differential Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra – Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry – Thomas & Finney (Pearson Education)
2. Differential Calculus – Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus – Gorakh Prasad (Pothishala, Allahabad)
4. Theory of Equations – M L Khanna

MAT 201(P&H) (Calculus II & Algebra II)

CALCULUS II

Unit 1: Second and higher order derivatives. Use of partial fractions. Use of De Moivre's theorem. Leibnitz theorem. Differentiability and differentials. Rolle's theorem. Theorem of Darboux. Mean value theorem. Lagrange's and Cauchy's forms. Indeterminate forms. L'Hospital's rule. Taylor's theorem. Lagrange's, Cauchy's and generalized form of remainder. Taylor's infinite series. Maclaurin's theorem and infinite series. Maxima and minima. Applied problems.

Unit 2: Reduction formulae for $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$, $\cos^m x \sin^n x$, $1/(a + b \cos x)^n$, $1/(x^2 + a^2)^n$. Integration by special devices.

Definition of a definite integral as the limit of a sum. Definite integral as an area. Geometric interpretation. Calculations. Primitives. Fundamental theorem of calculus. Summation of series. Properties of definite integral.

ALGEBRA II

Unit 3: Sequences. Definition. Bounded and unbounded sequences. Limit of a sequence. Convergent sequences. Limits of combination of sequences (proofs not required). Examples and counter examples. Non-convergent sequences. Monotone sequences. Cauchy sequences. Infinite series. Convergence and divergence of infinite series. Positive series - criterion of convergence. General theorems on convergence. Tests for convergence - series of positive terms. Comparison tests. D'Alembert's ratio test. Cauchy's root test. Raabe's test.

Unit 4: Recap of sets and mappings. Equivalence relations. Equivalence classes. Binary operations Group. Definition Examples. Abelian Group. Order of a group (types of group). Elementary properties of groups using definition. Integral power of an element of a group. Subgroups. Intersection of two subgroups.

Unit 5: Cyclic groups. Groups of permutation (definition and examples). Even and odd permutations. Rings. Integral domains. Fields. Definition. Examples. Elementary theorems. Simple consequences of the definitions.

Note: In Units 4 & 5, definitions & examples only to be discussed. Simple consequences of the definitions and theorems to be discussed. (Detailed discussion to be done in Honours course only).

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Modern Algebra	-	A R Vasishtha

MAT 301(P&H) (Advanced Calculus I & Higher Trigonometry)

ADVANCED CALCULUS I

Unit 1: Tangents and Normals Analytic Representation of a plane curve. Tangent. Normal. Subtangent. Subnormal. Polarcoordinate system. Pedal equation. Differential of arc length. Curvature Measure of bending. Radius of curvature. Theorem on centre of curvature. Concept of curvature. Newton's approach. Curvature at the origin. Coordinates of centre of curvature. Equation of circle of curvature. Evolute and involute. Chord of curvature.

Unit 2: Functions of Several Variables Function of two variables. Domain of definition. Geometric representation. Limit and continuity. Theorems-partial derivatives. Higher order-homogenous functions. Euler's theorem. Total differential. Concept of differentiability. Composite functions. Chain rules. Implicit functions. Maxima and minima of function of two variables.

Unit 3: Improper Integrals Types of improper integrals (1) infinite intervals (2) integrand having discontinuities. Comparison test for convergence. Beta and Gamma functions. Definitions and Relations. Multiple Integrals Calculation of a double integral. Equivalence with repeated integrals. Double integrals over domains other than rectangles. Change of variable.

HIGHER TRIGONOMETRY

Unit 4: De Moivre's Theorem. Statement. Proof of De Moivre's theorem for integral indices. Alternative method. Proof for rational indices. All possible values of $(\cos x + i \sin x)^{p/q}$. Application of De Moivre's theorem for integral and fractional indices. Expansion of $\sin nx$, $\cos nx$, in series of $\sin x$, $\cos x$. Expansion of $\sin^n x$, $\cos^n x$ in terms of $\sin$ and cosine of multiple angles. Series expansion of $\sin x$, $\cos x$ and $\tan x$.

Unit 5: Exponential, sine, cosine and logarithms of a complex number. Definitions. Logarithmic, exponential and hyperbolic functions. Inverse functions - trigonometric and hyperbolic functions. Laws of logarithm. Summation of series.

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Trigonometry	-	Mazumdar & Dasgupta

MAT 401(P&H) (Advanced Calculus II & Geometry)

ADVANCED CALCULUS II

Unit 1: Envelopes Family of curves. Envelope. Definition. Relation between envelope and curves enveloped. Evolute. Arc. Involute. Related curves. Inversion. Pedal curves. Reciprocal polars. Concavity and convexity. Concavity and Convexity. Criterion - points of inflexion. Singular points - at the origin of an algebraic curve and at points other than the origin. Conditions for existence of double points. Discrimination of species of a cusp.

Unit 2: Evaluation of area Quadrature of plane areas - Cartesian coordinates, sign of area. Area in parametric forms. Area included between two curves. Area of a closed curve. Area in polar coordinates. Lengths of plane curves Cartesian, polar and pedal forms. Intrinsic equation to a curve. Volumes and surfaces of revolution. Solids of revolution. Volumes and areas of surfaces.

Unit 3: Differential equations of the first order and first degree - Equation reducible to homogenous form. Bernoulli's equation. Exact differential equations. Differential equation of the first order but not of the first degree. Equations solvable for p , x , y . General and singular solutions. Clairaut's equation Linear differential equations of higher order with constant coefficients. Complementary function and particular integrals. Orthogonal trajectories.

GEOMETRY

Unit 4: 2D Geometry

General equation of the 2nd degree. Chord of contact. Pole and Polar. Conjugate points. Chord in terms of its middle point. Diameter. Conjugate diameter. Intersection of two conics. Conics through the points of intersection of two given conics. Pair of tangents. Director circle. Asymptotes.

Polar equation of a conic. Derivations of polar equation of a conic.

Unit 5: 3D Geometry

Sphere. Equation. Section of a sphere by a plane. Equation of a circle in space. Intersection of two spheres. A sphere passing through a circle. Tangent and tangent plane to a sphere. Cone. Equation of a cone with its vertex at the origin. Right circular cone. Tangent plane to a cone. Reciprocal cone. Three mutually perpendicular generators. Cylinder. Equation. Right circular cylinder.

Recommended Books:

1) Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2) Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3) Analytical Geometry	-	B Das (Orient Book Company)

MAT 501(P&H) (Mechanics I & Numerical Methods)

MECHANICS I (DYNAMICS)

Unit 1: Fundamental definitions and principles. Motion in a straight line. Simple harmonic motion. Motion under earth's attraction. Uniplanar motion where the accelerations parallel to fixed axes are given. Composition of simple harmonic motion.

Unit 2: Uniplanar motion referred to polar coordinates. Central orbit. Apses. Apsidal distance. Uniplanar motion when the acceleration is central and varying as the inverse square of the distance. Kepler's laws. Time of describing any arc of the path. Planetary motion.

Unit 3: Tangential and normal accelerations. Constrained motion. Conservation of energy. The simple pendulum. Motion on a rough curve. Motion in a resisting medium. Motion where the mass moving varies.

NUMERICAL METHODS

Unit 4: Finite differences. The operators Δ and ∇ . Properties. Interpolation with equal intervals. Newton-Gregory formula for forward interpolation. Newton-Gregory formula for backward interpolation. Interpolation with unequal intervals. Divided differences. Properties. Newton's formula for unequal intervals. Lagrange's interpolation formula for unequal intervals. Lagrange's interpolation formula for equal intervals.

Unit 5: Central difference formula. Operators δ , ∇ , α and μ . Gauss's central difference formula. Inverse interpolation. Use of Lagrange's formula. Successive approximations. Roots of algebraic equation by inverse interpolation. Numerical differentiation. Approximate expression for the derivative of a function. Numerical integration. General quadrature formula. The trapezoidal rule. Simpson's $1/3$ and $3/8$ rule.

Recommended Books:

- 1) An Elementary Treatise of the Dynamics of a Particle and of Rigid Bodies - S L Loney (Surjeet)
- 2) Finite Differences and Numerical Analysis - H C Saxena (S Chand & Co)

References:

- 1) Dynamics - P N Chatterjee

MAT 601(P&H) (Mechanics II & Vector Analysis)

MECHANICS II (STATICS)

Unit 1: Coplanar forces. Moment of a system of coplanar forces. Equation of line of action of the resultant of a system of coplanar forces. Necessary and sufficient condition for the equilibrium of a system of coplanar forces acting on a rigid body. Astatic equilibrium. Equilibrium of a rigid body under three forces. (m, n) theorem.

Unit 2: Work. Work done by a system of concurrent forces. Virtual work. Principle of virtual work for a system of coplanar forces acting on a particle. Omission of forces. Stability of equilibrium. Stable, unstable and neutral equilibrium. Work function test for the nature of stability of equilibrium. Energy test for equilibrium.

Unit 3: Centre of gravity. Definition and general formulation. Centre of gravity of arc, plane area, area bounded by curve, solid of revolution, surface of revolution. Centre of gravity bounded area in polar coordinates. The theorem of Pappus. Friction. Statical, dynamical and limiting friction. Laws of friction. Limiting equilibrium. Coefficient of friction. Angle of friction. Cone of friction. Equilibrium of a body on a rough inclined plane.

VECTOR ANALYSIS

Unit 4: Recap of vectors preliminaries. Scalar triple product and vector triple product. Their geometrical meanings. Product of four vectors. Reciprocal system of vectors. Vectors function of a scalar variable. Limit and continuity. Vector differentiation. Directional derivatives. Level surfaces. Tangent plane and normal to a level surface. Gradient, divergence and curl.

Unit 5: Vector integration. Line integrals. Surface integrals. Volume integral. Statements of Green's theorem. Gauss' theorem and Stoke's theorems. (proof not necessary). Problems based on surfaces like spheres, cylinders, cone, parallelepiped.

Recommended Books:

- 1) Statics - Md Motihur Rahman (New Central Book Agency, Kolkata)
- 2) A Textbook of Vector Analysis - Shanti Narayan and P K Mittal (S Chand & Co)

References:

- 1) A Textbook on Statics - M Ray, R D Sanglik
- 2) Vector Algebra - G C Sharma A R Vasishtha Sharma & Vasishtha
- 3) Vector Calculus - G C Sharma A R Vasishtha Sharma & Vasishtha

MAT 102(H) (Analysis)

ANALYSIS

Unit 1: Closed intervals. Open intervals. Semi-closed or semi-open intervals. Sets bounded above and sets bounded below. Bounded sets. Limit points of a set. Closed sets. Compact sets. Heine - Borel theorem. Concept of real sequence - boundedness, convergence, non-convergence. Infinite series - convergence and sum.

Unit 2: Real valued functions of a single variable. Limits. Continuity. Uniform continuity. Properties of functions continuous in closed intervals. Monotonic function. Function of bounded variation.

Unit 3: Derivability of real valued function of a single variable. Sign of derivative at a point. Darboux's Theorem. Rolle's Theorem. Higher derivatives. Young's form of Taylor's theorem. Applications of Taylor's theorem. The indeterminate forms.

Unit 4: Riemann integrability. Integral of a bounded function over finite domain. Darboux's theorem. Conditions for integrability. Particular class of bounded integrable functions. Properties of integrable functions. Functions defined by definite integrals. Mean value theorem of integral calculus. Change of variable in an integral. Integration by parts.

Unit 5: Fourier Series. Preliminary and main theorem. Fourier series for odd and even functions. Half-range series. Definite integral as functions of a parameter. Uniform convergence of improper integrals. The test for uniform convergence. Properties of uniformly convergent integrals.

Recommended Books:

1) Mathematical Analysis - Shanti Narayan (S Chand & Co)

References:

1) Real Analysis - S C Malik (New Age Publishers)

2) Fundamental Concepts of Analysis - Alton Smith & Walter Albrecht (PHI)

MAT 202(H) (Advanced Algebra I & Elementary Number Theory)

ADVANCED ALGEBRA I

Unit 1: Groups. Subgroups. Cosets. Normal subgroups. Cyclic group. Lagrange's theorem. Homomorphism Isomorphism.. Quotient groups. Permutation groups. Conjugate classes. Cauchy's theorem. Sylow's theorems.

Unit 2: Rings. Integral domains. Homomorphism. Isomorphism. Quotient fields. Ideals. Quotient rings. Prime and maximal ideals.

Unit 3: Factorisation. Euclidean domain. Principal ideal domain. Unique factorisation domain. Polynomial rings. Roots of polynomials. Factorisation of polynomials.

ELEMENTARY NUMBER THEORY

Unit 4: Divisibility. Primes. Congruences. Solution of congruences. Congruences of degree 1. Chinese remainder theorem. The function $\phi(n)$.

Unit 5: Quadratic Residues. Quadratic reciprocity. The Jacobi symbol. Greatest integer function. Arithmetic functions.

Recommended Books:

- 1) University Algebra
- 2) An Introduction to the Theory of Numbers
Gopalakrishnan (New Age) Niven and Zuckerman (New Age)

References:

- 1) An Introduction to Number Theory
- Ajay Kr Chaudhuri (New Central Book Agency, Kolkata)
- 2) Elementary Number Theory
- David M Burton (UBS, Guwahati)

MAT 302(H) (Advanced Algebra II & Advanced Differential Equations)

ADVANCED ALGEBRA II

Unit 1: Vector spaces. Definition and examples. Subspaces. Definition and examples. Linear dependence, independence and basis. Dimension. Linear transformation. Kernel. Isomorphism. Quotient space. First Isomorphism Theorem. Non-singular linear transformation. Orthogonal complement.

Unit 2: Modules. Submodule. Definition and example. Isomorphism theorems. Generator. Annihilator. Preliminaries of matrices. Matrices and linear transformation. Trace and transpose. Symmetric and skew-symmetric.

Unit 3: Rank. Row and column rank. Linear equations. Homogeneous and non-homogeneous. Minimum polynomial. Characteristic vector and root. Characteristic polynomial. Cayley Hamilton theorem.

ADVANCED DIFFERENTIAL EQUATIONS

Unit 4: Linear equation of second order. Standard form. Complete solution. Complementary function. Particular integral. Reduction to normal form. Transformation by changing the independent variable. Method of variation of parameters. Solution by operators.

Unit 5: Simultaneous equations of the form $dx/P = dy/Q = dz/R$. Solution. Geometrical interpretation Total differential equations. Solution by inspection. Homogeneous case (homogeneous in x, y, z). Solution by taking one variable as constant. Linear partial differential equation of order one. Lagrange's method. Integral surfaces passing through a given curve. Surfaces orthogonal to a given system of surfaces.

Recommended Books:

- 1) University Algebra - Gopalakrishnan (New Age)
- 2) Ordinary and Partial Differential Equations - Raisinghania (S Chand & Co)

References:

- 1) Elements of Partial Differential Equations - I N Sneddon (McGraw Hill)
- 2) Linear Algebra - K P Gupta

MAT 402(H) (Complex Analysis)

COMPLEX ANALYSIS

Unit 1: Complex number. Definition. Algebraic operations. Modulus, amplitude and their properties. Conjugate of a complex number and related results. Triangle inequality. Polar form of a complex number. Euler's formula. Functions of a complex variable. Limits, continuity, derivative, and differentiation formulas.

Unit 2: Definition of analytic function. Cauchy-Riemann equations. Necessary and sufficient condition for a function to be analytic (to be discussed and proved). Cauchy-Riemann equations in polar coordinates. Harmonic functions. Finding of harmonic conjugate given an analytic function. Zeros and poles of analytic functions. Examples of analytic functions.

Unit 3: Definite integrals of complex function of a real variable. Contours. Line integrals. Examples. Statement of Cauchy-Goursat theorem and problems based on the theorem. Cauchy's integral formula. Derivatives of analytic functions.

Unit 4: Morera's theorem. Maximum moduli of functions. Liouville's theorem. Fundamental theorem of algebra. Convergence of sequences and series of complex numbers. Taylor, Maclaurin, Laurent series. Problems. Definition of power series. Circle of convergence. Radius of convergence of a power series (definitions only).

Unit 5: Residues. Residue theorem. Principal part of a function. Residues at poles. Quotients of analytic functions. Evaluation of improper real integrals. Improper integrals involving sines and cosines. Definite integrals involving sines and cosines. Integration through a branch cut.

Recommended Books:

- 1) Complex Variables and Applications - R V Churchill & J W Brown (McGraw Hill) References:
1) Complex Analysis - J N Sharma

MAT 502(H) Differential Geometry

DIFFERENTIAL GEOMETRY

Unit 1: Space curve. Tangent. Arc length. Order of contact between curve and surface.

Fundamental planes (osculating, normal and rectifying plane). Curvature. Torsion. Serret-Frenet formula. Direction cosines of the principal normal and binormal. Fundamental theorems for space curves (existence and uniqueness theorems).

Unit 2: Osculating circle. Osculating sphere. Involute. Evolute. Surface. Regular points and singularities on a surface. Curvilinear equation of the curve on the surface. Parametric curves. Tangent plane and normal and their Cartesian equation.

Unit 3: Family of surface. Envelope. The edge of regression. Ruled surface. Developable surface. Necessary and sufficient condition that any surface represents a developable surface. Theorems related to developable surfaces. Developable associated with space curve. Theorems and questions on osculating developables. Polar developables. Rectifying developables.

Unit 4: First fundamental form and its geometrical interpretation and properties. Second fundamental form and geometrical interpretation. Weingarten equations (derivative of N). Direction coefficients. Direction ratios. Differential equation of family of curves. Orthogonal trajectories. Condition for orthogonalities.

Unit 5: Normal curvature (curvature of normal section). Mensnier's theorem. Principal direction. Principal curvature. First curvature. Mean curvature. Gaussian curvature. Minimal surface. Necessary and sufficient condition for a surface to be developable. Lines of curvature. Rodrique's formula. Lines of curvature as parametric curves. Euler's theorem.

Recommended Books:

- 1) Differential Geometry of Three Dimensions
- C E Weatherburn (Radha Publishing House, Kolkata)
- 2) Differential Geometry : An Integral Approach
- Nirmala Prakash (Tata McGraw Hill)
- 3) Vector Calculus
- M D Raisinghania (S Chand & Co., Guwahati)

References:

- 1) Three Dimensional Differential Geometry
- Gupta and Malik (Pragati Prakashan, Meerut)
- 2) Differential Geometry
- Mittal and Agrawal (Krishna Prakashan Media Pvt. Ltd., Meerut)
- 3) Differential Geometry M L Khanna
-

MAT 602(H) Choice (a) Computer Programming in C

COMPUTER PROGRAMMING IN C (THEORY)

Unit 1: Introduction to Programming, Algorithms, Introduction to Modularity, Functions. The `main()` Function, the `printf()` function. Data types. Arithmetic operations, Displaying Numerical results, Variable and Declarations, integer qualifiers, Common programming errors.

Unit 2: Assignment, Addresses, the `scanf()` function, `scanf()` function with buffered input, Symbolic constants, Relational expressions, the `if - else` statement, nested `if` statement, `if - else` chain, the `switch` statement, the `while` statement, `scanf()` within a `while` loop, `break` and `continue` statement. The `for` statement, `scanf()` within a `for` loop, nested loops. The `do` statement, validity checks.

Unit 3: Function definitions and Declarations, standard library functions (input, output, mathematical, string), variable scope, variable storage class, passing addresses, arrays (single and two dimensional), array names as pointers, pointer arithmetic, passing and using array addresses. String fundamentals (input, output, processing, character by character input). Formatting strings.

COMPUTER PROGRAMMING IN C (PRACTICAL)

Unit 4: Programs involving interactive input and formatted output are to be practiced involving all the functions discussed in the theory part. More emphasis will be laid on programs involving mathematical computations like finding the roots of quadratic, cubic polynomials, addition, subtraction, multiplication of matrices.

Unit 5: Simple numerical methods in finding roots of polynomials and Quadrature.

Recommended Books:

- 1) The C Programming Language
- Brian W Kernighan & Dennis M Ritchie (PHI)

MAT 602 (H)Choice (b) Mathematical Methods

MATHEMATICAL METHODS

Unit 1: Hypergeometric functions. General solutions. Elementary functions. Confluent hypergeometric functions. Derivative of confluent hypergeometric functions. Integral representation of confluent hypergeometric functions.

Unit 2: Bessel's function. Bessel's differential equation. Bessel's function in terms of hypergeometric functions. Recurrence relations. Generating function of Bessel's functions. Bessel's function of second kind. Orthogonality of Bessel's functions.

Unit 3: Legendre functions. Legendre's differential equation. Generating function. Legendre's polynomials. Recurrence relations. Orthogonality of Legendre's polynomials. Associated Legendre's function.

Unit 4: Fourier transforms. Definition. Fourier sine and cosine series. Properties of Fourier transforms. Fourier transforms for functions of two variables. Parseval's relations. Evaluation of integrals. Fourier transforms of derivatives. Fourier sine and cosine transforms of derivatives.

Unit 5: Laplace transforms. Definition. Existence. Properties. Laplace transform of derivatives. Laplace transforms of integrals. Laplace transforms using power series, differentiation. Inverse Laplace transforms. Properties. Application.

Recommended Books:

1) Mathematical Physics - Binoy Bhattacharya (New Central Book Agency, Kolkata)

MAT 602(H)Choice (c) Special Theory of Relativity

Special Theory of Relativity

Unit 1: Review of Newtonian mechanics. Inertial frames. Speed of light and Galilean relativity. Michelson-Morley experiment. Lorentz-Fitzgerald hypothesis.

Unit 2: Relative character of space and time. Postulates. Special Theory of relativity. Lorentz transformation equations. Group properties of Lorentz transformations.

Unit 3: Length contraction. Time dilation. Lorentz contraction factor. Four dimensional Minkowskian space-time of special relativity.

Unit 4: Time-like, light-like and space-like intervals. Null cone. Proper time. World line of a particle.

Unit 5: Four vectors tensor in Minkowskian space-time relativistics mechanics. Variation of mass with velocity. Equivalence of mass and energy.

Recommended Books:

1. Theory of Relativity - J K Goyal & K P Gupta
2. Introduction to the Theory of Relativity - P G Bergmann

:

MAT 611: Choice (d) Advanced Mechanics HYDROSTATICS

Unit 1: Fluid pressure under gravity. Related theorems. Differential equation of pressure.

Conditions of equilibrium. Homogeneous fluids. Equi-pressure surface. Lines of force. Curves of equi-pressure and equi-density. Pressures on plane surfaces (simple cases only) Centre of pressure. Centre of pressure of a parallelogram, triangular area, vertical circular area, etc (simple cases only)

Unit 2: Thrusts on curved surfaces. Resultant vertical thrust Resultant horizontal thrust. Buoyancy.

Force of Buoyancy. Centre of Buoyancy.

Equilibrium of floating bodies. Bodies floating in more than one liquid. Stability of floating bodies. Meta centre. Surface of Buoyancy. Plane of floatation. Surface of floatation.

DYNAMICS OF RIGID BODIES

Unit 3: Moment and product of inertia. Momental ellipsoid. Principal axes. D'Alembert's

principle. The general equations of motion. Independence of the motions of translation and rotation. Impulsive forces.

Unit 4: Motion about a fixed axis. Moment of momentum. The compound pendulum. Reactions of the axis of rotation. Motion about a fixed axis (impulsive forces). Centre of percussion.

Unit 5: Motion in two dimensions (Finite forces). Kinetic energy in two dimensions. Moment of momentum in two dimensions. Varying mass.

Recommended Books:

- 1) A Textbook of Hydrostatics - Ray and Sharma (S Chand)
- 2) Rigid Dynamics - Md Motiur Rahman (New Central Book Agency, Kolkata)

Syllabus of
BSc Honours Course
in
Physics
for 2018-19 Session

BSc PHYSICS SYLLABUS

COURSE STRUCTURE AND BROAD OUTLINE

Course Code		Course Title	Contact Hours	Weightage
Semester 1				
PHY101	P	Mechanics, Properties of Matter, Relativity and Electricity	60	4 Credits
PHY102	P	Practicals	45	1 Credit
PHY103	H	Mathematical Physics I	45	3 Credits
Semester 2				
PHY201	P	Thermal Physics and Oscillations	60	4 Credits
PHY202	P	Practicals	45	1 Credit
PHY203	H	Mathematical Physics II	30	2 Credits
PHY204	H	Computational Physics (Practicals)	45	1 Credit
Semester 3				
PHY301	P	Electrodynamics I and Quantum Mechanics I	60	4 Credits
PHY302	P	Practicals	45	1 Credit
PHY303	H	Thermodynamics and Statistical Physics	45	3 Credits
Semester 4				
PHY401	P	Electronics I and Optics	60	4 Credits
PHY402	P	Practicals	45	1 Credit
PHY403	H	Mathematical Physics III and Quantum Mechanics II	45	3 Credits
Semester 5				
PHY501	P	Nuclear Physics I and Solid State Physics I	60	4 Credits
PHY502	P	Practicals	45	1 Credit
PHY503	H	Electrodynamics II and Electronics II	45	3 Credits
Semester 6				
PHY601	P	Atomic Physics, Particle Physics & Cosmic Rays	60	4 Credits
PHY602	P	Practicals	45	1 Credit
PHY603	H	Astrophysics, Cosmology and Classical Mechanics	30	2 Credits
PHY604	H	Solid State Physics II	30	2 Credits
PHY605	H	Nuclear Physics II	30	2 Credits
PHY606	H	Practicals	45	1 Credit
PHY607	H	Project Work		2 Credits

Note: The student will select **only one paper** out of PHY603, PHY604, PHY605

PHY101

Mechanics, Properties of Matter, Relativity & Electricity

(4 credits - 60 hours)

Course Overview:

This paper provides a framework on which all other fields of physics are based. **Mechanics** deals with the study of forces that keep bodies in equilibrium or causes it to move. The hidden symmetry and invariance underlying Newton's laws, the relation between energy, momentum and their conservation laws which is at the heart of the motion of everything, will be studied. **Properties of Matter** will deal with the study of elastic properties of solids and fluids in motion. **Relativity** will introduce the student to the fascinating inter-relationship between space, time and mass and the equivalence between mass and energy. **Electricity** will explore the behaviour of alternating currents in various circuits, upon which electronics is based.

At the end of the study, the student will have learnt the fundamental principles governing the physical universe, have conceptual and mathematical understanding of the principles of physics and have developed problem solving skills.

Unit I: Mechanics (1)

(12 lectures/hours)

Newton's laws of motion: absolute time and absolute space, superposition principle. Fundamental forces of nature: gravitational, electromagnetic, strong nuclear and weak nuclear forces, frictional forces.

Energy method to analyse mechanical systems: simple harmonic oscillator, pendulum.

Phase space description of mechanical systems: simple harmonic oscillator.

Symmetry properties of Newton's equations: invariance under shift of coordinate system, invariance under rotation of coordinate axes, invariance under time translation, invariance under time reversal, invariance under mirror reflection, invariance under Galilean transformation.

Central force problem: two-dimensional motion of a projectile in Cartesian coordinate system with and without air drag.

Motion of two-dimensional projectile in radial polar coordinate system.

Kepler's problem of planetary motion and its solution, classification of Kepler orbits, orbits of artificial satellites, Virial theorem.

Motion in non-inertial reference frames: accelerating reference frame along a straight line, reference frame rotating with constant angular velocity, earth as reference frame, apparent gravitational acceleration, Coriolis force, Foucault pendulum.

Unit II: Mechanics (2)

(12 lectures/hours)

Work-Energy theorem, vector field and scalar fields, conservative force fields, non-conservative force fields, conservation of momentum, system of particles and centre of

mass, Sun-Earth system (Kepler's problem), kinetic and potential energy of a system of particles.

Translational symmetry and conservation of linear momentum, angular momentum of a single particle, angular momentum of a system of particles, rotational symmetry and conservation of angular momentum, angular momentum of rigid bodies.

Rigid Body Dynamics: kinetic energy of a rigid body and moment of inertia, equation of motion of a rigid body, examples of rotation about a single axis, rotation with constraints, rotation about more than one principal axis, gyroscope, gyroscopic motion, gyrostatic pendulum, precession of a top.

Unit III: Properties of Matter

(12 lectures/hours)

(a) Elasticity

Hooke's law, work done in strain, elongation strain, volume strain, shearing strain, Young's modulus, Bulk modulus and rigidity modulus and their inter-relationship, Poisson's ratio, torsion in a cylinder, twisting couple, variation of strain along its length.

Bending of beams and cantilevers in different cases: loaded at free end, loaded uniformly, bending moments.

(b) Viscosity

Equation of continuity, Energy of a liquid in flow, Bernoulli's theorem, critical velocity, Reynold's number, Poiseuille's equation, motion in a viscous medium: Stoke's law, streamline and turbulent flow.

(c) Hydrodynamics

Vorticity, equation of continuity, Euler's equation of motion, stream function in two dimensions, gravity waves and surface ripples.

Unit IV: Relativity

(12 lectures/hours)

Frames of reference, non-existence of absolute frame of reference, postulates of special relativity, Galilean and Lorentz transformations, inverse Lorentz transformations, length contraction, simultaneity, time dilation, proper time.

Doppler effect for light, expanding universe and Hubble's law, twin paradox, relation between electricity and magnetism.

Relativistic velocity addition, relativistic momentum, proper mass, relativistic mass, relativistic second law of motion, mass-energy equivalence, kinetic energy for slow speeds, energy and momentum relation in relativity, massless particles.

Minkowski's space time diagrams, Lorentz invariance, space time intervals.

General Relativity (without tensors - introduction only): Principle of equivalence, bending of starlight, perihelion of Mercury, gravitational waves.

Unit V: Electricity

(12 lectures/hours)

Network Calculations: Y and Delta networks, conversion between them, superposition.

Thevenin's theorem, Norton's theorem, series-parallel circuits, Wheatstone's bridge circuit, maximum power transfer.

Inductance: inductive reactance, inductors in series and parallel, circuit containing inductance only, RL series circuit, RL parallel circuit, Q of a coil, power in RL circuits.

Capacitance: capacitive reactance, circuit containing capacitance only, RC series circuit, power in RC circuits.

Single Phase Circuits: RLC series circuit, RLC parallel circuit, Q factor and power factor.

Transformers: ideal transformer characteristics, voltage ratio, current ratio, efficiency, impedance ratio, transformer losses and efficiency.

Three Phase Systems: Characteristics, three phase transformer connections, power in balanced three phase loads, unbalanced three phase loads.

Waveforms and Time Constant: RL series circuit waveforms, RL time constant, RC series circuit waveforms, RC time constant.

Reading List for PHY101

Mechanics

Books:

1. *Introduction to Mechanics*, Mahendra K. Verma, (Universities Press)
2. *Mechanics and General Properties of Matter*, P. K. Chakrabarti (New Central Book Agency)
3. *Introduction to Classical Mechanics*, R.G. Takwale, P. S. Puranik, (Tata-McGraw Hill India)
4. *Classical Mechanics*, K. S. Rao, (Universities Press)
5. *Mechanics*, D. S. Mathur, (S. Chand & Company)

References:

1. *Classical Mechanics: Analytical Dynamics*, Tiwari & Thakur, (Prentice Hall of India)
2. *Classical Mechanics*, Herbert Goldstein, Charles P. Poole, John Safko (Pearson Education)
3. *Feynman lectures on Physics Vol 1*, R. P. Feynman, R. B. Leighton, M. Sands, (Narosa Publishing House)
4. *Physics*, Robert Resnick, David Halliday & Kenneth Krane, (Wiley India)

Properties of Matter

Books:

1. *Mechanics and General Properties of Matter*, P. K. Chakrabati, (New Central Book Agency)
2. *Elements of Properties of Matter*, D. S. Mathur, (S. Chand & Company)

References:

1. *General Properties of Matter*, C. J. Smith, (Radha Publishing House)
2. *Feynman lectures on Physics - Vol II*, R. P. Feynman, R. B. Leighton, M. Sands, (Narosa Publishing House)

Relativity

Books:

1. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
2. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
3. *Modern Physics*, Murugesan & Sivaprasath, (S. Chand & Company Ltd)
4. *Introduction to Mechanics*, Mahendra K. Verma, (Universities Press)

References:

1. *Introduction to Special Relativity*, R. Resnick, (Wiley India Pvt Ltd)
2. *Elements of Properties of Matter*, D. S. Mathur, (S. Chand & Company)
3. *General Theory of Relativity*, P. A. M. Dirac, (Prentice-Hall of India)

Electricity

Books:

1. *Basic Electricity*, Milton Gussow, (Schaum's Outlines, Tata McGraw Hill)
2. *Electricity and Magnetism*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)

References:

1. *Introductory Circuit Analysis*, Robert Boylestad, (Prentice Hall)

PHY102

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of Kater's pendulum
2. Study of elastic constant by Konig's method
3. Study of elastic constant using Barton's apparatus
4. Study of moment of inertia using torsional pendulum
5. Study of viscosity and terminal velocity using Stokes method
6. Study of resistance of a galvanometer using P.O. Box
7. Study of impedance of an AC circuit containing RLC elements
8. Study of figure of merit of a ballistic galvanometer

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY103

Mathematical Physics I

(3 credits - 45 hours)

Course Overview

Mathematical Physics I focuses on mathematical tools from the physicist's point of view. **Vector Analysis** used extensively in almost all areas of physics; **Matrices** which finds applications in optics, quantum mechanics, solution of linear equations; **Fourier Series** which provides a simple analysis of complex oscillatory phenomena; these are all covered in this course.

At the end of the study, the student will have learned how to use these tools to apply them to various areas of physics and solve problems.

Unit I: Vectors (1)

(9 lectures/hours)

Cartesian system of base vectors: orthogonal basis, position vector.

Cauchy's inequality, Vector differentiation: derivative of a vector, del operator, Gradient and its concept, Divergence, Curl and Laplacian operators

Integration of Vectors: line integral, conservative forces, Gauss' divergence theorem, applications to electrostatics, heat conduction.

Unit II: Vectors (2)

(9 lectures/hours)

Green's theorem, Applications of Green's theorem, Stokes theorem, Applications of Stokes theorem.

Vector identities: Standard vector identities involving operator with their proofs.

Generalised curvilinear coordinates: orthogonal curvilinear coordinates, scale factors and unit vectors, expressions for gradient, divergence, curl and Laplacian, expressions in plane polar coordinates, cylindrical coordinates, spherical polar coordinates.

Unit III: Matrices (1)

(9 lectures/hours)

Column matrix, row matrix, null matrix, matrix operations: addition, multiplication, inner product, direct product.

Derivative of a matrix, integral of a matrix.

Partitioned matrices, sub-matrices.

Transpose, complex conjugate, hermitian conjugate.

Special matrices: unit matrix, diagonal matrix, singular matrix, cofactor matrix, adjoint of a matrix, self-adjoint matrix, symmetric matrix, skew-symmetric matrix.

Unit IV: Matrices (2)

(9 lectures/hours)

Hermitian matrix, unitary matrix, orthogonal matrix, trace of a matrix, inverse of a matrix.

Solution of a system of linear equations, eigenvalue value problem.

Coordinate transformations: rotation in two dimensions, rotation in three dimensions.

Unit V: Fourier Series

(9 lectures/hours)

Fourier Cosine and Sine series, change of interval, Fourier integral, Fourier's Theorem, Dirichlet's condition.

Complex form of Fourier series, examples $f(x) = x^2$ ($-\pi, \pi$), sawtooth wave, square wave and others, full wave rectifier, heat conduction equation.

Generalised Fourier series and Dirac delta function, Gibbs' phenomena.

Books:

1. *Introduction to Mathematical Physics*, Charlie Harper (Prentice-Hall India)
2. *Mathematical Methods in the Physical Sciences*, Mary L. Boas (Wiley India Pvt Ltd)
3. *Mathematical Physics*, H. K. Dass, (S. Chand)

References:

1. *Mathematical Methods for Physicists*, Arfken and Weber (Academic Press)
2. *Mathematical Physics*, B. D. Gupta (Vikas Publication House Pvt Ltd)
3. *Mathematical Physics*, B. S. Rajput. (Pragati Prakashan)
4. *Vector Analysis (Schaum's Outline)*, Murray Spiegel (Tata McGraw-Hill)
5. *Matrices and Tensors in Physics*, A. W. Joshi (New Age International)

PHY201

Thermal Physics & Oscillations

(4 credits – 60 hours)

Course Overview

Thermal Physics studies the relation between heat and work, the motion at the molecular and atomic level and its relation to the quantity we call heat and temperature on the large scale platform. This paper also deals with the kinetic theory, thermodynamics and thermal properties at ultra cold temperatures and the phenomenon of superconductivity. **Oscillations** starts from a study of simple repetitive motion of particles and then on to more complex motions which is at the heart of much of physics: mechanical oscillations such as sound, water waves to electrical oscillations and waves to quantum phenomenon. It ends with application of sound in real life; hall acoustics, music etc.

At the end of the study, the student will have learned the fundamental principles governing the behaviour of matter at the molecular level and its large-scale aspects of heat and temperature, have conceptual and mathematical understanding of the principles of oscillation physics and develop problem solving skills in these areas.

Unit I : Thermal Physics

(12 lectures/hours)

(a) Kinetic Theory of Gases

Maxwell's velocity distribution, average speed, rms speed, most probable speed, energy distribution of molecules, temperature dependence, degrees of freedom and equipartition of energy, mean free path, collision probability.

Transport phenomena: viscosity, diffusion, transport coefficients and size of molecules, relationship between transport coefficients, Brownian motion, vertical distribution of Brownian particles, Einstein's Theory of Brownian motion.

Behavior of Real Gases, isotherms and deviations from perfect gas equation, virial coefficients, van der Waals' equation of state, van der Waals' constants, critical constants.

(b) Radiation

Radiation: black body, Kirchoff's law, energy density and pressure of diffuse radiation, Stefan-Boltzmann law and Newton's law of cooling, Wein's law, Rayleigh-Jeans law, UV catastrophe, Planck's law.

Unit II: Thermodynamics

(12 lectures/hours)

Thermodynamics system, thermodynamics equilibrium, thermodynamic processes, first law of thermodynamics, difference between specific heats (Mayer's relation), elasticities of perfect gas, work done in different processes.

Second law of thermodynamics, Carnot cycle, heat engines, thermal efficiency, refrigerator, different statements of the second law, Carnot's theorem, reversible and irreversible

processes, entropy, entropy change in reversible processes, principle of increase of entropy, Joule expansion, entropy change of an ideal gas and van der Waals' gas, entropy and disorder, heat death.

Heat Engines: Rankine cycle, Otto cycle, Diesel cycle.

Low Temperature Physics: Joule-Thomson effect for a real gas, Joule-Thomson effect for a van der Waals' gas, regenerative cooling, adiabatic demagnetization, third law of thermodynamics and its consequences.

Unit III: Oscillations & Waves

(12 lectures/hours)

(a) Simple Harmonic Oscillations

Differential Equation of simple harmonic motion and its solution, displacement, velocity and acceleration, energy of oscillations, elasticity and simple harmonic vibrations, study of oscillations: gas in a cylinder, mass suspended by a spring, superposition of rectangular simple harmonic oscillations, Lissajous figures.

Damped simple harmonic vibration, motion of a dissipative system, energy of damped vibrations, effect of damping on frequency.

Forced vibration and resonance, amplitude resonance, power dissipation and sharpness of resonance, Q factor, mechanical impedance and resonance.

(b) Progressive Waves

Transverse and longitudinal waves, condensation and pressure curve, velocity curve, equation of a progressive wave, particle velocity and acceleration, wave velocity and particle velocity, differential equation of wave motion, energy of progressive wave.

Unit IV: Vibrations & Sound Waves

(12 lectures/hours)

(a) Vibration of Strings:

Equation of motion of a vibrating string, velocity of waves along a string, frequency and period of vibration of a string, harmonics and overtones.

(b) Propagation and Velocity of Sound Waves

Velocity of a wave in a fluid, Laplace's correction, factors affecting velocity, velocity of sound in solids, velocity of torsional waves in a rod.

(c) Interference of Sound Waves

Interference of parallel wave trains, interference of spherical waves, zones of silence, beats, combination tones.

(d) Stationary Waves

Reflection of waves in strings from free and fixed ends, stationary waves, nodes and anti-nodes, pressure and density changes at nodes and anti-nodes, distribution of energy in a stationary wave.

(e) Reflection, Refraction and Diffraction

Reflection of sound waves, Huygen's Principle, acoustical image, echo, reflection from curved surfaces, Applications of reflection.

Refraction of sound waves, Huygen's Principle, effect of wind on refraction of sound, effect of temperature.

Diffraction of sound waves, sound shadow, diffraction bands, sound filter, megaphone.

(f) Attenuation of Sound Waves

Causes of dissipation of sound energy, effect of viscosity, attenuation constant, effect of heat conduction, absorption of high frequency waves in gases, sound absorption in narrow tubes and cavities, transmission of power by plane waves, radiation resistance.

Unit V: Oscillations & Waves: Applications

(12 lectures/hours)

(a) Vibration of Rods and Surfaces

Longitudinal vibrations of rods, velocity of a longitudinal wave in a rod, stationary longitudinal waves in rods, transverse vibration of rods, tuning fork, vibration of plates, Chladni's figures, vibration of bells, vibration of stretched membranes and diaphragms, (non-mathematical treatment).

(b) Vibration of Air Columns

Flue pipes and reed pipes, vibrations of air columns in closed and open organ pipe, overtones, resonance in air columns, end corrections, effect of temperature on pitch.

(c) Musical Sounds

Noise and musical sounds, loudness, intensity level, decibel and phon, intensity of a sound, pitch, quality of sound.

(d) Musical Scales and Consonance

Diatonic musical scale, musical intervals, consonant intervals, Helmholtz's theory, consonance of important musical intervals, beats caused by difference tones and its effect on music, equal tone temperament..

(e) Technical Applications of Acoustical Principles

Sound ranging, geophone, hydrophone, echo sounding, seismograph, ultrasonics, piezoelectric effect, resonant vibration of crystal slices, piezoelectric generator, magnetostriction.

Architectural Acoustics: reverberation, absorption coefficient, Sabine's law, good acoustical designs of rooms, noise, measurement, noise reduction and sound insulation.

Reading List for PHY201

Thermal Physics

Books:

1. *Heat & Thermodynamics*, A. B. Gupta & H. P. Roy (New Central Book Agency)
2. *Theory and Experiment on Thermal Physics*, P. K. Chakrabarti (New Central Book Agency)
3. *Thermodynamics: A Core Course*, Saha Jain Srivastava, Abhay K. Jain (Prentice Hall of India)
4. *Thermodynamics*, S. C. Gupta (Pearson Education)
5. *Thermal Physics*, S. Garg, R. Bansal, C. Ghosh (Tata-McGraw Hill)
6. *A Text Book of Heat and Thermodynamics*, J. B. Rajam and C. L. Arora (S. Chand & Company)

References:

1. *A Treatise on Heat*, M. N. Saha and B. N. Srivastava, (Indian Press)
2. *Text Book of Thermodynamics*, D.K. Jha (Discovery House Publishers)

Oscillations

Books:

1. *A Text Book of Sound*, D. R. Khanna and R. S. Bedi, (Atma Ram & Sons)
2. *Vibrations, Waves and Acoustics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Sound*, M. Ghosh, (S. Chand & Company)

References:

1. *Fundamentals of Acoustic*, Lawrence Kinsler and Austin Frey, (Wiley Eastern)
2. *Introduction to Mechanics*, Mahendra K. Verma, (Universities Press)

PHY202

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of mechanical equivalent of heat by Joule's electrical calorimeter
2. Study of linear expansion of a solid by Pullinger's apparatus
3. Study of oscillations by Melde's apparatus
4. Study of Lissajous' figures with CRO
5. Study of specific heat by the method of cooling
6. Study of pressure coefficient and volume coefficients by Joly's constant volume and constant pressure thermometer
7. Study of resonance in series LCR circuits
8. Study of resonance in parallel LCR circuits

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY203

Mathematical Physics - II

(2 credits - 30 hours)

Course Overview

This paper dwells on the mathematical tools for the physicist. **Differential Equations** provides a simple description of natural phenomena involving rate at which things happen and has wide application in modeling (situations where simple equations and solutions are not available). Not only in physics but other areas of science and economics makes extensive use of differential equations. The harmonic functions such as Legendre polynomials, Hermite functions, Bessel functions etc will be studied in this paper. **Beta and Gamma Functions** which are essential to the solution of many integrals in applied physics, are covered in this paper.

At the end of the study, the student will have learned how to use these tools to apply them to various areas of physics and solve problems.

Unit I: Differential Equations (1)

(6 lectures/hours)

Ordinary differential equations: first order homogeneous/non-homogeneous equations with variable coefficients, separable equations, exact differentials.
General first order linear differential equation, integrating factor, Jacob Bernoulli equation.
Second order homogeneous equations with constant coefficients, examples: classical linear harmonic oscillator.

Unit II: Differential Equations (2)

(6 lectures/hours)

Second order non-homogeneous equations with constant coefficients, examples.
Second order non-homogeneous equations with variable coefficients, examples.
Second order homogeneous equations with variable coefficients, examples.

Unit III: Differential Equations (3)

(6 lectures/hours)

Partial Differential Equations: introduction and some examples - wave equation in 1-dimension, Poisson's and Laplace's equations, diffusion equation, Schrödinger wave equation, Helmholtz's equation, method of separation of variables.
Special Functions: One dimensional linear harmonic equation as Hermite's equation, series solution of Hermite's equation, generating function, Rodrigue's formula, Weber-Hermite functions, energy quantization, zero point energy.
Laplace's equation in spherical coordinates, spherical harmonics, separation of variables, solution to the azimuthal equation (Legendre differential equation).

Unit IV: Differential Equations (4)**(6 lectures/hours)**

Associated Legendre polynomials, angular momentum quantum number.

Radial equation and the Laguerre equation, solutions of the Laguerre equation, associated Laguerre polynomials.

Helmholtz's equation in cylindrical coordinates and Bessel's equation, solution of Bessel's equation, Bessel functions of the 1st kind, Bessel functions for integral, half-integral orders, Neumann functions.

Unit V: Differential Equations (5)**(6 lectures/hours)**

Hankel functions, modified Bessel function, spherical Bessel function, characteristics of various Bessel functions.

Gamma function, recursion formula, beta functions, their different forms, relation between beta and gamma functions, evaluation of integrals using gamma-beta functions

Books:

1. *Introduction to Mathematical Physics*, Charlie Harper (Prentice-Hall of India)
2. *Mathematical Methods in the Physical Sciences*, Mary L. Boas (Wiley India Pvt Ltd)
3. *Mathematical Physics*, H. K. Dass, (S. Chand)

References:

1. *Mathematical Methods for Physicists*, Arfken and Weber (Academic Press)
2. *Mathematical Physics*, B. D. Gupta (Vikas Publication House Pvt Ltd)
3. *Mathematical Physics*, B. S. Rajput (Pragati Prakashan)

PHY204

Computational Physics Practicals

(1 credit)

Course Overview

This course introduces computational approach to solve physics problems. After introducing the nuances of numerical programming, four different problems are addressed. Although each problem may have various approaches with their advantages and disadvantages, only one approach is selected. This is to ensure that the student gets enough time to focus on the problem and learn this new discipline.

At the end of the course, the student will have learnt to do numerical computations and be able to apply it to real-life problems of physics.

LIST OF NUMERICAL PROGRAMS TO DEVELOP

1. Numbers and their accuracy: exact and approximate numbers, significant digits and rounding off, errors and their computation, inherent errors and truncation errors
2. Displaying text: source code of a program, its structure, compiling a program, executing the compiled program, example of *Hello World*
3. Programming language characteristics: (taking Fortran as example, corresponding equivalents may be used for C or C++) character set, constants, variables, arithmetic expressions and statements, basic library functions
4. Introductory Program 1: *How to define variables and evaluate arithmetic expressions*
(With two numbers, to add, subtract, multiply, divide, exponentiation)
5. Introductory Program 2: *How to handle large/small numbers, define constants and use format command to display the results*
(To calculate up to nine significant figures, the gravitational force and the coulomb force between two electrons separated 1 mm apart and to find their ratio etc)
6. Introductory Program 3: *How to use control statements*
(To identify maximum, minimum and range of a set of numbers)
7. Introductory Program 4: *How to use loops to sum a series*
(ex: To find the value of e^x for a given x)
8. Program 5: *Finding the roots of a program by Newton-Raphson method*
 - (a) Theory
 - (b) Demo with different examples
 - (c) Typing/developing of code by student
 - (d) Compilation, execution and troubleshooting
 - (e) Running code for at least three different variable examples – calculating the error in the result
 - (f) Summary and submission of report by student

9. Program 6: *Interpolating a function by Lagrange's method* (with same six steps as above)
10. Program 7: *Numerical integration by Simpson's $\frac{1}{3}$ rule* (with same six steps as above)
(Background of trapezoid integration given first in theory)
11. Program 8: *Numerical solution of a differential equation by Runge-Kutta method* (with same six steps as above)
12. Program 9: *Least Squares approximation of a function by linear regression* (with the same six steps as above)

Books:

1. *Computer Oriented Numerical Methods*, V. Rajaraman, (Prentice Hall of India)
2. *Introductory Methods of Numerical Analysis*, S. S. Sastry (Prentice-Hall India)
3. *Fortran 77 and Numerical Methods*, C. Xavier (New Age International Publishers)

References:

1. *Numerical Recipes in Fortran*, William Press, Saul Teukolsky, William Vetterling, Brian Flannery (Cambridge University Press)
2. *Numerical Recipes in C*, William Press, Saul Teukolsky, William Vetterling, Brian Flannery (Cambridge University Press)
3. *Numerical Recipes: The Art of Scientific Computing*, William Press, Saul Teukolsky, William Vetterling, Brian Flannery (Cambridge University Press)
4. *Numerical Mathematical Analysis*, J. B. Scarborough (Oxford and IBH Publishing Co)

NOTE:

1. Computational Physics is only for Honours students. However, pass course students may be given the chance to attend this course if they so desire, as a non-credit course. It is expected that having learnt the essentials of programming, students will use this skill to gain better understanding of Physics as they go on to higher semesters.
2. Programming languages such as FORTRAN, C, C++ may be used. However, use of sophisticated software such as Maxima, Mathematica, Maple, Mathcad, Matlab etc (where the programming details are hidden from the user) may not be used. Other skills such as reading and writing to a file, using dimensioned variables, defining functions, plotting graphs etc may be developed gradually.
3. The choice of operating systems such as Linux/Open Source products is highly recommended as most distributions come complete with editors, graph plotting programs and compilers with support for the above mentioned programming language. Additional software can also be freely downloaded from the internet.

PHY301

Electrodynamics I and Quantum Mechanics I

(4 credits - 60 hours)

Course Overview

Electrodynamics I expounds on the fundamental inter-relation between magnetism and electricity. It starts off from Coulomb's law and ends up in electro-magnetic induction which relates mechanical energy to electric and magnetic energies. **Quantum Mechanics** studies the properties of matter and energy at sub-atomic levels and takes a different look at reality with non-intuitive conclusions. The student will learn how starting from simple assumptions, one can calculate the energy levels and states of atoms, lifetime of states etc.

At the end of the study, the student will have learnt the fundamental principles governing the relationship between electric and magnetic fields, have conceptual and mathematical understanding of the close inter-relation between electricity and magnetism as well as quantum mechanical concepts and develop problem solving skills.

Unit I: Electrostatics

(12 lectures/hours)

Coulomb's law, electric field, continuous charge distributions, electric field lines, electric flux, Gauss' law, differential and integral form, applications of Gauss' law, curl of $\mathbf{E}$, electric potential, Poisson's and Laplace's equation, potential of localised charge distributions, electrostatic boundary conditions.

Work done to move a charge, energy of a point charge and continuous charge distributions. Basic properties of conductors, induced charges, surface charge and force on a conductor. Capacitors and energy in a charged capacitor, electric dipoles (without multipole expansion), potential, field (polar and vector forms).

Unit II: Electric Fields

(12 lectures/hours)

Force in a non uniform field, torque and energy in an uniform field.

Method of images: point charge in front an infinite grounded plane, induced surface charge, force and energy, point charge near a grounded conducting sphere

Electric Fields in Matter

Dielectrics, induced dipoles, atomic polarizability, alignment of polar dipoles, electric polarization, electric field of a uniformly polarized sphere, bound charges and their interpretation, electric field inside a dielectric, electric displacement, Gauss' law for dielectrics, boundary conditions.

Linear dielectrics: susceptibility, absolute and relative permittivity, dielectric constant, parallel plate capacitor with a dielectric, energy in a dielectric system, forces on a dielectric, Clausius-Mossotti equation.

Unit III: Magnetic Fields

(12 lectures/hours)

Lorentz force law, cyclotron motion, cycloid motion.

Currents: line, surface and volume currents, continuity equation.

Biot-Savart's law, magnetic flux, Ampere's law: integral and differential form, application of Ampere's law: straight line current, uniform surface current, application of Ampere's law: solenoid, toroid.

Magnetic vector potential (without problems): magnetostatic boundary conditions, magnetic dipoles (without multipole expansion): torque and energy in an uniform field.

Magnetic Field in Matter

Effect of magnetic field on atomic orbits.

Magnetization, vector potential of a magnetised object, magnetic field of a uniformly magnetised sphere, bound currents, Ampere's law in magnetised materials, boundary conditions, magnetic susceptibility, absolute and relative permeability.

Electrodynamics

Ohm's law; emf, Faraday's and Lenz's laws, inductance and Neumann formula, energy in a magnetic field.

Maxwell's equations: displacement current, charging capacitor, Maxwell's equations in vacuum, Maxwell's equations in matter.

Unit IV: Quantum Mechanics (1)

(12 lectures/hours)

Particle Properties of Waves

Photoelectric effect, Einstein's photoelectric equation, Compton effect, pair production, gravitational red shift.

Wave Properties of Particles

Dual nature of light, wave-particle duality, de-Broglie waves, probability density, characteristics of waves (amplitude, frequency, angular frequency, time period, wave number, phase), wave packet, phase velocity, group velocity.

Davisson and Germer's experiment, G. P. Thomson's experiment, energy levels for a particle in a box.

Uncertainty principle

Gamma ray microscope, electron diffraction, uncertainty principle in atomic emissions, non-existence of nuclear electrons, proof using one-dimensional wave packet.

Unit V: Quantum Mechanics (2)

(12 lectures/hours)

Wave Mechanics

Wave function, normalisation, well-behaved wave functions, time-dependent wave equation, superposition of wave functions, expectation values, operators: energy and momentum operators.

Time-independent Schrödinger equation, eigenvalues, eigenfunctions, Hamiltonian operator.

Applications of the Wave Equation

Particle in a rigid box: energy levels, eigenfunctions, momentum.

Approximation to particle in a non-rigid box, step potential: reflectance and transmittance, probability current and its conservation, tunnel effect: transmission coefficient, applications of tunnel effect (without derivations): Scanning Electron Microscope, Atomic Force Microscope, α -decay.

Harmonic oscillator: energy levels, zero-point energy, wave functions of harmonic oscillator (without derivation) for first four, tenth quantum states.

Postulates of Quantum Mechanics

Five basic postulates of quantum mechanics with explanations.

Reading List for PHY301

Electrodynamics

Books:

1. *Introduction to Electrodynamics*, D. J. Griffiths, (Prentice-Hall of India)
2. *Electricity and Magnetism*, A. S. Mahajan and A. A. Rangwala, (Tata McGraw-Hill)
3. *Electricity and Magnetism*, Prantosh Chakraborty, (New Age International)
4. *Electricity and Magnetism*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
5. *Electricity and Magnetism*, K. K. Tewari, (S. Chand)
6. *Electricity and Magnetism*, R. Murugesan, (S. Chand)
7. *Electricity and Magnetism*, Navina Wadhvani, (Prentice-Hall India)

Reference:

1. *Feynman Lectures in Physics - Volume II*, R. P. Feynman, R. B. Leighton and M. Sands, (Narosa Publishing House)
2. *Electricity and Magnetism*, Edward M. Purcell, (Tata McGraw-Hill)

Quantum Mechanics

Books:

1. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
2. *Modern Physics*, R. Murugesan and K. Sivaprasath, (S. Chand & Company Ltd)

References:

1. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
2. *Introduction to Quantum Mechanics*, D. J. Griffiths, (Pearson Education)
3. *Quantum Mechanics*, G. Aruldas, (Prentice Hall India)
4. *Quantum Mechanics*, John L. Powell and Bernd Crasemann, (Oxford & IBH Publishing Co)

PHY302

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of magnetic moments using magnetometer
2. Study of variation of magnetic field with current and distance
3. Study of thermocouples
4. Study of photo electric effect and Planck's constant
5. Study of O ray and E ray by spectrometer using calcite/quartz prism
6. Study of electrolytic conductivity by Kohlrausch's method
7. Study of reduction factor of tangent galvanometer
8. To measure resistance of a wire using Carey Foster bridge

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Text Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY303

Thermodynamics & Statistical Physics

(3 credits - 45 hours)

Course Overview

This course is an advanced treatment of **Thermodynamics**. Starting from Maxwell's equations, it relates the measurable properties such as pressure and temperature to more abstract quantities such as entropy as well as phase transitions. **Statistical Physics** studies the motion of matter at the atomic level and relates the microscopic quantities such as molecular velocities to the macroscopic quantities such as pressure, heat etc and connects order/disorder to entropy. The statistics of classical particles and quantum particles are also discussed.

At the end of the study, the student will have learned the fundamental principles of heat at the macroscopic and microscopic levels, have conceptual and mathematical understanding of the principles involved and develop problem solving skills.

Unit I: Thermodynamic Relationships

(9 lectures/hours)

Maxwell's Relations, applications: specific heat equation, Joule-Thomson cooling, Clausius-Clayperon equation, thermodynamic relations with heat capacities, T-dS equations, free energy equations, heat of reaction (Gibbs-Helmholtz equation).

Free Energies, Equilibria & Phase Transitions

Helmholtz free energy, Gibbs free energy, enthalpy, thermodynamic potentials, thermodynamic equilibrium.

Unit II: Thermodynamics (Phase Transitions)

(9 lectures/hours)

Equilibrium between phases, phase transition, first order phase transitions, saturated vapour pressure, Young and Kirchoff's equation.

Clausius equation (second latent equation), second order phase transitions, Ehrenfest's equations, triple point, thermodynamics of triple point.

Behavior of thermodynamic potential during phase transition, Gibbs' phase rule.

Unit III: Statistical Physics (1)

(9 lectures/hours)

Statistical Basis of Thermodynamics

Energy states and energy levels, degeneracy, macroscopic and microscopic states, thermodynamic probability and mathematical probability, connection between statistics and thermodynamics, physical significance of Ω , Boltzmann's theorem and entropy, classical ideal gas.

Statistical Description of Systems of Particles

Statistical description of states, statistical ensemble, number of states accessible to a macroscopic system, constraints, equilibrium and irreversibility, quantum state and phase space.

Ensembles

Microcanonical ensemble, canonical ensemble, grand canonical ensemble, partition function, statistical analogue of entropy, electronic partition function.

Unit IV: Statistical Physics (2)

(9 lectures/hours)

Classical Statistics

Maxwell-Boltzmann distribution formula, Gibb's paradox, law of equipartition of energy, Maxwell-Boltzmann distribution of molecular velocities, partition function and thermodynamic quantities.

Quantum statistical mechanics

Difficulties with classical statistics, Bose-Einstein statistics, chemical potential, Boltzmann limit, Ideal Bose systems: Planck's radiation law, Bose-Einstein condensation.

Unit V: Statistical Physics (3)

(9 lectures/hours)

Fermi Dirac statistics, Fermi energy, Boltzmann limit for the fermion system, Richardson-Dushman equation for thermionic emission.

Applications of statistical mechanics: equation of state for an ideal gas, equilibrium of sedimentation, classical para-magnetism, Liouville's theorem.

Reading List for PHY303

Thermodynamics

Books:

1. *Heat and Thermodynamics*, A. B. Gupta and H. P. Roy (New Central Book Agency)
2. *Heat, Thermodynamics and Statistical Physics*, Brij Lal, N. Subrahmanyam, P. S. Hemne (S. Chand & Co)

References:

1. *A Treatise on Heat*, Saha & Srivastava, (Universities Press)

Statistical Physics

Books:

1. *Fundamentals of Statistical Mechanics*, A. K. Dasgupta (New Central Book Agency)
2. *Heat and Thermodynamics*, A. B. Gupta and H. P. Roy (New Central Book Agency)
3. *Heat, Thermodynamics and Statistical Physics*, Brij Lal, N. Subrahmanyam, P. S. Hemne (S. Chand & Co)

References:

1. *Fundamentals of Statistical and Thermal Physics*, Frederick Reif, (McGraw-Hill)

PHY401

Electronics I & Optics

(4 credits - 60 lectures)

Course Overview

Electronics is at the heart of the amazing technology at our disposal. The students will learn about the building blocks of electronics technology (diodes and transistors) and their roles and properties in different circuits. In **optics**, the student will study the principles of image formation from geometrical considerations and the oscillatory nature of light is brought out by the phenomenon of interference, diffraction and its relation to electrodynamics through the phenomenon of polarization and lasers.

At the end of the study, the student will have learned the fundamental principles governing the operation of electronic devices and circuits and optics, have developed conceptual and mathematical understanding of the principles involved and develop problem solving skills.

Unit I: Electronics (Diodes)

(12 lectures/hours)

p-n junction diode: forward and reverse biasing of *p-n* junction diode with their respective *V-I* characteristics, avalanche breakdown and dynamic resistance, load line and Q-point. Junction diode as a half wave rectifier with mathematical analysis for DC current and power output, RMS output current, AC power input, rectifier efficiency, ripple factor, peak inverse voltage, voltage regulation.

Full wave rectifier (for centre tapped transformer) with mathematical analysis for DC output current (average and RMS), power supplied and power output to a load, efficiency, ripple factor, PIV, bridge rectifier, average value of output voltage, output frequency.

Filter circuits with ripple factor calculations for shunt capacitance, series inductance, L – section filter, π – section filter.

Zener diode: *V-I* characteristics, voltage regulation.

Unit II: Electronics (Transistors)

(12 lectures/hours)

Construction (*pnp* and *nnp*) of transistors and principles of operation, CE *V-I* input-output characteristics and current gain, CB circuit, current amplification factor, relation between α and β , active region, cut-off region, saturation region, dynamic output resistance, current gain, CB characteristics: input and output characteristics, CC circuit, input and output characteristics.

Transistor Biasing

Base bias, collector bias, emitter bias, thermal runaway, voltage divider circuit and its AC equivalent circuit.

Transistor amplifiers

CE amplifier; DC current gain, AC current gain, voltage and power gain, input-output phase relationship, DC load line, AC load line and Q-point.

Frequency response of (capacitor coupled and bypass capacitor) CE single stage amplifier.

Field Effect Transistors

Construction (n -channel, p -channel) and principle, n -channel characteristics, drain curves, transconductance curves, drain resistance, transconductance, amplification factor, their relations.

Unit III: Optics (Geometrical Optics & Interference)**(12 lectures/hours)****Geometrical Optics**

Aberrations: chromatic aberrations, achromatic doublet, removal of chromatic aberration of a separated doublet, monochromatic aberrations: spherical aberrations, coma, astigmatism, distortion.

Interference

Interference from two point sources by division of wavefront, intensity distribution, Fresnel's bi-prism, phase change on reflection.

Interference by division of amplitude, colours of thin films, Newton's rings, Michelson's interferometer, coherence, line width, spatial coherence.

Unit IV: Optics (Diffraction)**(12 lectures/hours)**

Fraunhofer diffraction from single slit, limit of resolution and resolving power, two-slit Fraunhofer diffraction pattern, N-slit diffraction pattern, diffraction grating and resolving power.

Fresnel diffraction, half period zones, zone plate, diffraction at a straight edge.

Unit V: Optics (Polarization & Lasers)**(12 lectures/hours)****Polarization**

Production of polarized light, polarization by reflection, polarization by double refraction, Malus law, superposition of two disturbances, double refraction, interference of polarized light, optical activity.

Lasers

Einstein coefficients, population inversion, ruby laser, He-Ne laser, line shape function, threshold power calculation for ruby laser, optical resonators, stability conditions

Reading List for PHY 401**Electronics I****Books:**

1. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)
2. *Handbook of Electronics*, S. L. Gupta, V. K. Kumar, (Pragati Prakashan)
3. *Basic Electronics (Solid State)*, B. L. Theraja, (S. Chand & Company Ltd)

References:

1. *Electronic Principles*, A. P. Malvino, (Tata McGraw-Hill)
2. *Electronic Devices and Circuits*, Theodore F. Bogart, (Prentice Hall)
3. *Basic Electronics for Scientists*, James Brophy, (McGraw-Hill)
4. *Electronic Fundamentals and Applications*, John Ryder, (Prentice Hall)

Optics

Books:

1. *Optics*, Ajoy Ghatak, (Tata McGraw-Hill Publishing Company Ltd)
2. *Geometrical and Physical Optics*, P. K. Chakrabarti, (New Central Book Agency)
3. *Lasers and Non-Linear Optics*, B. B. Laud, (New Age International)
4. *A Text Book of Optics*, N. Subrahmanyam & Brij Lal, (S. Chand & Company)

References:

1. *Optics*, Miles V. Klien & Thomas E. Furtak, (John Wiley & Sons)
2. *Fundamentals of Optics*, Francis A. Jenkins & Harvey E. White, (McGraw-Hill)
3. *Lasers*, K. R. Nambiar, (New Age International)
4. *Optics*, Hecht (Pearson Education)

PHY402

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of rectifiers
2. Study of voltage regulation
3. Study of transistors characteristics and h parameters
4. Study of diode characteristics
5. Study of interference using Fresnel's bi-prism
6. Study of interference using diffraction grating
7. Study of optical activity using polarimeter
8. Study of refractive index of a prism using spectrometer

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY403

Mathematical Physics III & Quantum Mechanics II

(3 credits - 45 hours)

Course Overview

The algebra and calculus of complex number and complex functions is developed in **Mathematical Physics III** and the student will appreciate how complex integrations can greatly simplify a problem. Tensors which takes mathematics to a higher level of understanding and is the language of general relativity, fluid mechanics, elasticity, electrodynamics is studied in this paper. **Quantum Mechanics II** focuses of the matrix mechanics approach to the study of the field and develops the operator mechanism for solution of problems.

At the end of the study, the student will have learnt the fundamental principles governing the physical properties of matter at sub-microscopic levels, have developed conceptual and mathematical understanding of the principles involved and develop problem solving skills using these and the mathematical tools developed.

Unit I: Mathematical Physics (Complex Analysis)

(9 lectures/hours)

Complex Functions

Derivative of $f(z)$ and analyticity, Cauchy-Riemann conditions, Harmonic functions.

Contour integrals, Cauchy integral theorem, Cauchy's integral formula, Taylor series, Maclaurin series, Laurent expansion, analytical and principal parts.

Calculus of Residues

Zeros, singular points, poles, evaluation of residues: n th order pole, simple pole, Cauchy residue theorem, Cauchy principal value, evaluation of definite integrals .

Dispersion relations, Hilbert transform, conformal mapping.

Unit II: Mathematical Physics (Tensors)

(9 lectures/hours)

Notation, Rank and number of components of a tensor.

Transformation of co-ordinates in linear space, Einstein summation convention, Jacobian, Tensors of 1st rank, Kronecker delta, scalars and their invariance, higher rank tensors.

Symmetric and anti-symmetric tensors, polar and axial vectors.

Tensor addition, multiplication, contraction and inner products, quotient law.

Unit III: Quantum Mechanics (Operator Formalism)

(9 lectures/hours)

Linear Vector Space, orthogonal functions.

Operators, linear operators, product of two operators, commuting and non-commuting operators, commutator algebra and some relations; $[x, p_x]$, $[H, p_x]$,

Eigen values and eigen functions, Hermitian operators, properties and theorems.

Postulates of Quantum Mechanics - 1 (wave function, operators, expectation values).

Postulates of Quantum Mechanics - 2, (eigen values, eigen functions).

Time evolution of a quantum system, simultaneous measurability of observables, general uncertainty relation.

Unit IV: Quantum Mechanics (Operator Approach)

(9 lectures/hours)

Operator approach to Linear Harmonic Oscillator

Simple harmonic oscillator, creation and annihilation operators, commutator relations, eigen values, ground state, excited state, eigen functions and probability functions, orthogonality of the wave functions.

Angular Momentum

Cartesian operators for angular momentum and their commutation relations, ladder operators, L_z operator and their commutation relations, general orbital angular momentum operators in spherical coordinates. and their commutations, eigen values of L^2 and L_z operators, eigen functions of the angular momentum operators.

Unit V: Quantum Mechanics (Spin & Theory of Hydrogen Atom)

(9 lectures/hours)

Spin

Stern-Gerlach experiment, Uhlenbeck and Goudsmit's hypothesis for spin, spin angular momentum, spin 1/2 systems, spin magnetic moment of the electron, Pauli spin matrices and their properties, spin vectors.

Quantum theory of Hydrogen Atom

Schrödinger equation for the Hydrogen atom, and separation of the variables, solutions and the quantum numbers, space quantization, effect of spin.

Reading List for PHY403

Mathematical Physics III

Books:

1. *Introduction to Mathematical Physics*, Charlie Harper (Prentice-Hall India).
2. *Mathematical Methods in the Physical Sciences*, Mary L. Boas (Wiley India Pvt Ltd)
3. *Mathematical Physics*, H. K. Dass, (S. Chand)

References:

1. *Mathematical Methods for Physicists*, Arfken and Weber (Academic Press)
2. *Mathematical Physics*, B. D. Gupta (Vikas Publication House Pvt Ltd)
3. *Mathematical Physics*, B. S. Rajput. (Pragati Prakashan)

Quantum Mechanics II

Books:

1. *Quantum Mechanics*, G. Aruldas (Prentice-Hall India)
2. *Introduction to Quantum Mechanics*, D. J. Griffiths (Pearson Education)
3. *Quantum Mechanics*, Ajoy Ghatak and S. Lokanathan (Macmillan India Ltd)
4. *Modern Physics*, R. Murugesan and S. Sivaprasath; (S. Chand & Company Ltd.)

References:

1. *Feynman Lectures in Physics*, Feynman, Mathew, Sands (Narosa Publishing House)
2. *The Principles of Quantum Mechanics*, P. A. M. Dirac (Oxford University Press)

PHY501

Nuclear Physics I & Solid State Physics I

(4 credits - 60 hours)

Course Overview

Nuclear Physics I focuses on the sub-atomic world of the nucleus and its constituents. The shape of the nucleus and its properties, the lifetime of excited states and the extraction of energy through the process of fusion and fission will be studied. **Solid State Physics I** studies the inter-relations between the atoms to form the structures that we are more familiar with. From thermal properties and electrical properties of matter to the shape of the atomic crystals - the reach of this subject is vast.

At the end of the study, the student will have learnt the fundamental principles governing the behaviour of the nucleus and the complex relations between atoms to form structures through bonds, have conceptual and mathematical understanding of the principles of physics involved and develop problem solving skills.

Unit I: Nuclear Physics (Nuclear Structure & Radioactivity) (12 lectures/hours)

Nuclear Structure

Nuclear constituents, nuclear sizes and shapes, nuclear radii, nuclear masses, binding energy, binding energy per nucleon, packing fraction, nuclear forces, exchange forces (meson theory).

Radioactivity

Nuclear stability and decay, radioactivity, activity, radioactive decay laws, half life, mean life, Curie, conservation laws, Q value, α decay, Gamow's theory, properties of α particles (charge/mass, charge, velocity range, spectra), β decay, β decay spectra.

Unit II: Nuclear Physics (Radioactivity & Nuclear Reactions) (12 lectures/hours)

Radioactivity

Fermi's theory of β decay, K electron capture, γ decay, theory/origin of γ decay, nuclear isomerism, natural radioactivity, radio carbon dating, biological effects, Mossbauer effect.

Nuclear Reactions

Nuclear reactions and cross section, barns, centre of mass coordinate systems, compound nucleus, radio isotope production, low energy reactions, Q value, threshold kinetic energy. Fission, delayed neutrons, neutron moderators, nuclear fission reactors, different types (in brief).

Fusion reaction, p - p cycle, CNO cycle, confinement of fusion reactions: magnetic confinement (tokamak), inertial confinement (laser squeezing), applications in brief: Medical radiation physics, neutron activation analysis, synthetic elements.

Unit III: Nuclear Physics (Detectors & Accelerators)

(12 lectures/hours)

Particle Detectors

Ionization chamber, solid state detectors, Geiger-Muller counter, Wilson cloud chamber, spark chamber, nuclear emulsions, scintillation counter, Cerenkov counter.

Particle Accelerators

Cockcroft-Walton tension multiplier, Van de Graaf generator, linear accelerator, cyclotron electron synchrotron, proton synchrotron, betatron.

Unit IV: Solid State Physics (1)

(12 lectures/hours)

Properties of Crystals

Crystalline and Amorphous solids: long-range and short-range order, crystal defects, point defect, ductility, edge dislocation, screw dislocation.

Crystal lattice: lattice translation vectors, unit cell, symmetry operations: translation, rotation, reflection, inversion, types of lattices: lattice directions and planes, Miller indices, inter-planar spacing.

Simple crystal structures: hexagonal closed-packed structure, face-centered cubic structure, body-centered cubic structure, simple cubic structure, packing fractions of different crystal structures.

X-ray diffraction: Bragg's law

Crystal Binding

Bonding in Solids: ionic crystals: electron affinity, cohesive energy, binding energy, Madelung constant, covalent crystals: properties, examples, van der Waals bond: polar molecules, polarizability of molecules, hydrogen bond: dipole, Metallic bond: energy band, Ohm's law, resistivity, collision time, drift velocity, Weidemann-Franz Law.

Unit V: Solid State Physics (2)

(12 lectures/hours)

Band Theory

Band theory of solids: conductors, insulators, semiconductors, doped semiconductors, drift velocity, mobility and conductivity of intrinsic semiconductors, variation with temperature, carrier concentration and Fermi level for intrinsic semiconductors, law of mass action, carrier concentration, Fermi level and conductivity for extrinsic semiconductor, energy bands, free electron, Brillouin zones, origin of forbidden bands, effective mass.

Magnetic effects on charge carriers: Hall effect.

Superconductivity

Magnetic effects, Meissner effect, critical field and critical temperature, type I and type II superconductors, thermodynamic and optical properties: entropy, specific heat, energy gap, isotope effect, flux quantization, Josephson effect, Josephson junction.

BCS theory, bound electron pairs, Cooper pairs, High temperature superconductors.

Reading List for PHY501

Nuclear Physics I

Books:

1. *Nuclear Physics*, S. B. Patel, (New Age International)
2. *Modern Physics*, Kenneth Krane, (Wiley India)
3. *Concepts of Nuclear Physics*, Bernard L. Cohen, (McGraw-Hill)
4. *Modern Physics*, R. Murugesan and S. Sivaprasath (S. Chand & Company Ltd)

References:

1. *Introductory Nuclear Physics*, K. S. Krane (Wiley India Pvt Ltd)
2. *Nuclear Physics*, S. N. Goshal (S. Chand)
3. *Introductory Nuclear Physics*, Samuel Wong (Prentice-Hall India)

Solid State Physics I**Recommended Books:**

1. *Solid State Physics*, R. K. Puri and V. K. Babbar, (S. Chand & Company Ltd)
2. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
3. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
4. *Solid State Physics*, S. O. Pillai, (New Age International Publishers)
5. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)

Reference Books:

1. *Introduction to Solid State Physics*, C. Kittel, (Wiley Eastern Limited)

PHY502

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of band gap of a semiconductor
2. Study of Hall effect
3. Study of dispersive power of a prism
4. Study of interference using Michelson interferometer
5. Study of oscillators
6. Study of frequency response of amplifiers
7. Study of integrating and differentiating circuits
8. Study of focal length of a combination of lenses

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY503

Electrodynamics II and Electronics II

(3 credits - 45 hours)

Course Overview

Electrodynamics II provides more in-depth exposition of the subject, from Maxwell's equations to electromagnetic waves in media. **Electronics II** also gives a more detailed study of electronics including multistage amplifiers and oscillators and ends with digital electronics.

At the end of the study, the student will have learnt the fundamental principles of electromagnetism and electronics, have conceptual and mathematical understanding of the principles of physics involved and develop problem solving skills.

Unit I: Electrodynamics (1)

(9 lectures/hours)

Special techniques in calculating potentials

Laplace's equation and 1st and 2nd uniqueness theorems, solution of Laplace's equation in spherical coordinates.

Potential inside and outside an equipotential hollow sphere, uncharged metal sphere in a uniform electric field.

Multipole expansion: monopole and dipole terms and their fields, electric quadrupole and octopole moments (no field calculations), homogeneous linear dielectric sphere in a uniform electric field.

Multipole expansion of the magnetic vector potential, monopole, dipole and quadrupole terms.

Maxwell's equations

Review of Maxwell's equations, boundary conditions for electrodynamics, continuity equation, electrodynamic energy density, Poynting's theorem, conservation of momentum in electrodynamics.

Unit II: Electrodynamics (Electromagnetic Waves)

(9 lectures/hours)

Electromagnetic waves in vacuum, plane monochromatic electromagnetic waves, energy and momentum in electromagnetic waves, electromagnetic waves in linear media.

Reflection and transmission of electromagnetic waves under normal incidence, reflection and transmission of electromagnetic waves under oblique incidence, electromagnetic waves in conductors, skin depth, reflection at a conducting surface.

Dispersion, complex susceptibility, complex permittivity, complex dielectric constant, absorption coefficient, anomalous dispersion, Cauchy's formula.

Unit III: Electronics (Amplifier Circuits)**(9 lectures/hours)****Analysis of Amplifiers**

Two - port analysis of a network, Y and Z parameters, h -parameters, conversion formula, hybrid equivalent circuits, gain and impedance parameters, transistor h -parameters, BJT amplifier analysis using h -parameters, CE amplifier, CE h -parameter approximations.

Frequency Response of Amplifiers

Bandwidth, half-power frequencies, amplitude and phase distortion, decibels and log/semi-log plots, series capacitance and low frequency response, normalized gain and phase plots, Bode plots, shunt capacitance and high frequency response, transient response and high frequency response, low frequency response of CE amplifiers, high frequency response of CE amplifiers.

Unit IV: Electronics (Multi-Stage Amplifiers)**(9 lectures/hours)****Multistage amplifiers**

Gain relation in multistage amplifiers, frequency response of cascaded stages, RC-coupled amplifier.

Operational Amplifiers

Differential amplifier, difference voltage, ideal op-amp, common mode parameters, CMRR, practical differential amplifiers, bias methods in integrating circuits, ideal op-amp, inverting amplifier, non-inverting amplifier, feedback in non-inverting and inverting amplifiers, frequency response, stability, gain-bandwidth product, slew-rate, input offset currents and voltage, output offset voltage, simple application of op-amps: voltage summation and subtraction, integrating and differentiating circuits.

Oscillators

Negative feedback, Barkhausen criterion, Hartley oscillator, Colpitts oscillator, Wein-bridge oscillator, phase-shift oscillator.

Unit V: Electronics (Digital Electronics)**(9 lectures/hours)**

Binary systems and Boolean algebra: addition, subtraction, multiplication, division, commutative, associate and distributive law, De-Morgan's theorem.

OR, AND, NOT, NOR, NAND and XOR logic gates, equivalence of NAND and NOR gates and realization of De Morgan's law.

Logic gate realization with TTL circuits, RS, JK and Master-Slave, half-adder and full-adder.

Reading List for PHY503**Electrodynamics II****Books:**

1. *Introduction to Electrodynamics*, D. J. Griffiths, (Prentice-Hall of India)
2. *Electricity and Magnetism*, Mahajan and Rangwala, (Tata McGraw-Hill)
3. *Electricity and Magnetism*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)

References:

1. *Feynman Lectures in Physics - Volume II*, Feynman, Leighton and Sands, (Narosa Publishing House)
2. *Electricity and Magnetism*, Edward M. Purcell, (Tata McGraw-Hill)

Electronics II

Books:

1. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)
2. *Handbook of Electronics*, S. L. Gupta, V. K. Kumar, (Pragati Prakashan)
3. *Basic Electronics (Solid State)*, B. L. Theraja, (S. Chand & Company Ltd)

References:

1. *Electronic Principles*, A. P. Malvino, (Tata McGraw Hill)
2. *Electronic Devices and Circuits*, Theodore F. Bogart, (Prentice Hall)
3. *Basic Electronics for Scientists*, James Brophy, (McGraw Hill)
4. *Electronic Fundamentals and Applications*, John Ryder, (Prentice Hall)

PHY601

Atomic Physics, Particle Physics & Cosmic Rays

(4 credits - 60 hours)

Course Overview

Atomic Physics studies the behavior of atoms and molecules and the manifestations of its properties through emission of light, X rays and so on. The esoteric world of sub-nuclear particles at ultra high energies will be dealt with in **particle physics and cosmic rays**.

At the end of the study, the student will have learnt the fundamental principles governing the structure of the atom and the interactions of particles at ultra high energies, have developed conceptual and mathematical understanding of the principles of physics and problem solving skills.

Unit I: Atomic & Molecular Physics (Atom Models)

(12 lectures/hours)

Rutherford scattering experiment and the nuclear model of the atom, size of the nucleus, atomic spectra and spectral series.

Bohr model of the atom: energy levels and spectral series, line spectra, $m_e : m_H$ H, He⁺ spectra, discovery of deuterium, correspondence principle, nuclear (reduced) mass and its effect of the atomic spectra: discovery of deuterium, positronium and muonic atom energy levels compared to hydrogen energy levels, critical potentials, atomic excitation, Franck-Hertz experiments.

Sommerfeld relativistic model and fine structure of hydrogen.

Quantum (Vector) model of the hydrogen atom (no derivation) and quantum numbers, principal quantum number, orbital quantum number, magnetic quantum number, probabilistic electronic orbits (radial and angular), radiative transitions, selection rules.

Unit II: Atomic & Molecular Physics (Effect of Magnetic Fields and Many Electron Atoms)

(12 lectures/hours)

Normal Zeeman effect, gyro-magnetic ratio, Bohr magneton, spin of the electron, spin angular momentum, magnetic dipole moments due to orbital motion and spin of the electron, exclusion principle, Stern-Gerlach experiment.

Symmetric and anti-symmetric wave functions, bosons and fermions, atomic shells, sub-shells and periodic table

Spin-orbit coupling, anomalous Zeeman effect, Paschen-Back effect, Stark effect, total angular momentum, *LS* coupling, *j-j* coupling, singlet, doublet, triplet, term symbols.

Atomic spectra of hydrogen, sodium.

Atomic spectra of helium and mercury.

Unit III: Atomic & Molecular Physics (X-Ray and Molecular Physics)

(12 lectures/hours)

X-Ray Spectra

X-rays: production, Laue's experiment, Bragg's law, X-ray spectra: continuous and characteristic spectra, Mosley's law and X-ray series, Auger effect, X-ray absorption spectra, absorption edges

Molecular Physics

Molecular bond, covalent bond, H_2^+ molecular ion, Hydrogen molecule, complex molecules, hybrid orbitals: ethylene, benzene .

Rotational energy levels and rotational spectra, vibrational energy levels and spectra, vibration-rotation spectra, electronic spectra: fluorescence, phosphorescence.

Raman effect: stokes and anti-stokes lines, selection rules

Unit IV: Particle Physics & Cosmic Rays (Elementary Particles)

(12 lectures/hours)

Particles and fields, strong, electromagnetic and weak interactions, leptons, mesons and baryons, antiparticle, examples.

Conservation laws, lepton number, families of particles, leptons, mesons, strangeness, baryon, baryon number.

Particle interaction and decays, resonance particles, Q-value of particle reactions, reaction threshold kinetic energy.

Quark model

Unit V: Particle Physics & Cosmic Rays (Cosmic Rays)

(12 lectures/hours)

Discovery of cosmic rays, latitude effect, east-west effect, altitude effect.

Primary cosmic rays, secondary cosmic rays, cosmic ray showers, discovery of positron and mesons, effect of earth's magnetic field, Van Allen belts.

Origin of cosmic rays.

Reading List for PHY601

Atomic Physics

Books:

1. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
2. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)
3. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)

References:

1. *Introduction to Atomic Spectra*, H. E. White, (McGraw-Hill)
2. *Atomic Physics*, S. N. Goshal, (S. Chand & Company)
3. *Atomic Physics*, J. B. Rajam, (S. Chand & Company)
4. *Elements of Spectroscopy*, Gupta, Kumar, Sharma, (Prakati Prakashan)

Particle Physics & Cosmic Rays

Books:

1. *Modern Physics*, K. S. Krane (Wiley India Pvt Ltd)
2. *Concepts of Modern Physics*, Arthur Beiser (Tata McGraw-Hill)
3. *Modern Physics*, R. Murugesan and S. Sivaprasath (S. Chand & Company Ltd)

References:

1. *Introduction to Elementary Particles*, D. J. Griffiths (Wiley India Pvt Ltd)
2. *Atomic Physics*, J. B. Rajam, (S. Chand)

PHY602

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of Rydberg constant using hydrogen spectrum
2. Study of thermal conductivity by Searle's apparatus
3. Study of surface tension by Jaeger's method
4. Study of interference using Newton's rings
5. Study of power supply and filter circuits
6. Study of resistance of a galvanometer with post office box
7. Study of angle of minimum deviation of a prism with spectrometer
8. Study of Planck's constant and work function

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

Semester 6 - Physics (Honours) Theory

Note: The student will select only one paper from among PHY603, PHY604 and PHY605

PHY603

Astrophysics, Cosmology and Classical Mechanics

(2 credits - 30 hours)

Course Overview

Astrophysics deals with the physics of the Universe, including the physical properties of celestial objects, their interactions and behaviour. **Cosmology** deals with the origin, structure and space-time relationships of the universe. Stellar evolution, black holes, the Big Bang and the future of the universe are some of the topics to be studied in this paper. **Classical Mechanics** studies the fundamental nature of the forces governing motion, by reformulating Newton's laws of motion to address a huge range of problems ranging from molecular dynamics to the motion of celestial bodies. The student will study constrained motion, principle of virtual work, d'Alembert Principle to Lagrange's equation of motion.

At the end of the study, the student will have learnt the fundamental principles governing the structure and growth of celestial bodies in the universe and the complex relations between them. They will have developed conceptual and mathematical understanding of the principles of motion and develop problem solving skills.

(**Note:** Tensors are not to be used and depth should be at the level of the recommended texts)

Unit I: Astrophysics

(6 lectures/hours)

Classification of Stars - Harvard Classification Scheme, Hertzsprung - Russel Diagram, luminosity of a star, stellar evolution and the HR diagram, Chandrashekar Limit, photon diffusion time in a star.

Gravitational potential energy of a star, internal temperature of a star, internal pressure of a star.

Space and time, curved space and Gauss' law.

Unit II: General Relativity

(6 lectures/hours)

Gravity and curved space-time, equivalence principle, inertial and gravitational mass, general theory of relativity, Schwarzschild solution, Hubble's constant and deceleration parameter.

Tests of general relativity: gravitational spectral shift, deflection of starlight, delay of radar echoes, precession of perihelion of mercury, Schwarzschild radius, black holes.

Unit III: Stellar Evolution and Cosmology

(6 lectures/hours)

Stellar evolution, p-p cycle, nucleosynthesis, s-process, r-process, white dwarf stars, their radius, neutron stars, their radius, pulsars, black holes.

Cosmology

Expansion of the universe, Hubble's law, cosmic background radiation, total number of blackbody photons.

Big Bang cosmology, neutrino decoupling, deuterium formation, helium abundance, photon decoupling, Big Bang features: neutrino background, gravity waves, helium abundance, antimatter, mini black holes.

Quasars: cosmological red shift, Doppler red shift, gravitational red shift.

Critical density of the universe and its future, evidence of dark matter and dark energy.

Unit IV: Classical Mechanics (d'Alembert's Principle and Virtual Work)

(6 lectures/hours)

Constraints and their classification, examples of constraints, degrees of freedom and generalized coordinates, virtual displacement and principle of virtual work.

Lagrange's equation of motion of first kind, system of N particles with k constraints, d'Alembert's principle, applications of d'Alembert's principle: simple pendulum, inclined plane.

Unit V: Classical Mechanics (Lagrangian Formulation)

(6 lectures/hours)

Lagrange's equation of motion of the second kind, application of Euler-Lagrange's motion to simple pendulum, application of Euler-Lagrange's motion to central force, application of Euler-Lagrange's motion to linear harmonic oscillator.

Reading List for PHY603

Astrophysics and Cosmology

Recommended Books:

1. *Modern Physics*, K. S. Krane (Wiley India Pvt Ltd)
2. *Concepts of Modern Physics*, Arthur Beiser (Tata McGraw-Hill)
3. *Modern Physics*, R. Murugesan and S. Sivaprasath (S. Chand & Company Ltd)
4. *An Introduction to Astrophysics*, H. L. Duorah and K. Duorah

Reference Books:

1. *An Introduction to the Study of Stellar Structure*, S. Chandrasekhar (Dover Publications)
2. *An Introduction to Cosmology*, J. V. Narlikar (Cambridge University Press)
3. *Astrophysics For Physicists*, Choudhuri (Cambridge University Press)
4. *An Introduction To Astrophysics*, B. Basu, T. Chattopadhyay and S. N. Biswas (Prentice-Hall of India)
5. *Astronomy*, Dinah L. Moche (John Wiley & Sons)

Classical Mechanics

Recommended Books:

1. *Classical Mechanics*, N. C. Rana and P. S. Joag (Tata McGraw-Hill India)
2. *Classical Mechanics*, S.N. Biswas (Books and Allied Ltd)
3. *Introduction to Classical Mechanics*, Takwale and Puranik (Tata McGraw-Hill).

Reference Books:

1. *Classical Mechanics*, H. Goldstein (Narosa Publishing House)
2. *Classical Mechanics*, Mondal (Prentice-Hall India)
3. *Classical Mechanics: A Modern Perspective*, Barger & Olsson (McGraw Hill International)

Semester 6 – Physics (Honours) Theory

Note: The student will select only one paper from among PHY603, PHY604 and PHY605

PHY604

Solid State Physics II

(2 Credits – 30 hours)

Course Overview

Solid State Physics II continuous on with the study of crystals and X rays diffraction, heat, electrical and magnetic properties.

At the end of the study, the student will have developed deeper insight into solid state physics and the have developed problem solving skills.

Unit I: Crystal Physics

(6 lectures/hours)

Crystal systems: cubic, tetragonal, orthorhombic, monoclinic, triclinic, trigonal, hexagonal, symmetry elements in crystals: combination of symmetry elements, translational symmetry elements.

Point groups and space groups: Bravais lattices, types of lattices.

Reciprocal lattice, reciprocal lattice to SC lattice, reciprocal lattice to BCC lattice, reciprocal lattice to FCC lattice.

Unit II: X Ray Diffraction

(6 lectures/hours)

Laue's equations, Bragg's law of X ray diffraction in reciprocal lattice, Ewald construction, Brillouin zones of simple lattices, atomic scattering factor, geometrical scattering factor.

Unit III: Lattice Vibration and Specific Heat

(6 lectures/hours)

Vibrations of one-dimensional monatomic lattice, dispersion relation, phase velocity, group velocity.

Phonons: momentum of phonons, inelastic scattering of photons by phonons.

Specific Heat: classical theory of lattice heat capacity, Einstein's theory of lattice heat capacity, Debye's model of lattice heat capacity, density of modes, Debye approximation.

Unit IV: Free Electron Theory and Band Theory of Solids

(6 lectures/hours)

Drude-Lorentz classical theory, Sommerfeld's quantum theory: free electron gas in one-dimensional box, free electron gas in three dimensions, fermi function, density of available states, Fermi energy, average kinetic energy, electronic specific heat.

Band theory of solids: Bloch theorem, Kronig-Penney model, effective mass of electron.

Unit V: Magnetic and Di-electric Properties

(6 lectures/hours)

Types of magnetism, diamagnetism, Langevin's classical theory, quantum theory of diamagnetism, para-magnetism: Langevin's classical theory, quantum theory of para-

magnetism, ferromagnetism: Weiss theory. nature and origin of Weiss molecular field, exchange interaction, domains, hysteresis, antiferromagnetism, ferrimagnetism.

Books:

1. *Solid State Physics*, R. K. Puri and V. K. Babbar, (S. Chand & Company Ltd)
2. *Solid State Physics*, S. O. Pillai, (New Age International Publishers)
3. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
4. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
5. *Fundamentals of Solid State Physics*, B. S. Saxena, R. C. Gupta, P. N. Saxena, (Pragati Prakashan)
6. *Modern Physics*, Murugesan & Sivaprasath, (S. Chand & Company Ltd)

References:

1. *Introduction to Solid State Physics*, C. Kittel, (Wiley Eastern Limited)

Semester 6 – Physics (Honours) Theory

Note: The student will select only one paper from among PHY603, PHY604 and PHY605

PHY605

Nuclear Physics II

(2 units – 30 hours)

Course Overview

Nuclear Physics II studies α , β and γ ray spectroscopy, the liquid drop and shell models of the nucleus and the still not well-understood nature of nuclear forces.

At the end of the study, the student will have learnt the fundamental principles of nuclear physics and develop problem solving skills.

Unit I: β Ray Spectroscopy

(6 lectures/hours)

Continuous β ray spectrum, Pauli's neutrino hypothesis, Fermi's theory of β decay, life times of β decay and strength of interaction matrix element, selection rules for β decay, parity non-conservation in β decay.

Unit II: α and γ Ray Spectroscopy

(6 lectures/hours)

Range of α particles, Geiger-Nuttall law, α spectrum and fine structure, long range α particles, disintegration energy of spontaneous α decay, α decay paradox, barrier penetration.

γ Ray Spectroscopy

γ ray emission, selection rules, multipolarity in γ transitions, internal conversion.

Unit III: Liquid Drop Model

(6 lectures/hours)

Binding energies of nuclei, variation with mass number, Weizsacher's semi-empirical mass formula: volume term, surface energy term, coulomb term, asymmetry term, pairing term mass parabolas, stability limits against spontaneous fission, potential barrier for fusion, barrier penetration decay probabilities for spontaneous fission, nucleon emission

Unit IV: Shell Model of the Nucleus

(6 lectures/hours)

Experimental evidence, main assumptions of single particle shell model, spin-orbit coupling of electron bound in atom, spin-orbit coupling in nuclei, single particle shell model with parabolic potential, single particle shell model with square well potential, predictions of shell model.

Unit V: Nuclear Force

(6 lectures/hours)

Ground state of the deuteron, magnetic dipole and electric quadrupole moments of the deuteron, square well solution for the deuteron, central and non-central forces: tensor force,

exchange theory: meson force, types of exchange forces: space exchange, spin exchange, space-spin exchange.

Books:

1. *Nuclear Physics*, S. B. Patel, (New Age International)
2. *Concepts of Nuclear Physics*, Bernard L. Cohen, (McGraw-Hill)

References:

1. *Nuclear Physics Theory and Experiment*, R. R. Roy and B. P. Nigam (Wiley Eastern)
2. *Nuclear Physics Experimental and Theoretical*, H. S. Hans (New Age International)
3. *The Atomic Nucleus*, Robley D. Evans (Tata McGraw-Hill)

PHY606

Physics (Honours) Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of viscosity using capillary flow
2. Study of mechanical equivalent of heat by Callendar and Barnes' method
3. Study of thermal conductivity of bad conductors by Lee's method
4. Study of diffraction caused by a thin wire
5. Study of DAC
6. Study of triode valves

Phoenix Experiments

Additional experiments can be done using the phoenix kit. Some of the experiments that can be done with phoenix are

1. Analysis of AC mains pickup
2. Capacitor charging/discharging
3. Electro magnetic induction
4. Mutual induction
5. Dielectric constant of glass
6. Oscillation of pendulum
7. Pendulum with light barrier
8. Value of g
9. Cooling curve
10. Velocity of sound
11. Radiation counter using GM tube
12. Energy spectrum of radiation
13. High resolution ADC/DAC

Reference: www.iuac.res.in/~elab/phoenix/docs/phm_book.pdf

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.

2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY607

Project Work

(2 credits)

Course Overview

This course will introduce students to simple research work appropriate to their level where they will use their knowledge to apply it to some simple problem/application. This will lead them learn by themselves and develop a better understanding of Physics and may inspire them to take up research at a higher level.

Syllabus of
BSc Honours Course
in
Zoology
for 2018-19 Session

B. Sc. (Pass Course and Honours)
SYLLABUS

(Semester system, w.e.f. Academic Year 2012)

DEPARTMENT OF ZOOLOGY
NAGALAND UNIVERSITY

Semester		Course number	Name of paper	Credits	Total
I	Pass	ZOO-101	Introduction to Non-Chordates (Theory)	4	8
		ZOO-102	Introduction to Non-Chordates (Practicals)	1	
	Honours	ZOO-103	Evolutionary Biology and Animal Behaviour (Theory)	2	
		ZOO-104	Evolutionary Biology and Animal Behaviour (Practicals)	1	
II	Pass	ZOO-201	Chordates and Evolution (Theory)	4	8
		ZOO-202	Chordates and Evolution (Practicals)	1	
	Honours	ZOO-203	Immunology and Biostatistics (Theory)	2	
		ZOO-204	Immunology and Biostatistics (Practicals)	1	
III	Pass	ZOO-301	Cell and Molecular Biology I (Theory)	4	8
		ZOO-302	Cell and Molecular Biology I (Practicals)	1	
	Honours	ZOO-303	Cell and Molecular Biology II (Theory)	2	
		ZOO-304	Cell and Molecular Biology II (Practicals)	1	
IV	Pass	ZOO-401	Developmental Biology and Physiology (Theory)	4	8
		ZOO-402	Developmental Biology and Physiology (Practicals)	1	
	Honours	ZOO-403	Chordates and Physiology (Theory)	2	
		ZOO-404	Chordates and Physiology (Practicals)	1	
V	Pass	ZOO-501	Biochemistry and Genetics (Theory)	4	8
		ZOO-502	Biochemistry and Genetics (Practicals)	1	
	Honours	ZOO-503	Genetics/Applied Zoology/ Environmental Management (Theory)	2	
		ZOO-504	Genetics/Applied Zoology/ Environmental Management (Practicals)	1	
VI	Pass	ZOO-601	Ecology and Applied Zoology (Theory)	4	10
		ZOO-602	Ecology and Applied Zoology (Practicals)	1	
	Honours	ZOO-603	Choice Based Credit Paper. (NOTE: Colleges have the option of offering any paper relevant to zoology based on their manpower and infrastructure).	3	
		ZOO-604	Project work	2	

Guidelines

1. Fifteen (15) working weeks per semester (approx)
2. 1 credit (Theory) = 15 hours of teaching
3. 1 credit (Practicals) = 30 hours of teaching
4. Respective colleges to work out the required details/modalities based on number of classes per week and duration of classes.
5. All theory papers are of 100 marks (30% internal and 70% external assessment)
6. All practical papers are of 50 marks (100% internal assessment).

Semester I (Pass Course)

THEORY

ZOO-I01: Introduction to Non-Chordates

Unit I: Classification/Protozoa

Principles of Taxonomy: Binomial nomenclature; classification of animal kingdom.

Protozoa: General characters and outline classification up to classes with examples.

Type-study: Nutrition, locomotion and reproduction in *Amoeba*, *Paramecium*.

Parasitic Protozoa: *Entamoeba* and *Leishmania*.

Unit II: Porifera/Cnidaria

Porifera: General characters and outline classification up to classes with examples.

Type-study: *Ascon* and *Sycon*- canal System. Structural organization of *Sycon*.

Coelenterate/Cnidaria: General characters and outline classification up to classes with examples.

Type-study: Corals and coral reefs. Polymorphism in Cnidarians.

Unit III: Platyhelminthes/Aschelminthes

Platyhelminthes: General characters and outline classification up to classes with examples.

Type-study: *Fasciola* and *Taenia* (Life history and parasitic adaptations).

Aschelminthes: General characters and outline classification up to classes with examples.

Type-study: *Ascaris* (Life history and parasitic adaptations).

Unit IV: Annelida/Arthropoda

Annelida: General characters and outline classification up to classes with examples.

Type-study: *Polychaeta* (adaptive radiation). Types and significance of coelom; metamerism and its significance.

Arthropoda: General characters and outline classification up to classes with examples.

Larval forms of crustaceans; moulting and metamorphosis in insects.

Unit V: Mollusca/Echinodermata

Mollusca General characters and outline classification up to classes with examples.

Torsion and detorsion; modifications of foot.

Echinodermata: General characters and outline classification up to classes with examples.

Echinoderm larvae and its significance; water-vascular system.

Semester I (Pass Course)

PRACTICAL

ZOO-I02: Introduction to Non-Chordates.

1. Mounting: (Temporary)
 - a) Spicules, gemmules and spongin fibres.
 - b) Pharyngeal and septal nephridia of earthworm.
 - c) Salivary glands and mouth parts of cockroach.
2. Study of Specimens.
 - a) Amoeba, Euglena, Vorticella
 - b) Sycon
 - c) Obelia ; Physalia, Aurelia, Metridium
 - d) Fasciola, Taenia (Life history)
 - e) Male and Female Ascaris.
 - f) Aphrodite, Heteronereis, Chaetopterus, Tubifex, Hirudinaria.
 - g) Limulus, Balanus, Scolopendra, Julus, Termite, Louse, Honeybee, Silkworm, Peripatus.
 - h) Chiton, Dentalin, Unio, Loligo, Sepia, Nautilus.
 - i) Pentaceros. Ophiura, Cucumaria, Antedon.
3. Slides
 - a) T.S. and L.S. of Sycon
 - b) Earthworm: T.S. of pharynx, gizzard and typhlosolar intestine.
 - c) Crustacean larvae.
 - d) Pentaceros (T.S. Arm), Echinoderm larvae.
4. Dissections
 - a) Digestive and nervous systems of earthworm.
 - b) Digestive and nervous systems of cockroach.
 - c) Digestive systems of Pila.

Suggested readings:

1. Barnes, R. (1981). Invertebrate zoology. *W. B. Saunders Co*
2. Barrington, E. W. J. (1969). Invertebrate structure and function. *ELBS*
3. Cox, F. E. G. (1994). Modern parasitology. *Blackwell scientific publications.*
4. Jordan, E. L. & Verma, P. S. Invertebrate Zoology. *S. Chand & Co.*
5. Boolotin & Stiles. College zoology. *MacMillan*
6. Parker & Haswell. Text book of Zoology Vol. II. *MacMillan*
7. Paven, P. H. & Johnson, G. B. Biology. *Mosby College Publ.*
8. Marshal & Williams. Text book of zoology.

Semester I (Honours)

THEORY

ZOO-I03: Evolutionary Biology and Animal Behaviour.

Unit I: Population Genetics and Evolution

Gene pool and gene frequency; chance mating or panmixis.

Hardy Weinberg law; factors influencing allele frequency or deviations from Hardy Weinberg equilibrium (selection, mutation, meiotic drive and migration pressure; random genetic drift, Founder principle).

Genetic polymorphism.

Unit II: Products of evolutionary change

Species concept: Isolation; types of isolation and types of isolating mechanism; speciation and modes of Speciation; barriers and different types

Unit III: Evolution of Man

Phylogenetic trees; multiple sequence alignment; construction of phylogenetic tree; interpretation of trees.

Unit IV: Animal Behaviour

Introduction to ethology; patterns of behaviour (innate and acquired).

Territoriality; aggression and conflict behaviour.

Communication: Crypsis, waggle dance; pheromones.

Biological clock: Biological rhythms, types of rhythms.

Unit V: Social behaviour

Insect societies (bees, ants, termites)

Altruism; alarm call of birds; individual selection hypothesis; kin selection hypothesis, reciprocal altruism hypothesis.

Semester I (Honours)

PRACTICAL

ZOO-I04: Evolutionary Biology and Animal Behaviour.

1. DNA databases and sequence retrieval from databases.
2. Multiple sequence alignments.
3. Construction of phylogenetic trees and interpretation of results.
4. Study of Hardy- Weinberg law using simulations.
5. Study of specimen: Honeybee, ants, termites.

Suggested readings:

1. Kimura, M. (1983). The natural history of molecular evolution. *Cambridge University Press*.
2. Mayr, E. (1980). Principles of systematic zoology. *Tata McGraw Hill*.
3. Edward O. Dodson (1971). Evolution process and products. *East West Press, Delhi*.
4. Florkin, E. & Margulis, S. (1981). Biochemical evolution. *Cambridge University Press*.
5. Otto, T. Sorbrig (1966). Evolution and systematic. *The McMillan Co*.

Semester II (Pass Course)

THEORY

ZOO-20I: Introduction to Chordates and Evolution.

Unit I: Classification: Protochordates, Agnatha

General characters and classification of Chordata up to orders.

Protochordates: General features and phylogeny of Hemichordates, Urochordates and Cephalochordates; retrogressive metamorphosis.

Agnatha: General features of living Agnatha and classification up to classes.

Unit II: Pisces, Amphibia

Pisces: General features and classification up to orders.

Osmoregulation, migration and parental care.

Amphibia: General features and classification up to orders.

Origin of terrestrial ectotherms; neoteny in *Urodela*.

Unit III: Reptiles, Aves

Reptiles: General features and classification up to Orders.

Poisonous and Non-poisonous Snakes of India; poison apparatus and biting mechanisms in Snakes.

Aves: General features and classification up to orders; origin, flight adaptations; mechanism of flight and migration.

Unit IV: Mammals

General features and classification up to orders.

Egg-laying mammals; flying mammals; aquatic mammals; structure and derivatives of integument; osmoregulation in mammals.

Unit V: Evolution

Evidence of evolution; paleontological and geological time scales.

Theories of organic evolution: Lamarkism, Neo-Lamarkism, Darwinism, Neo-Darwinism, Modern Synthetic Theory, Germplasm Theory, Mutation Theory.

Natural Selection under Natural conditions: Melanism in moths or industrial melanism; resistance of insects to pesticides; antibiotic resistance in bacteria; infectious diseases in humans.

Semester II (Pass Course)

PRACTICAL

ZOO-202: Introduction to Chordates and Evolution.

A. Study of Specimen.

- a) Balanoglossus, Herdmania, Ciona, Salpa, Doliolum.
- b) Petromyzon, Scoliodon, Sphyrna, Torpedo, Chimaera, Notopterus, Labeo, Catla, Heteropneustes, Mystus.
- c) Necturus, Salamander, Bufo, Hyla.
- d) Chelona, Testuda, Hemidactylus, Varanus, Uromastix, Chameleon, Viper, Krait.
- e) Bat (Insectivorous and frugivorous).

B. Study of Slides.

- a) Balanoglossus, (proboscis, collar, hepatic region).
- b) Amphioxus (Oral hood, section through pharyngeal, intestinal and caudal regions).

C. Mounting.

- a) Placiod, cycloid and ctenoid Scales.

D. Osteology (Comparative study of amphibia to mammals).

- a) Atlas, Axis, Sacral vertebrae.
- b) Limb bones.
- c) Girdles.
- d) Ribs.

E. Histology: T.S. of Stomach, Intestine, Lungs, Kidney and Gonads in Frog / Mammal.

Dissection: Afferent branchial vessels of Scoliodon.

Efferent branchial vessels of Scoliodon.

Cranial nerves of Scoliodon.

Suggested readings:

1. Mayr, E. (1980). Principles of systematic zoology. *Tata McGraw Hill publishing company limited.*
2. Moody, P. A. (1970). Introduction to evolution. *Harper & Raw*
3. Savage, J. M. (1973). Evolution. *American Publishing Co.*
4. Volpe, E. P. (1089). Understanding evolution. *Universal Books, N. Delhi*
5. Chordate zoology and animal physiology. *S. Chand and Co*
6. Kent, G. C. (1965). Comparative anatomy of vertebrates. *C. V. Mosby & Co.*
7. Romer & Parsons. The vertebrate body. *Saunders.*
8. Hamilton, T. H. Process and pattern of evolution. *MacMillan*
9. Stebbins, T. H. Process of organic evolution. *PHI, N. Delhi.*

Semester II (Honours)

THEORY

ZOO-203: Immunology and Biostatistics.

Unit I: Components of Immune System

Innate: Adaptation (cell mediated and humoral)

Passive: Artificial and natural immunity.

Active: Artificial and natural immunity.

Haematopoiesis and role of haematopoietic factors; cells of the immune system; primary and secondary lymphoid organs, lymphatic system.

Unit II: Antigens/Immunoglobulins

Antigenicity and immunogenicity; immunogens, adjuvant and heptanes.

Immunoglobulins: Structure and functions; classes and function; antigenic determinants on immunoglobulin; antigen - antibody interactions.

Unit III: Immune Response

B lymphocytes and immune responsiveness.

T lymphocytes and immune responsiveness.

MHC: Structure, class, function and immune responsiveness.

Unit IV: Biostatistics I

Definition and scope - census and sampling methods.

Variables: Discrete and continuous.

Presentation of Data: Classification and tabulation.

Diagrams and graphs: Bar, pie, histogram, and line graph.

Concept of statistical population and sampling characteristics of frequency distribution.

Unit V: Biostatistics II

Measures of central tendency: Mean, median, mode and weighted arithmetic mean.

Measures of Dispersion: Range, quartile deviation, mean deviation and standard deviation.

Correlation and regression.

Semester II (Honours)

PRACTICAL

ZOO-204: Immunology and Biostatistics.

1. Dissection and display of lymphoid organ.
2. ABO blood group and Rh factor determination.
3. Preparation of single cell suspension of spleen.
4. Immunoelutrophoresis (working principle)
5. Preparation of charts – histogram, pie chart *etc* using statistical software.

Suggested readings:

1. Elgert, K. D. (1996). Immunology-understanding the immune system. *John Wiley & sons*.
2. Paul, W. E. (ed) (1999). Fundamental immunology, 4th ed. *Lippincott- Raven Publications*.
3. Mishra, B. N. & Mishra, M. K. (1988). Introductory practical biostatistics.

Semester III (Pass Course)

THEORY

ZOO-301: Cell and Molecular Biology-I.

Unit I: An overview of the Cell

Prokaryotic and eukaryotic cell; cell size and shape; phages, virioids, mycoplasma and *Escherechia coli*.

Composition of Cells: Molecules of cell, cell membranes and cell proteins.

Cell Cycle: Mitosis, meiosis.

Cell components: Plasma membrane; transport of small molecules; endocytosis.

Unit II: Nucleus, Protein sorting and Transport

Nucleus: Nuclear envelope, nuclear pore complex, nuclear lamina; transport across nuclear envelope; nucleolus and rRNA processing.

Protein sorting and transport: The endoplasmic reticulum, Golgi apparatus; mechanism of vesicular transport, lysosomes.

Unit III: Mitochondria, Chloroplasts and Peroxisomes

Mitochondria: Structural organization, function; marker enzymes, mitochondrial biogenesis; protein import in mitochondria; semi-autonomous nature of mitochondria and chloroplasts; chloroplast DNA; peroxisome assembly.

Cytoskeleton and cell movement: Structure and organization of actin filaments; actin, myosin and cell movements; intermediate filaments, microtubules.

Unit IV: Chromosomes

Chromatin fibres: Euchromatin, heterchromatin (types).

Chemical composition: DNA, Histone and Non-Histone Proteins

Ultrastructure: Nucleosome concept, nucleosome and solenoid models; 10 nm, 30 nm fibres; radial loops and metaphase chromosome.

Special types of Chromosomes: Pene chromosomes, lampbrush chromosomes, supernumerary chromosomes.

Unit V: Nucleic Acids convey Genetic information

DNA as the carrier of Genetic information; the Central dogma (key experiments); DNA double helix (salient features); genetic code; direction of protein synthesis (key principle); types of DNA; types of genetic material; denaturation, renaturation; Cot curves; organization of DNA in prokaryotes, viruses and eukaryotes.

Semester III (Pass Course)

PRACTICAL

ZOO-302: Cell and Molecular Biology.

1. Study of Cell organelles (Slides)
2. Squash preparation for study of mitosis and meiosis.
3. Staining techniques for study of nucleus, mitochondria and Golgi complex.
4. Cytochemical staining of protein with bromophenol blue.
5. Cytochemical staining of histones with fast green.
6. Cytochemical staining of DNA with Feulgen.
7. Preparation of polytene chromosome from Chironomous larva.
8. Demonstration of mammalian sex chromatin.

Suggested readings:

1. Alberts *et al* (2001). Molecular biology of the cell. *Garland publications*.
2. De Robertis, E. D. P. & De Robertis, E. M. F. (1987). Cell and molecular biology. *Lea & Febiger Intl. ed.*
3. Gerald Karp (2007). Cell and molecular biology: Concepts and experiments. *John Wiley*
4. Powar, C. B. (1986). Cell biology. *Himalaya Publ.*
5. Burke, J. D. C. (1970). Cell biology. *William & Wilkins Co*

Semester III (Honours)

THEORY

ZOO-303: Cell and Molecular Biology II.

Unit I: Cell Wall, Intracellular Matrix and Cell interactions

Eukaryotic cell wall; extracellular matrix and cell matrix interactions; cell to cell interactions.
Cell signalling: Signalling molecules and their receptor; functions of cell surface receptors;
Intracellular signal transduction pathway; signalling networks.

Unit II: Cell Cycle / Death / renewal

Eukaryotic cell cycle; regulation of cell cycle progression.
Cell death and renewal: Programmed cell death, stem cells and maintenance of adult tissues, embryonic stem cells.

Unit III: Cancer

Development and causes of cancer; tumour viruses, oncogenes, tumour suppressor genes, cancer treatment, molecular approach.

Unit IV: Replication of DNA (Prokaryotes and Eukaryotes) / Repair

General principles; unidirectional and bidirectional replication; semi conservative, semi discontinuous; RNA Priming/ enzymes involved in DNA replication - DNA polymerase, DNA lipase, primase, telomerase and accessory proteins.
DNA damage and repair.

Unit V: Mechanism of Transcription

Transcription in prokaryotes: Mechanism; principles of transcriptional regulation, regulation at initiation with examples from *lac* and *trp* operons.
Transcription in Eukaryotes: Mechanism; promoters, enhancer, gene silencers; mechanism of post transcriptional modification of mRNA.

Semester III (Honours)

PRACTICAL

ZOO-304: Cell and Molecular Biology II.

1. Study of bacterial and eukaryotic Cell (slides)
2. Study of semi conservative replication of DNA through micrographs/schematic representations.
3. Identification and study of cancer cells (slides).

Suggested readings:

1. Griffiths, A. J. F. *Et al* (1996). An introduction to genetic analysis. *W. H. Freeman and Co, N. York*.
2. Pollard, T. D. & Earnshaw, W. C. (2002). Cell biology. *Saunders*.
3. Gerald Karp (2007). Cell and molecular biology: Concepts and experiments. *Wiley and sons*.
4. Alberts, B. *et al* (1989). Molecular biology of cell II. Edn. *Garland Publishing Corp. Inc. London*.
5. Powar, C. B. (1986). Cell biology. *Himalaya Publ.*
6. De Robertis, E. D. P. & De Robertis, E. M. F. (1981). Cell and molecular biology. *Hold-Saimderu Int.*

Semester IV (Pass Course)

THEORY

ZOO-401: Developmental Biology and Physiology.

Unit I: Introduction

Structure of Gametes; types of eggs, egg membranes.

Gametogenesis: Spermatogenesis and oogenesis.

Early Embryonic development: Fertilization, sperm-egg interaction; biochemical events, mono- and polyspermy; types and patterns of cleavage; early development in chick (cleavage, blastulation, gastrulation); embryonic induction and organizers.

Unit II: Later embryonic development

Differentiation of Germ layers; formation of neural tube, skin, notochord, somites, coelom and digestive tubes (up to rudiments).

Extra embryonic membranes in human; implantation of embryo, placentation- structure, types and physiology of placenta.

Unit III: Nervous system and Muscles

Neuron: structure, types; resting membrane potential and its basis; action potential and its propagation in myelinated and unmyelinated nerve fibres; synaptic transmission and types of synapses, neuro-muscular junction, neurotransmitters.

Muscle: Types, ultrastructure; muscle proteins; molecular and chemical basis of muscle contractions; characteristics of muscle twitch; motor unit, summation; isotonic and isometric contractions, tetanus and rigor mortis, muscle dystrophies.

Unit IV: Respiration, Digestion, Excretion and Blood

Respiration: Histology of trachea and lungs; respiratory pigments; transport of oxygen in the blood (dissociation curve of oxyhaemoglobin); carbon monoxide poisoning; transport of CO₂ in the blood; respiratory volumes and capacities.

Digestion: Mechanical and chemical digestion of food; control and action of GIT secretion; role of GI hormones; absorption of carbohydrates, lipids, proteins, minerals and vitamins.

Excretion: Structure and function of kidney, ureter, bladder; renal blood supply; nitrogenous waste production (ureotelic, amonotelic, uricotelic)

Blood: ABO blood group; Rhesus System.

Unit V: Endocrine System

Nature of hormones; regulation of hormone secretion; structure of pituitary gland and control of anterior pituitary hormones by hypothalamic releasing hormones (neuroendocrine mechanism); control of posterior pituitary and its hormones; histology, functions and effects of abnormal secretion of endocrine glands; thyroid, parathyroid, thymus, pancreas, adrenal, ovary, testis.

Semester IV (Pass Course)

PRACTICAL

ZOO-402: Developmental biology and Physiology.

1. Study of permanent slides of developmental stages in frog (W.M and Sections): cleavage, blastula, gastrula, neurula, tail bud stage, tadpole.
2. Study of developmental stages showing primitive streak at 21h, 24h, 28h, 33h, 36h, 48h, 72h, 76h, 96h, by raising chick embryo in the laboratory.
3. Study of *in ovo* development of chick.
4. Study of gametes from slides (frog /rat).
5. Preparation of haemin crystals.
6. Estimation of haemoglobin content (by haemoglobinometer).
7. Estimation of O₂ consumption of fish with reference to body weight.
8. Blood grouping: A, B, O and Rh factor.
9. Permanent Slides: Examination of sections of mammalian, somach, duodenum, ileum, liver, lung, kidney, ovary, testis.

Suggested readings:

1. Gilbert, S. T. (2000). Developmental biology, 6th ed. *Sinauer, Sunderland.*
2. Hoar, W. S. (1983). General and comparative physiology. *Prentice Hall.*
3. Balinsky, B. I. (1976). An introduction to embryology, 6th ed. *W. B. Saunders & Co*
4. Prosser, C. L. Comparative animal physiology.
5. Chordate zoology and animal physiology. *S. Chand and Co*
6. Saunders, J. W. Developmental biology: Patterns/Principles/Problems. *MacMillan Publ.*
7. Wilson, J. A. Principles of animal physiology. *Collins MacMillan Publ.*

Semester IV (Honours)

THEORY

ZOO-403: Chordates and Physiology.

Unit I: Comparative Anatomy of Chordates

Respiratory system: Skin, gills, lungs, air sacs and voice apparatus, air bladder and accessory breathing organs in fishes.

Circulatory System: Evolution of heart and aortic arches, venous system and lymphatic system (frog, birds, reptiles, mammals).

Skeletal system: Axial and appendicular system (frog, birds, reptiles, mammals).

Nervous system: Central and autonomic nervous systems (frog, birds, reptiles, mammals).

Sense organs: Chemoreceptors; mammalian eye and ear.

Unit II: Blood / Heart

Blood: Composition; structure and function of haemoglobin; haemopoiesis; haemostasis; coagulation of blood; disorders of blood.

Heart: Outline structure of heart; coronary circulation; origin and conduction of cardiac muscle; cardiac cycle; cardiac output and its regulation; autonomic control and chemical regulation;

Blood pressure and its regulation; electrocardiogram.

Unit III: Excretory System

Urinerous tubules (structure); mechanism of urine formation; counter current system of urine concentration; hormonal control of renal function; water balance; renal failure and dialysis.

Unit IV: Endocrine System

Nature of hormones; regulation of hormone secretion; mode of action of hormones; signal transduction pathways utilised by steroidal and non steroidal hormones; role of cyclic AMP as a second messenger in hormone action.

Unit V: Reproductive physiology

Male reproductive system: Structure of testis; hormonal control of testicular function; endocrine function of the testes.

Female reproductive system: Structure of ovary; young oocyte; mature Graffian follicle;

Hormonal control of ovary function; estrous, anestrus, proestrus, metestrus;

Menstrual cycle: Proliferative phase, luteal phase, menstruation phase.

Semester IV (Honours)

PRACTICAL

ZOO-404: Chordates and Physiology.

1. Study of air bladder and accessory breathing organs in fishes.
2. Enumeration of total count of white blood cells.
3. Enumeration of total count of red blood cells.
4. Recording of frog's heart beat *in situ* and with perfused heart.
5. Recording of blood pressure using a sphygmomanometer.
6. Study of endocrine glands in rat/chick.
7. Histology of mammalian endocrine organs: Ovary, testis, adrenal, uterus, seminal vesicles, thyroid and pancreas.
8. Pituitary extract preparation - fish / frog / rat.

Suggested readings:

1. Samson Wright's applied physiology. *Oxford University Press*
2. Jordan, E. L. & Verma, P. S. Chordate Zoology. *S. Chand & Co.*
3. Eckert, R. & randall, D. Physiology. *W. H. Freeman & Co*
4. Hainsworth, F. R. Animal physiology: Adaptations in functions. *Addison-Wesley Publ.*
5. Gordon, M. S. *et al.* Animal physiology. *MacMillan Publ.*

Semester V (Pass Course)

THEORY

ZOO-501: Biochemistry and Genetics.

Unit I: Carbohydrates and their metabolism

Structure and properties of important mono-, di- and polysaccharides; glycolysis; fermentation; citric acid cycle; pentose phosphate pathway; gluconeogenesis.

Shuttle systems: malate - aspartate shuttle; glycerol phosphate shuttle, and cori cycle; glycogen metabolism (glycogenesis and glycogenolysis).

Unit II: Lipids and their metabolism

Structure, properties and functional significance of fatty acids, triglycerides and steroids. Biosynthesis and β -oxidation of saturated fatty acids, ketogenesis, types and properties of lipoproteins.

Unit III: Proteins and their metabolism

Structure and general properties of amino acids; four levels of structures in proteins;

Catabolism of amino acids: Transamination, deamination and urea cycle; fate of glucogenic and ketogenic amino acids with examples of serine and leucine respectively.

Enzymes: Introduction, kinetics, mechanism of action, inhibition.

Unit IV: Genetics

Mendelian genetics and its extension; principles of inheritance; Mendel's laws and experiments; concept of genotype, phenotype, dominance, recessiveness.

DNA as genetic material; chromosome theory of inheritance; laws of probability; pedigree analysis; incomplete dominance and co-dominance; multiple alleles, lethal alleles; epistasis and pleiotropy.

Interaction of genes: Complementary, supplementary, inhibitory and duplicate types.

Sex linked inheritance and sex linked traits.

Unit V: Linkage, crossing over and sex determination, gene Mapping

Linkage and crossing over; cytological basis of crossing over; molecular mechanism of crossing over; two factor and three factor crosses; interference and co-incidence; sex linkage and non-disjunction of sex chromosome in *Drosophila*.

Sex determination: Chromosomal mechanism; environmental factors affecting sex determination; Barr bodies; dosage compensation; gene mapping in *Drosophila*.

Semester V (Pass Course)

PRACTICAL

ZOO-502: Biochemistry and Genetics.

1. Biochemical detection of carbohydrates, proteins and lipids in a given sample.
2. Study of action of salivary amylase at optimum condition.
3. Effect of pH and temperature on the action of salivary amylase.
4. Detection of abnormal constituents in urine.
5. Calorimetric estimation of glucose/Protein in a given solution.
6. Mendelian laws and gene interaction using *Drosophila* crosses.
7. Study of human karyotype (normal and abnormal).
8. Study of linkage, recombination, gene mapping using marker based data from *Drosophila*.

Suggested readings:

1. Stryer, I. (1988). Biochemistry II. *Freeman and Co.*
2. Plummer, L. (1989). Practical biochemistry. *Tata McGraw.*
3. Murray, R. K. *et al* (1995). Harper's biochemistry, 24th ed. *Prentice Hall.*
4. Lewin, B. (2000). Gene. *John Wiley & sons.*
5. Strikburger, M. W. (1994). Genetics. *Macmillan Publ. Co.*
6. Russel, P. J. (1998). Genetics. *The Benjamin Cummins Publishing Co.*
7. Lehninger (2004). Principles of biochemistry 4th ed.
8. Gilbert, F. (2000). Basic concepts in biochemistry: A student's survival guide. 2nd ed. *McGraw Hill*
9. Price, N. E. & Stevens, L. (1982). Fundamentals of enzymology. *OUP*

Semester V (Honours)

THEORY

ZOO-503: Genetics / Applied Zoology / Environmental Management.

Unit I: Extra nuclear Inheritance

Inheritance in eukaryotes; maternal inheritance.

Inheritance by cellular organelles; chloroplast inheritance; mitotic segregation.

Inheritance by Mitochondria (Neurospora and yeast)

Inheritance by Endosymbionts; sigma virus in Drosophila, kappa particles.

Unit II: Chromosomal and gene Mutation

Cytogenetics: Structural changes in chromosome; deletion, duplication, inversion, translocation.

Changes in number of chromosomes - aneuploidy, euploidy, haploid, polyploidy.

Gene Mutation: Somatic and genetic mutation; spontaneous and induced mutation; forward and reverse mutation.

Mutagens: Radiations, temperature, chemical.

Unit III: Human Genetics

Pedigree analysis; amniocentesis; twins (basic types).

Disorders due to mutant genes; brachydactyly.

Inborn errors of metabolism: Phenylketonuria, alkaptonuria, albinism, sickle-cell anaemia.

Human sex anomalies: Turners syndrome, poly X females, Klinefelter's syndrome, XYY males, hermaphrodites.

Unit IV: Reproductive health and human welfare

Pregnancy; parturition; lactation; health and diseases during pregnancy.

Infertility in male and female: causes, diagnosis and management.

Foetal alcohol syndrome: Signs and symptoms; FAS related disabilities.

Assisted reproductive technology; sex selection, sperm banks, frozen embryos, *in vitro* fertilization (IVF).

Unit V: Effects of Human activities, Sustainable development, Resource conservation, Global environment change

Generation of waste; types (agricultural, municipal, industrial).

Management of waste and disposal (concept of reduce, reuse and recycle).

Eutrophication; bioremediation; depletion of forests.

Sustainable development; threats, ecological footprint.

Water: Rainwater harvesting, aquifers, groundwater recharge, watershed management;

Greenhouse effect and global warming; climate change; shrinkage of glaciers and polar ice caps and consequent effects on river and sea levels; ozone layer depletion; vegetation and biota.

Semester V (Honours)

PRACTICAL

ZOO-504: Genetics / Applied Zoology / Environmental Management.

1. Pedigree analysis (Human inherited traits).
2. Human karyotypes (Normal, abnormal)
3. Project work

Suggested readings:

1. Odum, E. P. (1996). Ecology: A bridge between science and society. *Senauer*
2. Lewin, B. (1997). Gene VI. *Oxford University Press*.
3. Russel, P. J. (1998). Genetics. *The Benjamin Cummins Publishing Co. Inc.*
4. Strickburger, M. W. (1977). Genetics. *MacMillan Collier Co.*

Semester VI (Pass Course)

THEORY

ZOO-601: Ecology and Applied Zoology.

Unit I: Introduction to Ecology

History; autecology, synecology; species (sympatric and allopatric);

Abiotic factors: laws of limiting factors; Liebig's law of minimum and Shelford's law of tolerance; brief account of light and temperature as limiting factors; sil types and soil erosion.

Unit II: Population

Unitary and modular populations; population density, natality, fecundity, mortality, life tables or survivorship curves, age ratio, sex ratio, age structure; population growth patterns: exponential/Malthusian and sigmoid growth patterns; population dispersal.

Unit III: Community

Characteristics of community diversity and community stratification.

Habitat and niche, ecotone/edge effect, ecotypes, ecological indicators, succession, stages of primary succession, climax community.

Structure of an ecosystem; food chain, food web, trophic levels, grazing and detritus type of food chain; ecological pyramids, energy flow in ecosystem.

Biogeochemical cycle: water, oxygen, carbon, nitrogen, sulphur, phosphorus

Unit IV: Human diseases

Epidemiology of infectious diseases; transmission, prevention and control of diseases; tuberculosis, amoebiasis, malaria and swine flu.

Applied entomology: Outlines of apiculture, sericulture with emphasis on *Bombyx mori*, lac culture.

Unit V: Insect control / Aquaculture

Insect control: Mechanical, physical, cultural; classification of insect control with reference to chlorinated hydrocarbons, organophosphates, carbonates and synthetic pyrethroids. general aspects of Integrated Pest Management (IPM).

Aquaculture: Introduction to aquaculture, binomics of Indian Major Carps (IMC), live fishes and exotic carps; induced breeding, integrated fish farming and transportation of fish seeds.

Semester VI (Pass Course)

PRACTICAL

ZOO-602: Ecology and Applied Zoology.

1. Determination of population density in a terrestrial community or hypothetical community by quadrat method.
2. Study of life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.
3. Study of types of soil, their texture by sieve method and rapid tests for pH, chlorides, nitrates, carbonates and organic carbon.
4. Estimation of primary productivity of grassland ecosystem.
5. Study of permanent slides and specimen of protozoan, helminthes (parasites) associated with human disease.
6. Study of permanent slides of commonly found parasites.
7. Economic importance of commonly occurring insect pests and preparation of life cycle of these pests.
8. Study of beneficial insects and their life stages.
9. Maintenance of freshwater aquarium.

Suggested readings:

1. Odum, E. P. (1996). Ecology: A bridge between science and society. *Sinauer Associates Inc.*
2. Chapman, J. L. And Reiss, M. J. (1992). Ecology, principles and applications. *Cambridge University Press.*
3. Verma, P. S. & Agarwal, V. K. (1983). Environmental biology (principles of ecology). *S. Chand & Co.*
4. Singh, J. H. et al (2006). Ecology, environment and resource conservation. *Anamaya Publ. N. Delhi*
5. Kendeigh, S. C. Animal ecology. *Prentice Hall*
6. Kormondy, E. T. Concept of ecology. *Prentice Hall*
7. Shukla & Upadhya. Economic zoology. *Rastogi Publ.*
8. Jingram, V. G. (1991). Fish and fisheries of India. *Hindustan Publishing Corp. N. Delhi*
9. NIIR Board of consultants and engineers (2003). Hand book of fisheries and aquaculture technology. *Asia Pacific Business Press Inc.*

Semester VI (Honours)

THEORY

ZOO-603: (Choice Based Credit System)

Colleges have the option of offering any paper relevant to zoology based on their manpower and infrastructure. Some broad topics are mentioned below as probable themes/topics.

Biotechnology
Genetic Engineering
Microscopy and Chromatography
Pisciculture
Aquaculture
Sericulture
Biodiversity

NAGALAND UNIVERSITY
UNDERGRADUATE B.Sc COURSE

ZOOLOGY
Semester VI (Honours Course)
THEORY

PAPER : ZOO – 603 (A): BIODIVERSITY

Total Marks:70

UNIT I : Understanding Biodiversity

Definition, Concept, scope and importance of biodiversity; pattern and levels of biodiversity – genetic diversity, species diversity, population diversity, community diversity, ecosystem diversity, biodiversity indicators.

Diversity of life; assessment of biodiversity at the global, national and local levels; National biodiversity act 2002 and rules 2004.

Unit II : Forest and Wildlife resources

Forest resources; principles, general concepts and extent of forest biodiversity. Forest resources of the world and India; Forest assessments; Principal forest types and extent of forest cover of India, Northeast India and Nagaland.

Wild life resources: definition, concept and utility; values of wildlife- ethical and cultural, ecological, commercial, scientific, aesthetic and recreational; wildlife corridors; distribution of wildlife in India.

UNIT III : Biodiversity Loss

Causes and consequences of loss of biodiversity; factors causing loss of biodiversity – habitat loss, demographic pressure, deforestation, shifting cultivation, habitat fragmentation, development of project, overexploitation and overgrazing.

IUCN threatened/ red list category; rarity and extinction processes; important threatened/ endemic plant and animal taxa of India and northeast India.

UNIT IV : Megadiversity and Biodiversity Hotspots

General concept, criteria and extent of world megadiversity countries; centers of megadiversity in India – western Ghats, western Himalaya, Andaman and Nicobar islands and Northeast India.

Biodiversity hotspots : general concept, definition and criteria of hotspots, status of biodiversity hotspots of the world and India. Primary and secondary losses of biodiversity hotspots; global change of biodiversity hotspots.

Unit V : Biodiversity conservation and Management

Threats and loss of biodiversity; need and reasons of biodiversity conservation. Biodiversity conservation methods; afforestation (Social forestry), Eco restoration, JFM; in-situ conservation- biosphere reserves, national parks, sanctuaries.

Case study – Project Gir Lion; Ex- situ conservation – botanical gardens, zoological gardens, herbarium, aquaria; in-vitro conservation- germplasm or Gene bank, tissue culture, micro propagation.

Semester VI (Honours Course)

PRACTICAL

PAPER: ZOO – 604 (A): BIODIVERSITY

1. Biodiversity related Practical works	- 50 marks
2. Field & Project work	– 100 marks

Semester VI (Honours)

PROJECT WORK

ZOO-604: Project work.

Colleges may offer any relevant project work.

Suggested readings:

1. Harris, R. (1991). Biological microscopy for biology: A practical approach. *Oxford University Press*.
2. Plummer, D. T. (1987). An introduction to practical biochemistry. *Tata McGraw Hill*.
3. Harris, R. Biological microscope for biology: A practical approach. *OUP*
4. Maniats, J. Molecular cloning: A laboratory manual. *Cold Spring*
5. Any other as may be deemed fit.

Syllabus of
BSc General Course
in
Botany
for 2018-19 Session

Semester-wise Syllabus for Undergraduate Programme

Botany

To be introduced from July 2012



DEPARTMENT OF BOTANY
NAGALAND UNIVERSITY
LUMAMI

INTRODUCTION

The Syllabus is designed to suit the semester pattern and credit system adopted by the University. The remodeling of the syllabus have been made with an inter-disciplinary approach and is therefore worked out trying to maintain an evolutionary link throughout the subject beginning with the origin and evolution of biodiversity through ecology and conservation. Attempts have been made to restructure the syllabus to meet the emerging concepts of twenty first century. It has been designed as to incorporate the new advances and trends in the disciplines within the limitations of the UG syllabus. Thus the latest concepts in Cell Biology, Biotechnology and Molecular Biology have been incorporated.

The syllabus has been also been developed envisaging the teacher, learner and the application of the synergetic interaction between the two. It aims to progressively enhance the students' knowledge over the subject and inculcate in them a sense of spirit, wonder and appreciation to the dynamics of nature. The syllabus has been drafted clearly and concisely so that the students have the knowledge to acknowledge and owe responsibility to the environment, ecology and biodiversity of plants.

Ethnobotany and traditional knowledge has been drafted to enrich the students with the treasures of our state and society. The study of Medicinal Botany and Economic botany enriches the Systematic Botany which can be of potential botanical, pharmacological and economic usage. This study will be useful in identifying medicinal taxa; since the students are aware of systematic botany (Morphology and Taxonomy of Flowering Plants).

The curriculum for B.Sc. programme in Botany which is of six semester duration contains in 6 Pass papers with 3 credit points each and 5 Honours papers with 2 credit points each. Each of the theory paper for both Pass and Honours course will have a corresponding practical with 1 credit point each. In the sixth semester, students can opt for a CBCS paper (Choice Based Credit System) from the options offered by the College which carries 3 credit point and a corresponding project work with 1 credit point of the CBCS.

While retaining the basic concepts of the subject, the practical components are designed in correspondence with the theory courses to impart the skills and techniques required in these areas. Seminars, tutorials, quiz, assignments, field survey, project, study tour and other such activities will supplement the programme of instruction relating to a unit. The

syllabus will give a solid foundation for the post-graduate courses like Molecular Biology, Microbiology, Medical Genetics, Horticulture and Plant Biotechnology besides Botany itself.

REFERENCES:

1. Present Nagaland University syllabus as template
2. Banaras Hindu University syllabus, U.P.
3. Bharathidasan University syllabus, Tiruchirappalli
4. Calcutta University syllabus, West Bengal
5. Calicut University syllabus, Kerela
6. Delhi University syllabus, Delhi
7. Guwahati University syllabus, Assam
8. Jamia Millia Islamia University syllabus.
9. Kannur University syllabus, Kerela
10. Madras University syllabus, Tamil Nadu
11. North Eastern Hill University syllabus, Meghalaya

**NAGALAND UNIVERSITY
CURRICULUM FOR B.Sc PROGRAMME IN BOTANY**

Semester		Course Number	Course Name	Credits	Total Credits
I	Pass	BOT-101 BOT-102	Biodiversity I Practical	4 1	8
	Honours	BOT-103 BOT-104	Microbiology and Plant Pathology Practical	2 1	
II	Pass	BOT-201 BOT-202	Biodiversity II and Plant Pathology Practical	4 1	8
	Honours	BOT-203 BOT-204	Embryology and Palynology Practical	2 1	
III	Pass	BOT-301 BOT-302	Morphology, Anatomy and Angiosperm Taxonomy Practical	4 1	8
	Honours	BOT-303 BOT-304	Ethnobotany, Economic Botany and Biometric Practical	2 1	
IV	Pass	BOT-401 BOT-402	Plant Physiology and Ecology Practical	4 1	8
	Honours	BOT-403 BOT-404	Environmental Biology and Phytogeography Practical	2 1	
V	Pass	BOT-501 BOT-502	Biochemistry and plant breeding Practical	4 1	8
	Honours	BOT-503 BOT-504	Molecular Biology and Biotechnology Practical	2 1	
VI	Pass	BOT-601 BOT-602	Cell Biology and Genetics Practical	4 1	10
	Honours	BOT-603	<u>Choice Based Credit System</u> a) Angiosperm Taxonomy b) Methodology and Perspective of Science c) Plant Biotechnology d) Forestry e) Mushroom Cultivation f) Horticulture	3	
		BOT-604	Project Work	2	

Highlights of the Curriculum

- *Choice Based Credit Paper will be offered depending on the availability of specialized teachers in respective colleges.
- * The Practical Examination will be conducted internally which will be of 50 marks. It will be a Continuous evaluation.
- * All theory papers are of 100 marks (70% external and 30% internal).
- * Each Theory Paper will have five units.
- * Project work will be assigned to students by the faculties of the department depending upon the availability of facilities and infrastructure of the department. Evaluation will be assessed jointly by internal and external examiners. In the absence of external examiner, the examination committee of the college may appoint a faculty member as an examiner.
- *Credits: - Theory: 1 Credit = 15 hrs
 Practical: 1 Credit = 30 hrs

SEMESTER I

Course No: **BOT-101** **BIODIVERSITY I (Bacteria, Algae, Fungi and Viruses)**

UNIT 1: **Origin and Evolution of Biodiversity**

General account on Darwin's theory of evolution; The evolution of populations; Concepts of species; Mechanism of speciation.

Three Domains of life—Archaea, Bacteria and Eukaryota;

Evolutionary relationship among the three domains.

11 HOURS

UNIT II: **Bacteriology**

Ultra structure of bacterial cell

Comparison of Archaeobacteria and Eubacteria

Gram positive and Gram negative Bacteria

Bergey's Classification of Bacteria

Shapes of bacteria

Reproduction- vegetative, asexual, sexual (conjugation, transformation and transduction)

Bacterial genome and plasmid

Economic importance of Bacteria

12 HOURS

UNIT III: **Phycology**

Cyanobacteria: Cell structure, thallus organization,

Structure and life history of *Nostoc* and *Anabaena*.

Outlines of Fritsch's classification of algae

Types of alternation of generation

Range of vegetative and reproductions in Chlorophyceae, Xanthophyceae, Phaeophyceae and Rhodophyceae

Important features of life cycle of *Oedogonium*, *Vaucheria*, *Ectocarpus*, and *Polysiphonia*

Economic importance of Algae

13 HOURS

UNIT IV: **Mycology**

General characters and classification of Fungi

Range of vegetative structure and reproduction in fungi

Important features of life cycle of *Pythium*, *Erysiphe*, *Aspergillus*, *Puccinia*, *Agaricus*, and *Alternaria*.

General account of Lichens

Mycorrhizae,

13 HOURS

UNIT V: **Virology**

Discovery of Virus

Replication, lytic (T4 phage) and Lysogenic cycle (Lambda phage);

Types-DNA virus (coliphage T32), RNA virus (TMV), Retro virus (HIV);

Viriods and Prions

11 HOURS

Suggested Readings:

- 1) Alexopoulos C.J and MIMS C.V 1988. **Introductory Mycology**, John Wiley and Sons.
- 2) Bold, H.C. and Wayne, M.J. 1996 **Introduction to Algae (2nd Edition)**. Prentice Hall, Inc. Englewood Cliffs, New Jersey.
- 3) Campbell, N.A. and Reece, J. B. (2008) **Biology 8th edition**, Pearson Benjamin Cummings, San Francisco.
- 4) Dubey R C and D K Maheswary : **A Text Book of Microbiology** : S Chand and Co New Delhi,
- 5) Lee, R.E. 2008. **Phycology, Fourth Edition**, Cambridge University Press, USA.
- 6) Pandey and Trivedi - **A text book of Fungi, Bacteria and Virus** Vikas Publishing House, New Delhi.
- 7) Pelczar, M.J. (2001) **Microbiology, 5th edition**, Tata Mc Graw-Hill Co, New Delhi.
- 8) Prescott, L. Harley, J. and Klein, D. (2005) **Microbiology, 6th edition**, Tata Mc Graw-Hill Co. New Delhi.
- 9) Raven, P.H *et al* (2006) **Biology 7th edition** Tata McGrawHill Publications, New Delhi
- 10) Sambamurthy, AVSS. 2006. **A Textbook of Algae**. I. K. International Pvt. Ltd., New Delhi.
- 11) Thakur Anil K, Bassi Susheel K, **Diversity of microbes and Cryptogams**. S. Chand and Company, New Delhi
- 12) Van den Hoek, C.; Mann, D.J. and Jahns, H.M. 1995. **Algae: An introduction to Phycology**. Cambridge Univ. Press.
- 13) Webster, J. and Weber, R. 2007 **Introduction to Fungi. 3rd edition**, Cambridge University Press, Cambridge.

PRACTICALS

Course No: **BOT-102** **BIODIVERSITY I (Bacteria, Algae, Fungi and Viruses)**

Section A

30 HOURS

1. Introduction on handling and maintenance of laboratory equipments
2. Types of bacteria from temporary/permanent slides.
3. Gram staining of bacteria from root nodules and curd.
4. Models of viruses and virus infected plants.

Section B

1. Introduction on techniques of slide preparation, stain preparation and staining.
2. Study of vegetative and reproductive structure of
 - i. *Chlamydomas*
 - ii. *Oedogonium*
 - iii. *Chara*
 - iv. *Ectocapus*
 - v. *Puccinia*
 - vi. *Pythium* ,
 - vii. *Erysiphe*,
 - viii. *Pezizia/Agaricus*
3. Study of types of lichens
4. Study of Mycorrhizae

SEMESTER II

Course No: **BOT-201** **BIODIVERSITY II (Archegoniatae) AND PALAEOBOTANY**

UNIT 1: BRYOLOGY

General characteristic of Bryophytes
Classification of Bryophytes (Proskauer, 1957)
Distribution, Structure (Morphological and anatomical), reproduction, life cycle and affinities of following: *Marchantia* (Hepaticopsida), *Anthoceros* (Anthocerotopsida), *Funaria* (Bryopsida)
Economic importance of Bryophytes

12 HOURS

UNIT II: PTERIDOLOGY

General account of Pteridophytes
Origin, Telome theory
General Classification
Evolution of stele,
Heterospory and Seeds habit
Life cycle of *Psilotum*, *Selaginella*, *Equisetum* and *Marsilea*.

12 HOURS

UNIT III: GYMNOSPERM

General account,
Classification of Gymnosperms (Sporne's, 1965)
Morphology and Anatomy of *Cycas*, *Pinus* and *Gnetum*.
Economic importance of Gymnosperms

12 HOURS

UNIT IV: REPRODUCTION IN GYMNOSPERM

Reproduction of *Cycas*, *Pinus* and *Gnetum*.
Affinities of Gymnosperms with Pteridophytes and Angiosperms

12 HOURS

UNIT V: PALAEOBOTANY

Geological time scale
Fossil types and their formation,
General account of dominant fossil flora of different ages,
Palaeobotany in relation to exploration of fossil fuels

12 HOURS

Suggested Readings:

BRYOPHYTES

- 1) Campbell H.D, 1940, *The Evolution of land plants (Embryophyta)*, Univ. Press, Stanford.
- 2) Chopra R.N. and P.K. Kumar, 1988, *Biology of Bryophytes*. Wiley Eastern Ltd. New Delhi.
- 3) Parihar, N.S. *An Introduction to Bryophyta* Central Book Depot, Allhabad, 1965.
- 4) Shaw.J.A. and Goffinet B., 2000, *Bryophyte Biology*, Cambridge University Press.
- 5) Smith G.M. 1938, Cryptogramic Botany Vol.II. *Bryophytes and Pteridophytes*. Mc Graw Hill Book Company, London.
- 6) Sporne K.R.,1967, *The Morphology of Bryophytes*. Hutchinson University Library, London.

- 7) Vasishta B.R. **Bryophyta**. S. Chand and Co. New Delhi.
- 8) Watson E.V. 1971, **The structure and life of Bryophytes**. Hutchinson University Library, London.

PTERIDOPHYTES

- 1) Bierhorst, D.W 1971 **Morphology of Vascular Plants** MacMillan Co., N.Y. & Collier-MacMillan Ltd., London.
- 2) Parihar, N.S. 1996. **The Biology and Morphology of Pteridophytes**. Central Book Depot, Allahabad.
- 3) Sharma, O.P 1990 **Textbook of Pteridophyta** MacMillan India Ltd., Delhi
- 4) Sporne, K.R. 1970 **The Morphology of Pteridophytes** (The Structure of Ferns and Allied Plants) Hutchinson University Library, London
- 5) Sundara Rajan, S. 1994 **Introduction to Pteridophyta** New Age International Publishers Ltd., Wiley Eastern Ltd., New Delhi,
- 6) Vashista, P.C. 1997 **Botany for Degree Students-Pteridophyta**. S. Chand & Co., New Delhi,
- 7) Zashhed, A 1999 **An Introduction to Pteridophyta** Vikas publishing Co., New Delhi,

GYMNOSPERMS

- 1) Bhatnagar, S.P and Alok Moitra 1997 **Gymnosperms** New Age International (P)Ltd., Publisher, New Delhi,
- 2) Sharma, O.P. 1997 **Gymnosperms** Pragati Prakashan, Meerut, India.
- 3) Sporne K.R. 1967, **The Morphology of Gymnosperms**, Hutchinson and Co. Ltd. London.
- 4) Sreevastava H.N. 1980, **A Text Book of Gymnosperms**. S. Chand and Co. Ltd., New Delhi.
- 5) Srivastava, H.N.1998 **Gymnosperms** Pradeep Publications, Jalandhar, India-
- 6) Vashista, P.C. 1996 **Botany for Degree Students – Gymnosperms (2nd Edition)** S. Chand & Co., New Delhi
- 7) Vasishta P.C. 1980, **Gymnosperms**. S. Chand and Co., Ltd., New Delhi.

PALAEOBOTANY

- 1) Clark DL 1976 **Fossils, Palaeobotany and Evolution** W.M.C. Brown Company New York.
- 2) Meyen SV., 1978 **Fundamentals of Palaeobotany** Chapman and Hall London
- 3) Misra SP and Shukla AC 1982 **Essentials of Palaeobotany** Vikas Publishing House, New Delhi
- 4) Steward WN and Rothwell GW 1993 **Palaeobotany and the Evolution of Plants** Publ. Cambridge University Press, London
- 5) Surnage KR 1966 **Indian Fossil Pteridophytes** C.S.I.R. New Delhi
- 6) Thomas BA and Spice RA 1986 **The Evolution and Palaeobotany of land Plants** Publ Crom Helm London & Sydney

PRACTICALS

Course No: **BOT-202** **BIODIVERSITY II (Archegoniatae) AND PALAEOBOTANY**
30 HOURS

Preparation of stain

Single and Double staining technique

Technique on preparation of permanent slide

Study of habit, Vegetative thallus organization and structure, reproductive structures of the following taxa through temporary mounts and permanent slides

Bryophytes: *Riccia*, *Marchantia*, *Anthoceros*.

Pteridophytes: *Psilotum*, *Selaginella*, *Equisetum*, *Marsilea*,

Gymnosperm: *Cycas* (coralloid root, T.S. of coralloid root, T.S. of leaflet, petiole, male cone and L.S. of male cone, microsporophyll, megasporophyll, T.S. of microsporophyll, ovule, L.S. of ovule and seed.)

Pinus (T.S. of stem and needle, male cone and female cone, L.S. of male cone and female cone, seed)

Gnetum (Stem T.S., leaf T.S., male and female cones, L.S. of ovule, seed)

Study of fossil specimens

SEMESTER III

Course No: **BOT-301 MORPHOLOGY, ANATOMY AND ANGIOSPERMIC TAXONOMY**

UNIT 1: VEGETATIVE MORPHOLOGY

Plant Habit

Root: Types, Modification for Storage, physiological and mechanical purposes.

Stem: Habit, types modification of stem for food, mechanical and underground modification of stem.

Leaves: Types, phyllotaxy, Venation, lamina; parts, shapes and modifications, leaf surface features and appendages.

Fruits: Structure, types and classification with examples

Detail Seed structure: dicot and monocot, albuminous and exalbuminous.

11 HOURS

UNIT II: FLORAL MORPHOLOGY

Types of inflorescence and specialized inflorescence

Flower: Flower as a modified shoot

Detailed structure of flowers

Floral parts, arrangement, relative position, numeric plan, cohesion and adhesion of floral parts,

Types of aestivation and placentation

Floral diagram and floral formulae

10 HOURS

UNIT III: PLANT ANATOMY-TISSUES

Classification and structure of tissues;

Simple tissue: Structure occurrence and function (parenchyma, collenchyma, sclerenchyma)

Complex tissues Definition Structure, Origin and function (Xylem & Phloem, tracheary elements and Sieve elements)

Secretory tissues: (glands, glandular hairs, nectaries, hydathodes, schizogenous and lysigenous ducts, resin ducts, mucilage ducts, kinoveins, laticifers)

Vascular bundle: Types (conjoint, collateral, bi-collateral, open closed, radial, concentric amphicribal and amphivasal.)

Stomatal complex

13 HOURS

UNIT IV: PLANT ANATOMY-STEMS AND ROOTS

Shoots: Theories on apical organisation (Apical cell theory, Histogen theory, Tunica-corpus theory)

Shoot chimeras

Arrangement of primary tissues in the Dicots and Monocots stem and leaves

Secondary growth and anomalous secondary growth (Amaranthus, Mirabilis and Dracaena.)

Roots: Organization of root apex (apical cell theory, Korper-kappe theory)

Root cap;

Arrangement of primary tissues in the Dicots and Monocots roots

Secondary growth in roots

12 HOURS

UNIT V: ANGIOSPERMIC TAXONOMY

Principles of systematic

Concept of species, genus and family

Nomenclature

Overview on types of classification; Sexual, natural, phylogenetical and modern system of classification

Comparative study of classification systems of

- i. Bentham and Hooker,
- ii. Engler and Prantle
- iii. and Hutchinson.

Taxonomic studies of the following families (Bentham and Hooker)

Dicots: Rununculaceae, Malvaceae, Leguminaceae, Compositaceae, Solanaceae, Cucurbitaceae

Monocots: Orchidaceae, Gramminae

14 HOURS

Suggested Readings:

1. Cronquist, A. (1981). *An Integrated System of Classification of Flowering Plants*. Columbia University Press, New York.
2. Datta S C., 1988 *Systematic Botany*, 4th Ed, Wiley Estern Ltd., New Delhi
3. Eames A. J. 1981 *Morphology of Angiosperms* - McGraw Hill, New York.
4. George, H.M. Lawrence. 1951. *Introduction to Plant Taxonomy*. Mac Millan comp. Ltd., New York.
5. Gifford EM. And Foster AS., 1989 *Morphology and Evolution of Vascular Plants* W.H.Freeman, New York
6. Naik V.N., 1991 *Taxonomy of Angiosperms* Tata McGraw-Hill Pub. Co. Ltd., New Delhi.
7. Pandey, S. N, and S.P. Misra (2008) *Taxonomy of Angiosperms* Ane Books India, New Delhi.
8. Prithipalsingh (2007), *An introduction to Biodiversity*, Ane books India, Delhi.
9. Simpson, M.G. 2006. *Plant Systematics*. Elsevier Academic Press, London
10. Singh G.1999. *Plant systematics: Theory and Practice*. Oxford and IBH Pvt.Ltd.New Delhi.
11. Sivarajan V. V - *Introduction to Principles of taxonomy* Oxford &I B H New Delhi.
12. Stussy, T.F. 1990. *Plant Taxonomy*, Columbia University Press, USA.
13. Takhtajan *Flowering Plants* Edinburg, Oliver & Boyd.
14. Vashishta P. C *Taxonomy of Angiosperms* Chand & Co, Meerut.
15. Vasudevan Nair, R *Taxonomy of Angiosperms* APH Pub. New Delhi
16. Cuttler, E.G. 1971. *Plant Anatomy, Part III Organs* Edward Arnold Ltd., London.
17. Cuttler, EG. 1969. *Plant Anatomy Part I Cells & Tissue*. Edward Arnold Ltd., London.
18. Eames, AJ and LH MacDaniels 1987 *An Introduction to Plant Anatomy*. Tata MacGraw-Hill Publishing company Ltd. New Delhi.
19. Esau k 1985 *Plant Anatomy 2nd Edition* Wiley Eastern, New Delhi.
20. Fahn A 1997 *Plant Anatomy* Aditya Books (P) Ltd. New Delhi.
21. Fahn A 2000. *Plant Anatomy*. Permagon Press.
22. Sen DN 1974. *Anatomy of Angiosperms*. S. Nagini & Co.
23. Vasishta P.C. 1974. *Plant Anatomy*, Pradeep Publication, Jalandhar.

PRACTICALS

Course No: **BOT-302 MORPHOLOGY, ANATOMY AND ANGIOSPERMIC TAXONOMY**
30 HOURS

Study of vegetative and floral characters of species of the families studied in theory.

Identification of selected taxa upto Genus using taxonomic keys.

Herbarium technique

Familiarity with local flora and preparation of herbarium sheet

Microscopic studies on: types of stomata, (Monocot and dicot)

Anatomical study of stem and root (Dicots and Monocots) by making double stained temporary/permanent slides

Anatomical studies of anomalous secondary structure in stem of *Mirabilis*, *Bignonia*, *Bougainvillea* and *Dracaena* by making double stained permanent slides

SEMESTER IV

Course No: **BOT-401** **PLANT PHYSIOLOGY AND ECOLOGY**

UNIT 1: UNIT 1: PLANT WATER RELATIONS AND MINERAL NUTRITION

Structure and properties of water

Absorption of water (active and passive),

Ascent of sap; Pathway of water movement; concepts of symplast and apoplast,

Guttation and transpiration, Significance of transpiration

Physiology role of stomata

Macro and Micro nutrients; Role of essential nutrients in plant metabolism and their deficiency symptoms.

Absorption of mineral elements-

- i. Active and passive absorption
- ii. Simple and facilitated diffusion
- iii. Donnan equilibrium
- iv. Role of ATP,
- v. Carrier systems, proton pump and ion flux

Outline of Nitrogen fixation and Nitrogen Assimilation,

Transamination and deamination,

12 HOURS

UNIT II: PHOTOSYNTHESIS AND RESPIRATION

Definition and Significance

Site of photosynthesis,

Photochemical phase

- i. Electron transport chain.
- ii. Photophosphorylation- (cyclic and non cyclic)
- iii. Z Scheme of Photosynthetic Electron Transfer

Biosynthetic phase,

- i. Benson and Calvin cycle
- ii. Hatch and Slack pathway
- iii. Crassulacean acid metabolism
- iv. Photorespiration

Law of limiting factors.

Source sink relationship. Mechanism of phloem transport. Phloem loading and unloading

Glycolysis

Oxidative decarboxylation of pyruvate into acetyl CoA

TCA cycle

Oxidative phosphorylation, and factors affecting oxidative processes

14 HOURS

UNIT III: PLANT GROWTH AND DEVELOPMENT

Physiological effect of Auxin. Cytokinins, Gibberellins and Ethylene and their role in plant development.

Physiology of senescence and abscission

Brief outlines on

- i. Photoperiodism
- ii. Vernalization.
- iii. Phytochrome,

10 HOURS

UNIT IV: **ECOLOGY**

Basic concept of Ecology

Ecological factors, (Light, Temperature, Moisture, Edaphic, Physiographic and Biotic,)

Ecological adaptations of Hydrophytes, Xerophytes, Epiphytes and Halophytes.

Community structure (Qualitative analytic and synthetic characters) and development (Primary and secondary succession)

Productivity (Primary and secondary productivity)

Trophic structure, trophic levels and ecological pyramid.

12 HOURS

UNIT V: **BIODIVERSITY**

Biodiversity, Hotspots, keystone species, flagship species

Values of biodiversity, equitability

Attributes of population,

Population growth and interaction.

Air and water pollution and their abatement.

Phytogeographic regions of India with special reference to North East India.

12 HOURS

Suggested Readings:

- 1) Daubenmier, R.F. 1970, *Plant Communities*, Wiley Eastern Private Limited
- 2) Daubenmier, RF.1970. *Plants and Environment: A text book of Plant Autoecology*, Wiley Eastern Private Limited
- 3) Dennis, D.T., Layzell, D.B., Lefebvre, D.D. and Turpin, D.H. (1997) *Plant Metabolism*. Addison Wesley Longman.
- 4) Hopkins, W.G. and Huner, P.A. (2008) *Introduction to Plant Physiology*. John Wiley and Sons.
- 5) Kandya AK and Gupta A 2007 *Advancing frontiers of Ecological Researches in India*
- 6) Kaul RP (2009) *Plant Metabolism*. Swastik Publishers and Distributors.
- 7) Koromondy EJ 1996 *Concepts of Ecology 4th Edition* Prentice-Hall of India Pvt. Ltd. New Delhi
- 8) Misra KC 1988 *Manuals of Plant Ecology (3rd Edition)* Oxford and IBH Publishing Co., New Delhi.
- 9) Mukherjee S., Ghosh AK., 2006 *Plant Physiology* New Central Book Agency Calcutta
- 10) Nelson, D.L., Cox, M.M. (2004) Lehninger *Principles of Biochemistry, 4th Edition*, WH Freeman and Company, New York, USA.
- 11) Odum EP 1983 *Basic Ecology 5th Edition* Thomson Business International Waldis Pvt Ltd. Baricahd
- 12) Odum, EP. (2008) *Ecology*. Oxford and IBH Publisher.

- 13) Salisbury, F.B. and Ross, C.W. (1991) **Plant Physiology**, Wadsworth Publishing Co. Ltd.
- 14) Sharma, P.D. (2010) **Ecology and Environment, (8th Edition)** Rastogi Publications, Meerut.
- 15) Singh, JS., Singh, SP. and Gupta, S. 2006 **Ecology Environment and Resource Conservation** Anamaya Publications, New Delhi
- 16) Sinha RK., 2007 **Modern Plant Physiology** 2nd Edition Tata McGraw, New Delhi.
- 17) Taiz, L. and Zeiger, E. (2006) **Plant Physiology**, 4th Edition Sinauer Associates Inc. Publishers, Massachusetts, USA
- 18) Wilkinson, D.M. 2007. **Fundamental Processes in Ecology. An Earth System Approach.** Oxford.

PRACTICALS

Course No: **BOT-402** **PLANT PHYSIOLOGY AND ECOLOGY** **30 HOURS**

PHYSIOLOGY

1. Preparation of solutions of various concentrations of a few selected solutes.
2. Study of transpiration rate in dorsiventral and isobilateral leaves by Blackman's apparatus.
3. Separation of plant pigments by paper chromatography.
4. Determination of photosynthetic activity by Wrinkler's method.
5. Calculation of the stomatal index, stomatal frequency and percentage of leaf area open through stomata in a mesophyte and a xerophytes.
6. Study of the mechanism of stomatal opening and closing
7. Rate of photosynthesis under varying HCO_3 concentration in an aquatic plant using bicarbonate and to find out the optimum and toxic concentration.

ECOLOGY

1. Study of adaptive anatomical and morphological features of Hydrophyte, Epiphytes and Xerophytes
2. Study of Soil pH
3. Estimation of soil carbonate content by qualitative method
4. Determination of requisite size and number of quadrat for the study of plant community
5. Study of structure of plant community by determining frequency, density and abundance of quadrat method.

,

SEMESTER V

Course No: **BOT-501** **BIOCHEMISTRY AND PLANT BREEDING**

UNIT 1: CONCEPT OF BIOCHEMISTRY

Biomolecules (The primordial biomolecules, the origin of biomolecules, the fitness of biomolecules, Hierarchy of Biomolecules)

The laws of thermodynamics

Bioenergetics (Entropy, Free energy change and equilibrium constant Activation energy)

Redox potential

Discovery and structure of ATP

Hydrolysis of ATP and role of ATP in Biological reactions **10 HOURS**

UNIT II: BIOMOLECULES (Carbohydrate)

Carbohydrates- Simple sugars, reducing and non-reducing sugars.

Classification into monosaccharides, oligosaccharides and polysaccharides.

Mutarotation and inversion.

Derivatisation in glycoprotein and Glycolipids

Biosynthesis and degradation of sucrose and starch. **12 HOURS**

UNIT III: BIOMOLECULES (Lipids and Nucleic acids)

Lipids- Classification and structure of lipids

Fatty acids- saturated and unsaturated, triacyl glycerols, phospholipids and sphingolipids

Fatty acids biosynthesis

Oxidation of fatty acids

Storage and mobilization of fatty acids and lipids.

Nucleic acid- Bases, Nucleoside and Nucleotide

Phosphodiester bonds, Hydrogen bonding.

DNA structure: DNA double helix (Watson and Crick model),

Super-coiling, Properties of DNA

Denaturation

Structure of t-RNA **15 HOURS**

UNIT IV: BIOMOLECULES (Proteins)

Proteins- Structure and classification of amino acids based on polarity

Zwitter ion nature; properties of amino acids

Peptide bond formation

Classification and Structure of proteins (Primary, secondary, tertiary and quaternary)

Conformation and Denaturation **11 HOURS**

UNIT V: PLANT BREEDING

Principles of plant breeding

Plant introduction and acclimatization

Hybridization: Technique and Significance

Heterosis

Brief account of

- i. mass selection,
- ii. pure line selection and

- iii. clonal selection.
- iv. Mutation breeding,
- v. Polyploidy breeding.

12 HOURS

Suggested Readings:

1. Berg, J.M., Tymoczko, J.L., Stryer, L. 2006, **Biochemistry 6th Edition**, W.H. Freeman and Company, New York.
2. Buchanan, B., Gruissem, W. and Jones, R. 2000 **Biochemistry and Molecular Biology of Plants** American Society of Plant Biologists.
3. Conn, E.E., Stumpf, P.K. and Bruening, G. 2006 **Outlines of Biochemistry 4th Edition**, John Wiley and Sons Inc.
4. Donald Voet, Judith.G. Voet and Charlotte W. Pratt (2006) **Fundamentals of Biochemistry**, 2nd Edition, John Wiley and Sons Inc.
5. Elliot 2009 **Biochemistry and Molecular Biology** Oxford Publishers.
6. Harper, 2003, **Biochemistry**, McGrawHill.
7. Keith Wilson and John Walker 2005 **Principles and Techniques of Biochemistry and Molecular Biology(6th Edition)**, Cambridge University Press, USA
8. Nelson, D.L., Cox, M.M. 2004 **Lehninger Principles of Biochemistry, 4th edition**, W.H. Freeman and Company, New York, USA.
9. Stryer, L., 2002, **Biochemistry**, W.H. Freeman.
10. Voet & Voet, 2000, **Biochemistry**, John Wiley, New York
11. Wilson K and Walker J., 2008 **Principles and techniques of Biochemistry and Molecular Biology**. Cambridge University Press.
12. Zubay, 1995, **Biochemistry**, Brown Publishers
13. Allard. R.W. 1960 **Principles of Plant breeding**, John Wiley & Sons, Inc, New York.
14. Chaudhari HK. **Elementary Principles of Plant breeding**, Oxford & IBH Publishers.
15. Singh,BD 2005 **Plant Breeding Principles & methods**, Kalyani Publishers, New Delhi.
16. Sinha U. and Sunitha S 2000 **Cytogenetics, Plant breeding & Evolution**, Vikas Publishing House.

PRACTICALS

Course No: **BOT-502**

BIOCHEMISTRY AND PLANT BREEDING

30 HOURS

- 1) Preparation of Molar, Normal and percent solutions
- 2) Preparation of Phosphate buffer.
- 3) Separation of amino acids by paper chromatography
- 4) Identification tests for carbohydrates (Fehling's test, Benedicts test) and proteins (Ninhydrin test, Xanthoproteic test).
- 5) Chemical separation of chloroplast pigments and determination of their absorption spectra.
- 6) Preparation of standard curve for estimation of soluble proteins in plant materials by Bradford method
- 7) To study the effect of various factors (temperature and substrate concentration) on the activity of amylase enzyme
- 8) Separation and identification of amino acids by thin layer chromatography.
- 9) Emasculation, bagging, tagging and pollination in self-pollinated plants.

SEMESTER VI

Course No: **BOT-601** **CELL BIOLOGY AND GENETICS**

UNIT 1: INTRODUCTION IN CELL BIOLOGY

Introduction to cell theory
Comparison of a generalized prokaryotic and eukaryotic cell
Elementary idea on Microscopy
Elementary idea on micrometry and Cell fractionation

8 HOURS

UNIT II: ORGANIZATION OF A CELL

Extranuclear

- i. Elementary knowledge of structure and function of plasma membrane
- ii. Introduction to endomembrane system; endoplasmic reticulum, Golgi complex, lysosome, peroxisome
- iii. Introduction to cytoskeleton
- iv. Structure and functions of mitochondria
- v. Structure and function of plastids

Nuclear

- i. Nuclear envelope, nucleolus and Ribosome
- ii. Interphase chromatin and metaphase chromosome
- iii. Introduction to polytene and lampbrush chromosomes

16 HOURS

UNIT III: CELL CYCLE

Basic features of the cell cycle
Process and phases of Mitosis, mitotic spindle and chromosome movement
Process and phases of meiosis and its significance
Programmed Cell Death, Stem Cells

11 HOURS

UNIT IV: INTRODUCTION TO GENETICS

Mendel's laws of inheritance-Law of dominance, law of segregation, law of independent assortment, deviations from Mendel's laws (Neo-Mendelism)

Interaction of genes- Intragenic and intergenic interactions, incomplete dominance, lethal genes, complementary genes, supplementary genes, inhibitory genes, duplicate genes, epistatic genes

Linkage and crossing over- Interrelationships and importance, crossing over and meiosis, cytological basis of crossing over (Holliday's Model), crossing over and linkage maps, linkage groups, interference

Sex determination: Chromosome theory of sex determination, sex determination in plants

13 HOURS

UNIT V: CHROMOSOMAL ABBERATIONS

Mutations- Point mutation-Transition, Transversion and Frame shift mutation.

Molecular mechanism (tautomerisation, alkylation, deamination, base analogue incorporation, dimerisation),

Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation,;

Gene mutations

Physical and chemical mutagens,

DNA repair mechanisms.

Chromosome theory of heredity, Chromosomal aberrations
Aneuploidy and Polyploidy
Extrachromosomal Inheritance: (Chloroplastic and Mitochondrial) Maternal Effect
12 HOURS

Suggested Readings:

- 1) Alberts *et al* 1998 **Essential Cell Biology** Garland Publishers
- 2) Alberts *et al* 2008 **Molecular Biology of the Cell** Garland Publishers
- 3) Becker, W.M., Kleinsmith, L.J., Hardin, J. and Bertoni, G. P. 2009. **The World of the Cell. 7th edition.** Pearson Benjamin Cummings Publishing, San Francisco.
- 4) Brooker 1999 **Genetics : Analysis and Principles** Addison-Wesley
- 5) Cooper, G.M. and Hausman, R.E. 2009. **The Cell: A Molecular Approach. 5th edition.** ASM Press & Sunderland, WashinPTon, D.C.; Sinauer Associates, MA.
- 6) De Robertis, E.D.P. and De Robertis, E.M.F. 2006. **Cell and Molecular Biology. 8th edition.** Lippincott Williams and Wilkins, Philadelphia.
- 7) Gardner, E.J., Simmons, M.J., Snustad, D.P. 2008. **Principles of Genetics.8th Edition** Wiley India.
- 8) Griffiths, AJF., Wessler, SR., Lewontin, RC. and Carroll, SB.. **Introduction to Genetic Analysis. IX Edition** W.H. Freeman and Co.
- 9) Hartl & Jones 2002 **Essential Genetics: A Genomic Perspective** Jones & Bartlett
- 10) Karp, G. 2010. **Cell and Molecular Biology: Concepts and Experiments. 6th Edition.** John Wiley & Sons. Inc.
- 11) Klug, WS., Cummings, MR, Spencer, CA. 2009. **Concepts of Genetics. XI Edition.** Benjamin Cummings.
- 12) Lewin 2008, **Genes IX** Jones & Bartlett
- 13) Lodish *et al* 2008 **Molecular Cell Biology** Freeman
- 14) Russell, PJ.2009. **Genetics: A Molecular Approach. III Edition.** Benjamin Cummings.
- 15) Snustad, D.P., Simmons, M.J. 2009. **Principles of Genetics. V Edition.** John Wiley and Sons Inc.

PRACTICALS

Course No: **BOT-602** **CELL BIOLOGY AND GENETICS** **30 HOURS**

- 1) Study of meiosis through temporary smear of flower buds.
- 2) Study of mitosis and meiosis through permanent slides
- 3) Genetic problems on dihybrid inheritance
- 4) Allelic and Non allelic gene interactions.
- 5) Mendelian laws and gene interaction using *Drosophila* crosses.
- 6) Study of Hardy-Weinberg Law using simulations (seeds).
- 7) Chi square analysis and probability factor of Genetics

Syllabus of
BSc General Course
in
Chemistry
for 2018-19 Session

B.Sc. Course Structure
Subject : Chemistry

Semester		Course Number	Course Name	Credits	Total Credits
I	Pass	CHEM-101	Inorganic (Theory)	4	8
		CHEM-102	Inorganic (Practical)	1	
	Honours	CHEM-103	Inorganic (Theory)	2	
		CHEM-104	Inorganic (Practical)	1	
II	Pass	CHEM-201	Organic (Theory)	4	8
		CHEM-202	Organic (Practical)	1	
	Honours	CHEM-203	Organic (Theory)	2	
		CHEM-204	Organic (Practical)	1	
III	Pass	CHEM-301	Physical (Theory)	4	8
		CHEM-302	Physical (Practical)	1	
	Honours	CHEM-303	Physical (Theory)	2	
		CHEM-304	Physical (Practical)	1	
IV	Pass	CHEM-401	Inorganic (Theory)	4	8
		CHEM-402	Inorganic (Practical)	1	
	Honours	CHEM-403	Quantum Chemistry & Molecular Spectroscopy	2	
		CHEM-404	Advanced Practical-1 (Physical, Inorganic and Organic)	1	
V	Pass	CHEM-501	Organic (Theory)	4	8
		CHEM-502	Organic (Practical)	1	
	Honours	CHEM-503	Analytical Chem & Applications of Spectroscopy.	2	
		CHEM-504	Advanced Practical-II (Physical, Inorganic and Organic)	1	
VI	Pass	CHEM-601	Physical (Theory)	4	10
		CHEM-602	Physical (Practical)	1	
	Honours	CHEM-603	Choice Based Credit Paper a. Biological Chemistry b. Nano Chemistry c. Medicinal Chemistry d. Environmental and Green Chemistry	3	
		CHEM-604	Project Work	2	

*** Choice based credit paper will be offered depending on the availability of specialized teacher in the respective colleges**

Salient Features of the Syllabus

1. For all theory papers, there will be five units irrespective of the credit of the paper. The total numbers of lectures/ contact hours against the credits are as follows:

Total credit	Total credit hours	Total no. of lectures	Total no. of units	No. of lectures per unit
4	60	80	5	16
2	30	40	5	8

* considering that one semester has around 15 working weeks, total credit hours are calculated. Since the class lectures are of 45 minutes, accordingly contact hours is converted into number of class lectures

2. The possible combinations for Chemistry Honours are as follows:

CHEMISTRY	BOTANY	ZOOLOGY
CHEMISTRY	PHYSICS	MATHEMATICS
CHEMISTRY	MATHEMATICS	COMPUTER SCIENCE
CHEMISTRY	GEOGRAPHY	ZOOLOGY
CHEMISTRY	GEOGRAPHY	BOTANY
CHEMISTRY	GEOLOGY	GEOGRAPHY
CHEMISTRY	ANTHROPOLOGY	BOTANY
CHEMISTRY	ANTHROPOLOGY	ZOOLOGY

*First two subject combinations are the preferred one

- 3 Students without Mathematics can also take admission into Honours Course in Chemistry, provided they have studied and cleared the subject Mathematics up to 12th standard.
- 4 The Choice Based Credit Course paper in the sixth semester needs to be selected by the respective Department, subject to availability of specialized Teacher.
- 5 The Practical Examination will be internal
- 6 All the theory papers are of 100 marks and out of that 30% is internal

SEMESTER-1

CHEM-101: Inorganic Chemistry (Pass Course - Theory)

Total Credits 4

Unit 1

a) Atomic Structure (16 L)

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of ψ and ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, and d orbitals. Aufbau and Pauli's exclusion principles, Hund's multiplicity rules. Electronic configurations of the elements, effective nuclear charge and shielding or screening effect.

b) Chemical periodicity:

Periodic classification of elements, salient characteristics of s, p, d and f- block elements. Periodic trends of atomic radii, ionic radii, ionization potential, electron affinity and Electronegativity in the periodic table, variation of metallic and non-metallic properties in different periods and groups, and diagonal relationship.

Unit II

a) Chemical bonding (16 L)

i) Covalent bonding

Basic idea of valence bond theory and its limitations; LCAO-MO theory and its application to homonuclear diatomic molecules (H_2 , N_2 , O_2 , O_2^{-2} , O_2^- , O_2^+ ,), concept of hybridization of orbitals; valence shell electron pair repulsion (VSEPR) theory and shapes of molecules and ions: BeF_2 , BF_3 , H_3O^+ , NH_3 , H_2O , H_2S , O_3 , CO_2 , BO_3^{3-} , PCl_3 , PCl_5 , SF_4 , SF_6 ;

(ii) Ionic Bonding: Ionic structures; radius ratio effect; limitation of radius ratio rule; concept of lattice energy and Born-Haber cycle; polarizing power; polarizability of ions and Fajan's rule, results of polarization on melting and boiling points.

.

Unit III

a) s and p Block Elements (16 L)

Electronic configuration, atomic and ionic radii, ionization enthalpy, electron gain enthalpy, Electronegativity, oxidation states, variation of acidic and basic properties of their oxides and oxy-acids, inert pair effect and catenation. Preparation, important reactions, structure and use of following compounds: Boric acid, borates, boron nitride, diborane and oxyacids of nitrogen, phosphorous, sulphur and chlorine. Basic properties of halogens and interhalogens, pseudo halides.

b) Chemistry of Noble Gases

Position in the periodic table, separation and isolation of helium, neon and argon from liquid air, study of the following compounds (preparation, structure and properties of XeF_2 , XeF_4 , and XeO_3 and $XeOF_4$).

Unit -IV

a) Oxidation and reduction

(16 L)

General concepts, Electrochemical series and its applications, redox stability in water – Frost (nitrogen) , Latimer (chlorine in acidic and basic medium, disproportionation of H_2O_2 into O_2 and H_2O under acid conditions)) and Pourbaix (iron species in natural water) diagrams .

b) Nuclear Chemistry-I

Fundamental particles (electron, proton, neutron, positron, neutrino and mesons); nuclear binding energy, mass defect and packing fraction; half-life and average life period; important applications of radioactive isotopes; unit of radioactivity; group displacement law; balancing of nuclear reactions; artificial radioactivity; elementary ideas of fission, fusion, controlled fission reactions , atomic energy & Nuclear reactors.

Unit –V

a) Acid-Base Concepts

(16 L)

Arrhenius concept; Bronsted-Lowry concept, the solvent-system (Franklin) concept and its limitations; Lewis concept; effect of substituent's and solvent on strengths of acids and bases – leveling effect; Relative strengths of acids and bases (pK_a , pK_b , and pH concepts). Hard and Soft Acid and Bases (HSAB): Classification of acids and bases as hard and soft, Pearson's HSAB principle and its applications, symbiosis, basis of hard-hard and soft-soft interactions.

b) Principles of Qualitative and Quantitative Analysis-I

Solubility product and its applications in the Group separations of cations, Volumetric analysis – standard solutions, primary standards, expressing concentrations of standard solutions, redox titrations (potassium permanganate, potassium dichromate, sodium thiosulphate and iodine), iodometric and iodimetric titrations, acid-base indicators and its theory.

Recommended Books

1. Comprehensive Inorganic Chemistry Vol – I & II: **Sulekh Chandra** (New Age Publication, New Delhi)
2. Advanced Inorganic Chemistry Vol I & II: **Satya Prakash, G.D.Tuli, R.D.Madan & S.K Basu**, S.Chand& Co. New Delhi
3. Selected topics in Inorganic Chemistry: **U.Malik, G.D.Tuli, R.D.Madan**, S.Chand& Co. New Delhi
4. Principles of Inorganic Chemistry: **Puri, Sharma & Kalia**, Vishal Publications, Jalandhar
5. Modern Inorganic Chemistry: **R.C. Aggarwal**, Kitab Mahal
6. Advanced Inorganic Chemistry Vol. I, II: **Gurdeep Raj**, Goel Publishing House, Meerut
7. Essentials of Nuclear Chemistry: **H.J. Arnika**, New Age Publication New Delhi
8. Basic Inorganic Chemistry: **Cotton, Wilkinson & Gaus**, Wiley
9. Concise Inorganic Chemistry: **J.D.Lee** (Blackwell Science)
10. Inorganic Chemistry: **Sharpe** (Pearson Education)
11. Inorganic Chemistry: Shiver & Atkins (Oxford University Press)
12. Inorganic Chemistry: **J.E. Huheey, E.A. Keiter & R.L Keiter**
13. Inorganic Chemistry: **R.Gopalan**, Universities Press (India) Pvt. Ltd. Hyderabad (A.P.)

CHEM-102 : Inorganic Chemistry
(Pass Course- Practical)

Total Credit : 1

Part I Qualitative Analysis

Inorganic mixtures containing five radicals/ions to be prepared from the following list: Ag^+ , Pb^{2+} , Hg_2^{2+} , Hg^{2+} , Bi^{3+} , Cu^{2+} , Cd^{2+} , As^{3+} , Sb^{3+} , Sn^{2+} , Sn^{4+} , Fe^{3+} , Al^{3+} , Ba^{2+} , Cr^{3+} , Zn^{2+} , Mn^{2+} , Co^{2+} , Ni^{2+} , Ca^{2+} , Sr^{2+} , Mg^{2+} ; Cl^- , Br^- , I^- , SO_4^{2-} , SO_3^{2-} , S^{2-} , CrO_4^{2-} , PO_4^{3-} , NO_3^- , NO_2^- , BO_3^{3-} , AsO_4^{3-} ,

Every mixture contains at least one interfering radical. Presence of Na^+ , NH_4^+ , K^+ , CO_3^{2-} , must be ignored and not to be reported. At least 5 salt mixtures have to be done by each student in the practical classes keeping records carefully.

Part 2: Volumetric Analysis

- (a) Estimation of ferrous ion by KMnO_4 method
- (b) Estimation of ferric ion by $\text{K}_2\text{Cr}_2\text{O}_7$ method.
- (c) Estimation of copper by iodometric method.
- (d) Determination of Acetic acid in Commercial Vinegar using NaOH .
- (e) Determination of alkali content – Antacid tablet using HCl .

(Standardization of solution will have to be done by each candidate by using his prepared standard solution and he will have to report the result)

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-II

CHEM-201: Organic Chemistry (Pass Course - Theory)

Total Credit : 4

Unit 1

a) Bondings and Shapes of Organic Molecules

16 L

Hybridizations of orbitals, implications of hybridization on the concept of bond length, bond energy, bond angles, shape of the molecules with the examples of molecules given below:

(i) CH_4 , H_3O^+ , $^-\text{CH}_3$, RNH_2 (ii) C_2H_4 , $^+\text{CH}_3$, carbonyl compounds and (iii) C_2H_2 , R-CN , allene, ketene.

Nature of covalent bond and its orbital representation in molecules listed above.

Conjugation, resonance, hyper-conjugation (propene and toluene), homolytic and heterolytic bond cleavage. Types of reagents – electrophiles and nucleophiles. Reactive intermediates – carbocations, carbanions, free radicals, carbenes and their stability and shape (with examples).

b) Organic Stereochemistry-I

Concepts of types of isomerism—Configuration and conformation isomerism. Fischer, Newman and Sawhorse projection formula with suitable examples ; geometrical isomerism, configuration of geometrical isomers, E and Z nomenclature, geometric isomers of oximes; configuration – optical activity, chiral carbon atom, relative and absolute configuration, optical isomerism of lactic and tartaric acids, enantiomerism and diastereoisomerism; meso compounds; racemic mixture, resolution of racemic mixtures..

Unit-2

a) Alkanes and Cycloalkanes

16 L

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reaction of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes- nomenclature, methods of formation, chemical reaction, Ring strain in small rings (Cyclopropane, cyclobutane, cyclopentane, cyclohexane), Baeyer's strain theory and its limitations and its modification.

b) Alkenes and Alkynes

Nomenclature of alkenes, methods of formation. The Saytzeff's rule, Hofmann elimination, physical properties and stabilities of alkenes. Chemical reaction of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation. Epoxidation , ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 Polymerization of alkenes.

Nomenclature, Structure and bonding in alkynes, methods of formation, chemical reactivity, electrophilic addition reactions (halogenations, hydration, HX, HOX), ozonolysis, alkynides (Cu and Ag); compare acidity of ethane, ethene and ethyne.

Unit 3

a) Arenes and Aromaticity

16 L

Nomenclature of benzene derivatives. Aromatic nucleus and side chain. Structure of benzene: Molecular formula and Kekule's structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity: Huckel rule, aromatic ions, Aromatic electrophilic substitution –Mechanism of nitration, halogenation, sulphonation, Friedel-Craft reaction. Effect of substituent groups (activating and deactivating substituents, directive influence).

b) Organic Reaction Mechanisms

Homolytic and heterolytic cleavage of bonds. Generation and stability of free radicals, carbocations and carbanions, electrophiles and nucleophiles.

Nucleophile, ambident nucleophile, SN^1 , SN^2 , factors affecting substitution reactions (structure of substrate, nature of nucleophile, solvent, role of leaving group), Mechanisms of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions, difference between nucleophiles and bases.

Elimination reactions (E1, E2), orientation in elimination reactions (Saytzeff's and Hoffmann's rule).

Unit 4

a) Alkyl and Aryl Halides

16L

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions (hydrogenolysis, aqueous and alcoholic KOH, NH_3 , KCN, AgCN, KNO_2 , $AgNO_2$, $RCOOAg$, $RONa$, Mg, Li, Na).

Polyhalogen compounds: chloroform, carbon tetrachloride.

Methods of formation of aryl halides, nuclear and side chain reaction. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Synthesis and uses of DDT.

b) Alcohols and Phenols

Classification and nomenclature : Monohydric alcohols – nomenclature, methods of preparation by reduction of Aldehydes, Ketones, carboxylic acids and esters (including hydroboration and mercuration). Hydrogen bonding. Acidic nature. Reactions of alcohols distinction between primary, secondary and tertiary alcohols (Victor Meyer's test) methods of formation, chemical reactions of ethylene glycol and glycerol.

Nomenclature, preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion, reactions of phenols – electrophilic aromatic substitution, acylation and carboxylation, Gatterman synthesis, Reimer-Tiemann reaction.

Unit 5

a) Aldehydes and Ketones

16L

Nomenclature and structure of the carbonyl group. Synthesis of Aldehydes and Ketones with particular reference to the synthesis of Aldehydes from acid chlorides, synthesis of ketones from nitriles and from carboxylic acids. Chemical reactivity of carbonyl group, general mechanism of nucleophilic additions and addition-elimination reactions. Reactions with HCN, NaSO₃H, NH₂OH, NH₂NH₂, C₆H₅NHNH₂, NH₂CONHNH₂,) and Cannizzaro reaction; acidity of α -hydrogen in carbonyl compounds and formation of enolates, Benzoin, Aldol, Perkin condensation., condensation with ammonia Oxidation of Aldehydes, oxidation of Ketones., Clemmensen, Wolf-Kishner reductions.

b) Ether And Epoxides: Nomenclature of ethers and methods of their formation, Physical properties. Chemical reactions, cleavage and auto-oxidation. Ziesel's method.

Recommended Books

1. Organic Chemistry: **Morrison and Boyd**, Prentice Hall of India Pvt. Ltd. New Delhi
2. Organic Chemistry, Arun Bahl & B.S. Bahl, S. Chand & Co. New Delhi
3. Reactions, Rearrangements and Reagents: **S.N. Sanyal**, *Bharati Bhawan Publishers and Distributors, Patna*
4. Stereochemistry: **P.S. Kalsi**, New Age International Publishers, New Delhi
5. Organic Reactions and their Mechanism: **P.S. Kalsi**, New Age International Publishers, New
6. Modern Organic Chemistry: **M.K. Jain and S.C. Sharma**: *Vishal Publishing Company, Jalandhar*
7. Undergraduate Organic Chemistry: **Jagdamba Singh & L.D.S. Yadav** Vol-I, II, III, *Pragati Prakashan, Meerut*
8. Advanced Organic Chemistry: **Jagdamba Singh & L.D.S. Yadav**, *Pragati Prakashan, Meerut*
9. Reaction Mechanism in Organic Chemistry, **S.M. Mukherji & S.P. Singh**, Macmillan India Ltd. Delhi
10. Stereochemistry of Carbon Compounds: **Ernest L. Eliel**, Tata McGraw-Hill Pub. Co. Ltd. New Delhi

CHEM-202 : Organic Chemistry
(Pass Course - Practical)

Total Credit : 1

Qualitative Analysis

Systematic qualitative analysis of organic compounds containing two functional groups.

- (a) Detection of elements (N,Cl,Br,I,S)
- (b) Detection of the following functional groups (with systematic reporting)
carbonyl, carboxyl, phenolic, amino, nitro, sulphonic, and amide group
- (c) Determination of the melting point/boiling point
- (d) separation of organic compounds by sublimation method.

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-III

CHEM-301 : Physical Chemistry (Pass Course - Theory)

Total Credit : 4

Unit-I

a) Thermodynamics-I

16L

Types of systems, Thermodynamic process. First Law of thermodynamics Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule Thomson Effect and coefficient, inversion temperature. Thermochemistry : Standard state, standard enthalpy of formation - Hess's Law of heat summation and its applications. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy: Kirchhoff's equation (derivation and application). (Numerical problem based on the topic)

a) Chemical Mathematics:-

Logarithm: - Rules of logarithm, Characteristic and mantissa, Change of sign and base. Graphical representation of equations: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems. Derivative:- Rules of differentiation and partial differentiation. Logarithmic and exponential functions and problems. Integration: - Rules of integration.

Unit-II

a)Gaseous state-I:

16 L

Postulates of kinetic theory of gases, deviation of real gases from ideal behaviour, van der Waals and Virial equation of state, critical phenomena, principle of corresponding states, equation for reduced state. Liquefaction of gases, distribution of molecular speeds, collisions between molecules in a gas: - collision diameter, collision number, collision frequency, mean free path, specific heat of solids.

b) Liquid state-I:

Intermolecular forces: - dipole-dipole forces, dipole-induced dipole force, London forces, hydrogen bonding (inter, and intra bonding), structure of liquids (a qualitative description). Liquid crystals: - classification, structure and properties of smectic, nematic and cholestric liquid crystals, Thermography,

Unit -III

a) Colloids

16 L

Definition, classification of colloids, solid in liquid colloids (sols), preparation of sols, properties- Kinetic, optical and electrical properties, stability of colloids, protective actions, Hardy-Schulze rule, gold number.

Liquids in liquids (Emulsions)- classification and properties, gel, surfactants and micelles, inhibition, general application of colloids.

b) Adsorption and Catalysis,

Theories of adsorption- Freundlich and Langmuir adsorption isotherm (derivation and limiting cases), Ion-exchange adsorption and its applications.

Catalysis: characteristic of catalyzed reactions, types of catalysis with examples, Theories of catalysis, Acid-Base catalysis, mechanism of enzyme catalysed reaction- Michaelis Menten equation.

Unit-IV

16 L

a) Phase rule and its application:

Definition of the following terms:- phase, component, degrees of freedom, derivation of the phase rule, phase equilibrium and metastable equilibrium phase diagram involving one component system (water and sulphur).

Phase equilibria of two component systems, solid-liquid equilibria, simple eutectic Pb-Ag systems and desilverization of lead.

b) Electrochemistry-I:

Electrical transport- conduction in metals and in solutions; specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific and equivalent conductance with dilution. and Kohlrausch law, Migrations of ions, Transport number.

Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations,

Unit-V

a) Chemical kinetics-I

16 L

Rate of reaction and rate constant, molecularity and order of reaction, zero order reaction, differential and integrated forms of first and second order reactions, pseudo-unimolecular reactions, experimental determination of order of reaction:- differential method, integral method, method of half life and isolation method, effect of temperature on reaction rates and activation energy, effect of catalyst. Temperature dependence on rate constant - The Arrhenius equation, Radioactive decay as a first order phenomenon

b) Macromolecules:

Characteristic of macromolecules, concept of number average and mass average molecular weight. Determination of molecular weight of macromolecules.

Recommended Books

1. Principles of Physical Chemistry: **Puri, Sharma and Pathania**, Vishal Publishing Co.
2. Advanced Physical Chemistry: **D.N. Bajpai**, S.Chand & company Ltd, New Delhi.
3. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.
4. Chemical Kinetics: **Laidler, Harper and Row**.
5. Physical Chemistry, **T.W. Atkins**, Oxford University Press

CHEM-302: Physical Chemistry
(Pass Course - Practical)

Total Credit : 1

List of Experiments:

- (1) Determination of the heat of neutralization of a strong acid by a strong base.
- (2) Determination of the molecular weight by Rast's method.
- (3) Study of the heat of dilution of H_2SO_4 and then to determine the strength of an unknown acid.
- (4) Determination of the velocity constant of the reaction between hydrogen peroxide and potassium permanganate, using ferric chloride as catalyst.
- (5) Determination of the solubility of a salt (BaCl_2 / Benzoic acid) at two different temperatures and to determine the heat of solution.
- (6) Study of the adsorption of oxalic acid on charcoal and verification of Freundlich's adsorption isotherm.
- (7) Verification of Hardy-Schulze law: Preparation and coagulation of arsenic sulphide (As_2S_3) sol using NaCl , BaCl_2 and AlCl_3 solutions.

(Only one experiment will be selected from the list by a candidate by lot during the examination.)

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-IV
CHEM-401: Inorganic Chemistry
(Pass Course - Theory)

Total Credits :4

Unit 1

16 L

a) Comparative study of d-Block Elements (Group 3-12)

Group discussion of transition elements with respect to position in the periodic table, electronic configuration, density, melting and boiling points, atomic volume, atomic and ionic radii, ionization potentials, electron affinity, Electronegativity, oxidation states, complexes and the relative stability of their oxidation states, oxides halides, hydrides and catalytic properties. Difference between first, second and third transition series.

Chemistry of Ti, V, Cr, Mn, Fe and Co in various oxidation states (excluding their metallurgy). Preparation, important reactions, structures and uses of potassium dichromate, potassium permanganate.

b) Nuclear Chemistry-II

Detection and measurement of radioactivity (G.M. Counter method); Decay kinetics-first order rate equation for radioactive disintegration; Theory of Radioactive disintegration; Radioactive series-Uranium; magic number concept; uses of radioactive and non-radioactive isotopes; transmutation of elements; purity and strength of radio isotopes, Radio chemical principle in the use of Tracers. Size of Nucleus; nuclear forces; nuclear binding energy; the possible forces between n-n, p-p, and n-p; nuclear reactions spallation. Basic principles and types of nuclear reactors; atomic energy and Q values of nuclear reactions (MeV).

Unit I1

16 L

a) Coordination Compounds

Werner's Coordination theory, coordination number, ligands and their classification, chelation, applications of chelate formation; nomenclature of coordination compounds, effective atomic number rule, Isomerism in coordination compounds, geometrical and optical isomerism in - and 6- coordinate complexes; Sidgwick's effective atomic number rule; stereochemistry of complexes with coordination numbers 4 and 6. Bonding in transition metal complexes: Valence Bond Theory and elementary idea of Crystal Field Theory for octahedral and tetrahedral complexes, their role in nature and medicine.

b) Environmental Chemistry

Composition of the atmosphere, photochemical reactions in the atmosphere, rain carbon monoxide and its effects, -- suspended particulate matter – size and effects on health, dual role of ozone in the atmosphere tropospheric ozone and stratospheric ozone, ozone hole, carbon dioxide and other gases responsible for global warming. Measures to control air pollution. Quality of water drinking and other purposes. Permissible limits. Common water pollutants—organic and inorganic. Heavy metals and their toxic effects. Pollution of water through use of chemical fertilizers. Fluoride contamination and fluorosis. Pollution due to mining. Measures taken to control water pollution.

Unit III

16 L

a) Chemistry of Lanthanide and Actinide Elements

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. General features and chemistry of Actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides. Preparation, reactions, structure and uses of uranium hexafluoride.

b) Separation Methods

Solvent extraction: Principles and process of solvent extraction; distribution law and partition coefficient; Batch extraction, continuous extraction and counter-current distribution.

Chromatography: Classification of chromatographic methods; principles of differential migration; adsorption phenomenon; nature of the adsorbents; solvent systems and R_f values.

Unit IV

16 L

a) Study of the following:

Active nitrogen, activated charcoal, allotropy, isomorphism, alloy and amalgams, principles of Iodometry and Iodimetry, resins-cationic and anionic resins, molecular sieves, Carborandum.

b) Inorganic Polymers:

Types of inorganic polymers: Comparison with organic polymers: Important synthesis, structural aspects and application of silicones. Phosphazenes: Uses, structure and bonding in Tri- and Tetra- Phosphonitrilic halides.

Unit V

16 L

a) Metal carbonyls

Preparation, properties, structure and bonding of mono nuclear carbonyls, π -acceptor behavior of carbon monoxide, synergic effect (MO diagram of CO be refer for synergic effect refer to IR frequencies) Carbonylate anions, Ferrocene and its Reactions.

b) Non – Aqueous solvents

Physical properties of a solvent for functioning as an effective reaction medium, types of solvents and their general characteristics. Liquid NH_3 as a non – aqueous solvent

Recommended Books

1. Advanced Inorganic Chemistry Vol I & II: **Satya Prakash, G.D.Tuli, R.D.Madan & S.K Basu**, S.Chand& Co.
2. Selected topics in Inorganic Chemistry: **U.Malik, G.D.Tuli, R.D.Madan**, S.Chand& Co. New Delhi
3. Principles of Inorganic Chemistry: **Puri, Sharma & Kalia**, Vishal Publications, Jalandhar
4. Advanced Inorganic Chemistry Vol. I, II: **Gurdeep Raj**, Goel Publishing House, Meerut
5. Essentials of Nuclear Chemistry: **H.J. Arnika**r, New Age Publication New Delhi
6. Basic Inorganic Chemistry: **Cotton, Wilkinson & Gaus**, Wiley
7. Concise Inorganic Chemistry: **J.D.Lee** (Blackwell Science)
8. Inorganic Chemistry: **Sharpe**, Pearson Education
9. Inorganic Chemistry: **Shriver & Atkins**, Oxford University Press
10. Inorganic Chemistry: **J.E. Huheey, E.A. Keiter & R.L Keiter**
11. Separation Chemistry: **R.P.Budhiraja**; New Age international (P) Ltd. Publishers.

CHEM-402 : Inorganic Chemistry
(Pass Course - Practical)

Total Credit : 1

Part I Volumetric Analysis

- (a) Estimation of Ca^{2+} by KMnO_4 method and by $\text{K}_2\text{Cr}_2\text{O}_7$ method
- (b) Cl^- by Mohr's and Volhard's method
- (c) Cu^{2+} and Cl^- from CuCl_2
- (d) Zn^{2+} and Cl^- from ZnCl_2
- (e) To determine volumetrically the number of molecules of water of crystallization of BaCl_2 crystals.
- (f) To determine volumetrically the percentage purity of a sample of Potassium Chloride
- (g) To estimate Copper as Cupric Oxide in a solution of CuSO_4

Part II Oxidation - Reduction Titrations

- a. To estimate the amount of Zinc present in the whole of the given ZnSO_4 solution being provided decinormal Potassium ferrocyanide solution of ZnSO_4 crystals.
- b. To estimate H_2O_2 by Iodometric method.

Part III Gravimetric Estimations of Two Constituents

- a. To estimate Copper and Zinc in the given solution.
- b. To estimate Silver and Zinc in the given solution.
- c. To estimate Copper and Magnesium in the given solution.

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-V

CHEM-501: Organic Chemistry (Pass Course - Theory)

Total Credit :4

Unit 1

16L

a) Carboxylic Acids and its derivatives

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Structure, nomenclature and preparation of esters, amides (urea), acid anhydride. Physical properties and chemical properties of esters, amides acid anhydrides. Methods of formation and chemical reactions of Malic acid.

b) Active methylene compounds

Tautomerism (keto-enol), difference between tautomerism and resonance, synthetic application of Diethyl malonate, Ethyl acetoacetate, Ethyl cyanoacetate.

Unit 2

16L

a) Nitro compounds

General methods of preparation, chemical reactions of nitroalkanes, reductions in acidic, neutral and alkaline media, hydrolysis, reaction with nitrous acid, acidic nature, Picric acid.

b) Amines

Structure and nomenclature of amines, Preparation of amines, physical properties, Structural features effecting basicity of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds nitriles), reductive amination of aldehydic and ketonic compounds. Chemical reactivity, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Gabriel-Phthalimide reaction, Hofmann bromide reaction. Distinction between primary, secondary and tertiary amines and their separation.

Unit 3

16L

a) Organometallic Compounds

Organomagnesium compounds: Formation of Grignard Reagent, synthesis of alkanes, alcohols, carboxylic acids, aldehydes, ketones, amines with Grignard Reagent.

Organolithium compounds: Preparation and synthetic use of alkyl Lithium.

b) Amino Acids, Peptides and Proteins

Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins.

Unit 4**16L****a) Carbohydrates-I**

Classification and nomenclature. Monosaccharides. Mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Cyclic structure of D(+)- glucose. Mechanism of mutarotation.

b) Carbohydrates –II

Determination of ring size of D-Glucose. Structures of ribose and deoxy-ribose. An introduction to disaccharides maltose, sucrose and their reactions and structure. Structure of starch and cellulose, Preparation of Cellulose nitrate, cellulose acetate, rayon and cellophane.

Unit 5**a) Synthetic Dyes****16L**

Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, crystal violet, Phenolphthalein, Fluorescein, Alizarin and indigo

b) Fats, Oils and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

c) Diazo compounds

Preparation and stability of diazo compounds (aliphatic and aromatic). Reactions of benzene diazonium chloride. Preparation and reaction of diazomethane

Recommended Books

1. Organic Chemistry: **Morrison and Boyd**, Prentice Hall of India Pvt. Ltd. New Delhi
2. Organic Chemistry: Mukherji, Singh and Kapoor. Vol: 1, II and III, New Age Publications
3. Organic Chemistry: Jagdamba Singh & L.D.S.Yadav Vol-I, II, III, Pragati Prakashan, Meerut.
4. A Text Book of Organic Chemistry, A. Bahl and B.S. Bahl, S. Chand & Co. New Delhi
5. Organic Chemistry, Paula Y. Bruice, Prentice Hall.
6. Organic Chemistry, S.H. Pine, Mc-Graw Hill

CHEM-502 : Organic Chemistry
(Pass Course - practical)

Total Credit : 1

- a) Identification of the compound with the help of a reference book.
- b) Determination of pH Of given aerated drinks, fruit juices,shampoos and soaps.

Note: Experiments may be added/deleted subject to availability of time and facilities

Semester-VI

CHEM-601: Physical Chemistry (Pass Course- Theory)

Total Credit : 04

Unit-1

16L

a) Thermodynamics-II

Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature (statement and it's derivation). Concept of Entropy: entropy as a state function, entropy as a function of V & T, Entropy as a function of P & T, entropy change for a spontaneous process in a physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium, Entropy change in ideal gases and mixing of gases.

b) Solid State

Definition of space lattice, unit cell. Laws of crystallography-(i) law of constancy of interfacial angles (ii) law of rationality of indices (iii) law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals, derivation of Bragg equation, determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Imperfections in a crystal:- point defects (Schottky defect, Frenkel defect, colour centres)

Unit-II

16L

a) Gaseous state –II

Real gases- deviation from ideality, compressibility factor, Maxwell's distribution law of molecular speeds, molecular speeds and energy distribution as a function of temperature, calculation of most probable velocity, root mean square velocity, average velocity from Maxwell's distribution law. Maxwell-Boltzmann law of distribution of molecular velocities, degrees of motion, principle of equipartition of energy, viscosity of gases, Boyle temperature, critical phenomena-critical constants, p-v isotherm of CO₂, continuity of state, law of corresponding states and reduced equation of state, methods of liquefaction of gases

Unit-III

16L

(a) Chemical equilibria

Law of mass action, equilibrium constant (K_c) from thermodynamic derivation of law of mass action, temp. and pressure dependence of equilibrium constant (K_p and K_c)- van't Hoff equation, relation between K_p and K_c , equilibria in homogeneous and heterogeneous system, le Chatelier's principle, Clausius-Clapeyron equation and its applications.

(b) Ionic Equilibria

Dissociation equilibria of weak electrolytes, dissociation constant of weak acids (K_a), ionic product of water (K_w), hydrogen ion concentration and pH scale, Common ion effects, Buffer solution and buffer activity, calculation of pH values of buffer's mixtures. Henderson-Hasselbalch equation, hydrolysis constant of a base (K_b), relation between K_a , K_w and K_b .

Derivation of hydrolysis constant for salts of – i) strong acids and weak base, ii) weak acids and strong base and iii) weak acids and weak bases. Solubility product and its application.

Unit-IV

16L

(a) Photochemistry

Introduction, difference between thermal and photochemical process, Beer-Lambert law, Laws of photochemistry- Grothus- Draper's law, Stark-Einstein law, Quantum efficiency and quantum yield, Jablonski diagram depicting various process occurring in the excited state, Fluorescence, Phosphorescence , non-radiative processes (internal conversion, intersystem crossing), Photosensitized reactions- energy transferred processes (simple examples).

b)Liquid State –II

Qualitative description of the structure of liquids, physical properties of liquids-vapour pressure, surface tension, viscosity, refractive index (definitions and descriptions), determination of surface tension, viscosity and refractive index of liquids. Physical properties and chemical constitution-additive and constitutive properties, molar volume, parachor, specific and molar refraction. Polar and non-polar liquids, dielectric constant, dipole moment, structure of molecules, polarization, Clausius-Mossotti equation

Unit-V

16L

a) Thermodynamics-III

Third law of thermodynamics, Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz equation; Gibbs function (G) and Helmholtz (A) as thermodynamic quantities, A&G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change variation of Gibbs function (G) and Helmholtz function (A) with P,V &T. Trouton's rule, Clausius-Clapeyron equation, Maxwell's equation, concept of chemical potential, equilibrium between different phases, derivation of the phase rule for the concept of chemical potential, partial molal quantities, variation of chemical potential with temperature and pressure, chemical potential of an ideal gas, Gibbs-Duhem equation; application of chemical potential.

Recommended Books

1. Principles of Physical Chemistry: **Puri, Sharma and Pathania**, Vishal Publishing Co.
2. Advanced Physical Chemistry: **D.N. Bajpai**, S.Chand & company Ltd, New Delhi.
3. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.
4. Chemical Kinetics: **Laidler, Harper and Row**.
5. Physical Chemistry, **T.W. Atkins**, Oxford University Press
6. An Introduction to Chemical Thermodynamics: **R.P. Rastogi and R.R. Misra**, Vikas Publications, New Delhi.

CHEM-602 : Physical Chemistry
(Pass Course - Practical)

Total Credit : 1

List of Experiments:

- 1) To study the kinetics of iodination of acetone.
- 2) To study the kinetics of a second order reaction (saponification of ethyl acetate).
- 3) Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it.
- 4) Determination of enthalpy of hydration of copper sulphate.
- 5) pH metric titrations of
 - i) Strong acid and strong base
 - ii) Weak acid and strong base

Note: Experiments may be added/deleted subject to availability of time and facilities

Syllabus of
BSc General Course
in
Computer Science
for 2018-19 Session

SYLLABUS FOR B.Sc. COURSE

SUBJECT: COMPUTER SCIENCE

(Pass Course)

FOR

Nagaland University

B.Sc. Course Structure
Subject : Computer Science

Semester	Course No	Course Name	Credits	Marks	Course
I	COMP101	Computer Basics(Theory)	4	100	Pass
	COMP102	Computer Basics (Practical)	1	50	Pass
II	COMP201	C Programming (Theory)	4	100	Pass
	COMP202	C Programming (Practical)	1	50	Pass
III	COMP301	Data Structures using C (Theory)	4	100	Pass
	COMP302	Data Structures using C (Practical)	1	50	Pass
IV	COMP401	Database Management Systems (Theory)	4	100	Pass
	COMP402	Database Management Systems (Practical)	1	50	Pass
V	COMP501	Visual Basic (Theory)	4	100	Pass
	COMP502	Visual Basic (Practical)	1	50	Pass
VI	COMP601	Web Technology(Theory)	4	100	Pass
	COMP602	Web Technology (Practical)	1	50	Pass

SEMESTER I

COMP101: Computer Basics (Theory)

Objective: *The objective of this paper is to introduce basic computer concepts to the students and help them to acquire the knowledge for developing their hardware and software skills.*

Unit-I: Introduction to computer

Introduction to Computer:-Definition, Characteristics. Generation of Computers, Capabilities and Limitations. Introduction to Operating System. Concept of Bios, Booting Files. Basic Components of a Computer System-Control Unit, ALU, Input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile , Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

Unit-II: Input and Output devices:

Input, Output Units:-Computer Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors, Touch-sensitive screens, Optical Recognition System, Pen based systems, Digitizers, MICR, OCR, OMR, Bar-code Reader, digital camera.

Hard Copy Devices:- Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer, Comb Printers, Non Impact Printers- DeskJet, Laser Printer, Thermal Transfer Printer, Barcode Printers, Electro static printers and plotters.

Unit-III: Software

Software and its different types- System Software, Application software. Hardware, Firmware, Compiler, Interpreter and Assembler. High Level Language and Low Level Language.

Unit IV: Windows Operating System: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screen saver and appearance. Using windows accessories

Unit-V- Disk Operating System

Internal and External Commands, Difference between External and Internal Commands. Internal Commands:- MD, CD, RD, COPY CON, TYPE, DATE & TIME, VOLUME VERSION, REN, PROMPT, CLS, DIR/P/W, COPY , DEL Etc. External commands:-FORMAT , DISKCOPY, DISKCOMP, XCOPY, CHKDISK, SCANDISK, HELP, DEBUG, PRINT etc.

Text Books:

1. Computer Fundamentals – B. Ram – New Age International Publishers
2. C.S. French "Data Processing and Information Technology", BPB Publications
3. P.K Sinha `Computer Fundamentals`, BPB Publications
4. S.K.Basandra, "Computers Today ", Galgotia Publications.

COMP102: Computer Basics (Practical)

The student needs to be exposed/shown various components and supposed how to switch on a computer.

- Creating and renaming of files and folders
- Opening and closing of different Windows,
- Windows Setting, Control Panels, Notepad, Window Accessories.

Switching Between DOS and Windows, Basic DOS Commands:

- Disk drives, Default drive
- Changing the default drive ,
- Directories ,Specifying a filename ,Copying files
- Abbreviating filenames in DOS
- Listing the contents of a file on the monitor, Subdirectories,
- The AUTOEXEC.BAT file

An Introduction to Word Processing:

- Opening Documents and Closing documents,.
- Save and Save AS, . Page Setup Printing of Documents,
- Display/Hiding of Paragraph Marks
- Inter Word Space, Moving Around in a Document
- Paragraph and Tab Setting, Text Selection
- Cut, copy and paste, Font and Size selection
- Draw Table

SEMESTER II

COMP201: C Programming (Theory)

Objective: *The objective of the course is to introduce the fundamentals of C programming language and develop the skills for solving problems using computers. This will also help them improve their reasoning and logical abilities.*

Unit I: C fundamentals

C Fundamentals: The C character set, identifiers and keywords, Data types, constants, variables and arrays, declarations, symbolic constants, Operators (Arithmetic, unary, relational, logical, assignment), expressions, statements, C program structure, Need of header files, Process of compiling and running a C program.

I/O functions: Header files (stdio.h, conio.h) - getch(), getche(), getchar(), putchar(), scanf(), printf(), gets(), puts(), clrscr(), window().

Unit II: Control statements

Control statements: Decision making and branching (**if..else**, **switch**), Decision making and looping (**while**, **do .. while**, **for**), Jumping (**break**, **continue**, **goto**), Nested loops

Unit III: Arrays and Functions

Arrays: Array, Single dimensional, Multi dimensional array.

Functions: Overview (definition, declaration), defining a function, accessing a function, function prototypes, call by value, call by reference. String functions (strcpy(), strcmp(), strcmpi (), strlen(), strrev (), strcat (), toupper (), tolower ()), Math functions (sqrt (), abs (), sin (), cos ()), Standard function- exit (), Memory allocation functions (malloc (), free (), realloc(), calloc()).

Unit IV: Pointers

Pointer definition and declarations, passing pointer to a function, pointer and one dimensional arrays, Operation on pointers, pointers and multidimensional arrays, arrays of pointers, passing functions to other functions, pointer to function, functions returning pointers.

Unit V: Structure and Union Defining a structure, processing a structure, user defined data types, structures and arrays, structures and pointers, passing structures to a function, Union, Union of structures, Enumerated, typedef.

Recommended Text Books

1. E. Balaguruswamy, *Programming in ANSI C*, (Second Edition), Tata McGraw Hill publication,
2. Yashavant Kanetkar, *Let us C*, (Fourth Edition), BPB Publications, 2003

References

1. Byron S. Gottfried, *Theory and Problems of Programming with C*, (Second Edition), Tata McGraw Hill Publication

COMP202: C Programming(Practical)

Practical Assignments

(Questions need not be restricted to this list)

1. Write a program to display the message "Welcome to the C programming world" on the screen.
2. Write a program to find out the sum of two integer values and display the result on the screen. Input the two values from the keyboard.
3. Write a program to find out the greatest of three numbers.
4. Write a program for **swap swapping** the two numbers with / without using another variable.
5. Write a program to find whether the given year is a leap year or not (use % modulus operator)
6. Write a program to find out the real roots of quadratic equation, $Ax^2+Bx+C=0$.
7. Write a program to convert the given temperature in Fahrenheit to Celsius using the following conversion formula, $C=(F-32)/1.8$.
8. Write a program to find out the average of any ten numbers. (Use (a) **while** loop, and (b) **for** loop).
9. Write a program to generate Fibonacci sequence. (1,1,2,3,5,8,13, ...)
10. An employee is paid 1.5 times the normal rate for every hour beyond 40 hours worked in a week. Write a program to calculate the weekly wage of an employee.
11. Write a program to check whether the given string is palindrome or not.
12. The total distance traveled by a vehicle in t seconds is given by $\text{Distance} = ut + (at^2)/2$
Where **u** is the initial velocity (meters per second), **a** is the acceleration (meters per second²). Write a program to evaluate the distance traveled at regular intervals of time, given the values of **u** and **a**. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of **u** and **a**.
13. For a certain electrical circuit with an inductance L and resistance R, the damped natural frequency is given by $\text{Frequency} = \omega \sqrt{1/LC - R^2/4C^2}$ It is desired to study the variation of this frequency with C (capacitance). Write a program to calculate the frequency for different value of C starting from **0.1** in steps of **0.01 0.01**.
14. Write a program to read the following numbers, round them off to the nearest integers and print out the results in integer form: 7.7 50.21 -23.73 -46.45
21. Write a program to sum the series : $2 * 3 - 3 * 5 + 4 * 7 + \dots$ to n terms
22. Given a number, write a program using while loop to reverse the digits of the number. For example, the number 12345 should be written as 54321. (**Hint:** Use modulus operator to extract the last digit and the integer division by 10 to get the n-1 digit number from the n digit number.)
23. Write a program for sorting the elements of an array by using Selection sort, Bubble sort, Insertion sort.
24. Write a program to generate positive prime numbers.
25. Write a program to display the multiplication table of a given number from 1 to 20.
26. Write a program to display the multiplication table of a given number for a given range.
27. Write a program to display the multiplication table of a given group of numbers (maximum five numbers) for a given range.
21. Write a program to find the biggest and smallest number and its position in the given array.
22. Write a program to find addition, subtraction and multiplication of matrices using function.
23. The factorial of an integer m is the product of consecutive integers from 1 to m. That is, $\text{Factorial } m = m! = m*(m-1)*(m-2)*\dots*1$.
24. Write a program to find the sum of row, column, and diagonals of the given matrix.
25. Write a program to find the largest number of the given matrix using function.
26. Write a program to sort all the elements of a matrix using function.

SEMESTER III

COMP301: Data Structures using C (Theory)

Objective: Objective of the course is to understand the ways of storing and organizing [data](#) in a [computer](#) and provide a means to manage huge amounts of data efficiently.

Unit I: Introduction to data structures

Definition. Classification of data structures. Operations on data structures, Introduction to Time and space Complexity. Primitive Data Structures Integer, Character, float, strings-memory representation and primitive operations, String manipulation using pointers. Arrays Storage Representation for 1D and 2D arrays, Insertion and deletion on 1D arrays, advantages and disadvantage of arrays.

Unit II: Linked Lists

Pointers, Dynamic Memory Allocation, singly Linked Lists, Operations on linked lists, Insertion and deletion of a node, Introduction to circularly linked lists and Doubly linked lists.

Unit III: Stacks

Concepts, Operations, sequential and linked implementation, Application of stacks, recursion, tower of Hanoi, infix to postfix conversion, Evaluation of Postfix Expressions.

Unit IV: Queues

Concepts, operations, sequential and linked implementation, Circular queues, Priority queues and Dequeues (Introductory concepts), Application of queues.

Unit V: Trees, Searching and sorting

Definitions and concepts – Binary trees, Sequential and Linked Representation of Binary Tree, Insertion and deletion on binary trees, Binary Tree Traversal Graphs Concepts, Sequential and linked representation of Graphs, BFS and DFS Traversal, Linear and Binary search, Selection sort, Insertion sort, Quick sort, Merge sort.

Recommended Text Books:

1. Ashok N Kamthane, “PROGRAMMING & DATA STRUCTURES” – Pearson Education
2. Ellis Horowitz & Sartaj Sahni: Fundamentals of Data Structure, Galgotia Book Source
3. Data structure using C – Aaron M Tanenbaum, Yedidyeh Langsam, Moshe J Augenstein.

COMP302: Data Structures using C (Practical)

Practical Assignments

(Questions need not be restricted to this list)

1. Write a program in C to implement simple Stack, Queue, Circular Queue, Priority Queue.
2. Write a menu driven program that implements singly linked list for the following operations:
Create, Display, Concatenate, merge, union, intersection
3. Write a menu driven program that implements doubly linked list for the following operations:
Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
4. Write a menu driven program that implements doubly linked list for the following operations:
Create, Display, Concatenate, merge, union, intersection
5. Write a menu driven program that implements Singly circular linked list for the following operations:
Create, Display, Count, Insert, Delete, Search, Copy, Reverse, Sort
6. Write a program in C for sorting methods.
7. Write a menu driven program in C to
 - a. Create a binary search tree
 - b. Traverse the tree in Inorder, Preorder and Post Order
 - c. Search the tree for a given node and delete the node
8. Write a program in C to implement insertion and deletion in AVL tree
9. Write a menu driven program that implements Heap tree (Maximum and Minimum Heap tree) for the following operations. (Using array) Insert, Delete
10. Write a program to implement double hashing technique to map given key to the address space. Also write code for collision resolution (linear probing)
11. Write a program in C to implement Dijkstra's shortest path algorithm for a given directed graph.
12. Write a program in C to insert and delete nodes in graph using adjacency matrix.
13. Write a program in C to implement Breadth First search using linked representation of graph.
14. Write a program in C to implement Depth first search using linked representation of graph.

SEMESTER IV

COMP401: Database Management Systems (DBMS) (Theory)

Objective: *The objective of the course is to let the student learn the design and management of database.*

Unit – I

DBMS Definition, Characteristics of DBMS ,Application and advantages of DBMS, Instances , Schemas and Database States, Three Levels of Architecture , Data Independence, DBMS languages, Data Dictionary, Database Users, Data Administrators.

Unit – II

Data Models, types and their comparison, Entity Relationship Model, Entity Types, Entity Sets, Attributes and its types, Keys, E-R Diagram, Data Integrity RDBMS –Concept, Components and Codd's rules.

Unit – III

Relational Algebra (selection, projection, union, intersection, Cartesian product, Different types of join like theta join, equi-join, natural join, outer join) Functional Dependencies, Good & Bad Decomposition, Anomalies as a database: A consequences of bad design, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF 5NF.

Unit – IV

Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Joining Multiple Tables (Equi Joins),Joining a Table to itself (self Joins) Functions.

Unit – V

Introduction to PL/SQL (blocks of PL/SQL, Variables, constants), Control Structure Introduction to Stored Procedures, Functions, Cursor and Triggers

Text Books :

1. Elmasri&Navathe, Fundamentals of Database systems, Addison &Weisely, New Delhi.

References:

1. H. F. Korth& A. Silverschatz, Database Concepts, Tata McGraw Hill, New Delhi
2. C. J. Date, Database Systems, Prentice Hall of India, New Delhi

COMP402: Database Management Systems (DBMS) (Practical)

Draw the E-R diagram. Create the database in systems like Oracle, MySQL, MSSQL. Compare the features of each of these systems.

Frame and execute the SQL queries for the following:

- List name of all students who have registered for courses in more than one department.
- List name and SSN of all students who have registered for more than one course in a specified department.
- List name of all students who have got atleast B grade in all the courses taken by him/her.
- List name of all students who have got A in all the courses offered by CS department.
- List the highest grade obtained in each course by students majoring in each of the departments.

SEMESTER V

COMP501: Visual Basic (Theory)

Objective: *The main objective of this course is to give a strong foundation in Visual Programming including Crystal Report, Menu Design, and Database Management.*

Unit I: Overview Environment

Overview: Visual Basic Application Types, Visual Basic Application Components- (Projects, Forms, Controls, Code modules, Class modules, User controls, Property pages)

VB Environment: Menu Bar, Toolbar, Toolbox, Form, Project explorer, Property window, Immediate window, Form layout window. Creating a project, Forms, Naming a project, Saving a project.

Controls: Label control, TextBox control, Command Button, Frames, Option Buttons, Check Boxes, Picture control, Image Control, Shape control, Line control, Timer control, HscrollBar control, VscrollBar control, FileListBox control, DirListBox, DriveListBox control.

List and Menus: List Box control, Combo Box Control. Menu System(Menu Standards, Menu editor, Common menu properties)

Events: Code window, Breakdown of an Event procedure, Form Events, Label events, TextBox events, Command Button events, Frame Events, Option button events, CheckBox events, Picture control events, Image control events, ListBox events, Listbox events, ComboBox events, Menu Events

Unit II: Programming

Variables: Data types, Declaring variables, Scope and lifetime of a variable, Examples of variables, Variant datatypes.

Arrays Types and Constants: Arrays(Fixed size, Dynamic, Preserving array contents), Setting array boundaries, Array() functions, Control Arrays.

Conditional Logic and Looping: If... Then, Select... Case, Do...While, While...Wend, Loop...While, Do...Until, Loop...Until, For... Next, Nested constructs, Exit For/Exit Do, Exit Sub/Exit Function

Unit III: Built in Functions

Built-in Functions: String Functions, Date Functions, Conversion Functions, Functions to test Data Types, Methods.

DialogBoxes: MsgBox, InputBox, Common Dialog Control, What is MDI

Unit IV: Data control and Programming

JET database Engine, ADODC, DAO Data Control

Data Entry with ADO: Creating a new ADO project, Adding data, Editing data, Deleting data.

Unit V: Creating Data Reports

Data Report – Data Environment – Report - Designer – Connection Object – Command Object – Section of the Data Report Designer – Data Report Controls, Crystal Report.

Text Books

1. Paul D Sheriff Sheriff, Paul Sheriff Teaches Visual Basic 6, Prentice Hall of India
2. Evangelos Petroutsos, Mastering Visual Basic 6, BPB Publication,

References

1. Michel C Amundsen and Curties L Smith Smith, Teach Yourself Database Programming with Visual Basic 5 in 21 Days, TechMedia
2. Peter Norton, Peter Norton's Guide to Visual Basic 6, Techmedia

COMP502: Visual Basic (Practical)

Practical Assignments

(Questions need not be restricted to this list)

Part A

1. Design a form and place a TextBox in it. Call it (assign its name property) txtInput. Place a Command Button and call it cmdExtract. Assign the caption property of the Command button as "Extract". Write a program to extract each digit or letter of a number, word or sentence that is entered in txtInput and display them in a second Text Box called txtOutput, one at a time on the click of a button.
2. A frmEmployee contains a TextBox (txtNumber) to enter number of employee records to be entered, two Command Buttons (cmdOK with the caption Ok and cmdClose with caption Close). As soon as a single digit number is entered, appropriate number of controls must be available in the form for entering Name, Address and Salary for the given number of employees. Write the code in the appropriate Event to accomplish these.
3. Design a form with suitable controls to input a single digit number and write appropriate event handlers to check if the number is automorphic or not. A number is called automorphic if the last digit of the square of the number is same as the number itself.(e.g. 6).
4. Design a form with suitable controls and write appropriate event handlers to list out all the Armstrong numbers within a given range of numbers 'm' to 'n'. A number is called an Armstrong number, if the number is equal to the sum of the cubes of the digits of the number.
5. Design a form with suitable controls and write appropriate event handlers to take in a string and determine whether the given string is palindrome or not.
6. Design a form with suitable controls and write appropriate event handlers to generate an Ordinary Calculator Program (Using Label, CommandButton). The calculator should support the facilities such as Addition, Subtraction, Multiplication, Division, and Storing in Memory, Clearing Memory and Adding to Memory etc. The display of the calculator should support up to 10 digits including decimal point. Your application should use control arrays.
7. In the color code that is used in resistors, the different colors have values as follows: Black=0, Brown=1, Red=2, Orange=3, Yellow=4, Green=5, Blue=6, Violet=7, Gray=8 and White=9. The value of the resistor is indicated by drawing three colored bands round it. The first two bands indicate the first two digits in the numerical value of the resistance, while the third band is the decimal multiplier, i.e., it gives the number of zeros after the two digits. For example, if the bands have colors, Green-Blue-Orange, successively then the numerical value is 56000. Design a form with suitable controls and write appropriate event handlers to accept the colors from the user and print the equivalent numerical.
8. Design a form with suitable controls and write appropriate event handlers to generate the calendar of a given month. The user must enter the month and the year. Assume that 1st January 1900 was a Monday. Do not use the standard Visual Basic functions to generate the calendar.
9. Using functions, write a program to calculate the simple interest accrued on a given principal using the

formula $SI = (\text{Principal} \times \text{Rate} \times \text{Time})/100$. The user input and the output thereof must be on different

forms. The input form must have a textbox where the principal will be entered by the user, a vertical scrollbar for the rate of interest, and a listbox from where the user can select the time (in years.) On clicking a button, the function must calculate the SI taking values from the textbox, scrollbar, and listbox, and the result shown in the second form. Provision must also be kept for adding and removing items to and from the listbox. The items in the listbox appear as: 1 year; 2 years; 3 years etc.....up to 10 years.

10. Write a program to calculate and display the factorial of a given number, using a recursive function.
11. Design a form with suitable controls and write appropriate event handlers to convert an input decimal number to a number with a user defined base (1 to 9), and vice versa.
12. Write a program to search for a particular word or pattern in a text and to display the position of the match. The match should also be selected. Do not use the standard VB library function *InStr()*.
13. Develop an application providing the facilities for a stopwatch, a timer, and a daily alarm at a preset time, as desired by the user.
14. Load a picture on an appropriate control such that the position of the picture randomly changes within the form with time.
15. Write a program to convert a string to proper case. Do not use standard VB functions; use ASCII values to convert from one case to another.
16. Design a project that will enable you to explore through the directory structure and open applications also, using a drive listbox, directory listbox, and a file listbox. Also design a variation of this application using common dialog control.
17. On a form, place two picture boxes and an image box. Load a picture in the first picture box, draw a diagonal through it using the line function, and give it an appropriate color. Now, copy the contents of the first picture box to the second and also to the image box. Notice the differences.
18. Write a line of text and place it centered on a form. Ensure that the text remains centered even if the form is resized manually or otherwise.
19. Design a form with suitable controls and write appropriate event handlers to load all the Colours (Using VScrollBar, HScrollBar).
20. Develop an application where all possible colours can be displayed in a picture box using the three primary colours red, green, blue, whose values are selected from three scrollbars.
21. Load a picture on an appropriate control such that the position of the picture randomly changes within the form with time.
22. A line of text Eg. "Over to Delhi for the second day's play." is entered by the user. Write a program to print the shortest and longest word so contained in the sentence.
23. Write a program to sort the elements of an array in descending order using bubble sort.
24. Write a program to search for an element in an array using binary search.
25. Develop a program to get the total file count and total size in a directory.

Part B

1. The following information is to be maintained regarding the users of electricity: Name, code and units consumed. Write a program that will take the name and units consumed and hence generate a bill. For the

first 20 units cost is 30p/unit, for the next 20 units, 40p/unit, for the rest, 50p/unit. Make provisions for reading, editing and deleting data. Make provisions to keep the rates alterable. Use ADO data control.

2. A publishing company maintains records with the following information: Name of Author, Author Code, Name of Book, Book ID and Year of Publish. Make provisions to add, edit and delete records. Every time a

new Author Name is added, the code must be generated, so also with the name of book and book ID. Use

ADOObjects(Connection, Recordset, Command etc)

3. Refer to the above question to design a Crystal Report to display the details of the books for a given Author and given Year of Publish . Design a Visual Basic form and write appropriate code to invoke the report.

4. Develop an application that will scan all the folders and the sub-folders therein of a particular drive and list them out in a richtextbox. This application should simulate the working of the DOS command DIR /S, the path of the folders should be displayed in bold. Also make provision for saving the output as a text file in a folder of user's choice and also to print the output.

5. Write a program that will enable the user to draw any shape – regular as well as free hand and will also allow filling the shape with color of user's choice. Note that this application window should always remain on top, even when it is not in focus.

6. Develop an application that allows the user to select a drive so that the application can list out the drive information viz., drive type, free disk space, current directory and the windows system directory in the drive.

SEMESTER VI

COMP601: Web Technology (Theory)

Unit I: The Markup Tags

Basic HTML Concepts ,HTML, HEAD, TITLE, BODY, Paragraphs, Lists, Formatted and Unformatted Text, Extended Quotations, Address, Horizontal Rules, Hyperlink, Font (Size, Color), Image (Add, Alignments), Table, Cell Spacing / Cell Padding, Frame Set, Form.

Unit II: Introduction to Dreamweaver

The Dream weaver Interface, Toolbars, Menus, Accessing Code, Building Styles Sheet.

Unit III: Designing Web Pages

Working with text, Inserting Images, Web Graphic Format GIF, JPEG, PNG, Inline Images , Background images, Horizontal Rules, Banner Ads, Rollover Images, Establishing Web Links, Understanding URLs, Adding an E-Mail Link, Navigating with Anchors, WorkingwithDivs and Layers, Placing <div> tags, Creating Layers, Modifying a Layer, Creating Lists, Unordered Lists, Ordered Lists, Definition Lists, Nested Lists.

Unit IV: Setting up Tables

HTML Table Fundamentals, Inserting Tables in Dreamweaver, Modifying Tables, Working with Table formats.

Unit V: Interactive Forms &Multimedia Element

How HTML forms work, Inserting a form in Dreamweaver, Using Text fields, Providing Checkboxes and Radio Buttons, Creating form lists and Menus, Activating forms with buttons, Using Hidden fields and File fields.

Using Audio on Web Page, Digital Audio File formats, MIDI files, Linking to Audio File.

Embedding Sounds and Music, Adding Video to Web Page, Video on the Web, The Streaming Media, RealMedia, QuickTime , Windows Media, Playing Videos

Reference Books

1. Dreamweaver MX 2004 BIBLE
2. WEB PUBLISHING BY MONICA D' SOUZA & JUDE D' SOUZA
3. COMPLETE REFERENCE - HTML – TOWELL

COMP602: Web Technology (Practical)

- Creation of the Home Page of a Web Site(HTML) with proper links.
- Creation of a dynamic web page using appropriate web development tool (e.g. Dream weaver) for three different concepts.
- Students should be given orientation of web/multimedia usability issues and interface design basics.

SYLLABUS OF COMPUTER SUBJECT (common Paper) FOR UG PROGRAMME IN THE SEMESTER SYSTEM

Semester III

Semester	Course No	Course Name	Theory	Course
III	CSC301	Computer and its Application	100	Pass (Common Paper)

CSC301: Computer and its Applications

Unit-I: Fundamentals of Computer

Basic Components of a Computer System-Control Unit, ALU, Input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile , Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

Unit-II: Input and Output devices

Computer Keyboard, Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors, Touch-sensitive screens, Optical Recognition System, Pen based systems, Digitizers, MICR, OCR, OMR, Bar-code Reader, digital camera. Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer, Comb Printers, Non Impact Printers- DeskJet, Laser Printer, Thermal Transfer Printer, Barcode Printers, Electro static printers and plotters

Unit-III: Windows Operating System Overview

MS-Windows: Operating system-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screen saver and appearance. Using windows accessories.

Unit-IV: Application Software

Documentation Using MS-Word - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advance Features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.

Unit-V: E-mail & Internet Some Basic Terminology (www, http, kbps, mbps, server, Email), E-mail Account & Its Functions, Search Engine, Surfing Web Pages, Basics of Social Networking Site & Virus.

Text Books:

1. Computer Fundamentals – B. Ram – New Age International Publishers
2. C.S. French "Data Processing and Information Technology", BPB Publications
3. P.K Sinha `Computer Fundamentals`, BPB Publications

Syllabus of
BSc General Course
in
Geography
for 2018-19 Session

**DEGREE SYLLABUS
FOR SEMESTER SYSTEM**

GEOGRAPHY

B.A./B.Sc. (*PASS & HONOURS*)

ACADEMIC SESSION 2016-



**DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY
LUMAMI**

PROPOSED COURSE OUTLINE FOR B.A./ B.Sc. SEMESTER SYSTEM
DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY

Semester	I (Code/Paper)	II (Code/Paper)	III (Code/Paper)	IV (Code/Paper)	V (Code/Paper)	VI (Code/Paper)	Total Credit
Theory (P & H)	GEOG-101/ (Physical basis of Geography)	GEOG-201/ (Climatology & Oceanography)	GEOG-301/ Human Geography	GEOG-401/ Economic Geography	GEOG-501/ Regional Geography of India	GEOG-601/ Regional Geography of North East India	
Credit/CH*	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	24
Practical (P & H)	GEOG-102/ Practical	GEOG-202/ Practical	GEOG-302/ Practical	GEOG-402/ Practical	GEOG-502/ Practical	GEOG-602/ Practical	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6
Theory (H)	GEOG-103/ Geographical Thought	GEOG-203/ Regional Geography of World	GEOG-303/ Political Geography	GEOG-403/ Advanced Geomorphology	GEOG-503/ Applied and Resource Management	GEOG-603/ Environment and Disaster Management	
Credit/CH*	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	18
Practical (H)	GEOG-104/ Practical	GEOG-204/ Practical	GEOG-304/ Practical	GEOG-404/ Practical	GEOG-504/ Practical	GEOG-604/ Project	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6

*Abbreviation: P & H = Pass & Honours, H= Honours

*CH = Contact Hours

Each semester would be of 90 working days

Credit=Contact Hours per week (double for practical)

SEMESTER -I
(Pass and Honours)
GEOG-101/ PAPER –I
Physical basis of Geography -I

Contact Hours: 60

Objectives:

The objective of this course is to introduce students to physical geography, in a brief but adequate manner, and to enlighten the students on career opportunities for geographers.

- Unit –I Nature and scope of Physical Geography, Branches of Physical Geography and their interrelations; Linkages of geography with physical sciences and social sciences like geology, biology, economics and sociology.
- Unit –II Origin of Solar System and Earth (Tidal Hypothesis of Jeans and Jeffrey, Gaseous Theory by Kant, Nebular Hypothesis of Laplace and Big-Bang Theory).
- Unit –III Major landforms: Mountains, Plateau and Plains;
Forces affecting earth's crust (endogenetic and exogenetic forces).
- Unit –IV Origin, composition and types of rocks, Soil profile: Processes of soil formation and soil types.
- Unit –V Meaning and Scope of Biogeography,
Ecosystem: Components and functioning, factors influencing plant growth
Major Biomes of the world.

Books Recommended

1. Bryant, H. Richard (2001): Physical Geography Made Simple, Rupa and Company. New Delhi
2. Bunnett, R.B. (2003): Physical Geography in Diagrams, Fourth GCSE edition, Pearson Education (Singapore) Private Ltd.
3. Garrison, T. (1998): Oceanography, Wordsworth Company, Belmont.
4. Lake, P. (1979): Physical Geography, Cambridge University Press, Cambridge.
5. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
6. Monkhouse, F.J. (1979): Physical Geography. Methuen, London
7. Singh, S. (2003): Physical Geography. Prayag Pustak Bhawan, Allahabad;
8. Strahler, A.N. and Stahler, A.M. (1992): Modern Physical Geography. John Wiley and Sons, New York.

SEMESTER -I
(Pass and Honours)
GEOG-102/ Practical

Contact Hours: 30

- Unit –I a) Types of scale; preparation of scale: simple, comparative and diagonal;
 b) Enlargement and Reduction of map by graphical method.
- Unit –II Interpretation of Toposheet: Topography (relief, plain, plateau, mountain etc.),
 Drainage (pattern)
- Unit –III Representation of different landforms and their profile (Cliff, Oxbow lake,
 Waterfall, Ria Coast, Fjord Coast, Cirque, Meander, River terrace)
- Unit –IV Viva voce and Practical Note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -II
(Pass and Honours)
GEOG-201/Physical Geography –II

Contact Hours: 60

Objectives:

This paper on physical geography is structured into components of climatology and oceanography as these are closely interrelated. Course content leads to the identification of climatic differentiation on the earth, and the consequences of human activities on the atmospheric processes.

Section –I (Climatology)

- Unit –I Definition and significance of climatology; elements of weather and climate; Composition and structure of atmosphere; Insolation and Heat budget.
- Unit -II Vertical and Horizontal distribution of temperature; Pressure and Pressure belts; Winds: Planetary periodic and Local winds; jet streams; Air masses and fronts; temperate and tropical Cyclones.
- Unit –III Major climatic types (Koppen’s and Thornthwaite’s classification of world climate); Global Climate change; role and response of man in climatic changes.

Section –II (Oceanography)

- Unit –IV Surface configuration of the ocean floor, continental shelf, continental slope, abyssal plain, mid-oceanic and oceanic trenches
Movement of Ocean Water: waves, tides and currents
- Unit –V Coral reefs: factors affecting formation of coral reefs, types; Types of marine deposits; Distribution of temperature and salinity of oceans and seas.

Books Recommended

1. Chorley, R.J. (2001): Atmosphere, Weather and Climate. Methuen, London.
2. Critchfield, H.J. (2002): General Climatology. Prentice-Hall of India, New Delhi.
3. Finch, J. C. and Trewartha, G. T.: Elements of Weather and Climate. Prentice-Hall, London.
4. Lal, D.S.(1986): Climatology. Chaitanya Publications, Allahabad.
5. Oliver, J.E. and Hidore, J.J. (2003): Climatology: An Atmospheric Science, Pearson Education Private Ltd, Delhi.
6. Singh, S. (2005): Climatology. Prayag Pustak Bhawan, Allahabad.

SEMESTER -II
(Pass and Honours)
GEOG-202/ Practical

Contact Hours: 30

- Unit –I a) Handling and use of weather instruments (Max-Min thermometer, Hygrometer, Barometer, Rain gauge, Anemometer).
 b) Interpretation of weather maps published by the Indian Meteorological Department.
- Unit –II Representation of weather data: Temperature, rainfall and humidity data by line and bar graph. Construction and significance of Hythergraph and Climograph.
- Unit –III Hypsometric and Bathymetric curve.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Monkhouse, F. J. and Wilkinson, F.J. (1985): Maps and Diagrams. Methuen, London.
2. Raisz, E. (1962): Principles of Cartography, McGraw Hill, New York.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi,.

* * *

SEMESTER -III
(Pass and Honours)
GEOG-301/ Human Geography

Contact Hours: 60

Objectives:

To acquaint the students with the nature of man-environment relationship and to make them understand human capability to adopt and modify the environment in its varied conditions from primitive lifestyle to modern living.

- Unit –I Meaning, nature and scope of Human geography; development and branches of Human geography
- Unit –II Man-environment dynamic relationships; determinism and Possibilism
- Unit –III Evolution of man; classification of races; characteristics of races and their broad distribution. Human adaptation to environment; Eskimos, Masai Bushman, Gujjars.
- Unit –IV Physical, economic and social factors influencing spatial distribution of world population, distribution and density of population; Concept of over population, under population and optimum population; Migration: types and consequences;
- Unit –V Settlement: Geographical factors influencing human settlement. Origin and growth of rural and urban settlement. Types and patterns of rural settlement. Urban settlement: morphology and functional classification.

Books Recommended

1. Husain, M. (1994): Human Geography, Rawat Publications, Jaipur.
2. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
3. Norton, W. (1995): Human Geography, Oxford University Press, New York.
4. Singh, L.R. (2005): Fundamentals of Human Geography, Sharda Pustak Bhawan, Allahabad
5. Stoddard, R.H., Wishart, D.J. and Blouet, B.W. : Human Geography. Prentice-Hall, Englewood Cliffs, New Jersey.

SEMESTER –III
(Pass and Honours)
GEOG-302/ Practical

Contact Hours: 30

- Unit –I a) Representation of population data: Distribution, density and growth by: Point (dots, proportionate circles and spheres), Line (isopleths and flow lines) and area (choropleth), line and bar graphs; Age-sex pyramid.
 b) Toposheet interpretation (settlement, transport and land use)
- Unit –II a) Definition and classification of map projection;
 b) Map Projection: Cylindrical (Simple and Equal area) with outline maps drawn.
- Unit –III Surveying: Chain and tape to plot a part of college building.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.
2. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

* * *

SEMESTER –IV
(Pass and Honours)
GEOG-401/ Economic Geography

Contact Hours: 60

Objectives:

To acquaint the students with the dynamic aspect of economic geography, transformation of economic activities from primary to secondary and tertiary stage and with various factors responsible for economic development.

- Unit –I Meaning, scope and approaches to study economic geography. Concept and classification of economic activity.
- Unit –II Primary activities: Agriculture- factors influencing agriculture, types of agriculture, forestry, fishing and mining.
- Unit –III Secondary activities: Basis of world industrial location; distribution and production of iron and steel, cotton textile industries.
- Unit –IV Tertiary activities: Transport and communication services; geographical factors in the development of water, land and air transport.
- Unit –V Bases of international trade; major trade blocs: EEC and ASEAN; Effects of globalisation on developing countries.

Books Recommended

1. Bryson, J., Henry, N., Keeble, D. and Martin, R. (eds.) (1999): The Economic Geography Reader: Producing and Consuming Global Capitalism. John Wiley and Sons, Inc, New York.
2. Coe, N. (2007): Economic Geography: A Contemporary Introduction. Blackwell Publishers, Inc., Massachusetts.
3. Guha, J. S. and Chattoraj, P.R.(2002): A New Approach to Economic Geography: A Study of Resources. The World Press Private Limited, Kolkata.
4. Hanink, D. M. (1997): Principles and Applications of Economic Geography: Economy, Policy, Environment. John Wiley and Sons, Inc, New York.
5. Leong, G. C. and Morgan, G. C.(1982): Human and Economic Geography, Oxford University Press, Singapore .
6. Roy, P.K. (2005): Economic Geography, A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.

SEMESTER -IV
(Pass and Honours)
GEOG-402/ Practical

Contact Hours: 30

- Unit –I a) Statistical methods: Measures of central tendency (Mean, Median and Mode);
 b) Measures of dispersion (Mean deviation, Quartile deviation and Standard deviation).
- Unit –II a) Representation of data by Line, Bar, Pie, and Block Pile diagram.
 b) Time series analysis of temporal data.
- Unit –III Map projection: Polar Zenithal (Stereographic, Orthographic and Equidistant) with outline maps drawn
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Bhagwathi, V. and Pillai, R.S.N. (2003): Practical Statistics, Sultan Chand and Company, New Delhi
2. Gupta, S.P. (1998): Advanced Practical Statistics, Sultan Chand and Company, New Delhi
3. Mahmood, A. (1986): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
4. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Zamir, A. (2002): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur.
7. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -V
(Pass and Honours)
GEOG-501/ Regional Geography of India

Contact Hours: 60

Objectives:

Aims at presenting a comprehensive, integrated and empirically based profile of India so as to understand its geopolitical personality and its relations with other countries.

- Unit –I Locational significance, unity and diversity. Physical environment: physiographic characteristics –Climate, soil and natural vegetation.
- Unit –II Population characteristics: population growth, distribution, density, structure and composition.
- Unit –III Agriculture: agricultural development and Indian economy, modernization of Indian agriculture, agro-climatic regions and special characteristics, agricultural trade.
- Unit –IV Transport: Roads and railways, air transport and pipe transport.
- Unit –V Industry: industrial development and Indian economy, distribution of major industries (iron and steel, cotton textile, petrochemicals, sugar, paper and cement industries) industrial policies and industrial trade.

Books Recommended

1. Gautam, A. (2006): Advanced Geography of India, Sharda Pustak Bhawan, Allahabad
2. Khullar, D.R. (2007): India: A Comprehensive Geography, Kalyani Publishers, New Delhi
3. Nag, P. and Gupta, S. S. (1992): Geography of India, Concept Publishing Company, New Delhi.
4. Singh , J. (2003): India: A Comprehensive Systematic Geography. Gyanodaya Prakashan, Gorakhpur
5. Singh, R.L. (ed.) (1971): India: A Regional Geography. National Geographical Society of India, Varanasi,.
6. Tiwari, R.C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad.

SEMESTER –V
(Pass and Honours)
GEOG-502/ Practical

Contact Hours: 30

- Unit –I Thematic mapping: Population, Resources and Industries of India.
Unit –II Conical projection (One and Two Standard parallel) with outline maps drawn.
Unit –III Polyconic Projection and Bonne’s Projection with outline maps drawn.
Unit –IV Viva voce and Practical note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
3. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
4. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -VI
(Pass and Honours)
GEOG-601/ Regional Geography -II
(Northeast India with Special Focus on Nagaland)

Contact Hours: 60

Objectives:

To focus on the regional study of Northeast India and Nagaland, and to prospect the region's potentiality for sustainable development.

- Unit –I Northeast India: Locational significance;
Physical characteristics: Physiography, drainage, climate, Soil and natural vegetation.
- Unit –II Population of Northeast India: Growth, Distribution and Density, Age-sex composition, Rural-urban composition and Religious composition.
- Unit –III Economic basis of Northeast India: Agriculture, Industries, Transport and communication system
- Unit -IV Disparity in socio-economic development; Socio-economic problems.
Demographic characteristics- Population distribution, Growth, Density
- Unit –V a) Nagaland - Physiography, Climate and Natural vegetation
b) Biodiversity and its conservation issues

Books Recommended

1. Bhagabati, A..K., Bora, A. K. and Kar, B.K. (2011): Geography of Assam, Rajesh Publications, New Delhi.
2. Bhagabati, A.K. (ed) : Biodiversity of Assam, Eastern Book House, Guwahati
3. Bhattacharya, P.(2006) : Trend in Tourism Potentiality, Bani Mandir, Guwahati
4. Bhattacharyya, N.N. (2005): North East India: A Systematic Geography, Rajesh Publication, New Delhi
5. Gopal Krishnan, R : Geography of North East India
6. Srivastava, S.C., : Demographic Profile of N.E. India, Mittal Publications
7. Taher, M. and Ahmed, P. (1998): Geography of North East India, Mani Manik Prakash, Guwahati.

SEMESTER -VI
(Pass and Honours)
GEOG-602/ Practical: Data based on North East India

Contact Hours: 30

- Unit –I Cartographic representation of economic data of Northeast India in spatial and temporal contexts: Histogram, Pie-graph, Age-sex pyramid.
- Unit –II Use of cartographic symbols and their uses: Iso-chronic cartograms, traffic flow diagrams and Choropleth mapping.
- Unit –III a) Survey: Plane Table (Radiation and Intersection)
 b) Use of Global Positioning System (GPS) for identifying a location (only demonstration of GPS device).
 c) Study of landscape by “Google Earth” through Internet enabled PCs.
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Monkhouse, F. J. (1985): Maps and Diagrams. Methuen, London.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.

Syllabus of

BSc General Course

in

Mathematics

for 2018-19 Session

B.Sc. (PASS & HONOURS) SYLLABUS IN MATHEMATICS.

Pass & Honours

	PASS		Credits	HONOURS		Credits
Semester I	MAT 101	Calculus I	5	MAT 102	Analysis	3
		Algebra I				
Semester II	MAT 201	Calculus II	5	MAT 202	Advanced Algebra I	3
		Algebra II			Elementary Number Theory	
Semester III	MAT 301	Advanced Calculus I	5	MAT 302	Advanced Algebra II	3
		Higher Trigonometry			Advanced Differential Equations	
Semester IV	MAT 401	Advanced Calculus II	5	MAT 402	Complex Analysis	3
		Analytical Geometry				
Semester V	MAT 501	Mechanics I (Dynamics)	5	MAT 502	Differential Geometry	3
		Numerical Methods				
Semester VI	MAT 601	Mechanics II (Statics)	5	MAT 602	CHOICE BASED (any one) a.Programming in C b.Mathematical Methods c.Special Theory of Relativity d.Advanced Mechanics	3
		Vector Analysis			PROJECT	2

MAT 101(P&H) (Calculus-I & Algebra-I)

CALCULUS I

Unit 1: Real variables. Continuous and discrete. Interval. Function. Domain of definition. Monotone functions. Inverse functions. Geometrical representations. Limit of a function on the real line. One-sided limits– right hand and left hand limits. Different types of limits. Theorems on limits. Continuous functions. Definitions. Discontinuous functions. Theorems. Properties. Uniform continuity (definition only).

Unit 2: Derivatives. Definition. Continuity of a derivable function. Algebraic and transcendental functions. General rules of differentiation. Function of a function. Chain rule. Inverse function. Logarithmic differentiation. Implicit functions. Parametric equations. Derivative as a rate measurer. Time rate of change. Rectilinear motion. Related rates. Geometric interpretation. Meaning of the sign of the derivative. Determination of multiple roots. Newton's method of approximating a root. Approximate calculations.

Unit 3: Basic methods of integration. Integration by substitution. Integration by parts. Integration of trigonometric and hyperbolic functions. Rational function of sine and cosine. Standard integrals. Integrals of the forms

$1/(a + b\sin x + c \cos x)$, $1/(a \cos x + b\sin x)$, $(a + b\sin x + c \cos x) / (a' + b' \sin x + c' \cos x)$, $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$. Trigonometric substitutions.

ALGEBRA I

Unit 4: Theory of Equations

Division algorithm. Remainder theorem. Factor theorem. Fundamental theorem of algebra. Nature of the roots of an equation. Complex roots. Surd roots. Relation between roots and coefficients. Symmetric functions of roots. Transformation of equations. Cardan's method of solution of a cubic equation. Descartes' rule of signs.

Unit 5: Matrix Algebra

Matrices of real numbers. Operations on matrices. The transpose of a matrix. Properties of transposes. Special types of matrices. Rank of a matrix. Its determination. Determination of rank by considering minors. Determination of rank by elementary transformations. Consistency and solution of system of linear equations with not more than three variables.

Recommended Books:

1. Differential Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra – Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry – Thomas & Finney (Pearson Education)
2. Differential Calculus – Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus – Gorakh Prasad (Pothishala, Allahabad)
4. Theory of Equations – M L Khanna

MAT 201(P&H) (Calculus II & Algebra II)

CALCULUS II

Unit 1: Second and higher order derivatives. Use of partial fractions. Use of De Moivre's theorem. Leibnitz theorem. Differentiability and differentials. Rolle's theorem. Theorem of Darboux. Mean value theorem. Lagrange's and Cauchy's forms. Indeterminate forms. L'Hospital's rule. Taylor's theorem. Lagrange's, Cauchy's and generalized form of remainder. Taylor's infinite series. Maclaurin's theorem and infinite series. Maxima and minima. Applied problems.

Unit 2: Reduction formulae for $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$, $\cos^m x \sin^n x$, $1/(a + b \cos x)^n$, $1/(x^2 + a^2)^n$. Integration by special devices.

Definition of a definite integral as the limit of a sum. Definite integral as an area. Geometric interpretation. Calculations. Primitives. Fundamental theorem of calculus. Summation of series. Properties of definite integral.

ALGEBRA II

Unit 3: Sequences. Definition. Bounded and unbounded sequences. Limit of a sequence. Convergent sequences. Limits of combination of sequences (proofs not required). Examples and counter examples. Non-convergent sequences. Monotone sequences. Cauchy sequences. Infinite series. Convergence and divergence of infinite series. Positive series - criterion of convergence. General theorems on convergence. Tests for convergence - series of positive terms. Comparison tests. D'Alembert's ratio test. Cauchy's root test. Raabe's test.

Unit 4: Recap of sets and mappings. Equivalence relations. Equivalence classes. Binary operations Group. Definition Examples. Abelian Group. Order of a group (types of group). Elementary properties of groups using definition. Integral power of an element of a group. Subgroups. Intersection of two subgroups.

Unit 5: Cyclic groups. Groups of permutation (definition and examples). Even and odd permutations. Rings. Integral domains. Fields. Definition. Examples. Elementary theorems. Simple consequences of the definitions.

Note: In Units 4 & 5, definitions & examples only to be discussed. Simple consequences of the definitions and theorems to be discussed. (Detailed discussion to be done in Honours course only).

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Modern Algebra	-	A R Vasishtha

MAT 301(P&H) (Advanced Calculus I & Higher Trigonometry)

ADVANCED CALCULUS I

Unit 1: Tangents and Normals Analytic Representation of a plane curve. Tangent. Normal. Subtangent. Subnormal. Polarcoordinate system. Pedal equation. Differential of arc length. Curvature Measure of bending. Radius of curvature. Theorem on centre of curvature. Concept of curvature. Newton's approach. Curvature at the origin. Coordinates of centre of curvature. Equation of circle of curvature. Evolute and involute. Chord of curvature.

Unit 2: Functions of Several Variables Function of two variables. Domain of definition. Geometric representation. Limit and continuity. Theorems-partial derivatives. Higher order-homogenous functions. Euler's theorem. Total differential. Concept of differentiability. Composite functions. Chain rules. Implicit functions. Maxima and minima of function of two variables.

Unit 3: Improper Integrals Types of improper integrals (1) infinite intervals (2) integrand having discontinuities. Comparison test for convergence. Beta and Gamma functions. Definitions and Relations. Multiple Integrals Calculation of a double integral. Equivalence with repeated integrals. Double integrals over domains other than rectangles. Change of variable.

HIGHER TRIGONOMETRY

Unit 4: De Moivre's Theorem. Statement. Proof of De Moivre's theorem for integral indices. Alternative method. Proof for rational indices. All possible values of $(\cos x + i \sin x)^{p/q}$. Application of De Moivre's theorem for integral and fractional indices. Expansion of $\sin nx$, $\cos nx$, in series of $\sin x$, $\cos x$. Expansion of $\sin^n x$, $\cos^n x$ in terms of $\sin$ and cosine of multiple angles. Series expansion of $\sin x$, $\cos x$ and $\tan x$.

Unit 5: Exponential, sine, cosine and logarithms of a complex number. Definitions. Logarithmic, exponential and hyperbolic functions. Inverse functions - trigonometric and hyperbolic functions. Laws of logarithm. Summation of series.

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Trigonometry	-	Mazumdar & Dasgupta

MAT 401(P&H) (Advanced Calculus II & Geometry)

ADVANCED CALCULUS II

Unit 1: Envelopes Family of curves. Envelope. Definition. Relation between envelope and curves enveloped. Evolute. Arc. Involute. Related curves. Inversion. Pedal curves. Reciprocal polars. Concavity and convexity. Concavity and Convexity. Criterion - points of inflexion. Singular points - at the origin of an algebraic curve and at points other than the origin. Conditions for existence of double points. Discrimination of species of a cusp.

Unit 2: Evaluation of area Quadrature of plane areas - Cartesian coordinates, sign of area. Area in parametric forms. Area included between two curves. Area of a closed curve. Area in polar coordinates. Lengths of plane curves Cartesian, polar and pedal forms. Intrinsic equation to a curve. Volumes and surfaces of revolution. Solids of revolution. Volumes and areas of surfaces.

Unit 3: Differential equations of the first order and first degree - Equation reducible to homogenous form. Bernoulli's equation. Exact differential equations. Differential equation of the first order but not of the first degree. Equations solvable for p , x , y . General and singular solutions. Clairaut's equation Linear differential equations of higher order with constant coefficients. Complementary function and particular integrals. Orthogonal trajectories.

GEOMETRY

Unit 4: 2D Geometry

General equation of the 2nd degree. Chord of contact. Pole and Polar. Conjugate points. Chord in terms of its middle point. Diameter. Conjugate diameter. Intersection of two conics. Conics through the points of intersection of two given conics. Pair of tangents. Director circle. Asymptotes.

Polar equation of a conic. Derivations of polar equation of a conic.

Unit 5: 3D Geometry

Sphere. Equation. Section of a sphere by a plane. Equation of a circle in space. Intersection of two spheres. A sphere passing through a circle. Tangent and tangent plane to a sphere. Cone. Equation of a cone with its vertex at the origin. Right circular cone. Tangent plane to a cone. Reciprocal cone. Three mutually perpendicular generators. Cylinder. Equation. Right circular cylinder.

Recommended Books:

1) Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2) Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3) Analytical Geometry	-	B Das (Orient Book Company)

MAT 501(P&H) (Mechanics I & Numerical Methods)

MECHANICS I (DYNAMICS)

Unit 1: Fundamental definitions and principles. Motion in a straight line. Simple harmonic motion. Motion under earth's attraction. Uniplanar motion where the accelerations parallel to fixed axes are given. Composition of simple harmonic motion.

Unit 2: Uniplanar motion referred to polar coordinates. Central orbit. Apses. Apsidal distance. Uniplanar motion when the acceleration is central and varying as the inverse square of the distance. Kepler's laws. Time of describing any arc of the path. Planetary motion.

Unit 3: Tangential and normal accelerations. Constrained motion. Conservation of energy. The simple pendulum. Motion on a rough curve. Motion in a resisting medium. Motion where the mass moving varies.

NUMERICAL METHODS

Unit 4: Finite differences. The operators Δ and ∇ . Properties. Interpolation with equal intervals. Newton-Gregory formula for forward interpolation. Newton-Gregory formula for backward interpolation. Interpolation with unequal intervals. Divided differences. Properties. Newton's formula for unequal intervals. Lagrange's interpolation formula for unequal intervals. Lagrange's interpolation formula for equal intervals.

Unit 5: Central difference formula. Operators δ , ∇ , α and μ . Gauss's central difference formula. Inverse interpolation. Use of Lagrange's formula. Successive approximations. Roots of algebraic equation by inverse interpolation. Numerical differentiation. Approximate expression for the derivative of a function. Numerical integration. General quadrature formula. The trapezoidal rule. Simpson's $1/3$ and $3/8$ rule.

Recommended Books:

- 1) An Elementary Treatise of the Dynamics of a Particle and of Rigid Bodies - S L Loney (Surjeet)
- 2) Finite Differences and Numerical Analysis - H C Saxena (S Chand & Co)

References:

- 1) Dynamics - P N Chatterjee

MAT 601(P&H) (Mechanics II & Vector Analysis)

MECHANICS II (STATICS)

Unit 1: Coplanar forces. Moment of a system of coplanar forces. Equation of line of action of the resultant of a system of coplanar forces. Necessary and sufficient condition for the equilibrium of a system of coplanar forces acting on a rigid body. Astatic equilibrium. Equilibrium of a rigid body under three forces. (m, n) theorem.

Unit 2: Work. Work done by a system of concurrent forces. Virtual work. Principle of virtual work for a system of coplanar forces acting on a particle. Omission of forces. Stability of equilibrium. Stable, unstable and neutral equilibrium. Work function test for the nature of stability of equilibrium. Energy test for equilibrium.

Unit 3: Centre of gravity. Definition and general formulation. Centre of gravity of arc, plane area, area bounded by curve, solid of revolution, surface of revolution. Centre of gravity bounded area in polar coordinates. The theorem of Pappus. Friction. Statical, dynamical and limiting friction. Laws of friction. Limiting equilibrium. Coefficient of friction. Angle of friction. Cone of friction. Equilibrium of a body on a rough inclined plane.

VECTOR ANALYSIS

Unit 4: Recap of vectors preliminaries. Scalar triple product and vector triple product. Their geometrical meanings. Product of four vectors. Reciprocal system of vectors. Vectors function of a scalar variable. Limit and continuity. Vector differentiation. Directional derivatives. Level surfaces. Tangent plane and normal to a level surface. Gradient, divergence and curl.

Unit 5: Vector integration. Line integrals. Surface integrals. Volume integral. Statements of Green's theorem. Gauss' theorem and Stoke's theorems. (proof not necessary). Problems based on surfaces like spheres, cylinders, cone, parallelepiped.

Recommended Books:

- 1) Statics - Md Motihur Rahman (New Central Book Agency, Kolkata)
- 2) A Textbook of Vector Analysis - Shanti Narayan and P K Mittal (S Chand & Co)

References:

- 1) A Textbook on Statics - M Ray, R D Sanglik
- 2) Vector Algebra - G C Sharma A R Vasishtha Sharma & Vasishtha
- 3) Vector Calculus - G C Sharma A R Vasishtha Sharma & Vasishtha

Syllabus of
BSc General Course
in
Physics
for 2018-19 Session

BSc PHYSICS SYLLABUS

COURSE STRUCTURE AND BROAD OUTLINE

Course Code		Course Title	Contact Hours	Weightage
Semester 1				
PHY101	P	Mechanics, Properties of Matter, Relativity and Electricity	60	4 Credits
PHY102	P	Practicals	45	1 Credit
PHY103	H	Mathematical Physics I	45	3 Credits
Semester 2				
PHY201	P	Thermal Physics and Oscillations	60	4 Credits
PHY202	P	Practicals	45	1 Credit
PHY203	H	Mathematical Physics II	30	2 Credits
PHY204	H	Computational Physics (Practicals)	45	1 Credit
Semester 3				
PHY301	P	Electrodynamics I and Quantum Mechanics I	60	4 Credits
PHY302	P	Practicals	45	1 Credit
PHY303	H	Thermodynamics and Statistical Physics	45	3 Credits
Semester 4				
PHY401	P	Electronics I and Optics	60	4 Credits
PHY402	P	Practicals	45	1 Credit
PHY403	H	Mathematical Physics III and Quantum Mechanics II	45	3 Credits
Semester 5				
PHY501	P	Nuclear Physics I and Solid State Physics I	60	4 Credits
PHY502	P	Practicals	45	1 Credit
PHY503	H	Electrodynamics II and Electronics II	45	3 Credits
Semester 6				
PHY601	P	Atomic Physics, Particle Physics & Cosmic Rays	60	4 Credits
PHY602	P	Practicals	45	1 Credit
PHY603	H	Astrophysics, Cosmology and Classical Mechanics	30	2 Credits
PHY604	H	Solid State Physics II	30	2 Credits
PHY605	H	Nuclear Physics II	30	2 Credits
PHY606	H	Practicals	45	1 Credit
PHY607	H	Project Work		2 Credits

Note: The student will select **only one paper** out of PHY603, PHY604, PHY605

PHY101

Mechanics, Properties of Matter, Relativity & Electricity

(4 credits - 60 hours)

Course Overview:

This paper provides a framework on which all other fields of physics are based. **Mechanics** deals with the study of forces that keep bodies in equilibrium or causes it to move. The hidden symmetry and invariance underlying Newton's laws, the relation between energy, momentum and their conservation laws which is at the heart of the motion of everything, will be studied. **Properties of Matter** will deal with the study of elastic properties of solids and fluids in motion. **Relativity** will introduce the student to the fascinating inter-relationship between space, time and mass and the equivalence between mass and energy. **Electricity** will explore the behaviour of alternating currents in various circuits, upon which electronics is based.

At the end of the study, the student will have learnt the fundamental principles governing the physical universe, have conceptual and mathematical understanding of the principles of physics and have developed problem solving skills.

Unit I: Mechanics (1)

(12 lectures/hours)

Newton's laws of motion: absolute time and absolute space, superposition principle. Fundamental forces of nature: gravitational, electromagnetic, strong nuclear and weak nuclear forces, frictional forces.

Energy method to analyse mechanical systems: simple harmonic oscillator, pendulum.

Phase space description of mechanical systems: simple harmonic oscillator.

Symmetry properties of Newton's equations: invariance under shift of coordinate system, invariance under rotation of coordinate axes, invariance under time translation, invariance under time reversal, invariance under mirror reflection, invariance under Galilean transformation.

Central force problem: two-dimensional motion of a projectile in Cartesian coordinate system with and without air drag.

Motion of two-dimensional projectile in radial polar coordinate system.

Kepler's problem of planetary motion and its solution, classification of Kepler orbits, orbits of artificial satellites, Virial theorem.

Motion in non-inertial reference frames: accelerating reference frame along a straight line, reference frame rotating with constant angular velocity, earth as reference frame, apparent gravitational acceleration, Coriolis force, Foucault pendulum.

Unit II: Mechanics (2)

(12 lectures/hours)

Work-Energy theorem, vector field and scalar fields, conservative force fields, non-conservative force fields, conservation of momentum, system of particles and centre of

mass, Sun-Earth system (Kepler's problem), kinetic and potential energy of a system of particles.

Translational symmetry and conservation of linear momentum, angular momentum of a single particle, angular momentum of a system of particles, rotational symmetry and conservation of angular momentum, angular momentum of rigid bodies.

Rigid Body Dynamics: kinetic energy of a rigid body and moment of inertia, equation of motion of a rigid body, examples of rotation about a single axis, rotation with constraints, rotation about more than one principal axis, gyroscope, gyroscopic motion, gyrostatic pendulum, precession of a top.

Unit III: Properties of Matter

(12 lectures/hours)

(a) Elasticity

Hooke's law, work done in strain, elongation strain, volume strain, shearing strain, Young's modulus, Bulk modulus and rigidity modulus and their inter-relationship, Poisson's ratio, torsion in a cylinder, twisting couple, variation of strain along its length.

Bending of beams and cantilevers in different cases: loaded at free end, loaded uniformly, bending moments.

(b) Viscosity

Equation of continuity, Energy of a liquid in flow, Bernoulli's theorem, critical velocity, Reynold's number, Poiseuille's equation, motion in a viscous medium: Stoke's law, streamline and turbulent flow.

(c) Hydrodynamics

Vorticity, equation of continuity, Euler's equation of motion, stream function in two dimensions, gravity waves and surface ripples.

Unit IV: Relativity

(12 lectures/hours)

Frames of reference, non-existence of absolute frame of reference, postulates of special relativity, Galilean and Lorentz transformations, inverse Lorentz transformations, length contraction, simultaneity, time dilation, proper time.

Doppler effect for light, expanding universe and Hubble's law, twin paradox, relation between electricity and magnetism.

Relativistic velocity addition, relativistic momentum, proper mass, relativistic mass, relativistic second law of motion, mass-energy equivalence, kinetic energy for slow speeds, energy and momentum relation in relativity, massless particles.

Minkowski's space time diagrams, Lorentz invariance, space time intervals.

General Relativity (without tensors - introduction only): Principle of equivalence, bending of starlight, perihelion of Mercury, gravitational waves.

Unit V: Electricity

(12 lectures/hours)

Network Calculations: Y and Delta networks, conversion between them, superposition.

Thevenin's theorem, Norton's theorem, series-parallel circuits, Wheatstone's bridge circuit, maximum power transfer.

Inductance: inductive reactance, inductors in series and parallel, circuit containing inductance only, RL series circuit, RL parallel circuit, Q of a coil, power in RL circuits.

Capacitance: capacitive reactance, circuit containing capacitance only, RC series circuit, power in RC circuits.

Single Phase Circuits: RLC series circuit, RLC parallel circuit, Q factor and power factor.

Transformers: ideal transformer characteristics, voltage ratio, current ratio, efficiency, impedance ratio, transformer losses and efficiency.

Three Phase Systems: Characteristics, three phase transformer connections, power in balanced three phase loads, unbalanced three phase loads.

Waveforms and Time Constant: RL series circuit waveforms, RL time constant, RC series circuit waveforms, RC time constant.

Reading List for PHY101

Mechanics

Books:

1. *Introduction to Mechanics*, Mahendra K. Verma, (Universities Press)
2. *Mechanics and General Properties of Matter*, P. K. Chakrabarti (New Central Book Agency)
3. *Introduction to Classical Mechanics*, R.G. Takwale, P. S. Puranik, (Tata-McGraw Hill India)
4. *Classical Mechanics*, K. S. Rao, (Universities Press)
5. *Mechanics*, D. S. Mathur, (S. Chand & Company)

References:

1. *Classical Mechanics: Analytical Dynamics*, Tiwari & Thakur, (Prentice Hall of India)
2. *Classical Mechanics*, Herbert Goldstein, Charles P. Poole, John Safko (Pearson Education)
3. *Feynman lectures on Physics Vol 1*, R. P. Feynman, R. B. Leighton, M. Sands, (Narosa Publishing House)
4. *Physics*, Robert Resnick, David Halliday & Kenneth Krane, (Wiley India)

Properties of Matter

Books:

1. *Mechanics and General Properties of Matter*, P. K. Chakrabati, (New Central Book Agency)
2. *Elements of Properties of Matter*, D. S. Mathur, (S. Chand & Company)

References:

1. *General Properties of Matter*, C. J. Smith, (Radha Publishing House)
2. *Feynman lectures on Physics - Vol II*, R. P. Feynman, R. B. Leighton, M. Sands, (Narosa Publishing House)

Relativity

Books:

1. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
2. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
3. *Modern Physics*, Murugesan & Sivaprasath, (S. Chand & Company Ltd)
4. *Introduction to Mechanics*, Mahendra K. Verma, (Universities Press)

References:

1. *Introduction to Special Relativity*, R. Resnick, (Wiley India Pvt Ltd)
2. *Elements of Properties of Matter*, D. S. Mathur, (S. Chand & Company)
3. *General Theory of Relativity*, P. A. M. Dirac, (Prentice-Hall of India)

Electricity

Books:

1. *Basic Electricity*, Milton Gussow, (Schaum's Outlines, Tata McGraw Hill)
2. *Electricity and Magnetism*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)

References:

1. *Introductory Circuit Analysis*, Robert Boylestad, (Prentice Hall)

PHY102

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of Kater's pendulum
2. Study of elastic constant by Konig's method
3. Study of elastic constant using Barton's apparatus
4. Study of moment of inertia using torsional pendulum
5. Study of viscosity and terminal velocity using Stokes method
6. Study of resistance of a galvanometer using P.O. Box
7. Study of impedance of an AC circuit containing RLC elements
8. Study of figure of merit of a ballistic galvanometer

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY201

Thermal Physics & Oscillations

(4 credits – 60 hours)

Course Overview

Thermal Physics studies the relation between heat and work, the motion at the molecular and atomic level and its relation to the quantity we call heat and temperature on the large scale platform. This paper also deals with the kinetic theory, thermodynamics and thermal properties at ultra cold temperatures and the phenomenon of superconductivity. **Oscillations** starts from a study of simple repetitive motion of particles and then on to more complex motions which is at the heart of much of physics: mechanical oscillations such as sound, water waves to electrical oscillations and waves to quantum phenomenon. It ends with application of sound in real life; hall acoustics, music etc.

At the end of the study, the student will have learned the fundamental principles governing the behaviour of matter at the molecular level and its large-scale aspects of heat and temperature, have conceptual and mathematical understanding of the principles of oscillation physics and develop problem solving skills in these areas.

Unit I : Thermal Physics

(12 lectures/hours)

(a) Kinetic Theory of Gases

Maxwell's velocity distribution, average speed, rms speed, most probable speed, energy distribution of molecules, temperature dependence, degrees of freedom and equipartition of energy, mean free path, collision probability.

Transport phenomena: viscosity, diffusion, transport coefficients and size of molecules, relationship between transport coefficients, Brownian motion, vertical distribution of Brownian particles, Einstein's Theory of Brownian motion.

Behavior of Real Gases, isotherms and deviations from perfect gas equation, virial coefficients, van der Waals' equation of state, van der Waals' constants, critical constants.

(b) Radiation

Radiation: black body, Kirchoff's law, energy density and pressure of diffuse radiation, Stefan-Boltzmann law and Newton's law of cooling, Wein's law, Rayleigh-Jeans law, UV catastrophe, Planck's law.

Unit II: Thermodynamics

(12 lectures/hours)

Thermodynamics system, thermodynamics equilibrium, thermodynamic processes, first law of thermodynamics, difference between specific heats (Mayer's relation), elasticities of perfect gas, work done in different processes.

Second law of thermodynamics, Carnot cycle, heat engines, thermal efficiency, refrigerator, different statements of the second law, Carnot's theorem, reversible and irreversible

processes, entropy, entropy change in reversible processes, principle of increase of entropy, Joule expansion, entropy change of an ideal gas and van der Waals' gas, entropy and disorder, heat death.

Heat Engines: Rankine cycle, Otto cycle, Diesel cycle.

Low Temperature Physics: Joule-Thomson effect for a real gas, Joule-Thomson effect for a van der Waals' gas, regenerative cooling, adiabatic demagnetization, third law of thermodynamics and its consequences.

Unit III: Oscillations & Waves

(12 lectures/hours)

(a) Simple Harmonic Oscillations

Differential Equation of simple harmonic motion and its solution, displacement, velocity and acceleration, energy of oscillations, elasticity and simple harmonic vibrations, study of oscillations: gas in a cylinder, mass suspended by a spring, superposition of rectangular simple harmonic oscillations, Lissajous figures.

Damped simple harmonic vibration, motion of a dissipative system, energy of damped vibrations, effect of damping on frequency.

Forced vibration and resonance, amplitude resonance, power dissipation and sharpness of resonance, Q factor, mechanical impedance and resonance.

(b) Progressive Waves

Transverse and longitudinal waves, condensation and pressure curve, velocity curve, equation of a progressive wave, particle velocity and acceleration, wave velocity and particle velocity, differential equation of wave motion, energy of progressive wave.

Unit IV: Vibrations & Sound Waves

(12 lectures/hours)

(a) Vibration of Strings:

Equation of motion of a vibrating string, velocity of waves along a string, frequency and period of vibration of a string, harmonics and overtones.

(b) Propagation and Velocity of Sound Waves

Velocity of a wave in a fluid, Laplace's correction, factors affecting velocity, velocity of sound in solids, velocity of torsional waves in a rod.

(c) Interference of Sound Waves

Interference of parallel wave trains, interference of spherical waves, zones of silence, beats, combination tones.

(d) Stationary Waves

Reflection of waves in strings from free and fixed ends, stationary waves, nodes and anti-nodes, pressure and density changes at nodes and anti-nodes, distribution of energy in a stationary wave.

(e) Reflection, Refraction and Diffraction

Reflection of sound waves, Huygen's Principle, acoustical image, echo, reflection from curved surfaces, Applications of reflection.

Refraction of sound waves, Huygen's Principle, effect of wind on refraction of sound, effect of temperature.

Diffraction of sound waves, sound shadow, diffraction bands, sound filter, megaphone.

(f) Attenuation of Sound Waves

Causes of dissipation of sound energy, effect of viscosity, attenuation constant, effect of heat conduction, absorption of high frequency waves in gases, sound absorption in narrow tubes and cavities, transmission of power by plane waves, radiation resistance.

Unit V: Oscillations & Waves: Applications

(12 lectures/hours)

(a) Vibration of Rods and Surfaces

Longitudinal vibrations of rods, velocity of a longitudinal wave in a rod, stationary longitudinal waves in rods, transverse vibration of rods, tuning fork, vibration of plates, Chladni's figures, vibration of bells, vibration of stretched membranes and diaphragms, (non-mathematical treatment).

(b) Vibration of Air Columns

Flue pipes and reed pipes, vibrations of air columns in closed and open organ pipe, overtones, resonance in air columns, end corrections, effect of temperature on pitch.

(c) Musical Sounds

Noise and musical sounds, loudness, intensity level, decibel and phon, intensity of a sound, pitch, quality of sound.

(d) Musical Scales and Consonance

Diatonic musical scale, musical intervals, consonant intervals, Helmholtz's theory, consonance of important musical intervals, beats caused by difference tones and its effect on music, equal tone temperament..

(e) Technical Applications of Acoustical Principles

Sound ranging, geophone, hydrophone, echo sounding, seismograph, ultrasonics, piezoelectric effect, resonant vibration of crystal slices, piezoelectric generator, magnetostriction.

Architectural Acoustics: reverberation, absorption coefficient, Sabine's law, good acoustical designs of rooms, noise, measurement, noise reduction and sound insulation.

Reading List for PHY201

Thermal Physics

Books:

1. *Heat & Thermodynamics*, A. B. Gupta & H. P. Roy (New Central Book Agency)
2. *Theory and Experiment on Thermal Physics*, P. K. Chakrabarti (New Central Book Agency)
3. *Thermodynamics: A Core Course*, Saha Jain Srivastava, Abhay K. Jain (Prentice Hall of India)
4. *Thermodynamics*, S. C. Gupta (Pearson Education)
5. *Thermal Physics*, S. Garg, R. Bansal, C. Ghosh (Tata-McGraw Hill)
6. *A Text Book of Heat and Thermodynamics*, J. B. Rajam and C. L. Arora (S. Chand & Company)

References:

1. *A Treatise on Heat*, M. N. Saha and B. N. Srivastava, (Indian Press)
2. *Text Book of Thermodynamics*, D.K. Jha (Discovery House Publishers)

Oscillations

Books:

1. *A Text Book of Sound*, D. R. Khanna and R. S. Bedi, (Atma Ram & Sons)
2. *Vibrations, Waves and Acoustics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Sound*, M. Ghosh, (S. Chand & Company)

References:

1. *Fundamentals of Acoustic*, Lawrence Kinsler and Austin Frey, (Wiley Eastern)
2. *Introduction to Mechanics*, Mahendra K. Verma, (Universities Press)

PHY202

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of mechanical equivalent of heat by Joule's electrical calorimeter
2. Study of linear expansion of a solid by Pullinger's apparatus
3. Study of oscillations by Melde's apparatus
4. Study of Lissajous' figures with CRO
5. Study of specific heat by the method of cooling
6. Study of pressure coefficient and volume coefficients by Joly's constant volume and constant pressure thermometer
7. Study of resonance in series LCR circuits
8. Study of resonance in parallel LCR circuits

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY301

Electrodynamics I and Quantum Mechanics I

(4 credits - 60 hours)

Course Overview

Electrodynamics I expounds on the fundamental inter-relation between magnetism and electricity. It starts off from Coulomb's law and ends up in electro-magnetic induction which relates mechanical energy to electric and magnetic energies. **Quantum Mechanics** studies the properties of matter and energy at sub-atomic levels and takes a different look at reality with non-intuitive conclusions. The student will learn how starting from simple assumptions, one can calculate the energy levels and states of atoms, lifetime of states etc.

At the end of the study, the student will have learnt the fundamental principles governing the relationship between electric and magnetic fields, have conceptual and mathematical understanding of the close inter-relation between electricity and magnetism as well as quantum mechanical concepts and develop problem solving skills.

Unit I: Electrostatics

(12 lectures/hours)

Coulomb's law, electric field, continuous charge distributions, electric field lines, electric flux, Gauss' law, differential and integral form, applications of Gauss' law, curl of $\mathbf{E}$, electric potential, Poisson's and Laplace's equation, potential of localised charge distributions, electrostatic boundary conditions.

Work done to move a charge, energy of a point charge and continuous charge distributions. Basic properties of conductors, induced charges, surface charge and force on a conductor. Capacitors and energy in a charged capacitor, electric dipoles (without multipole expansion), potential, field (polar and vector forms).

Unit II: Electric Fields

(12 lectures/hours)

Force in a non uniform field, torque and energy in an uniform field.

Method of images: point charge in front an infinite grounded plane, induced surface charge, force and energy, point charge near a grounded conducting sphere

Electric Fields in Matter

Dielectrics, induced dipoles, atomic polarizability, alignment of polar dipoles, electric polarization, electric field of a uniformly polarized sphere, bound charges and their interpretation, electric field inside a dielectric, electric displacement, Gauss' law for dielectrics, boundary conditions.

Linear dielectrics: susceptibility, absolute and relative permittivity, dielectric constant, parallel plate capacitor with a dielectric, energy in a dielectric system, forces on a dielectric, Clausius-Mossotti equation.

Unit III: Magnetic Fields

(12 lectures/hours)

Lorentz force law, cyclotron motion, cycloid motion.

Currents: line, surface and volume currents, continuity equation.

Biot-Savart's law, magnetic flux, Ampere's law: integral and differential form, application of Ampere's law: straight line current, uniform surface current, application of Ampere's law: solenoid, toroid.

Magnetic vector potential (without problems): magnetostatic boundary conditions, magnetic dipoles (without multipole expansion): torque and energy in an uniform field.

Magnetic Field in Matter

Effect of magnetic field on atomic orbits.

Magnetization, vector potential of a magnetised object, magnetic field of a uniformly magnetised sphere, bound currents, Ampere's law in magnetised materials, boundary conditions, magnetic susceptibility, absolute and relative permeability.

Electrodynamics

Ohm's law; emf, Faraday's and Lenz's laws, inductance and Neumann formula, energy in a magnetic field.

Maxwell's equations: displacement current, charging capacitor, Maxwell's equations in vacuum, Maxwell's equations in matter.

Unit IV: Quantum Mechanics (1)

(12 lectures/hours)

Particle Properties of Waves

Photoelectric effect, Einstein's photoelectric equation, Compton effect, pair production, gravitational red shift.

Wave Properties of Particles

Dual nature of light, wave-particle duality, de-Broglie waves, probability density, characteristics of waves (amplitude, frequency, angular frequency, time period, wave number, phase), wave packet, phase velocity, group velocity.

Davisson and Germer's experiment, G. P. Thomson's experiment, energy levels for a particle in a box.

Uncertainty principle

Gamma ray microscope, electron diffraction, uncertainty principle in atomic emissions, non-existence of nuclear electrons, proof using one-dimensional wave packet.

Unit V: Quantum Mechanics (2)

(12 lectures/hours)

Wave Mechanics

Wave function, normalisation, well-behaved wave functions, time-dependent wave equation, superposition of wave functions, expectation values, operators: energy and momentum operators.

Time-independent Schrödinger equation, eigenvalues, eigenfunctions, Hamiltonian operator.

Applications of the Wave Equation

Particle in a rigid box: energy levels, eigenfunctions, momentum.

Approximation to particle in a non-rigid box, step potential: reflectance and transmittance, probability current and its conservation, tunnel effect: transmission coefficient, applications of tunnel effect (without derivations): Scanning Electron Microscope, Atomic Force Microscope, α -decay.

Harmonic oscillator: energy levels, zero-point energy, wave functions of harmonic oscillator (without derivation) for first four, tenth quantum states.

Postulates of Quantum Mechanics

Five basic postulates of quantum mechanics with explanations.

Reading List for PHY301

Electrodynamics

Books:

1. *Introduction to Electrodynamics*, D. J. Griffiths, (Prentice-Hall of India)
2. *Electricity and Magnetism*, A. S. Mahajan and A. A. Rangwala, (Tata McGraw-Hill)
3. *Electricity and Magnetism*, Prantosh Chakraborty, (New Age International)
4. *Electricity and Magnetism*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
5. *Electricity and Magnetism*, K. K. Tewari, (S. Chand)
6. *Electricity and Magnetism*, R. Murugesan, (S. Chand)
7. *Electricity and Magnetism*, Navina Wadhvani, (Prentice-Hall India)

Reference:

1. *Feynman Lectures in Physics - Volume II*, R. P. Feynman, R. B. Leighton and M. Sands, (Narosa Publishing House)
2. *Electricity and Magnetism*, Edward M. Purcell, (Tata McGraw-Hill)

Quantum Mechanics

Books:

1. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
2. *Modern Physics*, R. Murugesan and K. Sivaprasath, (S. Chand & Company Ltd)

References:

1. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
2. *Introduction to Quantum Mechanics*, D. J. Griffiths, (Pearson Education)
3. *Quantum Mechanics*, G. Aruldas, (Prentice Hall India)
4. *Quantum Mechanics*, John L. Powell and Bernd Crasemann, (Oxford & IBH Publishing Co)

PHY302

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of magnetic moments using magnetometer
2. Study of variation of magnetic field with current and distance
3. Study of thermocouples
4. Study of photo electric effect and Planck's constant
5. Study of O ray and E ray by spectrometer using calcite/quartz prism
6. Study of electrolytic conductivity by Kohlrausch's method
7. Study of reduction factor of tangent galvanometer
8. To measure resistance of a wire using Carey Foster bridge

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Text Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY401

Electronics I & Optics

(4 credits - 60 lectures)

Course Overview

Electronics is at the heart of the amazing technology at our disposal. The students will learn about the building blocks of electronics technology (diodes and transistors) and their roles and properties in different circuits. In **optics**, the student will study the principles of image formation from geometrical considerations and the oscillatory nature of light is brought out by the phenomenon of interference, diffraction and its relation to electrodynamics through the phenomenon of polarization and lasers.

At the end of the study, the student will have learned the fundamental principles governing the operation of electronic devices and circuits and optics, have developed conceptual and mathematical understanding of the principles involved and develop problem solving skills.

Unit I: Electronics (Diodes)

(12 lectures/hours)

p-n junction diode: forward and reverse biasing of *p-n* junction diode with their respective *V-I* characteristics, avalanche breakdown and dynamic resistance, load line and Q-point. Junction diode as a half wave rectifier with mathematical analysis for DC current and power output, RMS output current, AC power input, rectifier efficiency, ripple factor, peak inverse voltage, voltage regulation.

Full wave rectifier (for centre tapped transformer) with mathematical analysis for DC output current (average and RMS), power supplied and power output to a load, efficiency, ripple factor, PIV, bridge rectifier, average value of output voltage, output frequency.

Filter circuits with ripple factor calculations for shunt capacitance, series inductance, L – section filter, π – section filter.

Zener diode: *V-I* characteristics, voltage regulation.

Unit II: Electronics (Transistors)

(12 lectures/hours)

Construction (*pnp* and *nnp*) of transistors and principles of operation, CE *V-I* input-output characteristics and current gain, CB circuit, current amplification factor, relation between α and β , active region, cut-off region, saturation region, dynamic output resistance, current gain, CB characteristics: input and output characteristics, CC circuit, input and output characteristics.

Transistor Biasing

Base bias, collector bias, emitter bias, thermal runaway, voltage divider circuit and its AC equivalent circuit.

Transistor amplifiers

CE amplifier; DC current gain, AC current gain, voltage and power gain, input-output phase relationship, DC load line, AC load line and Q-point.

Frequency response of (capacitor coupled and bypass capacitor) CE single stage amplifier.

Field Effect Transistors

Construction (n -channel, p -channel) and principle, n -channel characteristics, drain curves, transconductance curves, drain resistance, transconductance, amplification factor, their relations.

Unit III: Optics (Geometrical Optics & Interference)**(12 lectures/hours)****Geometrical Optics**

Aberrations: chromatic aberrations, achromatic doublet, removal of chromatic aberration of a separated doublet, monochromatic aberrations: spherical aberrations, coma, astigmatism, distortion.

Interference

Interference from two point sources by division of wavefront, intensity distribution, Fresnel's bi-prism, phase change on reflection.

Interference by division of amplitude, colours of thin films, Newton's rings, Michelson's interferometer, coherence, line width, spatial coherence.

Unit IV: Optics (Diffraction)**(12 lectures/hours)**

Fraunhofer diffraction from single slit, limit of resolution and resolving power, two-slit Fraunhofer diffraction pattern, N-slit diffraction pattern, diffraction grating and resolving power.

Fresnel diffraction, half period zones, zone plate, diffraction at a straight edge.

Unit V: Optics (Polarization & Lasers)**(12 lectures/hours)****Polarization**

Production of polarized light, polarization by reflection, polarization by double refraction, Malus law, superposition of two disturbances, double refraction, interference of polarized light, optical activity.

Lasers

Einstein coefficients, population inversion, ruby laser, He-Ne laser, line shape function, threshold power calculation for ruby laser, optical resonators, stability conditions

Reading List for PHY 401**Electronics I****Books:**

1. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)
2. *Handbook of Electronics*, S. L. Gupta, V. K. Kumar, (Pragati Prakashan)
3. *Basic Electronics (Solid State)*, B. L. Theraja, (S. Chand & Company Ltd)

References:

1. *Electronic Principles*, A. P. Malvino, (Tata McGraw-Hill)
2. *Electronic Devices and Circuits*, Theodore F. Bogart, (Prentice Hall)
3. *Basic Electronics for Scientists*, James Brophy, (McGraw-Hill)
4. *Electronic Fundamentals and Applications*, John Ryder, (Prentice Hall)

Optics

Books:

1. *Optics*, Ajoy Ghatak, (Tata McGraw-Hill Publishing Company Ltd)
2. *Geometrical and Physical Optics*, P. K. Chakrabarti, (New Central Book Agency)
3. *Lasers and Non-Linear Optics*, B. B. Laud, (New Age International)
4. *A Text Book of Optics*, N. Subrahmanyam & Brij Lal, (S. Chand & Company)

References:

1. *Optics*, Miles V. Klien & Thomas E. Furtak, (John Wiley & Sons)
2. *Fundamentals of Optics*, Francis A. Jenkins & Harvey E. White, (McGraw-Hill)
3. *Lasers*, K. R. Nambiar, (New Age International)
4. *Optics*, Hecht (Pearson Education)

PHY402

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of rectifiers
2. Study of voltage regulation
3. Study of transistors characteristics and h parameters
4. Study of diode characteristics
5. Study of interference using Fresnel's bi-prism
6. Study of interference using diffraction grating
7. Study of optical activity using polarimeter
8. Study of refractive index of a prism using spectrometer

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY501

Nuclear Physics I & Solid State Physics I

(4 credits - 60 hours)

Course Overview

Nuclear Physics I focuses on the sub-atomic world of the nucleus and its constituents. The shape of the nucleus and its properties, the lifetime of excited states and the extraction of energy through the process of fusion and fission will be studied. **Solid State Physics I** studies the inter-relations between the atoms to form the structures that we are more familiar with. From thermal properties and electrical properties of matter to the shape of the atomic crystals - the reach of this subject is vast.

At the end of the study, the student will have learnt the fundamental principles governing the behaviour of the nucleus and the complex relations between atoms to form structures through bonds, have conceptual and mathematical understanding of the principles of physics involved and develop problem solving skills.

Unit I: Nuclear Physics (Nuclear Structure & Radioactivity) (12 lectures/hours)

Nuclear Structure

Nuclear constituents, nuclear sizes and shapes, nuclear radii, nuclear masses, binding energy, binding energy per nucleon, packing fraction, nuclear forces, exchange forces (meson theory).

Radioactivity

Nuclear stability and decay, radioactivity, activity, radioactive decay laws, half life, mean life, Curie, conservation laws, Q value, α decay, Gamow's theory, properties of α particles (charge/mass, charge, velocity range, spectra), β decay, β decay spectra.

Unit II: Nuclear Physics (Radioactivity & Nuclear Reactions) (12 lectures/hours)

Radioactivity

Fermi's theory of β decay, K electron capture, γ decay, theory/origin of γ decay, nuclear isomerism, natural radioactivity, radio carbon dating, biological effects, Mossbauer effect.

Nuclear Reactions

Nuclear reactions and cross section, barns, centre of mass coordinate systems, compound nucleus, radio isotope production, low energy reactions, Q value, threshold kinetic energy. Fission, delayed neutrons, neutron moderators, nuclear fission reactors, different types (in brief).

Fusion reaction, p - p cycle, CNO cycle, confinement of fusion reactions: magnetic confinement (tokamak), inertial confinement (laser squeezing), applications in brief: Medical radiation physics, neutron activation analysis, synthetic elements.

Unit III: Nuclear Physics (Detectors & Accelerators)

(12 lectures/hours)

Particle Detectors

Ionization chamber, solid state detectors, Geiger-Muller counter, Wilson cloud chamber, spark chamber, nuclear emulsions, scintillation counter, Cerenkov counter.

Particle Accelerators

Cockcroft-Walton tension multiplier, Van de Graaf generator, linear accelerator, cyclotron electron synchrotron, proton synchrotron, betatron.

Unit IV: Solid State Physics (1)

(12 lectures/hours)

Properties of Crystals

Crystalline and Amorphous solids: long-range and short-range order, crystal defects, point defect, ductility, edge dislocation, screw dislocation.

Crystal lattice: lattice translation vectors, unit cell, symmetry operations: translation, rotation, reflection, inversion, types of lattices: lattice directions and planes, Miller indices, inter-planar spacing.

Simple crystal structures: hexagonal closed-packed structure, face-centered cubic structure, body-centered cubic structure, simple cubic structure, packing fractions of different crystal structures.

X-ray diffraction: Bragg's law

Crystal Binding

Bonding in Solids: ionic crystals: electron affinity, cohesive energy, binding energy, Madelung constant, covalent crystals: properties, examples, van der Waals bond: polar molecules, polarizability of molecules, hydrogen bond: dipole, Metallic bond: energy band, Ohm's law, resistivity, collision time, drift velocity, Weidemann-Franz Law.

Unit V: Solid State Physics (2)

(12 lectures/hours)

Band Theory

Band theory of solids: conductors, insulators, semiconductors, doped semiconductors, drift velocity, mobility and conductivity of intrinsic semiconductors, variation with temperature, carrier concentration and Fermi level for intrinsic semiconductors, law of mass action, carrier concentration, Fermi level and conductivity for extrinsic semiconductor, energy bands, free electron, Brillouin zones, origin of forbidden bands, effective mass.

Magnetic effects on charge carriers: Hall effect.

Superconductivity

Magnetic effects, Meissner effect, critical field and critical temperature, type I and type II superconductors, thermodynamic and optical properties: entropy, specific heat, energy gap, isotope effect, flux quantization, Josephson effect, Josephson junction.

BCS theory, bound electron pairs, Cooper pairs, High temperature superconductors.

Reading List for PHY501

Nuclear Physics I

Books:

1. *Nuclear Physics*, S. B. Patel, (New Age International)
2. *Modern Physics*, Kenneth Krane, (Wiley India)
3. *Concepts of Nuclear Physics*, Bernard L. Cohen, (McGraw-Hill)
4. *Modern Physics*, R. Murugesan and S. Sivaprasath (S. Chand & Company Ltd)

References:

1. *Introductory Nuclear Physics*, K. S. Krane (Wiley India Pvt Ltd)
2. *Nuclear Physics*, S. N. Goshal (S. Chand)
3. *Introductory Nuclear Physics*, Samuel Wong (Prentice-Hall India)

Solid State Physics I**Recommended Books:**

1. *Solid State Physics*, R. K. Puri and V. K. Babbar, (S. Chand & Company Ltd)
2. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
3. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)
4. *Solid State Physics*, S. O. Pillai, (New Age International Publishers)
5. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)

Reference Books:

1. *Introduction to Solid State Physics*, C. Kittel, (Wiley Eastern Limited)

PHY502

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of band gap of a semiconductor
2. Study of Hall effect
3. Study of dispersive power of a prism
4. Study of interference using Michelson interferometer
5. Study of oscillators
6. Study of frequency response of amplifiers
7. Study of integrating and differentiating circuits
8. Study of focal length of a combination of lenses

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

PHY601

Atomic Physics, Particle Physics & Cosmic Rays

(4 credits - 60 hours)

Course Overview

Atomic Physics studies the behavior of atoms and molecules and the manifestations of its properties through emission of light, X rays and so on. The esoteric world of sub-nuclear particles at ultra high energies will be dealt with in **particle physics and cosmic rays**.

At the end of the study, the student will have learnt the fundamental principles governing the structure of the atom and the interactions of particles at ultra high energies, have developed conceptual and mathematical understanding of the principles of physics and problem solving skills.

Unit I: Atomic & Molecular Physics (Atom Models)

(12 lectures/hours)

Rutherford scattering experiment and the nuclear model of the atom, size of the nucleus, atomic spectra and spectral series.

Bohr model of the atom: energy levels and spectral series, line spectra, $m_e : m_H$ H, He⁺ spectra, discovery of deuterium, correspondence principle, nuclear (reduced) mass and its effect of the atomic spectra: discovery of deuterium, positronium and muonic atom energy levels compared to hydrogen energy levels, critical potentials, atomic excitation, Franck-Hertz experiments.

Sommerfeld relativistic model and fine structure of hydrogen.

Quantum (Vector) model of the hydrogen atom (no derivation) and quantum numbers, principal quantum number, orbital quantum number, magnetic quantum number, probabilistic electronic orbits (radial and angular), radiative transitions, selection rules.

Unit II: Atomic & Molecular Physics (Effect of Magnetic Fields and Many Electron Atoms)

(12 lectures/hours)

Normal Zeeman effect, gyro-magnetic ratio, Bohr magneton, spin of the electron, spin angular momentum, magnetic dipole moments due to orbital motion and spin of the electron, exclusion principle, Stern-Gerlach experiment.

Symmetric and anti-symmetric wave functions, bosons and fermions, atomic shells, sub-shells and periodic table

Spin-orbit coupling, anomalous Zeeman effect, Paschen-Back effect, Stark effect, total angular momentum, *LS* coupling, *j-j* coupling, singlet, doublet, triplet, term symbols.

Atomic spectra of hydrogen, sodium.

Atomic spectra of helium and mercury.

Unit III: Atomic & Molecular Physics (X-Ray and Molecular Physics)

(12 lectures/hours)

X-Ray Spectra

X-rays: production, Laue's experiment, Bragg's law, X-ray spectra: continuous and characteristic spectra, Mosley's law and X-ray series, Auger effect, X-ray absorption spectra, absorption edges

Molecular Physics

Molecular bond, covalent bond, H_2^+ molecular ion, Hydrogen molecule, complex molecules, hybrid orbitals: ethylene, benzene .

Rotational energy levels and rotational spectra, vibrational energy levels and spectra, vibration-rotation spectra, electronic spectra: fluorescence, phosphorescence.

Raman effect: stokes and anti-stokes lines, selection rules

Unit IV: Particle Physics & Cosmic Rays (Elementary Particles)

(12 lectures/hours)

Particles and fields, strong, electromagnetic and weak interactions, leptons, mesons and baryons, antiparticle, examples.

Conservation laws, lepton number, families of particles, leptons, mesons, strangeness, baryon, baryon number.

Particle interaction and decays, resonance particles, Q-value of particle reactions, reaction threshold kinetic energy.

Quark model

Unit V: Particle Physics & Cosmic Rays (Cosmic Rays)

(12 lectures/hours)

Discovery of cosmic rays, latitude effect, east-west effect, altitude effect.

Primary cosmic rays, secondary cosmic rays, cosmic ray showers, discovery of positron and mesons, effect of earth's magnetic field, Van Allen belts.

Origin of cosmic rays.

Reading List for PHY601

Atomic Physics

Books:

1. *Concepts of Modern Physics*, Arthur Beiser, (Tata McGraw-Hill)
2. *Modern Physics*, R. Murugesan and S. Sivaprasath, (S. Chand & Company Ltd)
3. *Modern Physics*, K. S. Krane, (Wiley India Pvt Ltd)

References:

1. *Introduction to Atomic Spectra*, H. E. White, (McGraw-Hill)
2. *Atomic Physics*, S. N. Goshal, (S. Chand & Company)
3. *Atomic Physics*, J. B. Rajam, (S. Chand & Company)
4. *Elements of Spectroscopy*, Gupta, Kumar, Sharma, (Prakati Prakashan)

Particle Physics & Cosmic Rays

Books:

1. *Modern Physics*, K. S. Krane (Wiley India Pvt Ltd)
2. *Concepts of Modern Physics*, Arthur Beiser (Tata McGraw-Hill)
3. *Modern Physics*, R. Murugesan and S. Sivaprasath (S. Chand & Company Ltd)

References:

1. *Introduction to Elementary Particles*, D. J. Griffiths (Wiley India Pvt Ltd)
2. *Atomic Physics*, J. B. Rajam, (S. Chand)

PHY602

Practicals

(1 credit)

Course Overview

This course introduces students to the methods of experimental physics. Emphasis will be given on laboratory techniques such as accuracy of measurements and data analysis. The concepts that are learnt in the lecture sessions will be translated to the laboratory sessions thus providing a hands-on learning experience.

LIST OF EXPERIMENTS

1. Study of Rydberg constant using hydrogen spectrum
2. Study of thermal conductivity by Searle's apparatus
3. Study of surface tension by Jaeger's method
4. Study of interference using Newton's rings
5. Study of power supply and filter circuits
6. Study of resistance of a galvanometer with post office box
7. Study of angle of minimum deviation of a prism with spectrometer
8. Study of Planck's constant and work function

Note:

1. A student should try to perform/complete all the experiments in each practical paper. Most of the experiments are open-ended experiments; hence the instructor can modify the experiment to suit local conditions/constraints.
2. For assessment of each experiment, the marks/scores may be awarded as follows.
 - (a) Theory, presentation/scope of the technique, limitations of the technique etc - 20 %
 - (b) Accuracy of observations, precautions observed rigorously – 50 %
 - (c) Presentation of data in tables, graphs, error estimation etc – 30 %
3. Marks/Weightage allotted to the different experiments may be proportional to the level of complexity of the experiment.

Books:

1. *BSc Practical Physics*, C. L. Arora, (S. Chand)
2. *An Advanced Course in Practical Physics*, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. *A Text Book of Advanced Practical Physics*, S. Ghosh, (New Central Book Agency)

Syllabus of
BSc General Course
in
Zoology
for 2018-19 Session

B. Sc. (Pass Course and Honours)
SYLLABUS

(Semester system, w.e.f. Academic Year 2012)

DEPARTMENT OF ZOOLOGY
NAGALAND UNIVERSITY

Semester		Course number	Name of paper	Credits	Total
I	Pass	ZOO-101	Introduction to Non-Chordates (Theory)	4	8
		ZOO-102	Introduction to Non-Chordates (Practicals)	1	
	Honours	ZOO-103	Evolutionary Biology and Animal Behaviour (Theory)	2	
		ZOO-104	Evolutionary Biology and Animal Behaviour (Practicals)	1	
II	Pass	ZOO-201	Chordates and Evolution (Theory)	4	8
		ZOO-202	Chordates and Evolution (Practicals)	1	
	Honours	ZOO-203	Immunology and Biostatistics (Theory)	2	
		ZOO-204	Immunology and Biostatistics (Practicals)	1	
III	Pass	ZOO-301	Cell and Molecular Biology I (Theory)	4	8
		ZOO-302	Cell and Molecular Biology I (Practicals)	1	
	Honours	ZOO-303	Cell and Molecular Biology II (Theory)	2	
		ZOO-304	Cell and Molecular Biology II (Practicals)	1	
IV	Pass	ZOO-401	Developmental Biology and Physiology (Theory)	4	8
		ZOO-402	Developmental Biology and Physiology (Practicals)	1	
	Honours	ZOO-403	Chordates and Physiology (Theory)	2	
		ZOO-404	Chordates and Physiology (Practicals)	1	
V	Pass	ZOO-501	Biochemistry and Genetics (Theory)	4	8
		ZOO-502	Biochemistry and Genetics (Practicals)	1	
	Honours	ZOO-503	Genetics/Applied Zoology/ Environmental Management (Theory)	2	
		ZOO-504	Genetics/Applied Zoology/ Environmental Management (Practicals)	1	
VI	Pass	ZOO-601	Ecology and Applied Zoology (Theory)	4	10
		ZOO-602	Ecology and Applied Zoology (Practicals)	1	
	Honours	ZOO-603	Choice Based Credit Paper. (NOTE: Colleges have the option of offering any paper relevant to zoology based on their manpower and infrastructure).	3	
		ZOO-604	Project work	2	

Guidelines

1. Fifteen (15) working weeks per semester (approx)
2. 1 credit (Theory) = 15 hours of teaching
3. 1 credit (Practicals) = 30 hours of teaching
4. Respective colleges to work out the required details/modalities based on number of classes per week and duration of classes.
5. All theory papers are of 100 marks (30% internal and 70% external assessment)
6. All practical papers are of 50 marks (100% internal assessment).

Semester I (Pass Course)

THEORY

ZOO-I01: Introduction to Non-Chordates

Unit I: Classification/Protozoa

Principles of Taxonomy: Binomial nomenclature; classification of animal kingdom.

Protozoa: General characters and outline classification up to classes with examples.

Type-study: Nutrition, locomotion and reproduction in *Amoeba*, *Paramecium*.

Parasitic Protozoa: *Entamoeba* and *Leishmania*.

Unit II: Porifera/Cnidaria

Porifera: General characters and outline classification up to classes with examples.

Type-study: *Ascon* and *Sycon*- canal System. Structural organization of *Sycon*.

Coelenterate/Cnidaria: General characters and outline classification up to classes with examples.

Type-study: Corals and coral reefs. Polymorphism in Cnidarians.

Unit III: Platyhelminthes/Aschelminthes

Platyhelminthes: General characters and outline classification up to classes with examples.

Type-study: *Fasciola* and *Taenia* (Life history and parasitic adaptations).

Aschelminthes: General characters and outline classification up to classes with examples.

Type-study: *Ascaris* (Life history and parasitic adaptations).

Unit IV: Annelida/Arthropoda

Annelida: General characters and outline classification up to classes with examples.

Type-study: *Polychaeta* (adaptive radiation). Types and significance of coelom; metamerism and its significance.

Arthropoda: General characters and outline classification up to classes with examples.

Larval forms of crustaceans; moulting and metamorphosis in insects.

Unit V: Mollusca/Echinodermata

Mollusca General characters and outline classification up to classes with examples.

Torsion and detorsion; modifications of foot.

Echinodermata: General characters and outline classification up to classes with examples.

Echinoderm larvae and its significance; water-vascular system.

Semester I (Pass Course)

PRACTICAL

ZOO-I02: Introduction to Non-Chordates.

1. Mounting: (Temporary)
 - a) Spicules, gemmules and spongin fibres.
 - b) Pharyngeal and septal nephridia of earthworm.
 - c) Salivary glands and mouth parts of cockroach.
2. Study of Specimens.
 - a) Amoeba, Euglena, Vorticella
 - b) Sycon
 - c) Obelia ; Physalia, Aurelia, Metridium
 - d) Fasciola, Taenia (Life history)
 - e) Male and Female Ascaris.
 - f) Aphrodite, Heteronereis, Chaetopterus, Tubifex, Hirudinaria.
 - g) Limulus, Balanus, Scolopendra, Julus, Termite, Louse, Honeybee, Silkworm, Peripatus.
 - h) Chiton, Dentalin, Unio, Loligo, Sepia, Nautilus.
 - i) Pentaceros. Ophiura, Cucumaria, Antedon.
3. Slides
 - a) T.S. and L.S. of Sycon
 - b) Earthworm: T.S. of pharynx, gizzard and typhlosolar intestine.
 - c) Crustacean larvae.
 - d) Pentaceros (T.S. Arm), Echinoderm larvae.
4. Dissections
 - a) Digestive and nervous systems of earthworm.
 - b) Digestive and nervous systems of cockroach.
 - c) Digestive systems of Pila.

Suggested readings:

1. Barnes, R. (1981). Invertebrate zoology. *W. B. Saunders Co*
2. Barrington, E. W. J. (1969). Invertebrate structure and function. *ELBS*
3. Cox, F. E. G. (1994). Modern parasitology. *Blackwell scientific publications.*
4. Jordan, E. L. & Verma, P. S. Invertebrate Zoology. *S. Chand & Co.*
5. Boolotin & Stiles. College zoology. *MacMillan*
6. Parker & Haswell. Text book of Zoology Vol. II. *MacMillan*
7. Paven, P. H. & Johnson, G. B. Biology. *Mosby College Publ.*
8. Marshal & Williams. Text book of zoology.

Semester II (Pass Course)

THEORY

ZOO-20I: Introduction to Chordates and Evolution.

Unit I: Classification: Protochordates, Agnatha

General characters and classification of Chordata up to orders.

Protochordates: General features and phylogeny of Hemichordates, Urochordates and Cephalochordates; retrogressive metamorphosis.

Agnatha: General features of living Agnatha and classification up to classes.

Unit II: Pisces, Amphibia

Pisces: General features and classification up to orders.

Osmoregulation, migration and parental care.

Amphibia: General features and classification up to orders.

Origin of terrestrial ectotherms; neoteny in *Urodela*.

Unit III: Reptiles, Aves

Reptiles: General features and classification up to Orders.

Poisonous and Non-poisonous Snakes of India; poison apparatus and biting mechanisms in Snakes.

Aves: General features and classification up to orders; origin, flight adaptations; mechanism of flight and migration.

Unit IV: Mammals

General features and classification up to orders.

Egg-laying mammals; flying mammals; aquatic mammals; structure and derivatives of integument; osmoregulation in mammals.

Unit V: Evolution

Evidence of evolution; paleontological and geological time scales.

Theories of organic evolution: Lamarkism, Neo-Lamarkism, Darwinism, Neo-Darwinism, Modern Synthetic Theory, Germplasm Theory, Mutation Theory.

Natural Selection under Natural conditions: Melanism in moths or industrial melanism; resistance of insects to pesticides; antibiotic resistance in bacteria; infectious diseases in humans.

Semester II (Pass Course)

PRACTICAL

ZOO-202: Introduction to Chordates and Evolution.

A. Study of Specimen.

- a) Balanoglossus, Herdmania, Ciona, Salpa, Doliolum.
- b) Petromyzon, Scoliodon, Sphyrna, Torpedo, Chimaera, Notopterus, Labeo, Catla, Heteropneustes, Mystus.
- c) Necturus, Salamander, Bufo, Hyla.
- d) Chelona, Testuda, Hemidactylus, Varanus, Uromastix, Chameleon, Viper, Krait.
- e) Bat (Insectivorous and frugivorous).

B. Study of Slides.

- a) Balanoglossus, (proboscis, collar, hepatic region).
- b) Amphioxus (Oral hood, section through pharyngeal, intestinal and caudal regions).

C. Mounting.

- a) Placiod, cycloid and ctenoid Scales.

D. Osteology (Comparative study of amphibia to mammals).

- a) Atlas, Axis, Sacral vertebrae.
- b) Limb bones.
- c) Girdles.
- d) Ribs.

E. Histology: T.S. of Stomach, Intestine, Lungs, Kidney and Gonads in Frog / Mammal.

Dissection: Afferent branchial vessels of Scoliodon.

Efferent branchial vessels of Scoliodon.

Cranial nerves of Scoliodon.

Suggested readings:

1. Mayr, E. (1980). Principles of systematic zoology. *Tata McGraw Hill publishing company limited.*
2. Moody, P. A. (1970). Introduction to evolution. *Harper & Raw*
3. Savage, J. M. (1973). Evolution. *American Publishing Co.*
4. Volpe, E. P. (1089). Understanding evolution. *Universal Books, N. Delhi*
5. Chordate zoology and animal physiology. *S. Chand and Co*
6. Kent, G. C. (1965). Comparative anatomy of vertebrates. *C. V. Mosby & Co.*
7. Romer & Parsons. The vertebrate body. *Saunders.*
8. Hamilton, T. H. Process and pattern of evolution. *MacMillan*
9. Stebbins, T. H. Process of organic evolution. *PHI, N. Delhi.*

Semester III (Pass Course)

THEORY

ZOO-301: Cell and Molecular Biology-I.

Unit I: An overview of the Cell

Prokaryotic and eukaryotic cell; cell size and shape; phages, virioids, mycoplasma and *Escherichia coli*.

Composition of Cells: Molecules of cell, cell membranes and cell proteins.

Cell Cycle: Mitosis, meiosis.

Cell components: Plasma membrane; transport of small molecules; endocytosis.

Unit II: Nucleus, Protein sorting and Transport

Nucleus: Nuclear envelope, nuclear pore complex, nuclear lamina; transport across nuclear envelope; nucleolus and rRNA processing.

Protein sorting and transport: The endoplasmic reticulum, Golgi apparatus; mechanism of vesicular transport, lysosomes.

Unit III: Mitochondria, Chloroplasts and Peroxisomes

Mitochondria: Structural organization, function; marker enzymes, mitochondrial biogenesis; protein import in mitochondria; semi-autonomous nature of mitochondria and chloroplasts; chloroplast DNA; peroxisome assembly.

Cytoskeleton and cell movement: Structure and organization of actin filaments; actin, myosin and cell movements; intermediate filaments, microtubules.

Unit IV: Chromosomes

Chromatin fibres: Euchromatin, heterchromatin (types).

Chemical composition: DNA, Histone and Non-Histone Proteins

Ultrastructure: Nucleosome concept, nucleosome and solenoid models; 10 nm, 30 nm fibres; radial loops and metaphase chromosome.

Special types of Chromosomes: Pene chromosomes, lampbrush chromosomes, supernumerary chromosomes.

Unit V: Nucleic Acids convey Genetic information

DNA as the carrier of Genetic information; the Central dogma (key experiments); DNA double helix (salient features); genetic code; direction of protein synthesis (key principle); types of DNA; types of genetic material; denaturation, renaturation; Cot curves; organization of DNA in prokaryotes, viruses and eukaryotes.

Semester III (Pass Course)

PRACTICAL

ZOO-302: Cell and Molecular Biology.

1. Study of Cell organelles (Slides)
2. Squash preparation for study of mitosis and meiosis.
3. Staining techniques for study of nucleus, mitochondria and Golgi complex.
4. Cytochemical staining of protein with bromophenol blue.
5. Cytochemical staining of histones with fast green.
6. Cytochemical staining of DNA with Feulgen.
7. Preparation of polytene chromosome from Chironomous larva.
8. Demonstration of mammalian sex chromatin.

Suggested readings:

1. Alberts *et al* (2001). Molecular biology of the cell. *Garland publications*.
2. De Robertis, E. D. P. & De Robertis, E. M. F. (1987). Cell and molecular biology. *Lea & Febiger Intl. ed.*
3. Gerald Karp (2007). Cell and molecular biology: Concepts and experiments. *John Wiley*
4. Powar, C. B. (1986). Cell biology. *Himalaya Publ.*
5. Burke, J. D. C. (1970). Cell biology. *William & Wilkins Co*

Semester IV (Pass Course)

THEORY

ZOO-401: Developmental Biology and Physiology.

Unit I: Introduction

Structure of Gametes; types of eggs, egg membranes.

Gametogenesis: Spermatogenesis and oogenesis.

Early Embryonic development: Fertilization, sperm-egg interaction; biochemical events, mono- and polyspermy; types and patterns of cleavage; early development in chick (cleavage, blastulation, gastrulation); embryonic induction and organizers.

Unit II: Later embryonic development

Differentiation of Germ layers; formation of neural tube, skin, notochord, somites, coelom and digestive tubes (up to rudiments).

Extra embryonic membranes in human; implantation of embryo, placentation- structure, types and physiology of placenta.

Unit III: Nervous system and Muscles

Neuron: structure, types; resting membrane potential and its basis; action potential and its propagation in myelinated and unmyelinated nerve fibres; synaptic transmission and types of synapses, neuro-muscular junction, neurotransmitters.

Muscle: Types, ultrastructure; muscle proteins; molecular and chemical basis of muscle contractions; characteristics of muscle twitch; motor unit, summation; isotonic and isometric contractions, tetanus and rigor mortis, muscle dystrophies.

Unit IV: Respiration, Digestion, Excretion and Blood

Respiration: Histology of trachea and lungs; respiratory pigments; transport of oxygen in the blood (dissociation curve of oxyhaemoglobin); carbon monoxide poisoning; transport of CO₂ in the blood; respiratory volumes and capacities.

Digestion: Mechanical and chemical digestion of food; control and action of GIT secretion; role of GI hormones; absorption of carbohydrates, lipids, proteins, minerals and vitamins.

Excretion: Structure and function of kidney, ureter, bladder; renal blood supply; nitrogenous waste production (ureotelic, amonotelic, uricotelic)

Blood: ABO blood group; Rhesus System.

Unit V: Endocrine System

Nature of hormones; regulation of hormone secretion; structure of pituitary gland and control of anterior pituitary hormones by hypothalamic releasing hormones (neuroendocrine mechanism); control of posterior pituitary and its hormones; histology, functions and effects of abnormal secretion of endocrine glands; thyroid, parathyroid, thymus, pancreas, adrenal, ovary, testis.

Semester IV (Pass Course)

PRACTICAL

ZOO-402: Developmental biology and Physiology.

1. Study of permanent slides of developmental stages in frog (W.M and Sections): cleavage, blastula, gastrula, neurula, tail bud stage, tadpole.
2. Study of developmental stages showing primitive streak at 21h, 24h, 28h, 33h, 36h, 48h, 72h, 76h, 96h, by raising chick embryo in the laboratory.
3. Study of *in ovo* development of chick.
4. Study of gametes from slides (frog /rat).
5. Preparation of haemin crystals.
6. Estimation of haemoglobin content (by haemoglobinometer).
7. Estimation of O₂ consumption of fish with reference to body weight.
8. Blood grouping: A, B, O and Rh factor.
9. Permanent Slides: Examination of sections of mammalian, somach, duodenum, ileum, liver, lung, kidney, ovary, testis.

Suggested readings:

1. Gilbert, S. T. (2000). Developmental biology, 6th ed. *Sinauer, Sunderland.*
2. Hoar, W. S. (1983). General and comparative physiology. *Prentice Hall.*
3. Balinsky, B. I. (1976). An introduction to embryology, 6th ed. *W. B. Saunders & Co*
4. Prosser, C. L. Comparative animal physiology.
5. Chordate zoology and animal physiology. *S. Chand and Co*
6. Saunders, J. W. Developmental biology: Patterns/Principles/Problems. *MacMillan Publ.*
7. Wilson, J. A. Principles of animal physiology. *Collins MacMillan Publ.*

Semester V (Pass Course)

THEORY

ZOO-501: Biochemistry and Genetics.

Unit I: Carbohydrates and their metabolism

Structure and properties of important mono-, di- and polysaccharides; glycolysis; fermentation; citric acid cycle; pentose phosphate pathway; gluconeogenesis.

Shuttle systems: malate - aspartate shuttle; glycerol phosphate shuttle, and cori cycle; glycogen metabolism (glycogenesis and glycogenolysis).

Unit II: Lipids and their metabolism

Structure, properties and functional significance of fatty acids, triglycerides and steroids. Biosynthesis and β -oxidation of saturated fatty acids, ketogenesis, types and properties of lipoproteins.

Unit III: Proteins and their metabolism

Structure and general properties of amino acids; four levels of structures in proteins;

Catabolism of amino acids: Transamination, deamination and urea cycle; fate of glucogenic and ketogenic amino acids with examples of serine and leucine respectively.

Enzymes: Introduction, kinetics, mechanism of action, inhibition.

Unit IV: Genetics

Mendelian genetics and its extension; principles of inheritance; Mendel's laws and experiments; concept of genotype, phenotype, dominance, recessiveness.

DNA as genetic material; chromosome theory of inheritance; laws of probability; pedigree analysis; incomplete dominance and co-dominance; multiple alleles, lethal alleles; epistasis and pleiotropy.

Interaction of genes: Complementary, supplementary, inhibitory and duplicate types.

Sex linked inheritance and sex linked traits.

Unit V: Linkage, crossing over and sex determination, gene Mapping

Linkage and crossing over; cytological basis of crossing over; molecular mechanism of crossing over; two factor and three factor crosses; interference and co-incidence; sex linkage and non-disjunction of sex chromosome in *Drosophila*.

Sex determination: Chromosomal mechanism; environmental factors affecting sex determination; Barr bodies; dosage compensation; gene mapping in *Drosophila*.

Semester V (Pass Course)

PRACTICAL

ZOO-502: Biochemistry and Genetics.

1. Biochemical detection of carbohydrates, proteins and lipids in a given sample.
2. Study of action of salivary amylase at optimum condition.
3. Effect of pH and temperature on the action of salivary amylase.
4. Detection of abnormal constituents in urine.
5. Calorimetric estimation of glucose/Protein in a given solution.
6. Mendelian laws and gene interaction using *Drosophila* crosses.
7. Study of human karyotype (normal and abnormal).
8. Study of linkage, recombination, gene mapping using marker based data from *Drosophila*.

Suggested readings:

1. Stryer, I. (1988). Biochemistry II. *Freeman and Co.*
2. Plummer, L. (1989). Practical biochemistry. *Tata McGraw.*
3. Murray, R. K. *et al* (1995). Harper's biochemistry, 24th ed. *Prentice Hall.*
4. Lewin, B. (2000). Gene. *John Wiley & sons.*
5. Strikburger, M. W. (1994). Genetics. *Macmillan Publ. Co.*
6. Russel, P. J. (1998). Genetics. *The Benjamin Cummins Publishing Co.*
7. Lehninger (2004). Principles of biochemistry 4th ed.
8. Gilbert, F. (2000). Basic concepts in biochemistry: A student's survival guide. 2nd ed. *McGraw Hill*
9. Price, N. E. & Stevens, L. (1982). Fundamentals of enzymology. *OUP*

Semester VI (Pass Course)

THEORY

ZOO-601: Ecology and Applied Zoology.

Unit I: Introduction to Ecology

History; autecology, synecology; species (sympatric and allopatric);

Abiotic factors: laws of limiting factors; Liebig's law of minimum and Shelford's law of tolerance; brief account of light and temperature as limiting factors; sil types and soil erosion.

Unit II: Population

Unitary and modular populations; population density, natality, fecundity, mortality, life tables or survivorship curves, age ratio, sex ratio, age structure; population growth patterns: exponential/Malthusian and sigmoid growth patterns; population dispersal.

Unit III: Community

Characteristics of community diversity and community stratification.

Habitat and niche, ecotone/edge effect, ecotypes, ecological indicators, succession, stages of primary succession, climax community.

Structure of an ecosystem; food chain, food web, trophic levels, grazing and detritus type of food chain; ecological pyramids, energy flow in ecosystem.

Biogeochemical cycle: water, oxygen, carbon, nitrogen, sulphur, phosphorus

Unit IV: Human diseases

Epidemiology of infectious diseases; transmission, prevention and control of diseases; tuberculosis, amoebiasis, malaria and swine flu.

Applied entomology: Outlines of apiculture, sericulture with emphasis on *Bombyx mori*, lac culture.

Unit V: Insect control / Aquaculture

Insect control: Mechanical, physical, cultural; classification of insect control with reference to chlorinated hydrocarbons, organophosphates, carbonates and synthetic pyrethroids. general aspects of Integrated Pest Management (IPM).

Aquaculture: Introduction to aquaculture, binomics of Indian Major Carps (IMC), live fishes and exotic carps; induced breeding, integrated fish farming and transportation of fish seeds.

Semester VI (Pass Course)

PRACTICAL

ZOO-602: Ecology and Applied Zoology.

1. Determination of population density in a terrestrial community or hypothetical community by quadrat method.
2. Study of life table and fecundity table, plotting of the three types of survivorship curves from the hypothetical data.
3. Study of types of soil, their texture by sieve method and rapid tests for pH, chlorides, nitrates, carbonates and organic carbon.
4. Estimation of primary productivity of grassland ecosystem.
5. Study of permanent slides and specimen of protozoan, helminthes (parasites) associated with human disease.
6. Study of permanent slides of commonly found parasites.
7. Economic importance of commonly occurring insect pests and preparation of life cycle of these pests.
8. Study of beneficial insects and their life stages.
9. Maintenance of freshwater aquarium.

Suggested readings:

1. Odum, E. P. (1996). Ecology: A bridge between science and society. *Sinauer Associates Inc.*
2. Chapman, J. L. And Reiss, M. J. (1992). Ecology, principles and applications. *Cambridge University Press.*
3. Verma, P. S. & Agarwal, V. K. (1983). Environmental biology (principles of ecology). *S. Chand & Co.*
4. Singh, J. H. et al (2006). Ecology, environment and resource conservation. *Anamaya Publ. N. Delhi*
5. Kendeigh, S. C. Animal ecology. *Prentice Hall*
6. Kormondy, E. T. Concept of ecology. *Prentice Hall*
7. Shukla & Upadhya. Economic zoology. *Rastogi Publ.*
8. Jingram, V. G. (1991). Fish and fisheries of India. *Hindustan Publishing Corp. N. Delhi*
9. NIIR Board of consultants and engineers (2003). Hand book of fisheries and aquaculture technology. *Asia Pacific Business Press Inc.*

Syllabus of
BA Honours Course
in
Economics
for 2018-19 Session

**SYLLABUS FOR
UNDERGRADUATE COURSE
(B.A PASS & HONOURS)**

ECONOMICS

**NAGALAND UNIVERSITY
HQS. LUMAMI**

2012

ECONOMICS B.A (Pass & Honours)

COURSE STRUCTURE

COMPULSORY PAPERS FOR B.A (General & Honours)			
Semester	Code No	TITLE	General/Honours
Semester-I	ECO-101	Micro Economics-I	General/Honours
	ECO-102	Quantitative Technique-I (Mathematics)	Honours
Semester-II	ECO-201	Micro Economics-II	General/Honours
	ECO-202	Quantitative Technique-II (Statistics)	Honours
Semester-III	ECO-301	Macro Economics-I	General/Honours
	ECO-302	Public Finance and Banking	Honours
Semester-IV	ECO-401	Macro Economics-II	General/Honours
	ECO-402	International Economics	Honours
Semester- V	ECO-501	Indian Economy-I	General/Honours
	ECO-502	Economics of Growth and Development	Honours
		Optional-I for Honours	
	ECO-503(a)	Agricultural Economics	Honours
	ECO-503(b)	Mathematical Economics	Honours
	ECO-503(c)	Econometric Methods	Honours
	ECO-503(d)	Industrial Economics	Honours
Semester-VI	ECO-601	Indian Economy-II	General/Honours
	ECO-602	Economics of Environment	Honours
		Optional-II for Honours	
	ECO-603(a)	Demography	Honours
	ECO-603(b)	Financial Institutions and Markets	Honours
	ECO-603(c)	History of Economic Thought	Honours
	ECO-603(d)	Regional Economics	Honours
	ECO-603(e)	Project	Honours

SEMESTER WISE PAPER DISTRIBUTION (Pass and Honours)

COURSE	FIRST YEAR		SECOND YEAR		THIRD YEAR	
	SEMESTER I	SEMESTER II	SEMESTER III	SEMESTER IV	SEMESTER V	SEMESTER VI
B.A (Pass and Honours)	ECO 101 Micro Economics-I	ECO 201 Micro Economics-II	ECO 301 Macro Economics-I	ECO 401 Macro Economics-II	ECO 501 Indian Economy-I	ECO 601 Indian Economy-II
B.A (Honours)	ECO 102 Quantitative Technique-I (Mathematics)	ECO 202 Quantitative Technique-II (Statistics)	ECO 302 Public Finance and Banking	ECO 402 International Economics	ECO 502 Economics of Growth and Development	ECO 602 Economics of Environment
					*OPTIONAL (I) ECO- 503 (a)-(d)	**OPTIONAL (II) ECO - 603 (a)- (d) or ***ECO 603(e) PROJECT

* Students can choose any one of the optional papers [ECO-503 (a to d)] during V Semester

**Students can opt for an optional papers [ECO-603 (a to d)] or ECO 603 (e) Project during semester VI.

*** For course “ECO 603(e) PROJECT”, the department shall decide the topics which will be assigned to the student at the beginning of the semester. The project report should be submitted one month before the end semester examinations. The report shall contain a minimum of 5000 words, including tables and annexure.

SEMESTER I
(General & Honours)
Eco-101: MICRO ECONOMICS-I

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Nature and Scope of Economics: Basic economic problem. Definition of Economics. Methodology of economics. Concept of Equilibrium. Economic models-its application. Concept of demand and supply-measurement and elasticity	12	20
Unit II	Theories of Consumer Demand: Utility approach (cardinal and ordinal). Indifference curves approach; Consumer equilibrium-Hicks and Slutsky's theorem, Compensated demand, Engel curve. Consumer surplus.	15	20
Unit III	Theory of Production: Importance of the theory of production; Returns to a factor: total, average and marginal products; Laws of returns to scale. Laws of variable proportions. Production functions-short and long run. Cobb-Douglas production functions. Least cost combination of input. Factor substitution.	15	20
Unit IV	Theory of Cost: Cost functions; Concept of cost. Traditional and Modern theory of cost. Derivation of long and short run cost curves and their relationship, Recent development in cost theory. Analysis of Economics of scale-Real and Pecuniary.	13	20
Unit V	Welfare Economics: Nature, scope and concept. Problems in measuring social welfare. Role of value judgment. Criteria of social welfare-Growth of GNP, Bentham's, Cardinalist and Pareto.	13	20
Total contact hours and Marks		68	100

Basic Reading List.

- Ahuja, H L. (1990) Advance economic Theory, S. Chand & Co, New Delhi.
- Henderson, J and R.E Quandt (1980), Microeconomic Theory: A Mathematical Approach, McGraw Hill, New Delhi.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan.
- Sen. A. (1999), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
- Varian, H.R. (2000), Microeconomics Analysis: W.W. Norton, New York.

- Varian, H.H. (2000), Intermediate Microeconomics: A Modern Approach, East West Press, New Delhi.
- Satya, R. Chakraborty, Micro Economics, Allied Publishers, New Delhi.
- Samuelson P.A and W.D . Nordhus (1998), Economics, Tata McGraw Hills.
- Raj, N.C. (1975), An Introduction to Micro Economics, Macmillan Corporation Ltd India.

SEMESTER I
(Honours)
ECO-102: QUANTITATIVE TECHNIQUE-I (MATHEMATICS)

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Sets and Relations: Functions-types of function and its application in economics, System of equations and Inequalities in Market Equilibrium	13	20
Unit II	Number System: Uses of numbers, Axiomatic properties of real number and completeness, complex number, graphical representation of complex number. Analytical Geometry: Application of straight line, points and lines, slope of the line curves, distance and section formulas, parabola, circle, isoprofit and isocost lines.	13	20
Unit III	Differentiation: Rules of differentiation, Marginal revenue, average revenue, total revenue, marginal cost, average cost and total cost, Maxima and Minima, profit maximisation. Integration: rules of integration. Consumer and producers surplus.	16	20
Unit IV	Matrix and Determinants: Different types and solution of simultaneous equation through Cramers rule and matrix methods.	13	20
Unit V	Linear programming: Concepts and formulation, solution of linear programming through graphs. Input- output analysis.	13	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Mike Rosser, Basic Mathematics for Economists, Routledge Taylor and Francis Group, 29 west 35th street, New York, NY 10001.
- Suranjan Saha, Mathematics and Statistics [for C.A Professional Education (course)-I], New Central Book agency (P) Ltd, 9/1 Chintamani Das Lane, Kolkata 700009.
- Frank Werner and Yuri N. Sotskov, Mathematics of Economics and Business, Routledge, 270 Madison Ave, New York, NY 10016.
- G.S Monga, Mathematics and Statistics for Economics, Vikas Publication.
- Mehta and Madnani, Mathematics for Economists, Sultan Chand and Sons. New Delhi.
- Taro Yamane, Mathematics for Economist, Prentice-Hall of India.

SEMESTER II
(General & Honours)
Eco-201: MICRO ECONOMICS-I

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Market Structure and Pricing: Perfect and Imperfect markets. Equilibrium of a firm. Perfect Competition-short and long run equilibrium of the firm and industry. Monopoly-short and long run equilibrium. Price Discrimination, Measure of Monopoly Power. Monopoly control and regulation.	14	20
Unit II	Monopolistic Competition: Concepts. General and Chamberlin approach to short and long run equilibrium.	12	20
Unit III	Oligopoly: Characteristics of Oligopoly. Models of Oligopoly-Sweezy, Cournot and Edgeworth.	14	20
Unit IV	Theories of Wages and Rent: Wages and Collective Bargaining. Wage Differential. Marginal Productivity theory. Modern theory of Wage. Rent - Concepts. Scarcity Rent. Differential Rent. Quasi Rent. Ricardian theory of Rent.	14	20
Unit V	Theories of Interest and Profits: Interest-Classical and Neo-Classical. Profits -Innovation, Risk and Uncertainty.	14	20
	Total contact hours and Marks	68	100

Basic Reading List.

- Ahuja, H L. (1990) Advance economic Theory, S. Chand & Co, New Delhi.
- Henderson, J and R.E Quandt (1980), Microeconomic Theory: A Mathematical Approach, McGraw Hill, New Delhi.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan.
- Sen. A. (1999), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
- Varian, H.R. (2000), Microeconomics Analysis: W.W. Norton, New York.
- Varian, H.H. (2000), Intermediate Microeconomics: A Modern Approach, East West Press, New Delhi.
- Satya, R. Chakraborty, Micro Economics, Allied Publishers, New Delhi.
- Samuelson P.A and W.D Nordhus (1998), Economics, Tata McGraw Hills.
- Raj, N.C. (1975), An Introduction to Micro Economics, Macmillan Corporation Ltd India.

SEMESTER II
(Honours)
ECO-202: QUANTITATIVE TECHNIQUE-II (STATISTICS)

Total Mark: 100

Credit: 4

UNIT	TOPIC	CONTACT HOURS	WEIGHTAGE
Unit I	Introduction to Statistics: Basic concepts, definitions, frequency distribution, cumulative frequency, graphic and diagrammatic representation of data, techniques of data collection, sampling vs. population, primary and secondary data.	13	20
Unit II	Central Tendency and Dispersion: Measures of central tendency-Mean, Mode, Range, Mean deviation, Standard deviation, Coefficient of variation, Skewness and Kurtosis.	14	20
Unit III	Correlation and Regression: Coefficient of correlation-Karl Pearson and Rank correlation. Regression-linear regression, two regression lines, methods of least squares.	14	20
Unit IV	Time Series and Index Numbers: Time series analysis- concept and components, measurement of trend, determination of seasonal variations. Index numbers- concept, methods of constructing index numbers (Laspeyers, Paaches and Fishers index, Family budget method, Chain index numbers), Problems in construction and limitation of index numbers.	14	20
Unit V	Probability: Concept, theorems of probability (Addition and Multiplication), conditional probability, Mathematical expectation.	13	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Croxton, F.E. D.J, Dowdon and S Klein (1973), Applied General Statistics, Prentice Hall, New Delhi.
- Goon, A. M, M.K, Gupta and B. Das, Gupta (1993), Fundamentals of Statistics, Vol. 1. The World Press Ltd, Calcutta.
- Gupta, S.P. and V.K Kapoor (1993), Fundamentals of Applied Statistics, S Chand & Sons, New Delhi.
- Millar, J. (1996), Statistic for Advanced level, Cambridge University Press, Cambridge.
- Monga, G.S. Mathematics and Statistics for Economists, Vikas Publication
- Speigal, M.R. (1992), Theory and Problems of Statistics, McGraw Hill London.

SEMESTER III
(General & Honours)
ECO-301: MACRO ECONOMICS- I

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	National Income and Social Accounting: Concepts and measurement of National Income, factors determining N.I, difficulties in the calculation of N.I, importance of N.I. Social accounting- Meaning, the development of National accounting ; Technique of social accounting, preparation of accounts, nature of double entry, purpose of each accounts. Flow of funds accounts, BOP account, Green accounting.	18	20
Unit II	Output and Employment: Say's law of market and the Classical theory of employment; Keynes objection to the Classical theory; Aggregate demand and aggregate supply functions; The principle of effective demand, Keynes determination of income and employment.	15	20
Unit III	Consumption Function: Consumption. Short and Long run. Factors influencing average and marginal propensity to consume, Keynes psychological law of consumption spending and Relative Income Hypothesis.	15	20
Unit IV	Theories of Interest: Classical view on interest, Neo-Classical theories of interest, Keynesian theory of interest and Modern theory of interest.	10	20
Unit V	Investment Theory: Theory of investment- Autonomous and Induced investment; marginal efficiency of capital; General equilibrium- IS and LM curve. Investment multiplier and its effectiveness in LDCs.	10	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Branson W.A (1989), Macro Economic Theory and Policy, Harper and Row, New York.
- Gupta, R.D and A.S. Rana, Keynes and Post Keynesian Economics, Kalyani Publishers, Ludhiana.
- Maria John Kennedy.M (2011), Macroeconomic Theory, PHI Learning Pvt. Ltd, New Delhi.
- Seth, M.L and Lakshmi Narian Agarwal (2010) Macroeconomics.
- H.L. Ahuja (2010) Macroeconomics: Theory and Practices, S Chand & Co, New Delhi.
- Shapiro. E (1996), Macroeconomics Analysis, Galgodia Publications, New Delhi.
- Gregory, N. Mankiw (2000), Macro Economics, Macmillan, New Delhi.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.

SEMESTER III
(Honours)
ECO-302: PUBLIC FINANCE AND BANKING

Total Marks:

100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Public Finance and Fiscal Policy: Meaning and scope of Public Finance, Principle of maximum advantage, fiscal and monetary policy. Objectives and role of fiscal policy.	13	20
Unit II	Public Debt and Expenditure Sources public borrowing, types, causes and effects of public borrowing, burden of public debt, and redemption of public debt. Deficit financing. Wagner's law, Wiseman-peacock hypothesis, Types, causes and effects of public expenditure.	14	20
Unit III	Taxation: Taxation-Direct and indirect taxation, impact and incidence of taxation, canons of taxation, taxable capacity, India's tax structure. Sources of public revenue.	13	20
Unit IV	Indian Public Finance: Centre-State financial relations. Revenue of the states and local bodies. India's public debt and expenditure, Finance Commission, Union Budget.	14	20
Unit V	Banking: Functions of Central Bank, instruments of control, objectives and limitations of monetary policy. Functions of Commercial Banks, Process of credit creation and limitations, Nationalization of banks, Recent reforms in banking sectors in India	14	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Mithani D M (1998) Modern Public Finance, Himalaya Publishing House, Mumbai
- Musgrave, R .A and P.B. Musgrave (1976) Public Finance in Theory and Practice, MacGraw Hill, Kogakusa, Tokyo.
- Musgrave R. A (1959), The Theory of Public Finance , McGraw Hill, Kogakusa, Tokyo.
- H.L Bhatia , Public Finance, Vikas Publishing House Pvt. Ltd
- Misra, B (1997) Public Economics, Macmillan India Limited, New Delhi

SEMESTER IV
(General & Honours)
ECO-401: MACRO ECONOMICS- II

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Theory of Demand for Money: Concept of money, functions; Quantity theories of money – Cash Transaction, Cash Balances Approach, Keynesian approach.	12	20
Unit II	Banking: Commercial banking – functions, Credit Creation – purpose and limitations. Central banking – functions. Methods of Credit control.	12	20
Unit III	Supply of money: Definition, components and definition of supply of money. Money multiplier and high powered money. RBI policies and money supply.	12	20
Unit IV	Inflation: Inflation, definition, types, causes, effects of inflation on different Sectors of economy; Demand – pull inflation and cost – push inflation. Measures to control Inflation. Trade off between inflation and unemployment.	16	20
Unit V	Trade cycle: Nature and characteristics; Hawtrey's monetary theory; Keynes view on trade cycle, Concept of accelerator; Samuelson and Hicks multiplier and accelerator interaction Model, control of trade cycle.	16	20
Total contact hours and Marks		68	100

Basic Reading List:

- Branson W.A (1989), Macro Economic Theory and Policy, Harper and Row, New York.
- Gupta, R.D and A.S. Rana, Keynes and Post Keynesian Economics, Kalyani Publishers, Ludhiana.
- Maria John Kennedy.M (2011), Macroeconomic Theory, PHI Learning Pvt.Ltd, New Delhi.
- Seth, M.L and Lakshmi Narian Agarwal (2010) Macroeconomics.
- H.L. Ahuja (2010) Macroeconomics: Theory and Practices, Advance Analysis, S Chand & Co, New Delhi.
- Shapiro. E (1996), Macroeconomics Analysis, Galgodia Publications, New Delhi.
- Gregory, N. Mankiw (2000), Macro Economics, Macmillan, New Delhi.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.

SEMESTER IV
(Honours)
ECO-402: INTERNATIONAL ECONOMICS

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Theories of Trade: Absolute advantage, Comparative advantage and Opportunity Cost. H-O theorem and Leontief Paradox	14	20
Unit II	Tariff: Effects of tariff (Partial and General equilibrium analysis). Theories of Optimum Tariff, Optimum tariff formula and Import Quota.	13	20
Unit III	Balance of Payment: Concept and components of Balance of Trade and Payment. Equilibrium and disequilibrium in the Balance of Payment.	13	20
Unit IV	International Monetary System: IMF, ADB, International Finance Corporation (IFC), International Development Association (IDA) and World Bank.	14	20
Unit V	Trading Blocks: SAARC. GATT. WTO. ASEAN and SAFTA	14	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Salvatore, D.L (1997), International Economics, Prentice Hall, Upper Saddle River, N.J
- Sodersten, Bo (1991), International Economics, Macmillan Press Ltd., London
- Mannur, H. G (1998) International Economics, Vikas Publication, Delhi.
- R.R. Paul, Monetary Economics.

SEMESTER V
(General & Honours)
ECO-501: INDIAN ECONOMY-I

Total marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Structure of the Indian Economy : Basic feature; Natural resources; Population-size and growth rates, sex composition, rural-Urban migration, occupational distribution, population policy.	13	20
Unit II	Areas of Concern: Poverty and inequality, unemployment, prices and inflation.	13	20
Unit III	National Income: Growth performance, measures for growth performance, National income by industrial origin and occupational structure.	13	20
Unit IV	Planning in India: Objectives, strategy broad achievements and failures, current five year plan- objectives, allocation and targets. New economic reforms - liberalization, privatization, rational behind economic reforms; progress of privatization and globalization.	16	20
Unit V	Banking in India: Growth and performance of nationalized banks, Reserved bank and monetary regulation in India.	13	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Agarwal, A.N, Indian Economy, Vikas Publishers, New Delhi.
- Datt,R. and K.P.M.Sundaram , Indian Economy, S.Chand and company Ltd, New Delhi.
- Misra,S.K and V.K .Puri, Indian economy-Its Development and experience, Himalaya publishing house, Mumbai.
- Kapila Uma, Indian Economy, Academic Foundation, New Delhi.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.
- Dhingra, I.C (2001). Indian Economy: Environment and Policy, Sultan Chand & Sons, New Delhi.

SEMESTER V
(Honours)
ECO-502: ECONOMICS OF GROWTH AND DEVELOPMENT

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Economic Growth and Development: Development and underdevelopment. Perpetuation of underdevelopment. Measurement of economic development. Factors affecting economic growth. Importance of Agriculture, Industry and Infrastructure.	10	20
Unit II	Theories of Economic Development: Classical theories of development- Smith, Ricardo, Malthus, Mills, Karl Marx and Schumpeter.	15	20
Unit III	Theories of Economic Growth: Harrod and Domar, Solow, Joan Robinson, Kaldor and New Growth theory (Paul Romer).	15	20
Unit IV	Partial Theories of Growth and Development: Circular causation, Rostow's stages of Growth, Big push, Balanced versus Unbalanced growth.	13	20
Unit V	Investment and Planning: Meaning and need for planning. Types of planning. Investment Criterion, Cost-Benefit analysis, Choice of technique in LDCs.	15	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- R.C. Agarwal -Lakshmi Narain Agrawal, Economics of Development and Planning (Theory and Practice)
- Higgins, B, Economic Development, Norton, New York.
- Lekhi, R.K (1990), The Economics of Development and Planning, Kalyani Publishers, Ludhiana.
- Mishra and Puri (2010), Economic Development and Planning.
- Taneja and Myer (2010), Economic Development and Planning and Methods, Vishal Publishing Co, Jhalandhar.
- Todaro, M.P , Economic Development in Third World Countries, Longman, New York.
- Todaro, M.P (1974), Development Planning: Models and Methods, Oxford University Press, Oxford.
- Thirlwall, A.P, Growth and Development, Palgrave, Macmillan.
- Hayami, Y, Development Economics, Oxford University Press, India.

SEMESTER VI
(General & Honours)
ECO-601: INDIAN ECONOMY II

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Agriculture: Nature and importance ;trends in agricultural production and productivity, factors determining productivity, Land reforms, Green Revolution, Rural credit, agricultural marketing.	13	20
Unit II	Industry: Industrial development during the planning period; Industrial policies. Industrial licensing policies- MRTP Act, FERA and FEMA. Growth and problems of small scale industries; Role of public sector enterprises.	16	20
Unit III	External sector: Role of foreign trade, trends in exports and imports, composition and direction of India's foreign trade, BOP crisis and the new economic reforms - export promotion measures and the new trade policies. Foreign capital - FDI and MNC	13	20
Unit IV	Economy of Nagaland : Natural resources; Population, Infrastructure and Structural change in Nagaland Economy.	13	20
Unit V	Industry and Agricultural Sectors of Nagaland: Industrial development, prospects and problems. Agricultural systems, production, productivity and problems.	13	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Agarwal, A.N, Indian Economy, Vikas Publishers, New Delhi.
- Datt,R. and K.P.M.Sundaram , Indian Economy, S.Chand and company Ltd, New Delhi.
- Misra,S.K and V.K .Puri, Indian Economy-Its Development and Experience, Himalaya Publishing House, Mumbai.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.
- Dhingra, I.C (2001). Indian Economy: Environment and Policy, Sultan Chand & Sons, New Delhi.
- Joshua Thomas & Gurudas Das (eds 2002), Dimensions of Development in Nagaland, Regency Publications, New Delhi.
- Joshua Thomas & Gurudas Das (eds), Structural change in North East India: Resource Industry Linkages, Akansha Publishing house, New Delhi.
- Borthagur, Dharendra Nath (1992), Agricultural Development of North East Region with special reference to hill agriculture, Bee Cee Prakashen, Guwahati.
- NUTA, Economic Development in Nagaland: Prospects and Constraints.
- Statistical Hand Books, GON; Economic Surveys (Various Issues), Government of India

SEMESTER VI
(Honours)
ECO-602: ECONOMICS OF ENVIRONMENT

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Environment and Ecology: Meaning and elements of ecology, the environment and economic linkages; entropy laws, population environment linkage; environment as a public good; market failure for environmental goods.	14	20
Unit II	Basic Concepts: Pareto optimality and competitive equilibrium; fundamental theories of welfare economics, renewable and non renewable resources, common property resources, social cost-benefit analysis.	12	20
Unit III	The Common problems: Property right approach to environmental problems; concepts and indicators of sustainable development; international trade and the environment.	12	20
Unit IV	Valuation of Environmental Goods: Total economic valuation of environmental goods, valuation of environmental damages/ benefits (willingness to pay and accept), indirect methods (Household production theory) and direct methods (contingent valuation theory)	15	20
Unit V	Environment Regulation Instruments: Prevention, control and abatement of pollution; command and control; market based instruments; Evaluation of environment legislation and institutions in India.	15	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Bhattacharya, R.N (Ed) (2001), Environmental Economics: An Indian Perspective, Oxford University Press.
- Kolstad, C.D.(2000),Environmental Economics, Oxford University Press, Oxford
- Sengupta, R.P. (Ed.) (2001), Ecology and economics: An Approach to sustainable development, Oxford University Press, New Delhi.
- Woodhall, M,(1992),Cost-Benefit analysis in Educational Planning, UNESCO, Paris.
- Nick Hanley, Jason F, Shogren and Ben White, Environmental Economics in Theory and Practice, Macmillan India Ltd.
- Pearce, D.W and R.K. Turner, (1991), Ecology and Economics: An Approach to Sustainable Development, Oxford University Press.
- Shankar, U, (2001), Environmental Economics, Oxford University Press, New Delhi.

SEMESTER V (Honours)
OPTIONAL - I
ECO-503 (a): AGRICULTURAL ECONOMICS

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Development of Agriculture: Role and importance of agriculture in Economic development, changing nature of linkages, agricultural resources in India, land utilization and cropping pattern, irrigation in India, command and development and flood control.	17	20
Unit II	Technological Changes in Agriculture: Traditional techniques and practices, HYV seeds-fertilizers, Green revolution, sustainable agriculture, emerging trends in agricultural technology. Dry land farming, use of bio- technology techniques	17	20
Unit III	Agricultural Marketing and Finance: Markets and functions, channels of distribution of commodities, regulated markets and co-operatives, Role of rural finance, sources of finance-NABARD	10	20
Unit IV	Agricultural Price Policy(APP): Nature of demand and supply of agricultural products; need for state intervention, objectives of the APP, instruments and evaluation, food security and public distribution in India.	12	20
Unit V	Agriculture and Allied Activities: Fisheries, horticulture, floriculture, and forestry - Growth, problems and state policies. Agro based industries and food processing industries, development of rural infrastructure.	12	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Sadhu, AN and Singh J., Agricultural problems in India- Himalaya Publishing House, Mumbai.
- Sadhu, AN and Singh J., An Introduction to Agricultural Economics, Himalaya Publishing House, Mumbai.
- R.N. Soni ., Leading Issues in Agricultural Economics, Arihant Press, Jalandhar.
- Bilgrami, S.A.R., An Introduction to Agricultural Economics, Himalaya Publishing House, Mumbai.
- John B. Penson Jr., Oral Capps (et al), Introduction to Agricultural Economics, Prentice Hall.
- R.G Desai, Agricultural Economics, Indus books, New Delhi.
- Lekhi, R.K. and Joginder Singh, Agricultural Economics: An Indian Perspective, Kalyani Publishers, Ludiana.

SEMESTER V (Honours)
OPTIONAL - I
PAPER- XIII (b)
ECO-503 (b): MATHEMATICAL ECONOMICS

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Differentiation and Difference Equation: Constrained and unconstrained optimisation, partial differentiation and difference equation.	13	20
Unit II	Quadratic equations and solution to differential equations.	13	20
Unit III	Consumer Theory: Utility function, budget line, consumer equilibrium, marginal rate of substitution and price effects-Slutsky equation, derivatives of demand curves, elasticity of demand and consumer surplus.	14	20
Unit IV	Theory of Production: Constant product curves, constrained profit maximisation, Homogeneous and Non-Homogeneous production function, Cobb-Douglas and CES production function; returns to scale, derivation of cost curves, and equilibrium conditions for producers, adding up theorem.	14	20
Unit V	Market Structure and Prices: Market equilibrium under perfect competition, monopoly, price discrimination, monopolistic competition, prices, subsidies and taxes; Cobweb model.	14	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Mike Rosser, Basic Mathematics for Economists, Routledge Taylor and Francis Group, 29 west 35th street, New York, NY 10001.
- Suranjan Saha, Mathematics and Statistics [for C.A Professional Education (course)-I], New Central Book agency (P) Ltd, 9/1 Chintamani Das Lane, Kolkata 700009.
- Frank Werner and Yuri N. Sotskov, Mathematics of Economics and Business, Routledge, 270 Madison Ave, New York, NY 10016.
- GS Monga, Mathematics and Statistics for Economics, Vikas Publication.
- Mehta and Madnani, Mathematics for economists, Sultan Chand and Sons.
- Taro Yamane, Mathematics for economist, Prentice-Hall of India

SEMESTER V (Honours)
OPTIONAL - I
ECO-503 (c): ECONOMETRIC METHODS

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Introduction to Econometrics: Origin, definition, objectives and scope of econometrics, limitations of econometrics, Methodology of econometric research, specification and estimation of an econometric model.	17	20
Unit II	Estimation and Regression Analysis: Basic concept of estimation, desirable properties of estimators, unbiasedness, efficiency, consistency and sufficiency. Correlation and regression, coefficient of determination, estimation of an equation.	17	20
Unit III	Theoretical Distribution and Hypothesis Testing: Theoretical frequency distribution, basic concept of binomial, Poisson and normal distribution. Hypothesis testing-Design and evaluation of test: Type-I and type-II errors, standard errors.	17	20
Unit IV	Estimation theory and problems: Ordinary Least Squares (OLS) method-assumption, Gauss-Markov theorem standard errors of estimates. Testing of regression coefficient; coefficient of determination-test; problems of heteroscedasticity and correlation (1 st order); multicollinearity—their consequences, test and remedies.	17	20
Unit V	Lag models and summary variables: Lag in econometric models-concepts, Koyck model, partial adjustments and adaptive expectation models. Summary variable; Qualitative data, seasonal analysis, use of dummy variables for pooled data, posey variable-concept and uses.	17	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Green, W, (1997), Econometric Analysis, prentice Hall, New York
- Griffith, W.F., R.H. Hill and G.G. judge (1993), Learning and practicing Econometrics, John Wiley, New York.
- Gujarati, D. (1995), Basic Econometrics, (3rd Edition), MacGraw Hill, New Delhi
- Johnston, J. (1985), Econometric Methods, McGraw Hill, New York.
- Johnston, J. And J.D. Nardo (1997), Econometric Methods, McGraw Hill, New York
- Kmenta, J. (1997), Elements of Econometrics, (2nd Edition), The Macmillan Press Ltd., Hampshire
- Maddala, G.S. (1993), Econometrics-An Introduction, McGraw Hill, New York.

SEMESTER V (Honours)
OPTIONAL - I
ECO-503 (d): INDUSTRIAL ECONOMICS

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Introduction, Efficiency and Organisation: Concept and Scope of Industrial economics; Industrial Efficiency-concepts and measurement; Organisational forms and their motives.	13	20
Unit II	Cost theory, Pricing and Profitability: Theory of cost and production; Pricing decisions; Profitability-concept and measurement; labour productivity.	13	20
Unit III	Industrial Finance, Accounting and Industrial location: Types, sources and choice of finance, role and functions of financial institutions; balance sheet, profit and loss account; Industrial location-determinants and approaches.	14	20
Unit IV	Industrial growth in India: Industrial policies, industrial licensing policies, patterns and trends of industrial growth; Cottage and small industries; Public and Private industries.	14	20
Unit V	Issues regarding Indian Industries: FDI, WTO, MNCs and Indian industries; some large industries (Iron and Steel, Sugar, Jute)	14	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Barthwal, R.R. (1992), Industrial Economics; An Introductory Text Book, Wiley Eastern Ltd, New Delhi.
- Singh, A and A.N Sadhu (1998), Industrial Economics, Himalaya Publishing House.
- Devine, P. J et.al (1978) An introduction to Industrial Economics (3rd. edition), George Allen and Unwin, London.
- Kuchal, S.C (1980,) Industrial Economy of India (5th, edition) Chaitanya Publishing House, Allahabad.
- Reserve Bank of India, Report on currency and finance (Annual) Mumbai
- Kenneth, D George, Caroline Joll and E.L. Lynk (1991), Industrial organization: Competition, Growth and structural change (4th. Edition) Routledge, New York.

SEMESTER VI (Honours)
OPTIONAL - I
EC0-603 (a): DEMOGRAPHY

Total Marks: 100
Credit : 5

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Introduction: Population study; its relation with other disciplines; Theories of population-Malthus, Optimum Theory, Demographic transition; historical evidence of population growth in developed and developing countries.	17	20
Unit II	Sources of demographic data and census: Definition, features, organising census and enumeration methods. Sources of demographic data in India. Census-civil registration system and demographic surveys.	17	20
Unit III	Study of fertility and technique of analysis: Meaning- crude birth rate, age, specific fertility rate, total fertility, relation between total fertility and fertility rate and crude birth rate and death rate, age specific birth and death rates. Techniques of analysis of crude birth and death rates, age specific birth and death rates, standardized birth and death rates.	17	20
Unit IV	Marital status, population and growth Definitions, crude marriage, relation between marital age and fertility age. Meaning and uses of life tables. Concept of stationary, stable and quasi stable population. Techniques of population projection and common measures of growth.	17	20
Unit V	Migration and population policy: Kinds of migration, estimation of migration rate. Reproductive and child health in India, aging of population, evaluation of population policy in India. Composition and trends of population in Nagaland.	17	20
	Total Contact Hours and Marks	85	100

Basic Reading List:

- Agarwal, S.N. (1985), India's Population Problems, Tata McGraw Hill, Bombay.
- Agarwal U.D. (1999), Population projections, and Their Accuracy, B.R. Publishing Corporation, New Delhi.
- Census Reports, Government of India, Various Issues.
- Gulati, S.C.(1988), Fertility in India: An Econometric Analysis of a Metropolis, Sage Publications, New Delhi.
- Mishra, B.D. (1980), An Introduction to Study of Population, South Asian Publishers, New Delhi.
- Srinivasan, K. (1998), Basic Demographic Techniques and Applications, Sage Publications, New Delhi.

SEMESTER VI (Honours)
Optional –II
Eco-603 (b): FINANCIAL INSTITUTIONS AND MARKETS

Total Marks: 100

Credit: 5

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Financial system: Structure, role and functions. Growth of the Indian Financial System since 1960. Review of the recent Financial and Banking Sectors reforms and its impact.	15	20
Unit II	Banks and Non-Banks: Commercial Banks- Functions and Role. Credit Creation and its limiting factors. Bank Nationalization-rational and review. Definition and Types of Non-Bank Financial Institutions-Role and Functions. Development Banks-Role and Functions. Distinction between Banks and Non-Banks Financial Institutions.	20	20
Unit III	Central Bank: Functions and Role in Developed and Developing Economics. Goals, Target and Constraints of Monetary policy. Instruments of Monetary Regulation.	15	20
Unit IV	Financial Markets: Regulated and Unregulated credit markets. Capital and Money market. Features of Developed and Undeveloped money and capital market with special reference to India.	15	20
Unit V	Foreign Exchange Markets: Nature, organization and participants. Exchange Rates-Determination, types and system. Determination of exchange rates under fixed and flexible exchange rate regimes. Role of hedging in the determination of exchange rates.	20	20
Total Contact Hours and Marks		85	100

Basic Reading List:

- Bhole, L.M. (2000), Indian Financial System, Chugh Publication, Allahabad.
- Datt, R and K.P.M Sunderam, Indian Economy, S. Chand and Company Ltd, New Delhi.
- Gupta, S.B. (1983), Monetary Economics, S. Chand and Company Ltd, New Delhi.
- Gupta, S.B. (1995), Monetary Economics, Institutions, Theory and Policy, S. Chand and Company Ltd, New Delhi.
- Mitra, S. (1970), Money and Banking, Random House, New York.
- Misra, S.K and V.K Puri, Indian Economy- Its Development and Experience, Himalaya Publishing House, Mumbai.
- Uppal, R.K. (2011). Money, Banking and Finance in India. *Evolution and Present Structure*, New Century Publications, New Delhi.

SEMESTER VI (Honours)
OPTIONAL - I
ECO-603 (c): HISTORY OF ECONOMIC THOUGHT

Total Marks: 100

Credit: 5

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Early Period: History of economic thought and economic history. Methodological approaches to economic thought, importance of history of economic thoughts. Contributions of Plato and Aristotle.	17	20
Unit II	Mercantilism and Physiocracy : Factors responsible for the rise of Mercantilism and their main ideas. Contribution Hume and Cantillon. Factors responsible for the rise of Physiocracy. Contribution of Turgot and Quesnay	17	20
Unit III	Classical Period Features of classical economics- Adam Smith on value and economic growth, Ricardo on distribution and economic growth, Malthus theory of population and economic growth.	17	20
Unit IV	New Classical: Wicksell on General theory of capital. Marshall on value and Distribution. Weiser on theory of alternative costs and imputation	17	20
Unit V	Modern Economics: Keynes General theory of employment, interest and money; Friedman on money and consumption; Schumpeter on the role of entrepreneur and innovation.	17	20
Total Contact Hours and Marks		85	100

References

- Blaug, M (1997), Economic Theory in Retrospect A history of thought from Adam Smith to J.M Keynes,(5th.Edition) , Cambridge University Press, Cambridge.
- Blackhouse, R(1985), A History of Modern Economic Analysis, Basil Blackwell Oxford.
- Schumpeter, J.A. (1954), History of Economic Analysis, Oxford University Press, Oxford
- Grey, A and A.E.Thompson (1980), The Development of Economic Doctrine,(2nd. Edition), Longman Group, London.
- R.R Paul (1979), History of Economic Thought, Kalyani Publishers, Ludhiana, New Delhi.

SEMESTER VI (Honours)
OPTIONAL - I
ECO-603 (d): REGIONAL ECONOMICS

Total Marks: 100
Credit: 5

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Concepts and Location of Firms: Concepts of Region and Regional Economics, Regional Income, Problem of Estimation. Indicators of Regional Development. One Market One Input Case, Hotelling Phenomena.	15	20
Unit II	Spatial Economic Models: Price equilibrium in geographically separated and interlinked markets. Models of Pricing Under Free Entry, Spatial Monopoly and Price Discrimination. Spatial Monopolistic Competition, Inter Regional Income Models, Inter Regional Factor Movements, Regional Multiplier.	20	20
Unit III	Regional growth models: Neo-classical growth models- cumulative causation, Center-Periphery models. Growth pole analysis, convergence and divergence of disparities in per capital regional income.	15	20
Unit IV	Techniques of Regional Analysis: Techniques of Regional Analysis, regional and interregional input-output analysis, Attraction model; Gravity model; shift- share analysis, Impact studies.	10	20
Unit V	Regional Policy: People prosperity versus place prosperity; Formulation of interregional objectives, consistency between national and regional objectives; Alternate regional policy measures; historical evidence; regional policy in India and Intra regional differences in North-Eastern Region of India (NER)	25	20
	Total Contact Hours and Marks	85	100

Basic Reading List:

- Brahmananda, P.R and V.R. Panchmukhi (Eds)(2001), Development Experience in the Indian Economy: Inter-State Perspective, Bookwell, New Delhi.
- Chand, M. And V.K.Puri (1983), Regional planning in India, Allied Publishers, New Delhi.
- Hoover, E.M. (1974), An Introduction to Regional Economics, Alfred A. Knof, New York.
- Rao.Hanumantha (1984), Regional Disparities and Development in India, Ashish Publishing House, New Delhi.
- Seth, V.K (1987), Industrialisation in India: A Spatial Perspective, Commonwealth Publishers, New Delhi.
- Siebert, H (1969), Regional Economic Growth: Theory and Policy, International Textbook Company, Scranton.

SEMESTER VI (Honours)
OPTIONAL - I
ECO-603 (e): PROJECT

Total Marks: 100
Credit: 5

Objective: To let the students get familiarize with the empirical aspects of the subject and develop research aptitude.

	Steps	WEIGHTAGE
Step I	Formulation of project work (theory) Identification of problems, objectives and hypothesis of study, analysis, report writing and presentation	
Step II	Data collection Primary (Field survey) and secondary data collection	
Step III	Data Analysis	
Step IV	Report writing	75
Step V	Presentation	25
	Total Marks	100

Syllabus of
BA Honours Course
in
Education
for 2018-19 Session

NAGALAND UNIVERSITY
Department of Education, Kohima Campus: Meriema
EDUCATION SYLABI FOR BA HONOURS AND GENERAL 2012

General information:

1. All papers are of 100 marks: External Examination 70 marks and Internal Assessment: 30 marks
2. For Internal Assessment: Programs/activities such as assignments, class tests and group activity in terms of seminars/debate/quiz may be taken up. At least two programs/activities shall be mandatory.
3. There will be fourteen papers in all for honours and six for pass/general students. Each paper will comprise of five units. Each unit will be of 14 marks (14x5 units = 70 marks). Out of the 70 marks, 45 marks shall be for descriptive questions and 25 for objective type/short descriptive questions in case of general course.
4. For General papers the teacher will be required to set 5 essay type questions of 9 marks each with internal option (9x5=45), 1 short answer question of 3 marks each one from each unit (3x5) and two extra questions from any unit (total 7 questions) and 10 multiple type questions of 1 mark each (1x10) two from each unit ie., (9+3+2=14 marks per unit).
5. For Honours there should be 5 essay type questions with internal options (14 x5=70)
6. Care should be taken to see to it that every unit is covered whether it is in the essay type or short questions.
7. Honours students may opt for a Project work of 100 marks in the sixth semester in lieu of one paper ie., 604 or 605.
8. Credits: Every paper has a value of 4 credits each for electives and Honours except in the 6th semester where the last optional paper or project work is of 5 credits as illustrated below.

List of papers for BA in Education (General & Honours) spread over six semesters:

Course No & Code	Course title	Contact hour/no of lectures	Weightage marks	credits
Semester 1			14x5=70	
Gen/Hons BA/EDN-101	Psychological bases of education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
2.Hons BA/EDN- 102	Pedagogy	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester II			14x5=70	
Gen/Hons BA/EDN-201	Sociological Foundations of Education	4 hours per week x17 weeks/semester	14 marks per unit	4x1
Hons - BA/EDN-202	Educational Management	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester III			14x5=70	
Gen/Hons BA/EDN-301	Development of Education in	4 hours per week x 17	14 marks per unit	4x1

	India –	weeks/semester		
Hons BA/EDN-302 (optional)	- Trends & Issues in Indian Education or Structure	4 hours per week x17 weeks/semester	14 marks per unit	4x1
Hons BA EDN-303 (optional)	Issues of Education in Contemporary India	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester IV			14x5=70	
Gen/Hons BA/EDN-401	Philosophical Foundations of Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN-402	Educational Measurement & Evaluation	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester V			14x5=70	
Gen/Hons BA/EDN-501	Education in Modern India	4 hours per week x17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN-502	Statistics in Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
BA/EDN- 503 or	Educational Thoughts & Practices or	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
BA/EDN-504	Peace & Human Rights Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester VI			14x5=70	
Gen/Hons BA/EDN-601	Educational Technology	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN 602 or	Guidance and Counseling in Education or	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN 603	Inclusive Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN-604 or (optional)	Curriculum Development & Construction or	4 hours per week x 17 weeks/semester	14 marks per unit	5x1
Hons BA/EDN- 605	Education in the Northeast India	4 hours per week x 17 weeks/semester	14 marks per unit	5x1
Project work in lieu of 604 or 605 in 6 th semester.	Project work on any relevant topic	4 hours per week x 17 weeks/semester	100	5x1

COURSE CODE – BA/EDU -101
SEMESTER I
PSYCHOLOGICAL BASES OF EDUCATION

Course Objectives

1. To enable the students to understand the meaning and concept of Psychology.
2. To enable them to understand the dimensions of Growth and Development.
3. To familiarize students with knowledge of Learning and Motivation.
4. To acquaint them with the knowledge of Intelligence and Creativity.
5. To enable them to understand the different aspects of personality and means of developing an integrated personality.

Course Contents

- UNIT I Concept of Educational Psychology**
a. Concept of Psychology and Educational Psychology
b. Methods of Educational Psychology - Experimental, Differential & Clinical
c. Application of Educational Psychology in teaching-learning process.
- UNIT II Meaning of Growth and Development**
a. Principles of Development
b. Stages of Development with special reference to adolescence period – physical, social, emotional and intellectual
c. Concept of individual difference – aptitude, interest and attention
- UNIT III Intelligence and Creativity: Concept and Theories**
a. Meaning and Characteristics of Intelligence and Creativity
b. Concept of IQ & Factors of Creativity
c. Theories of Intelligence- Two factor theory, Group Factor Theory and Structure of Intellect (SoI)
- UNIT IV Theories of learning**
a. Meaning and Nature of Learning
b. Factors affecting Learning.
c. Theories of Learning- Trial and Error, Insightful Learning, Transfer of Learning.
- UNIT V Personality and its nature, determinants and approaches**
a. Meaning and Nature of Personality.
b. Determinants of Personality Development (Home & School).
c. Type and Trait approaches of Personality (Jung and Cattell).
d. Freud's theory of Personality.

Suggested Readings

1. Educational Psychology – S.K.Mangal, Prakash Brothers Educational Publishers.
2. Advanced Educational Psychology- S.S.Chauhan, Vikas Publishing House.
3. Essentials of Educational Psychology- J.C.Aggarwal, Vikas Publishing House.

COURSE CODE – BA/EDU- 102
SEMESTER I

PEDAGOGY

Course Objectives

1. To initiate the concept of Pedagogy and familiarize with the educational process.
2. To develop the ability to analyze classroom teaching-learning and the ability to observe classroom behavior.
3. To develop a positive attitude towards life and the teaching profession.

Course Contents

UNIT I Conceptual background on Pedagogy

- a. Concept & meaning of pedagogy
- b. Definition, nature & characteristics of teaching
- c. Relationship between teaching and learning

UNIT II General principles of Teaching

- a. General principles of teaching
- b. Factors affecting teaching: Input and Output Variables.
- c. Characteristics of a good teacher

UNIT III Classroom Teaching

- a. Observation of classroom behaviour
- b. Flanders Interaction Analysis
- c. Concept & difference between traditional, macro & micro Teaching.

UNIT IV Teaching Methods and Skills

- a. Teaching Methods- Lecture, demonstration, problem solving, programme instruction and Story telling
- b. Teaching skills – use of blackboard, introducing a lesson, stimulus variation, probing questions, reinforcement

UNIT V Functions of a Teacher

- a. Functions of a teacher as a
 - Planner
 - Facilitator
 - Counselor
 - Researcher

Suggested Readings

1. Essentials of Educational Technology: Teaching learning, Innovation in Education – J.C.Agarwal, Delhi Vikas Publishing House Pvt. Ltd.
2. Technology of Teaching – N.R. Swarup Saxena, Surya Publications, Meerut-250001.

COURSE CODE-BA/EDU-201
SEMESTER-II

SOCIOLOGICAL FOUNDATIONS OF EDUCATION

Course Objectives

1. To develop an understanding of the role of sociology in education
2. To acquaint with the sociological foundations of education
3. To understand the role of education in relation to social change, social interaction and culture
4. To understand and appreciate the role of community in resolving social issues and educational inequalities

Course Contents

UNIT-I Introduction

- a. Meaning of Educational Sociology & Sociology of Education
- b. Relationship between Sociology and Education
- c. Sociological determinants of education

UNIT-II Social Change

- a. Meaning of social change.
- b. Factors affecting social change (Political, Educational and Technological)
- c. Education as an instrument of social change.

UNIT-III Education and Social Group

- a. Primary and Secondary groups
- b. Social interaction and its educational implications
- c. Concept & forms of social stratification

UNIT-IV Education and Culture

- a. Concept & components of culture
- b. Role of education in preservation and transmission of culture
- c. Cultural heritage of India with special reference to Nagaland

UNIT-V Current Social Problems in India with special reference to North-East

- a. Equalization of educational opportunities
- b. Role of community in solving social problems in the field of education
- c. Concept of Communitization of elementary education in Nagaland

Suggested Readings

1. C. N Shankar Rao. Sociology. 1995. S Chand & Company Ltd. New Delhi
2. S.S Mathur. Sociological Approach to Indian education.
3. S.S Chandra.2002. Sociological Foundation of Education.
4. N.R Saxena. Philosophical & Sociological Foundations of Education.
5. Yogendra K Sharma. Sociological Philosophy of Education.

COURSE CODE-BA/EDU-202
SEMESTER-II

EDUCATIONAL MANAGEMENT

Course Objectives

1. To develop knowledge and understanding of the nature, scope, process and types of management.
2. To develop the ability to identify the roles of participating members (individual or collective) and to plan various institutionalized managerial activities.
3. To enhance the ability of decision making in educational management.

Course Contents

UNIT I Educational Management

- a. Meaning, nature, scope and need
- b. Types of Educational Management - Centralized and Decentralized, Authoritative/Autocratic and Democratic, Dynamic/Creative and Laissez faire

UNIT II Personnel Management

- a. Meaning of Management
- b. Leadership – meaning & nature, effective leadership
- c. Factors affecting managerial behavior - Personal, Social, Cultural, Political, Institutional

UNIT III Management of Teaching-Learning Process

- a. Concept of teaching-learning process
- b. Steps of managing teaching-learning (planning, organizing, leading, and controlling)
- c. Teacher as a manager

UNIT IV Institutional Planning & Management

- a. Institutional planning – concept, need & importance
- b. Curricular and Co-curricular programs, timetable
- c. School Plant including - equipments and assets
- d. Institutional climate and discipline

UNIT V Educational Planning

- a. Meaning, need & significance
- b. Types & strategies of educational planning
- c. Steps in educational planning

Suggested Readings

1. J. C Agarwal. Educational Administration and Management
2. R.N Sharma. Educational Administration and Management.

COURSE CODE-BA/EDU-301
SEMESTER-III

DEVELOPMENT OF EDUCATION IN INDIA

Course Objectives

1. To understand the historical development of education in India
2. To understand the salient features of ancient & medieval education
2. To acquaint with the genesis of the Modern Indian Education

Course Contents

- UNIT-I Ancient India**
a. Vedic Education: aims, curriculum and organization of education.
b. Buddhist Education: aims, curriculum and organization.
- UNIT-II Medieval India**
a. Islamic Education: its salient features, objectives and curriculum.
b. State patronage in education.
- UNIT-III Education in British India**
a. Contributions of Christian Missionaries for the development of education in India.
b. Significance of Charter Act of 1813.
- UNIT-IV Growth of Modern System of Education**
a. Macaulay's Minutes, 1835.
b. Wood's Despatch, 1854.
c. Hunter Commission, 1882.
- UNIT-V Movement for Compulsory Education in India**
a. Gokhale's Bill, 1910.
b. Calcutta University Commission, 1917.
c. Hartog Committee Report, 1929.
d. Basic Education, 1937.

Suggested Readings

1. J.C Agarwal. Landmarks in the History of Modern Indian Education.
2. Lal and Sinha. Development of Indian Education and its Problem.
3. S.P. Chaube. History and Development of Indian Education.
4. J.C. Agarwal. Landmark in the History of Modern Indian education

COURSE CODE-BA/EDU-302
SEMESTER-III

TRENDS & ISSUES OF CONTEMPORARY INDIAN EDUCATION

Course Objectives

1. To develop understanding of significant trends and issues in contemporary education
2. To focus on certain major national and social issues and the role of education in relation to them
3. To develop understanding of alternative systems of education

Course Contents

UNIT I Continuing Education

- a. Concept of Adult, Continuing and Lifelong Education
- b. Efforts on Adult Education/Literacy- NAEP, NLM & Sakshar Bharat
- c. General/ Liberal Education through open learning system
- d. Technical/Vocational Education

UNIT II Population Education

- a. Significance, need & objectives of Population Education
- b. Problems of Population Education
- c. Relation between Population Education & Sex Education
- d. National Population Policy 2000

UNIT III Education of Women and Girls

- a. Concept and need of prioritizing education for women & girls
- b. Promoting gender equality
- c. Schemes of the Government of India for promoting girls' education
- d. Problems and remedial measures

UNIT IV Value Education

- a. Meaning & significance of Value Education
- b. Modern & Traditional Values
- c. Role of education in inculcation of values
- d. Programs/methods for development of value

UNIT V Open & Distance Education

- a. Concept, need and scope of distance education
- b. Modes of DE – correspondence education & open learning system
- c. Merits & limitations of Open & Distance Education

Suggested Readings

1. S.K Kochhar. Pivotal Issues in Indian Education.
2. J.C Aggarwal. Education in India. Policies, Programmes & Development.
3. R.P. Pathak. History, Development & Contemporary Problems of Indian Education.

COURSE CODE-BA/EDU-303
SEMESTER-III

STRUCTURE & ISSUES OF COMTEMPORARY EDUCATION IN INDIA

Course Objectives

1. to understand the structure education in contemporary India.
2. to develop understanding of the objectives & aims at various level of education
3. to provide information on the important regulatory institution/bodies and their role in education.

Course Contents

UNIT I Early Childhood Care & Education

- a. Concept, need & relevance of ECCE in the context of universalization of elementary education (UEE)
- b. ECCE & District Primary Education Program
- c. Challenges & priority task

UNIT II Elementary Education

- a. Aims & objectives
- b. Concept of UEE
- c. Promotion of UEE through Sarva Shiksha Abhiyan (SSA)
Right to Education Act 2009
- d. Concept of Continuous Comprehensive Evaluation (CCE)

UNIT III Secondary Education

- a. Aims & objectives
- b. Vocationalization of secondary education
- c. Universalization of secondary education and the role of Rashtriya Madhyamik Shiksha Abhiyan (RMSA)
- d. Problems and remedial measures

UNIT IV Higher Education

- a. Aims & objectives
- b. Types of universities
- c. Quality control of higher education and National Accreditation and Assessment Council (NAAC)
- d. Autonomy & accountability in higher education

UNIT V Regulatory and Training Institution/Bodies

- a. NCERT, SCERT, National Council of Teacher Education (NCTE), College of Teacher Education (CTE), District Institute of Education & Training (DIET)
- b. UGC, AICTE, ICSSR & CSIR

Suggested Readings

1. J.C. Agarwal. Development and Planning of Modern Education.
2. J.C Aggarwal. Education in India. Policies, Programmes & Development.
3. R.S. Pandey. Development of Indian System of Education.
4. Ministry of Education. New Delhi. Challenges of Education: A Policy Perspective 1985.

COURSE CODE-BA/EDU-401
SEMESTER-IV

PHILOSOPHICAL FOUNDATIONS OF EDUCATION

Course Objectives

1. To understand the meaning, aims and function of education
2. To develop an understanding of the role of major schools of philosophy in education
3. To acquaint with the philosophical foundations of education.

Course Contents

UNIT-I Introduction

- a. Meaning of Educational Philosophy
- b. Relationship between Philosophy and Education
- c. Aims of education: Individual, Social, Vocational

UNIT-II Functions of Education

- a. Self-actualization
- b. Human Resource Development
- c. National integration and International understanding

UNIT-III Some Major Schools of Philosophy

- a. Idealism, Naturalism and Pragmatism
- b. Their contributions to present day education towards aims, curriculum, methods of teaching and discipline

UNIT-IV Development of Values

- a. Meaning of values
- b. Classification of values (Social, Moral and Aesthetic)
- c. Strategies for inculcation of values through co-curricular and extra-curricular activities in schools and colleges

UNIT-V Freedom and Discipline

- a. Meaning of Freedom and Discipline
- b. Types of discipline
- c. Importance of discipline in social life

Suggested Readings

1. B.N Dash- Principles of Education and Education in the Emerging Indian Society. Ajanta Prakashan, 2768, Gali Samaj Bazar Sita Ram, Delhi-110006.
2. V. R Taneja. Educational Thought & Practices.
3. A.S Thakur. The Philosophical Foundations of Education.

COURSE CODE-BA/EDU-402
SEMESTER-IV

EDUCATIONAL MEASUREMENT & EVALUATION

Course Objectives

1. To develop understanding of the concepts of measurement and evaluation in the field of education
2. To acquaint with different types of measuring instruments and their uses
3. To acquaint with the principals of test construction both educational and psychological
4. To develop understanding of a good measuring instrument and their importance in educational measurement

Course Contents

Unit I Educational Measurement and Evaluation

- a. Meaning & nature of educational measurement
- b. Need for measurement in education
- c. Concept of evaluation in education
- d. Relation between measurement and evaluation

Unit II Tools used in Educational Measurement

- a. Measuring instrument and their classification
- b. Types of scales in educational measurement
- c. Norm referenced and criterions referenced test
- d. Types of Examination – Objective & Essay/Descriptive Type

Unit III Measuring instruments

- a. Characteristics of a good measuring instrument
Validity, Reliability, Objectivity

Unit IV Measurement of Attitude, Personality and Creativity

- a. Measurement of attitude (Likert), personality (Rorschach-Ink Blot), creativity (Baquer Medhi)

Unit V Test Construction and Standardization

- a. General principles of test construction and standardization
- b. Scoring of students achievement
- c. Reporting test results & cumulative record card

Suggested Readings

1. Marami Goswami, 2003. Measurement and Evaluation in Psychology and Education.
2. Bepin Asthana. Measurement and Evaluation in Psychology and Education.
3. S.M. Sungoh. Educational Evaluation & Testing.

COURSE CODE-BA/EDU-501
SEMESTER-V

EDUCATION IN MODERN INDIA

Course Objectives

1. To acquire adequate knowledge of the recommendations of various education commissions
2. To understand the issues and problems of education at various levels of education

Course Contents

- UNIT-I Development of Indian Education post Independence period with special reference to :**
- a. University Education Commission (1948-49)
 - b. Secondary Education Commission (1952-53).
 - c. Kothari Commission (1964-66).
- UNIT-II National Policy on Education (NPE 1986) and its revised formation 1992**
- UNIT III Educational Provisions**
- a. Constitutional provisions in relation to Education
 - b. Right to Education 2009
 - c. Provisions for education of the disabled children with special reference to the Integrated Education for Disabled Children
- UNIT-IV Studies on some national commissions relevant to education**
- a. National Knowledge Commission, 2006 (Sam Pitroda) with special reference to Higher Education
 - b. Salient Features of Yash Pal Committee Report.
- UNIT-V Studies on Regulatory Bodies and training Institutions, Literacy status and problems of education**
- a. Functions of University Grants Commission, National Council of Educational Research and Training, National Assessment and Accreditation Council
 - b. Literacy status of India and Nagaland
 - c. Problems of primary, secondary and higher education in the North-East with special reference to Nagaland.

Suggested Readings

1. S.P Chaube. History and Development of Indian Education
2. J. C Aggarwal. Landmark in the History of Modern Indian Education.
3. ---- Development & Planning of Modern Education
4. R.S Pandey. Development of Indian System of Education.
5. Ministry of Education, New Delhi. Challenges of Education. A Policy Perspective 1985.

COURSE CODE-BA/EDU-502
SEMESTER-V

STATISTICS IN EDUCATION

Course Objectives

1. To develop the ability to use various statistics measures in analysis and interpretation of educational data.
2. To develop the ability to organize relevant educational data
3. To develop the ability to represent educational data graphs and to develop the skill in analyzing different descriptive measures.

Course Contents

Unit I - Introduction to Educational Statistics

- a. Meaning, nature, scope & use of educational statistics
- b. Sources of educational data and use of educational statistics
- c. Importance of statistics in education

Unit II Central Tendencies & Variability

- a. Measures of central tendencies – mean, median and mode
- b. Measures of variability – Standard Deviation

Unit III Normal Probability

- a. Concept of normal probability
- b. Properties and uses of normal probability curve in interpretation of test scores
- c. Divergence from normality- skewness & kurtosis

Unit IV Measures of Correlation

- a. Concept and kinds of correlation
- b. Computation of coefficient of correlation by rank difference & product moment method

Unit V Representation of Data

- a. Concept of variable
- b. Types of data – grouped and ungrouped
- c. Graphical presentation of data – pie diagram, histogram, frequency polygon
- d. Cumulative frequency, graph - ogive and its uses
- e. Application of computer in data processing

Suggested Readings

1. Garrett H.E. Woodworth R.S. 1979. Statistics in Psychology and Education.
2. Kothari C. R. 2005. Research Methodology.
3. Best John W., and Kahn, James V.1986. Research in Education
4. S.K. Mangal. Statistics in Psychology and Education.

COURSE CODE-BA/EDU-503
SEMESTER-V

EDUCATIONAL THOUGHTS & PRACTICES

Course Objectives

1. To develop an understanding of educational ideas of Indian and western educators
2. To obtain knowledge of pedagogical concepts given by various educators
3. To understand and appreciate scientific approach to the study of some educational problems

Course Contents

Unit I Contributions of some prominent Indian Philosophers to Education

- a. Critical study of the contribution of Acharya Vinobha Bhave to the field of education
- b. Mahatma Gandhi's contribution to the field of education

Unit II Educational Thought and practice

- a. Rabindranath Tagore's idea on education with special reference to *Shantiniketan/Vishva Bharti University*
- b. Contribution of Radhakrishnan to the field of higher education

Unit III Ideas on education of some western philosophers

- a. Educational thoughts of Bertrand Russell
- b. John Dewey's idea on education with special reference to project method

Unit IV Contributions of some Western Thinkers to Education

Educational Philosophy of JJ Rousseau

Contribution of Paulo Freire to the field of education of the oppressed

Unit V Views and ideas of some prominent Ancient Greek philosophers on Education

- a. Views and ideas of Socrates and Plato on education

Suggested Readings

1. V. R Taneja. 2005. Educational Thought and Practice.
2. A Biswas and J.C Aggarwal. Seven Indian Educationists
3. S. P. Chaube. Some Great Western Educators.

COURSE CODE-BA/EDU- 504
SEMESTER-V
PEACE & HUMAN RIGHTS EDUCATION

Course Objectives

1. To understand the need and significance of peace education in conflict ridden society
2. To acquaint of the dimension of peace education and the efforts made by the various commissions/committees on peace & human rights
3. To learn to live in peace & harmony with others
4. Enforcement agencies & organizations on peace & human rights

Course Contents

UNIT 1 Concept, objectives & dimensions of peace education

- a. Concept of peace education
- b. Aims and objectives
- c. Dimensions of peace education

UNIT II Learning to Live Together

- a. Concept of learning to live together
- b. Characteristics of learning to live together
- c. Learning to live together in schools

UNIT III Commissions & Committees on Peace Education

- a. Delor's Commission 1996
- b. UNESCO's Conference for Peace & International Understanding, Tokyo 1999
- c. Global Campaign for Peace Education 1999

UNIT IV Concept of Human Rights

- a. Universal Declaration of Human Rights 1948
- b. Fundamental rights and fundamental duties under Indian Constitution
- c. Directive Principles of State Policy

UNIT V Enforcement Agencies of Human Rights Education

- a. Role of National Human Rights Commission & State Human Rights Commission and Judiciary
- b. Role of Civil Society Organizations
- c. Mass Media - print & electronics

Suggested Readings

1. NCERT, Peace Education: Self Instructional Package for Teacher Education, NCERT, New Delhi 2004
2. NCERT, National Curriculum Framework, New Delhi 2005
3. NCERT, NCF 2005 Position Paper, National Focus Groups on Education for Peace, New Delhi 2006
4. Delor Jacques. Learning the Treasures Within. UNESCO Publishing, Paris 1996
5. Agarwal, H.D. Implementation of Human Rights Contents with special reference to India. D.K Publishers 1993
6. Bhalle, S.L. Human Rights: An Institutional Framework for Implementation. D.K. Publishers New Delhi 1993

COURSE CODE-BA/EDU-601
SEMESTER-VI

EDUCATIONAL TECHNOLOGY

Course Objectives

1. To understand the meaning, nature and scope of educational technology
2. Create an understanding of the application of basics of technology in the process of education
3. To familiarize with the technological advances made and to develop a positive attitude toward the use of ICT in the educational process.

Course Contents

UNIT I Educational Technology

- a. Meaning, nature and scope
- b. Types - Hardware and software

UNIT II Communication Process

- a. Meaning & nature
- b. Process & components
- c. Types of classroom communication
- d. Mass media approach in educational technology

UNIT III System Approach & Instructional System

- a. Systems Approach to instructional process
- b. Instructional system designing - concept, component, physical & human resources

UNIT IV Innovation in Educational Technology

- a. Programmed learning
- b. Micro and macro teaching
- c. Team teaching

UNIT V Personalized System of Instruction (PSI)

- a. Computerized Assisted Instruction
- b. Simulated Teaching
- c. Information Communication Technology (ICT) in distance education

Suggested Readings

1. R. A Sharma. Advanced Educational Technology.
2. J. Mohanty. Educational Technology.
3. S.K Mangal. Educational Technology.

COURSE CODE – BA/EDU- 602
SEMESTER VI

GUIDANCE & COUNSELLING IN EDUCATION

Course Objectives

1. To help in understanding the meaning and importance of guidance and counseling.
2. To develop the ability to interpret various records for assessing the students' strengths and weaknesses.
3. To acquaint the students to various approaches in organizing vocational guidance.
4. To help in understanding the importance of job analysis and occupational information services.

Course Contents

UNIT I Introduction to Guidance

- a. Concept of Guidance
- b. Meaning, nature and scope
- c. Principles of guidance
- d. Philosophical, psychological & social bases of guidance

UNIT 2 Educational Guidance

- a. Meaning, need and importance of educational guidance
- b. Principles of educational guidance
- c. Basic data necessary for educational guidance: Pupils' abilities, aptitudes, personality, interest and attitudes

UNIT 3 Vocational Guidance

- a. Meaning and objectives
- b. Vocational guidance at the secondary stage
- c. Job analysis & job satisfaction

UNIT 4 Concept of Counseling

- a. Meaning, nature, scope & types
- b. Various steps and techniques
- c. Relationship between guidance & counseling
- d. Important qualities of a good Counselor

UNIT 5 Career Counseling

- a. Meaning and importance
- b. Career counseling with college students, adults & women
- c. Various approaches in organizing career guidance & counseling - Career corner, career talk, career conference, simulated interview

Suggested Readings

1. Indira Madhukar. Guidance and Counselling . Authors Press Publishers of Scholarly Books, New Delhi.
2. Sitaram Jaiswal. Principles of Guidance and Counselling.
3. J.C.Aggarwal, Doaba. Educational Vocational Guidance and Counselling . House Booksellers & Publishers, 1688, Nai Sark, New Delhi-110006.
4. Rashmi Agarwal. Educational Vocational Guidance & Counselling: Principles, Techniques & Programmes. Shipra Publication, New Delhi-110092.

COURSE CODE-BA/EDU-603
SEMESTER-VI

INCLUSIVE EDUCATION

Course Objectives

1. To introduce the concept of Inclusive Education
2. To understand the different categories of children with special needs
3. To understand and appreciate the needs of such children in the society

Course Contents

UNIT I Introduction to Inclusive Education

- a. Concept and meaning of Inclusive Education
- b. Need and importance
- c. Objectives of Inclusive Education

UNIT II Children with special needs (CWSN)

- a. Types and characteristics of children with special needs (CWSN)
 - Visual and hearing impaired
 - Speech and language impaired
 - Orthopaedically challenged
 - Children with learning disabilities
 - Socially disadvantaged

UNIT III Policies and Programs of Inclusion

- People with Disabilities Act 1995-96
- Convention on the Rights of Children (CRC)
- National Commission for Protection of Child Rights

UNIT IV Techniques and Aids for the Education of Children with Special Needs

- a. Techniques and Aids for the Education of Children with Special Needs-
 - Visual and hearing impaired
 - Speech and language impaired
 - Orthopaedically challenged
 - Children with learning disabilities
 - Socially disadvantaged

UNIT V Role of Family and Community and NGOs

- a. Role of family & community in the nurturance of children with special needs
- b. Role of NGOs in providing for the CWSNs
- c. Inclusive Education under Sarva Shiksha Abhiyan (SSA)

Suggested Readings

1. Advani Lal & Chadha A.2003. You and Your Special Children.
2. Panda K. C. 1997. Education of the Exceptional Children.
3. S.K Mangal.2008. Educating of the Exceptional Children: An Introduction to Special Education

COURSE CODE – BA/EDU - 604
SEMESTER VI

CURRICULUM DEVOPMENT & CONSTRUCTION

Course Objectives

1. To understand the meaning, types and importance of Curriculum.
2. To understand the basics of Curriculum Construction, Transaction and Evaluation
3. To acquaint with the national policies on Curriculum

Course Contents

UNIT I Introduction

- a. Meaning, need and importance of curriculum
- b. Aims and objectives of curriculum and its relation to different domains of personality
- c. Determinants of curriculum
- d. Core curriculum and Co-curricular activities

UNIT 2 Curriculum Framework, Construction and Transaction

- a. Curriculum Framework at Different Levels of Education
- b. Principles of curriculum construction.
- c. Construction of a balanced curriculum.
- d. Process of curriculum transaction.

UNIT 3 Curriculum Development

- a. Its process – steps in curriculum development, mechanics and model of curriculum development
- b. Evaluation of Curriculum – meaning, need and aspects

UNIT 4 Types of Curriculum

- a. Traditional
- b. Activity
- c. Experience-centred.

UNIT 5 National Curriculum in India

- a. Reform in Curriculum (Indian Education Commission 1966)
- b. Salient features of the National Curriculum Framework 2005

Suggested Readings

1. Janardhan Prasad Vijay Kumari. Advanced Curriculum Construction. Kanishka Publishers & Distributors, 4697/5-21A, Ansari Road, Daryanganj New Delhi-110002.
2. Maitreya Bolsara. Principles of Curriculum Construction. Kanishka Publishers & Distributors, 4697/5-21A, Ansari Road, Daryanganj, New Delhi-110002.
3. R.K.Safaya & B.D.Shaida. Development of Educational Theory and Practice

COURSE CODE-BA/EDU-605
SEMESTER-VI

DEVELOPMENT OF EDUCATION IN NORTH-EAST OF INDIA

Course Objectives

1. To trace the growth and development of education in the North East of India
2. To understand some issues & problems of education - elementary, secondary and higher education in the North-East of India
3. To understand the status and types of teacher education in the NE
4. To acquaint with educational administration and management in the context of Nagaland

Course Contents

UNIT I **Education in the North East Indian Region**

- a. History of Education in N-E India
- b. A background of the region and its people
- c. Education in the Pre-Independence period
- d. Development of education in Independent India

UNIT II **Elementary Education in the North-East Region**

- e. Structure and pattern of elementary education
- f. Steps taken to achieve the target of universalization of elementary of education (UEE)
- g. Problems of elementary education

UNIT III **Secondary Education**

- h. Review of the development of secondary education in the North-East
- i. Problems of secondary education
- j. Vocationalization of secondary education

UNIT IV **Higher Education**

- k. Development of higher education in the North-East
- l. Technical education
- m. University education
- n. Issues of higher education in the North-East

UNIT V **Teacher Education and Educational Administration**

- o. Status of teacher education in the North-East
- p. Types of teacher education institutions
- q. Agencies for in-service education of teachers
- r. Educational administration and management with special reference to Nagaland

Suggested Readings

1. R.P Tiwari. Problems of Education in North East India. Vikas Brothers, Ludhiana.
2. North East India Education Society. North East Education. Journal of the North East India Education Society.
3. North East India Education Society. Proceedings of the Annual Conferences & Seminars.

Project work:

Honours students may undertake a Project Work of 100 marks on any educational topic in the VIth semester in lieu of the last theory paper (Paper No.604 or 605). The size of the project work should be substantial enough and the number of pages may be between 60-70 pages. Space of 1.5mm in between lines may be maintained and font size should be 14. For evaluation of project work out of 100 marks 70 are reserved for project report and 30 marks for presentation and viva voce. Project work shall be jointly evaluated by external and internal evaluator (70 for external and 30 for internal).

Syllabus of
BA Honours Course
in
English
for 2018-19 Session



Nagaland University
Department of English
Kohima Campus, Meriema

ENGLISH SYLLABI FOR BA / B.COM/BBA / B.SC./BCA& FUNCTIONAL ENGLISH 2012

General Guidelines:

1. All papers are of 100 marks for 3 hours : External exams 70 marks (pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5).
2. For Internal Assessment: 30 marks may be divided according to convenience into: Assignments: 10 marks; Group activity (debate/seminars etc): 10 marks; class tests:10 marks).
3. Only English Honours students will do Elective English papers.
4. Those who drop out of English Honours, their marks of Elective English papers will be taken in lieu of B.A. General English papers.
5. English Honours students do not take General English; Alternative English & Functional English.
6. English Honours students have to offer an additional Elective subject in lieu of General & Alt. English in the I, II, III, IV Semesters.

COURSE STRUCTURE FOR BA/BSc/BCA/BCom/GENERAL ENGLISH/ALTERNATIVE ENGLISH/FUNCTIONAL ENGLISH

Course /type of papers/credits assigned	First Year Course/Papers and credit value		Second Year Course/Papers and credit value		Third Year Course/Papers and credit value		Total Credit value
	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	
Other courses B B.Com/BBA	ENG(G)101 ENG(BCM/BBA)104 3 credits each	ENG(G)201 ENG(BCM/BBA)204 3 credits each	ALTE(BA)301 ALTE(BCM/BBA)304 3 credits each	ALTE(BA)401 ALTE(BCM/BBA)404 3 credits each			12
Other courses (Science)	ENG(BSC/BCA) 105 2 credits each	ENG(BSC/BCA) 205 credits each					4

COURSE STRUCTURE FOR ELECTIVE ENGLISH/HONOURS

Course /type of papers/credits assigned		First Year Course/Papers and credit value		Second Year Course/Papers and credit value		Third Year Course/Papers and credit value		Total Credit value
		I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	
English for Pass & Hons Courses	Elective Papers	ELENG 102 4 credits	ELENG 202 4 credits	ELENG 302 4 credits	ELENG 402 4 credits	ELENG 501 4 credits	ELENG 601/602/603/604 4 credits	24 credits
	English Honours Papers	ENG(H)103 4 credits	ENG(H)203 4 credits	ENG(H)303 4 credits	ENG(H)403 4 credits	ENG(H)502 4 credits ENG(H)503 4 credits	ENG(H)605 3 credits ENG(H)606/607/608/609 3 credits	30 credits
Total Credits		8	8	8	8	12	10	54

CREDIT DISTRIBUTION FOR FUNCTIONAL ENGLISH

Course /type of papers/credits assigned		First Year Course/Papers and credit value		Second Year Course/Papers and credit value		Third Year Course/Papers and credit value		Total Credit value
		I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	
Eng for Pass & Hons Courses	Elective papers	FUNENG 106 4 credits	FUNENG 206 4 credits	FUNENG 305 4 credits	FUNENG 405 4 credits	FUNENG 504 4 credits	FUNENG 610 4 credits	
Total Credits		4	4	4	4	4	4	24

COURSE CODES: ENG(G): General English ; ELENG: Elective English; ENG(BCM): B.Com English;
 ALTE(BCM); B.Com Alt. English; ENG(BSC/BCA): B.Sc/BCA English; FUNENG: Functional English

1. ENG(G)101 B.A. GENERAL ENGLISH PAPER I

POETRY, BASIC ENGLISH USAGE & LANGUAGE SKILLS

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FIRST SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the students to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value / moral in the literary writings, and to teach and revise remedial grammar/ structural approach to language learning and skills of composition, compilation and communication.

Unit I: Poetry - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. John Donne : Song: Sweet Love, I do not Goe
2. John Milton : On His Blindness
3. Alexander Pope: Extract from An Essay on Man

Unit II: Poetry – 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. William Wordsworth : The Solitary Reaper
2. S.T. Coleridge: Youth and Age
3. John Keats : To Autumn

Unit III: Poetry – 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Tennyson : Lotus Eaters
2. Browning : My Last Duchess
3. Arnold : Dover Beach

Unit IV: Grammar and Usages – 14 marks: (Objective questions for 14 marks)

1. Verbs: Auxiliaries and Modals, Person and Number, infinitive and participle, subject verb agreement.
2. Tenses
3. Transformation of Sentences
4. Preposition: Simple, Compound & Phrase
5. Adjective –possessive & definite
6. Adverbs

Unit V: Language Skills – 14 marks: 1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Letter/ Application writing along with a CV /Business Communications
2. Assignment Writing: Assignments and term papers; scholarly style of writing; writing assignments and term papers; making notes and working bibliography; footnotes/end notes.

Recommended Books:

NU Anthology of Poetry, Published by Macmillan 2012.

E.Albert, *History of English Literature*, OUP.

G.C Thornley & Gwyneth Roberts, *An Outline of English Literature*, Orient Longman, 1991.

Wood, F.T, *A Remedial English Grammar for Foreign Students*, Macmillan.

Thomson & Martin, *Practical English Grammar*, OUP.

C.A. Shepherd & David Reid Thomas, *Grammar and Composition*, Orient Longman, 1977.

Vandana R.Singh. *The Written Word*. New Delhi: OUP, 2007.

R.K. Madhukar. *Business Communication*. New Delhi: Vikas Publishing House, 2005.

Liz Hamp-Lyons & Ben Heasley. *Study Writing: A Course in Writing Skills for Academic Purposes*. New Delhi: Cambridge University Press: 2006.

Geetha Nagaraj. *Write to Communicate*. New Delhi: Cambridge University Press (Foundation Books), 2009.

Dhanavel, S.P. *English and Soft Skills*. Hyderabad: Orient Blackswan, 2010.

Suresh Kumar, E & P. Sreehari. *Communicative English*. Hyderabad: Orient Blackswan, 2007.

Das, Bikram K. *Functional Grammar & Spoken and Written Communication in English*. Hyderabad: Orient Longman, 2010.

Synergy: Communication in English and Study Skills. Hyderabad: Orient Blackswan.

Joseph Gibaldi. *MLA Handbook for Writers of Research Papers*. Sixth edition. Delhi: First East- West Press Edition, 2004.

+++++

2. ENG(G)201 B.A. GENERAL ENGLISH PAPER II DRAMA, PROSE & LANGUAGE SKILLS

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SECOND SEMESTER

3 credits

Descriptive & objective/short answer type questions as indicated : 70 marks

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the students to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works, interpret the didactic value / moral in the literary writings, teach and revise remedial grammar/ structural approach to language learning and to teach theory and practice of creative writing, essay writing etc.

Unit I: Drama – 14 marks : 1 questions of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Shakespeare : *Twelfth Night*

Unit II: Prose- 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. C.F. Lamb : Albert Schweitzer
2. E.R. Braithwaite : Job Hunting
3. George Orwell : Shooting an Elephant
4. Marcel Jusod : The First Atom Bomb

Unit III: Language Skills - 14 marks : 1 question of 14 marks

1. Comprehension

Unit IV: Language Skills – 14 marks : 1 question of 14 marks

2. Essay

Unit V: - Creative Writing: 14 marks : 1 question of 14 marks

1. Writing Stories
2. Writing Poems

Recommended for Background reading :

C.A. Shephard & David Reid Thomas, *Grammar and Composition*, Orient Longman, 1977.

Michael Swan, *Basic English Usage*,

Vandana R. Singh. *The Written Word*. New Delhi: OUP, 2007.

David Morley. *Cambridge Introduction to creative writing*. New Delhi: Cambridge University Press, 2010.

+++++

3. ALTE(BA) 301 B.A. ALTERNATIVE ENGLISH PAPER I (Poetry, Short Story & Composition)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE THIRD SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works, interpret the didactic value/ moral in the literary writings, etc, teach and revise remedial grammar/ structural approach to language learning along with skills of composition like paragraph writing.

Unit I: Poetry - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. William Blake : The Tyger
2. P.B. Shelly: Ode to the West Wind
3. G.M. Hopkins : God's Grandeur

Unit II: Poetry - 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. W.B. Yeats : A Prayer for My Daughter
2. T.S. Eliot : Journey of the Magi
3. Robert Frost: Stopping by the Woods on a Snowy Evening

Unit III: Short Story - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Leo Tolstoy : The Imp and the Peasant's Bread
2. O' Henry : The Gift of the Magi

Unit IV: Short Story - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Arthur Conan Doyle : A Case of Identity
2. Anton Chekov : The Bet

Unit V: Composition - 14marks: 1question of 14 marks

1. Paragraph Writing

Recommended Texts :

NU Anthology of Poetry, Published by Macmillan 2012.

Vandana R. Singh. *The Written Word*. Delhi: OUP, 2007.

+++++

4. ALTE(BA)401 .B.A. ALTERNATIVE ENGLISH PAPER II (Prose, Poetry, Play & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FOURTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc. and to teach and revise remedial grammar/ structural approach to language learning along with the principles and practice of précis writing.

Unit I: Prose - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Osbert Sitwell : The Best Years of Life
2. George Bernard Shaw : The Religion of the Future

Unit II: Prose - 14marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Somerset Maugham : Visit to the Pagodas
2. A.G. Macdonell: A Village Cricket Match

Unit III: One Act Play - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Fritz Karinthy : *Refund*

Unit IV: Poetry - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Nissim Ezekiel: Night of the Scorpion
2. Sarojini Naidu: Indian Weavers

Unit V: Language Skills – 14 marks : 1question of 14 marks

1. Précis Writing

Recommended Texts:

NU Anthology of Prose & Short Stories, Published by Macmillan, 2012.

NU Anthology of Poetry, Published by Macmillan, 2012.

Satyanarayan Singh, ed. *Selected One Act Plays*. Macmillian, 2009.

+++++

-

5. ELENG 102 ELECTIVE ENGLISH PAPER I (Poetry, Grammar & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FIRST SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc. and to teach and revise approaches to research skills as prescribed in unit V.

Unit I: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

Forms of Poetry: Lyric, Ode, Sonnet, Elegy, Idyll, Epic, Ballad, Satire (B.Prasad pp.5-41)

Prosody: Versification and stanza forms (L.T. Lemon. pp. 51-62/ Bose & Sterling, pp.141-191))

Unit II: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Shakespeare: Sonnet 29
2. John Donne : A Valediction: Forbidding Mourning
3. Milton : Lycidas

Unit III: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Coleridge: Kubla Khan
2. John Keats: Ode to a Nightingale
3. Wordsworth : Three Years She Grew

Unit IV: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Tennyson : Ulysses
2. G.M Hopkins : Pied Beauty
3. Thomas Hardy : The Darkling Thrush

Unit V: Language/ Research Skills – 14 marks : 2 questions of 7 marks

Assignment Writing: Assignments and term papers; scholarly style of writing; writing assignments and term papers; making notes and working bibliography; footnotes/end notes.

Recommended texts:

L.T. Lemon. *A Glossary for the Study of English*. New Delhi: OUP.

B. Prasad. *A Background to the Study of English Literature*. Chennai: Macmillan.

Bose & Sterling. *Rhetoric and Prosody*. Calcutta: Chatterjee & Co, 1978.

NU Anthology of Poetry, Published by Macmillan, 2012.

Vandana R. Singh. *The Written Word*. Delhi: OUP, 2007.

John Lennard. *The Poetry Handbook*. New Delhi: OUP, 2006.

M.H. Abrams. *A Glossary of Literary Terms*. Prism India 6th/ 7th Edn.

Liz Hamp-Lyons & Ben Heasley. *Study Writing: A Course in Writing Skills for Academic Purposes*. New Delhi: Cambridge University Press: 2006.

Joseph Gibaldi. *MLA Handbook for Writers of Research Papers*. Sixth edition. Delhi: First East- West Press Edition, 2004.

+++++

6. ELEN202 ELECTIVE ENGLISH PAPER II (Poetry & Applied Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SECOND SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc. and to teach and revise approaches to language skills like paraphrasing, annotating and analyzing beyond summarizing.

Unit I: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. W.B. Yeats: Sailing to Byzantium
2. T.S. Eliot : The Love Song of J. Alfred Prufrock

Unit II: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. W.H. Auden : September 1939
2. Dylan Thomas : Fern Hill

Unit III: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Kamala Das: An Introduction
2. A.K. Ramanujan: Still Another View of Grace

Unit IV: Poetry – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Walt Whitman : In Paths Untrodden
2. Robert Frost : Spring Pools

Unit V: Language Skills – 14 marks : 1 question of 14 marks
Paraphrasing

Recommended texts :

NU Anthology of Poetry, Published by Macmillan, 2012.

L.T. Lemon. *A Glossary for the Study of English*. New Delhi: OUP.

+++++

7. ELEG 302 ELECTIVE ENGLISH PAPER III (Drama & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE THIRD SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc. and to teach and revise language skills like journalistic report writing, critical writing etc.

UNIT I: Introduction to Drama – 14 marks) 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.
Plot Construction, Characterization, Theme, Tragedy, Comedy, etc.

UNIT II: Drama – 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.
1. Shakespeare : *Othello*

Unit III: Drama – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.
1. Ben Jonson: *Volpone*

Unit IV: Drama – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.
1. John Webster : *The White Devil*

Unit V: Language Skills – 14 marks : 1 question of 14 marks
1. Journalistic Report Writing

Recommended Reading:

L.T. Lemon. *A Glossary for the Study of English*. New Delhi: OUP.

B. Prasad. *A Background to the Study of English Literature*. Delhi: Macmillan, 2000.

Stanley Wells (ed), *The Cambridge Companion of Shakespeare Studies*, CUP

A.C. Bradley, *Shakespearean Tragedy*, MacMillan, 1974.

NU Anthology of Prose and Short Stories, MacMillan, 2012.

M.H. Abrams. *A Glossary of Literary Terms*. Prism India 6th/ 7th Edn.

Geeta Nagaraj. *Write to Communicate*. New Delhi: Cambridge University Press (Foundation Books), 2009.

+++++

8. ELENG 402 ELECTIVE ENGLISH PAPER IV (Fiction & Applied Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FOURTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc. and to teach and revise language skills like letter/application writing, critical comments, etc.

Unit I: Introduction to the Novel – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.
Characterization, Plot Construction, Theme, Symbolism, Narrative Technique

Unit II: Fiction – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Defoe : *Robinson Crusoe*

Unit III: Fiction – 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Jane Austen : *Emma*

Unit IV: Fiction – 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Emily Bronte : *Wuthering Heights*

Unit V: Language Skills – 14 marks : 2 questions of 7 marks

1. Letter writing/ Application writing with CV; Commercial letters.

Recommended texts:

L.T. Lemon. *A Glossary for the Study of English*. New Delhi: OUP.

B. Prasad. *A Background to the Study of English Literature*. Chennai: Macmillan.

M.H. Abrams. *A Glossary of Literary Terms*. Noida: Harcourt Asia Pte Ltd, 2000.

John Richetti (ed), *Cambridge Companion to 18th Century Novel*,

Edward Copeland & Juliet McMaster (ed), *Cambridge Companion to Jane Austen*,

Vandana R. Singh. *The Written Word*. Delhi: OUP, 2007.

R.K. Madhukar. *Business Communication*. New Delhi: Vikas Publishing House, 2005.

Geeta Nagaraj. *Write to Communicate*. New Delhi: Cambridge University Press (Foundation Books), 2009.

+++++

9. ELENG 501 ELECTIVE ENGLISH PAPER V (Literary Criticism)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FIFTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
4 credits

Objectives: To make point wise summary of the views of the critics in the prescribed texts to understand and realize them in proper perspectives to apply them in analyzing the literary texts and to study history/ development of literary criticism and principles of practical criticism with application.

Unit I: Introduction to Literary Criticism –14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

(The students are to be given a brief account of the development of Criticism like : Background of English Criticism : The Greek Masters, Plato & Aristotle, Roman Classicists Horace, Quintilian, Longinus and Dante; , English Criticism: The battle of tastes, Triumph of Classicism, Romantic revolt, Victorian Compromise, Age of Interrogation. (ref: B. Prasad. *An Introduction to English Criticism*)

Unit II: Literary Criticism –14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Wordsworth : *Preface to the Lyrical Ballads*

Unit III: Literary Criticism – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Mathew Arnold : *Function of Criticism at the Present Time*

Unit IV: Practical Criticism – 14 marks : 1 question of 14 marks

1. Prose

Unit V: Practical Criticism – 14 marks : 1 question of 14 marks

1. Poetry

Recommended reading :

B. Prasad. *An Introduction to English Criticism*. Chennai: Macmillan.

Das & Mohanty, *Literary Criticism*, Calcutta:OUP, 1985.

I. A. Richards, *Practical Criticism*. London: Routledge & Kegan Paul, 1978.

V.S. Seturaman, C.T. Indra & T. Sriraman. Eds. *Practical Criticism*. Chennai: Macmillan, 2004.

Jonathan Culler, *Literary Theory*, OUP.

David Daiches, *Critical Approaches to Literature*

M.H. Abrams. *A Glossary of Literary Terms*. Noida: Harcourt Asia Pte Ltd, 2000.

Wilfred L. Guerin et al. *A Handbook of Critical Approaches to Literature*. New Delhi: OUP, 1999.

+++++

10. ELENG ELECTIVE ENGLISH PAPER VI

Option A

ELENG 601 American Literature (Poetry, Prose & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, and to enthuse them to write literary essays on various aspects of literature.

Unit I: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Walt Whitman : I Hear America Singing
2. Walt Whitman : When Lilacs Last in the Dooryard Bloomed

Unit II: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Emily Dickinson: I Heard a Fly Buzz
2. Emily Dickinson : Because I could not Stop for Death

Unit III: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Robert Frost : *The Road not Taken*
2. Robert Frost : *Birches*

Unit IV: Prose – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Ralph Waldo Emerson: *Nature*

Unit V: Language Skills – 14 marks (12 lectures) 1 question of 14 marks

1. Literary Essay Writing

Recommended Reading:

NU Anthology of Prose & Short Stories, Published by Macmillan, 2012.

NU Anthology of Poetry, Published by Macmillan, 2012.

W.H. Hudson. *A Background to the Study of English Literature*. Ludhiana: Kalyani Publishers, 1985.

W.R. Goodman. *Quintessence of Literary Essays*. New Delhi: Doaba House.

R.J.Rees. *English Literature*. New Delhi: Macmillan.

R.A. Scott-James. *Making of English Literature*. New Delhi: Macmillan.

+++++

OR

Option B

ELENG 602 Indian Writing in English (Poetry, Short Story & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, and to enthuse them to write literary essays on various aspects of literature.

Unit I: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Nissim Ezekiel: A Poem of Dedication
2. Jayanta Mahapatra: The Abandoned British Cemetery at Balasore

Unit II: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Arun Kolatkar: The Railway Station
2. Keki N. Daruwalla: Wolf

Unit III: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Dilip Chitre: Father Returning Home
2. Adil Jussawalla: Land's End

Unit IV: Short Story – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Jhumpa Lahiri: "Unaccustomed Earth"
2. Jhumpa Lahiri: "Hell – Heaven"
(From Jhumpa Lahiri. *Unaccustomed Earth*. New Delhi: Random House India, 2008)

Unit V: Language Skills – 14 marks: 1 question of 14 marks

1. Literary Essay Writing

Recommended Reading:

Arvind Krishna Mehrotra. *The Oxford India Anthology of Twelve Modern Indian Poets*. New Delhi: OUP, 2003.

Jhumpa Lahiri. *Unaccustomed Earth*. New Delhi: Random House India, 2008.

NU Anthology of Poetry, Published by Macmillan, 2012.

W.H. Hudson. *A Background to the Study of English Literature*. Ludhiana: Kalyani Publishers, 1985.

W.R. Goodman. *Quintessence of Literary Essays*. New Delhi: Doaba House.

R.J.Rees. *English Literature*. New Delhi: Macmillan.

R.A. Scott-James. *Making of English Literature*. New Delhi: Macmillan.

+++++

OR

Option C

ELENG 603 ELECTIVE ENGLISH PAPER VI (Commonwealth Literature: Poetry, Prose & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, and to enthuse them to write literary essays on various aspects of literature.

Unit I: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Judith Wright: Legend
2. A. D. Hope: Australia

Unit II: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Derek Walcott: Crusoe's Journal
2. Edward Kamau Brathwaite: Wings of Dove

Unit III: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Margaret Atwood: Animals in that Country
2. Daniel David Moses: Inukshuk

Unit IV: Prose – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Bill Ashcroft, Gareth Griffiths and Helen Tiffin: "Post Colonial Reconstructions: Literature, Meaning, Value."
(From their book *The Empire Writes Back: Theory and Practice in Post-Colonial Literature*).

Unit V: Language Skills – 14 marks: 1 question of 14 marks

1. Literary Essay Writing

Recommended Reading:

NU Anthology of Prose & Short Stories, Published by Macmillan, 2012.

NU Anthology of Poetry, Published by Macmillan, 2012.

W.H. Hudson. *A Background to the Study of English Literature*. Ludhiana: Kalyani Publishers, 1985.

W.R. Goodman. *Quintessence of Literary Essays*. New Delhi: Doaba House.

R.J.Rees. *English Literature*. New Delhi: Macmillan.

R.A. Scott-James. *Making of English Literature*. New Delhi: Macmillan.

Bill Ashcroft, Gareth Griffiths and Helen Tiffin: "Post Colonial Reconstructions: Literature, Meaning, Value."

The Empire Writes Back: Theory and Practice in Post-Colonial Literature. Oxford: Oxford University Press.

+++++

OR

Option D

ELENG 604 ELECTIVE ENGLISH PAPER VI (INDIAN WOMEN WRITING IN ENGLISH (Poetry, Fiction & Language Skills)
100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, and to enthuse them to write literary essays on various aspects of literature.

Unit I: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Kamala Das: Punishment in the Kindergarten
2. Eunice De Souza: Varca, 1942
3. Mamang Dai: River Poems

Unit II: Poetry – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Esther Syiem: Myllem
2. Anupama Basumatary: Sculptor
3. Mona Zote: Homecoming

Unit III: Fiction – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Anita Desai : *Fire on the Mountain*

Unit IV: Fiction – 14 marks:1 question of 10 marks; 2 short answer questions of 2 marks each.

1. Namita Gokhale : *Shakuntala*

Unit V: Language Skills – 14 :1 question of 14 marks

1. Literary Essay Writing

Recommended Reading

NU Anthology of Poetry. Macmillan, 2012.

Kynpham Sing Nongkynrih & Robin S Ngangom. Ed. *Anthology of Contemporary Poetry From the Northeast..* Shillong: NEHU Publications, 2003.

W.H. Hudson. *A Background to the Study of English Literature*. Ludhiana: Kalyani Publishers, 1985.

W.R. Goodman. *Quintessence of Literary Essays*. New Delhi: Doaba House.

R.J.Rees. *English Literature*. New Delhi: Macmillan.

R.A. Scott-James. *Making of English Literature*. New Delhi: Macmillan.

+++++

11. ENG(H)103 PAPER VII (HISTORY OF ENGLISH LITERATURE) (This paper is compulsory)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5 Time: 3 hours

TO TEACH IN THE FIRST SEMESTER

Descriptive: 5X10=50; 4X5=20

4 credits

Objectives: To make close study of the development of the various forms of literature age-wise, contributions of minor and major authors and their works and to enumerate the literary terms and concepts developed by the authors in various ages. This paper will identify major trends of English Literature with emphasis on social conditions and culture during the Elizabethan Age and subsequent Ages as given below.

Unit I: Elizabethan Age – 14 marks : 1 question of 10 marks; 1 question of 4 marks

UNIT II: The Age of Dryden and Pope – 14 marks : 1 question of 10 marks; 1 questions of 4 marks

Unit III: The Romantic Movement – 14 marks : 1 question of 10 marks; 1 question of 4 marks

Unit IV: The Victorian Age – 14 marks : 1 question of 10 marks; 1 question of 4 marks

Unit V: Modern Age – 14 marks : 1 question of 10 marks; 1 question of 4 marks

Suggested reading:

William J. Long. *English Literature: Its History and Its Significance*. Books Way

Ifor Evans : *A Short History of English Literature*.

David Daiches : *A Critical History of English Literature*.

Legouis & Cazamian : *History of English Literature*.

Edward Albert, *History of English Literature*, OUP.

Compton-rickett. *History of English Literature*. New Delhi: UBS Publishers' Distributors (p) Ltd.

Sanders, Andrew, *Short Oxford History of English Literature*, OUP.

Drabble Margaret, *Concise Oxford Companion to English Literature*, OUP.

Bibhash Choudhury. *English Social and Cultural History*. New Delhi: Prentice Hall of India Pvt Ltd, 2005.

+++++

12. ENG(H) 203 PAPER VIII (HISTORY OF ENGLISH LANGUAGE & LITERARY TERMS) (This paper is compulsory)
100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SECOND SEMESTER

4 credits

Objectives: To make close study of the development of the English language and the influence of other languages on the English language, to enumerate the loan words, to study the literary terms, forms and concepts thoroughly and to study English Phonetics and practice Phonetic transcription.

Unit I: History of English Language – 14 marks: 1 question of 10 marks; 1 question of 4 marks

a) Old English, b) Middle English, c) Modern English

Unit II: History of English Language – 14 marks : 1 question of 10 marks; 1 question of 4 marks

a) Scandinavian elements in English b) French influence in English c) Latin influence in English d) Greek influence in English e) Indian elements in English f) Difference between British and American English.

Unit III: History of English Language – 14 marks : 1 question of 10 marks; 1 question of 4 marks

a) Word making in English b) Semantics c) Historical development of English grammar.

Unit IV: Literary & Critical Terms – 14 marks : 2 Short Notes of 7 marks each.

1) Blank Verse 2) Conceit 3) Theme & Motif 4) Dramatic Monologue 5) Free Verse 6) Heroic Couplet 7) Allegory 8) Comedy of manners 9) Comedy of Humours 10) Heroic drama 11) Melodrama 12) Poetic Justice 13) Narrative Technique 14) Metaphor & Simile 15) Stream of Consciousness 16) Expressionism 17) New Criticism 18) Touchstone 19) Reader-Response Criticism 20) Negative Capability 21) Dissociation of Sensibility 22) Surrealism 23) Objective correlative 24) Symbolism 25) Paradox 26) Figures of Speech 27) Personification 28) Myth 29) Onomatopoeia 30) Deconstruction.

Unit V : Phonetics – 14 marks (to transcribe 6 words: 6X1=6marks & 2 short note of 4 marks=8marks)

a) Linguistics & Phonetics b) Phonetics & Phonology c) The organs of speech d). Vowel and consonant sounds e) Phonetic symbols f) Transcription.

Suggested reading:

Jespersen : *Growth and Structure of English Language*

Simeon Potter : *Our Language*;

Indranee Ghosh. *History of English Language: A Critical Companion*. New Delhi: Worldview Publications, 2004.

F.T. Wood : *An Outline History of English Language*

C.L. Barber : *The Story of English*

Concise Oxford Companion to English Language, OUP.

R.N. Roy, *A History of English Language*, A. Mukherjee Pvt. Ltd., Calcutta.

Daniel Jones, *An Outline of English Phonetics*.

A.C. Gimson, *An Introduction to the Pronunciation of English*.

Kansakar, T.R. *A Course in English Phonetics*. Hyderabad: Orient Blackswan, 1998.

T. Balasubramanian, *A Text Book of English Phonetics for Indian Students*.

-----, *English Phonetics for Indian Students (A Workbook)*

Gimson, *English Pronouncing Dictionary*.

J.A., Cuddon, *A Dictionary of Literary Terms*.

Chris Baldick, *The Concise Oxford Dictionary of Literary Terms*.

M.H. Abrams. *A Glossary of Literary Terms*. Noida: Harcourt Asia Pte Ltd, 2000.

John Peck & Martin Coyle, *Literary Terms and Criticism*.

Ross Murfin & Supryia, *The Bedford Glossary of Critical and Literary Terms*.

+++++

13. ENG(H)303 PAPER IX (WRITING IN ENGLISH FROM NAGALAND) (This paper is compulsory)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE THIRD SEMESTER

Descriptive & short answer type questions as indicated : 70 marks

4 credits

Objectives: The teachers are to give the students the bio-details of the authors, and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc.

Unit I : 14 marks: 1 question of 10 marks 1 question of 4 marks

(The teacher is to give the students an outline of the development of the particular genre and background of the author from relevant sections of the recommended books).

1. The Naga Ethnic, Political and Literary World (Sanjay Hazarika. *The Strangers of Mist*. Penguin, 1996; Temsula Ao. *The Ao Naga Oral Tradition*. Baroda: Bhasha Publications, 1999; Inato Yekhetto Shikhu. *A Rediscovery and Rebuilding of Naga Cultural Values*. New Delhi: Regency Publications, 2007).

Unit II: Short Stories – 14 marks: 1 question of 10 marks, 1 question of 4 marks

Following 4 Stories from Temsula Ao's *These Hills Called Home* (New Delhi: Zubaan, Penguin, 2006)

1. The Jungle Major
2. The Pot Maker
3. The Old Man Remembers
4. A New Chapter

Unit III: Novel – 14 marks :1 question of 10 marks; 1 question of 4 marks.

1. Easterine Irulu: *A Terrible Patriarchy* (New Delhi: Zubaan, 2007)

Unit IV: Poetry – 14 marks : 1 question of 10 marks; 1 question of 4 marks.

(Selected from *The Nagaland University Anthology of Poetry*. New Delhi: Macmillan.)

1. Nini Lungalang: Mirror
2. Nini Lungalang: Greeting, Pain

Unit V: Unit IV: Poetry – 14 marks : 1 question of 10 marks; 1 question of 4 marks.

1. Monalisa Changkija: Cain's Shoes
2. Monalisa Changkija: May be

Recommended reading:

Sanjay Hazarika. *The Strangers of Mist*. New Delhi: Penguin, 1994. (pp.86-110).

Temsula Ao. *The Ao Naga Oral Tradition*. Baroda: Bhasha Publications, 1999.

Inato Yekhetto Shikhu. *A Rediscovery and Rebuilding of Naga Cultural Values*. New Delhi: Regency Publications, 2007

Fables from the Misty Mountains: Folklore of the Nagas Published by Govt. of Nagaland, Deptt. Of Art & Culture in Collaboration with Red River, LBS, Publications, Guwhati 2009.

+++++

14. ENG(H) 403 PAPER X (DRAMA& COMPOSITION) (This paper is compulsory)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FOURTH SEMESTER

Descriptive & short answer type questions as indicated : 70 marks
4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, and to teach the skills of composition and dialogue writing.

Unit I: Aspects of Drama & Dramaturgy : 14 marks : 1 question of 10 marks; 1 question of 4 marks.

(The teacher is to give the students an outline of the development of the particular genre and background of the particular age or author from relevant sections of the recommended books).

1. Dramatic Art, Dramatic Types, Dramatic devices (B. Prasad pp.106-139)

Unit II – 14 marks : 1 question of 10 marks; 1 question of 4 marks.

1. Sheridan: *The School for Scandal*

Unit III: – 14 marks : 1 question of 10 marks; 1 question of 4 marks.

1. Bernard Shaw : *Pygmalion*

Unit IV: – 14 marks : 1 question of 10 marks; 1 question of 4 marks.

1. T. S. Eliot : *Murder in the Cathedral*

Unit V: Composition – 14 marks : 1 question of 14 marks

1. Dialogue Writing

- Suggested reading:

B. Prasad. *A Background to the Study of English Literature*. Delhi: Macmillan.

Vandana R. Singh. *The Written Word*. Delhi: OUP, 2007.

+++++

15. ENG(H)502 PAPER XI (FICTION & LANGUAGE SKILLS) (This paper is compulsory)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FIFTH SEMESTER

Descriptive: 7X10=70

4 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, and to teach them skills of composition and book review.

Unit I: – 14 Marks : 1 question of 10 marks; 1 question of 4 marks.

(The teacher is to give the students an outline of the development of the particular genre and background of the particular age or author from relevant sections of the recommended books).

1. Aspects of Fictional writing: The Novel & The Short Story

Unit II: – 14 Marks : 1 question of 10 marks; 1 question of 4 marks.

1. Charles Dickens: *Hard Times*

Unit III: – 14 Marks : 1 question of 10 marks; 1 question of 4 marks.

1. Thomas Hardy : *Jude the Obscure*

Unit IV – 14 Marks : 1 question of 10 marks; 1 question of 4 marks.

1. Virginia Woolf : *Mrs. Dalloway*

Unit V: Language Skills – 14 Marks : 1 question of 14 marks

- 1 Book Review

Books recommended:

E.M. Forster. *The Aspects of Novel*. London: Edward Arnold, 1927.

W.H. Hudson. *A Background to the Study of Literature*. Kalyani pub, Ludhiana. 1985.

B. Prasad. *A Background to the Study of English Literature*. Macmillan.

R.J. Rees. *English Literature*. OUP.

Jeremy Hawthorn. *Studying the Novel*. New Delhi: Universal Book Stall, 1992.

+++++

16. ENG(H)503 PAPER XII (LITERARY CRITICISM) (This paper is compulsory)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FIFTH SEMESTER

Descriptive: 5X14=70

4 credits

Objectives: To make point wise summary of the views of the critics in the prescribed texts and to understand and realize them in proper perspectives to apply them in analyzing the literary texts and study the history of Literary Criticism.

Unit I : 14 marks : 1 question of 14 marks

1. Why study Literary Criticism?

Unit II : – 14 marks : 1 question of 14 marks

1. Introduction to Modern Criticism: (The students are to be instructed briefly on the following a) Twentieth Century I & Twentieth Century II from Harry Blamires, *A History of Literary Criticism*, pp. 303-380).

Unit III : – 14 marks : 1 question of 14 marks

1. T.S. Eliot : *The Function of Criticism*

Unit IV : – 14 marks : 1 question of 14 marks

1. Cleanth Brooks : *The Language of Paradox*

Unit V : – 14 marks : 1 question of 14 marks

1. F.R. Leavis : *Keats*

Recommended reading :

NU Anthology of Prose & Short Stories, Published by Macmillan, 2012.

Harry Blamires. *A History of Literary Criticism*. New Delhi: Macmillan, 2001.

Das & Mohanty, *Literary Criticism*, Calcutta: OUP, 1985.

I. A. Richards, *Practical Criticism*. New Delhi: Allied Publishers, 1987.

Guerin, *A Handbook of Critical Approaches to Literature*, OUP.

Jonathan Culler, *Literary Theory*, OUP. 1997.

David Daiches, *Critical Approaches to Literature*.

I A Richards, *Principles of Literary Criticism*.

W.R. Goodman. *Contemporary Literary Theory*. New Delhi: Doaba Publications, 2004.

+++++

17. ENG(H) 605 PAPER XIII (LITERARY THEORY) (This paper is compulsory)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive: 5X14=70

3 credits

Objectives: To make point wise summary of the views of the critics in the prescribed texts and to understand and realize them in proper perspectives to apply them in analyzing the literary texts.

Unit I: – 14 Marks (15 lectures) 1 question of 14 marks.

1. Modernism

Unit II: – 14 marks : 1 question of 14 marks

1. Post Modernism

Unit III: – 14 marks : 1 question of 14 marks.

1. Structuralism

Unit IV: -14 marks : 1 question of 14 marks.

1. Post Structuralism

Unit V: -14 marks : 1 question of 14 marks.

1. Deconstruction

(To focus on Meaning, Features and Literary Perspective)

Recommended reading:

Das & Mohanty, *Literary Criticism*, Calcutta:OUP, 1985.

I. A. Richards, *Practical Criticism*

Guerin, *A Handbook of Critical Approaches to Literature*, OUP.

Jonathan Culler, *Literary Theory*, OUP.

David Daiches, *Critical Approaches to Literature*

Avik Gangopadhyay, *Literary Theories and Criticism Beyond Modernism*, Kolkata: Books Way, 2005.

Dennis Walder(ed), *Literature in the Modern World: Critical Essays & Documents*, Oxford: Oxford University Press, 2004.

+++++

18. ENG(H): PAPER XIV

Option A

(i) ENG(H)606 American Literature (Fiction & Drama)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive: 5X14=70

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc.

Unit I : 14 marks : 1 question of 14 marks

(The teacher is to give the students an outline of the development of the particular genre and background of the particular age or author from relevant sections of the recommended books).

1. History of American Fiction & Drama

FICTION

Unit II: Fiction– 14 marks : 1 question of 14 marks

1. Toni Morrison: *The Bluest Eye*

Unit III: Fiction – 14 marks : 1 question of 14 marks

1. Ernest Hemingway: *A Farewell to Arms*

DRAMA

Unit IV: Drama – 14 marks: 1 question of 14 marks.

1. Eugene O'Neil: *The Hairy Ape*

Unit V: Drama – 14 marks : 1 question of 14 marks.

1. Arthur Miller: *Death of a Salesman*

Recommended Reading:

Lawrence Shaffer. *History Of American Literature And Drama*. New Delhi: Sarup & Sons 2000.

Richard Foster. Ed. *Six American Novelists of the 19th Century*. Ludhiana: Lyall Book Dept, 1968.

C.D. Narasimhaih. Ed. *Student's Handbook of American Literature*. Ludhiana: Kalyani Publishers, 1997.

Thomas Porter. *Myth and Modern American Drama*. Ludhiana: Kalyani Publishers, 1971.

B.M. Bhalla. Ed. *20th Century American Novel*. Ludhiana: Kalyani Publishers, 1981.

+++++

OR

Option B

(ii) ENG(H)607 Indian Writing in English (Fiction & Drama)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive: 5X14=70

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc.

Unit I: 14 marks : 1 question of 14 marks

(The teacher is to give the students an outline of the development of the particular genre and background of the particular age or author from relevant sections of the recommended books).

1. History of Indian English Fiction & Drama

FICTION

Unit II: - 14 marks : 1 question of 14 marks

1. R. K Narayan: *Swami and Friends*

Unit III: - 14 marks : 1 question of 14 marks

1. Kiran Desai : *Inheritance of Loss*

DRAMA

Unit IV : - 14 marks: 1 question of 14 marks.

1. Vijay Tendulkar: *Kamala*
(from Vijay Tendulkar. *Five Plays*. New Delhi: OUP, 2007)

Unit V : - 14 marks: 1 question of 14 marks.

1. Mahesh Dattani: *Tara*
(from Mahesh Dattani. *Collected Plays*. New Delhi: Penguin Books, 2000.)

Recommended Books:

K.R. Srinivasa Iyengar. *Indian Writing in English*. New Delhi: Sterling Publishers, 1987.

M.K. Naik. *A History of Indian English Literature*. New Delhi: Sahitya Akademi, 1981.

M.K. Naik & S.A. Narayan. *Indian English Literature: 1980-2000*. New Delhi: Pencraft International, 2001.

+++++

OR

Option C

(iii) ENG(H)608 Commonwealth Literature (FICTION)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive: 5X14=70

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc.

Unit I: 14 marks : 1 question of 14 marks.

(The teacher is to give the students an outline of the development of the particular genre and background of the particular age or author from relevant sections of the recommended books).

1. History of Commonwealth Fiction & Drama

FICTION

Unit II: – 14 marks : 1 question of 14 marks

1. Chinua Achebe: *Things Fall Apart*

Unit III: – 14 marks : 1 question of 14 marks

1. Alan Paton: *Cry, The Beloved Country*

DRAMA

Unit IV: 14 marks: 1 question of 14 marks.

1. Girish Karnad : *Wedding Album* marks
(Girish Karnad. *Wedding Album*. New Delhi: OUP. 2009.)

Unit V: 14 marks: 1 question of 14 marks.

1. Badal Sircar : *Life of Bangla*
(Badal Sircar. *Two Plays: Indian History Made Easy & Life of Bangla*. New Delhi: OUP,2010)

Books Recommended:

Trevor James. *English Literature from the Third World*. Essex: Longman, 1986.

B.K. Das. *Aspects of Commonwealth Literature*. New Delhi: Atlantic Publishers.

+++++

OR

Option D

(iv) ENG(H) 609 WRITING IN ENGLISH FROM NORTHEAST INDIA

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SIXTH SEMESTER

Descriptive: 5X14=70 3 credits

100 marks : External marks: 70 (Pass mark: 28) Internal Assessment: 30 (Pass mark=12)

Objectives : Keeping in mind the ethnic, cultural, linguistic and literary diversity of the region this paper consists of a selection of writings by North-East writers in English. The teachers are to let students be aware of the multiplicity and variety of experience in the works of the writers and elucidate the text as per the objectives outlined).

UNIT-I : Short Stories : 14 marks : 1 question of 14 marks

1. Hope: Mitra Phukan
2. A "Happy Journey" for Mr. Ta En: W. Kharkrang
3. One Night : Keisham Priyokumar
4. Supping with the Spirits: Easterine Iralu

(Selected from Kailash C. Baral. Ed. *Earth Songs: Stories from Northeast India*. New Delhi: Sahitya Akademi, 2005)

UNIT-II : Novel – 14 marks : 1 question of 14 marks

1. Dhruba Hazarika: *A Bowstring Winter* (New Delhi:Penguin Books, 2006)

UNIT-III : Legends and Folktales: 14 marks : 1 question of 14 marks

1. Seven Clans
2. The Lost Manuscript
3. Ka Nam and the Tiger
4. The Man-eating Serpent, U Thlen
5. Legend of Ka Lidakha

(Selected from: Khynpham S. Nongkynrih : *Around the Hearth: Khasi Legends*. New Delhi : Penguin, 2007)

UNIT-IV : Legends and Folktales: 14 marks : 1 question of 14 marks

1. The Boy who fell from the Sky
2. The Strange Case of Kalen, the Hunter
3. The Silence of Adela and Kepi
4. Pinyar, the Widow
5. Small Histories Recalled in the Season of Rain

(Selected from: Mamang Dai : *The Legends of Pensam*. New Delhi: Penguin, 2006)

6. Fire and Water
7. How Pets Turned Wild
8. The Man Snake
9. Spirit, Tiger and man
10. Man Turns to Monkey

(Selected from *Fables from the Misty Mountains: Folklore of the Nagas* Published by Govt. of Nagaland, Deptt. of Art & Culture in Collaboration with Red River, LBS, Publications, Guwahati 2009)

UNIT-V : Poetry : 14 marks : 1 question of 14 marks

1. Stone People from Lumterok: Temsula Ao
2. Letter from Pahambir: Desmond L. Kharmawphlang
3. The Belt of the Spinning Wheel: trans. Pradip Acharya
4. When You Do Not Return: Robin S. Ngangom

Selected from *Dancing Earth : An Anthology of Poetry from North -East India*. Edited by Khynpham S. Nongkynrih and Robin S. Ngangon. New Delhi: Penguin Books, 2009.

+++++

Syllabus of
BA Honours Course
in
Geography
for 2018-19 Session

**DEGREE SYLLABUS
FOR SEMESTER SYSTEM**

GEOGRAPHY

B.A./B.Sc. (*PASS & HONOURS*)

ACADEMIC SESSION 2016-



**DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY
LUMAMI**

PROPOSED COURSE OUTLINE FOR B.A./ B.Sc. SEMESTER SYSTEM
DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY

Semester	I (Code/Paper)	II (Code/Paper)	III (Code/Paper)	IV (Code/Paper)	V (Code/Paper)	VI (Code/Paper)	Total Credit
Theory (P & H)	GEOG-101/ (Physical basis of Geography)	GEOG-201/ (Climatology & Oceanography)	GEOG-301/ Human Geography	GEOG-401/ Economic Geography	GEOG-501/ Regional Geography of India	GEOG-601/ Regional Geography of North East India	
Credit/CH*	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	24
Practical (P & H)	GEOG-102/ Practical	GEOG-202/ Practical	GEOG-302/ Practical	GEOG-402/ Practical	GEOG-502/ Practical	GEOG-602/ Practical	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6
Theory (H)	GEOG-103/ Geographical Thought	GEOG-203/ Regional Geography of World	GEOG-303/ Political Geography	GEOG-403/ Advanced Geomorphology	GEOG-503/ Applied and Resource Management	GEOG-603/ Environment and Disaster Management	
Credit/CH*	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	18
Practical (H)	GEOG-104/ Practical	GEOG-204/ Practical	GEOG-304/ Practical	GEOG-404/ Practical	GEOG-504/ Practical	GEOG-604/ Project	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6

*Abbreviation: P & H = Pass & Honours, H= Honours

*CH = Contact Hours

Each semester would be of 90 working days

Credit=Contact Hours per week (double for practical)

SEMESTER -I
(Pass and Honours)
GEOG-101/ PAPER –I
Physical basis of Geography -I

Contact Hours: 60

Objectives:

The objective of this course is to introduce students to physical geography, in a brief but adequate manner, and to enlighten the students on career opportunities for geographers.

- Unit –I Nature and scope of Physical Geography, Branches of Physical Geography and their interrelations; Linkages of geography with physical sciences and social sciences like geology, biology, economics and sociology.
- Unit –II Origin of Solar System and Earth (Tidal Hypothesis of Jeans and Jeffrey, Gaseous Theory by Kant, Nebular Hypothesis of Laplace and Big-Bang Theory).
- Unit –III Major landforms: Mountains, Plateau and Plains;
Forces affecting earth's crust (endogenetic and exogenetic forces).
- Unit –IV Origin, composition and types of rocks, Soil profile: Processes of soil formation and soil types.
- Unit –V Meaning and Scope of Biogeography,
Ecosystem: Components and functioning, factors influencing plant growth
Major Biomes of the world.

Books Recommended

1. Bryant, H. Richard (2001): Physical Geography Made Simple, Rupa and Company. New Delhi
2. Bunnett, R.B. (2003): Physical Geography in Diagrams, Fourth GCSE edition, Pearson Education (Singapore) Private Ltd.
3. Garrison, T. (1998): Oceanography, Wordsworth Company, Belmont.
4. Lake, P. (1979): Physical Geography, Cambridge University Press, Cambridge.
5. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
6. Monkhouse, F.J. (1979): Physical Geography. Methuen, London
7. Singh, S. (2003): Physical Geography. Prayag Pustak Bhawan, Allahabad;
8. Strahler, A.N. and Stahler, A.M. (1992): Modern Physical Geography. John Wiley and Sons, New York.

SEMESTER -I
(Pass and Honours)
GEOG-102/ Practical

Contact Hours: 30

- Unit –I a) Types of scale; preparation of scale: simple, comparative and diagonal;
 b) Enlargement and Reduction of map by graphical method.
- Unit –II Interpretation of Toposheet: Topography (relief, plain, plateau, mountain etc.),
 Drainage (pattern)
- Unit –III Representation of different landforms and their profile (Cliff, Oxbow lake,
 Waterfall, Ria Coast, Fjord Coast, Cirque, Meander, River terrace)
- Unit –IV Viva voce and Practical Note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -I
(Honours)
GEOG-103/ Geographical Thought

Contact Hours: 45

Objectives:

To introduce the students to the philosophical and methodological foundations of the subject and to its place in the world of knowledge. To familiarize them with the major landmarks in development of geographic thought at different periods of time.

- Unit –I Classical geography –contributions of Greeks (Herodotus, Eratosthenes), Romans (Strabo, Ptolemy) and Indian geographers.
Medieval geography –Arab Geographers (Al-Masudi, Ibn-Batuta)
- Unit –II Impact of Exploration and Inventions.
Geography in the classification of science –Immanuel Kant.
- Unit –III Dichotomies in geography: Determinism vs. Possibilism.
Physical vs. Human Geography
- Unit –IV Founders of modern geographical thought: Alexander Von Humboldt and Carl Ritter.
Contribution of geographers: Vidal de Lablache and Elisee Reclus
- Unit –V Concept of geography:
(a) Geography as an earth science
(b) Geography as the study of Landscape both physical and cultural
(c) Geography as a science of distribution

Books Recommended

1. Ali, S.M. (1960): Arab Geography, Institute of Islamic Studies, Aligarh Muslim University, Aligarh, First Edition.
2. Ali, S.M. (1983): The Geography of Puranas, People's Publishing House, New Delhi, Third Edition
3. Diddee, J. (ed.) (1990): Indian Geography, Institute of Indian Geographers, Pune, first edition.
4. Dikshit, R. D. (2003): Geographical Thought. A Critical History of Ideas. Prentice-Hall of India, New Delhi.
5. Husain, M. (2002): Evolution of Geographical Thought, Rawat Publications, Jaipur.

SEMESTER -I
(Honours)
GEOG-104/ Practical

Contact Hours: 30

- Unit –I a) The nature and scope of cartography, development trend, traditional versus modern Cartography.
 b) The Earth: shape, size, area, coordinate system: latitude and longitude; concept of Great circle and Small circle; direction and distance; concept of scale and spatial resolution;
- Unit –II Combination of Maps from different scales.
- Unit –III Preparation of profiles from Toposheet: Serial, Superimposed, Projected and composite profiles.
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -II
(Pass and Honours)
GEOG-201/Physical Geography –II

Contact Hours: 60

Objectives:

This paper on physical geography is structured into components of climatology and oceanography as these are closely interrelated. Course content leads to the identification of climatic differentiation on the earth, and the consequences of human activities on the atmospheric processes.

Section –I (Climatology)

- Unit –I Definition and significance of climatology; elements of weather and climate; Composition and structure of atmosphere; Insolation and Heat budget.
- Unit -II Vertical and Horizontal distribution of temperature; Pressure and Pressure belts; Winds: Planetary periodic and Local winds; jet streams; Air masses and fronts; temperate and tropical Cyclones.
- Unit –III Major climatic types (Koppen’s and Thornthwaite’s classification of world climate); Global Climate change; role and response of man in climatic changes.

Section –II (Oceanography)

- Unit –IV Surface configuration of the ocean floor, continental shelf, continental slope, abyssal plain, mid-oceanic and oceanic trenches
Movement of Ocean Water: waves, tides and currents
- Unit –V Coral reefs: factors affecting formation of coral reefs, types; Types of marine deposits; Distribution of temperature and salinity of oceans and seas.

Books Recommended

1. Chorley, R.J. (2001): Atmosphere, Weather and Climate. Methuen, London.
2. Critchfield, H.J. (2002): General Climatology. Prentice-Hall of India, New Delhi.
3. Finch, J. C. and Trewartha, G. T.: Elements of Weather and Climate. Prentice-Hall, London.
4. Lal, D.S.(1986): Climatology. Chaitanya Publications, Allahabad.
5. Oliver, J.E. and Hidore, J.J. (2003): Climatology: An Atmospheric Science, Pearson Education Private Ltd, Delhi.
6. Singh, S. (2005): Climatology. Prayag Pustak Bhawan, Allahabad.

SEMESTER -II
(Pass and Honours)
GEOG-202/ Practical

Contact Hours: 30

- Unit –I a) Handling and use of weather instruments (Max-Min thermometer, Hygrometer, Barometer, Rain gauge, Anemometer).
 b) Interpretation of weather maps published by the Indian Meteorological Department.
- Unit –II Representation of weather data: Temperature, rainfall and humidity data by line and bar graph. Construction and significance of Hythergraph and Climograph.
- Unit –III Hypsometric and Bathymetric curve.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Monkhouse, F. J. and Wilkinson, F.J. (1985): Maps and Diagrams. Methuen, London.
2. Raisz, E. (1962): Principles of Cartography, McGraw Hill, New York.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi,.

* * *

SEMESTER -II
(Honours)
GEOG-203/ Regional Geography of the World

Contact Hours: 45

Objectives:

To have general knowledge about the world and Asia, and to have comparisons between developed and developing nations.

- Unit –I World Regional Geography: An overview; Concepts, bases and characteristics of developed and developing countries.
- Unit –II Population growth, Density and distribution, major population density zones.
- Unit –III Brief regional account of Asia: Physiography, Climate, Power and mineral resources.
- Unit –IV China: Agricultural and industrial regions.
- Unit –V USA: Physiography, agricultural and industrial regions.

Books Recommended

1. di Blij, H. and Muller, O. (1993): Geography: Regions and Concepts. John Wiley and Sons, New York..
2. Jackson, R. H. and Husman, L. E. (1991): World Regional Geography: Issues for Today. John Wiley and Sons, New York.
3. Jones, P. and Bryan, P. (1954): North America: An Historical, Economic and Regional Geography, Methuen and Company. Ltd, London.
4. Kolb, A. (1971): East Asia, China, Japan, Korea, Vietnam, Methuen, London.
5. Sharma, P. R. (ed.) (1991): Perspectives on Third World Development. Rishi Publication, Varanasi.
6. Stamp, L. D. (1976): Asia: A Regional and Economic Geography, Methuen, London.

SEMESTER -II
(Honours)
GEOG-204/ Practical

Contact Hours: 30

- Unit –I a) Concept of base map and types of map; Map design and layout.
 b) Base maps of World, Asia, USA, China and India.
- Unit –II Thematic mapping showing (world population, climate and resources)
- Unit –III Exercise on time calculation from given locations (longitude).
- Unit –IV Practical notebook and viva voce.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -III
(Pass and Honours)
GEOG-301/ Human Geography

Contact Hours: 60

Objectives:

To acquaint the students with the nature of man-environment relationship and to make them understand human capability to adopt and modify the environment in its varied conditions from primitive lifestyle to modern living.

- Unit –I Meaning, nature and scope of Human geography; development and branches of Human geography
- Unit –II Man-environment dynamic relationships; determinism and Possibilism
- Unit –III Evolution of man; classification of races; characteristics of races and their broad distribution. Human adaptation to environment; Eskimos, Masai Bushman, Gujjars.
- Unit –IV Physical, economic and social factors influencing spatial distribution of world population, distribution and density of population; Concept of over population, under population and optimum population; Migration: types and consequences;
- Unit –V Settlement: Geographical factors influencing human settlement. Origin and growth of rural and urban settlement. Types and patterns of rural settlement. Urban settlement: morphology and functional classification.

Books Recommended

1. Husain, M. (1994): Human Geography, Rawat Publications, Jaipur.
2. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
3. Norton, W. (1995): Human Geography, Oxford University Press, New York.
4. Singh, L.R. (2005): Fundamentals of Human Geography, Sharda Pustak Bhawan, Allahabad
5. Stoddard, R.H., Wishart, D.J. and Blouet, B.W. : Human Geography. Prentice-Hall, Englewood Cliffs, New Jersey.

SEMESTER –III
(Pass and Honours)
GEOG-302/ Practical

Contact Hours: 30

- Unit –I a) Representation of population data: Distribution, density and growth by: Point (dots, proportionate circles and spheres), Line (isopleths and flow lines) and area (choropleth), line and bar graphs; Age-sex pyramid.
 b) Toposheet interpretation (settlement, transport and land use)
- Unit –II a) Definition and classification of map projection;
 b) Map Projection: Cylindrical (Simple and Equal area) with outline maps drawn.
- Unit –III Surveying: Chain and tape to plot a part of college building.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.
2. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -III
(Honours)
GEOG-303/ Political Geography

Contact Hours: 45

Objectives:

To familiarize the students with the geographical factors which have a bearing on the political/ administrative organization of space, and to enhance awareness of the multi-dimensional nature of geo-political space.

- Unit –I Nature, approach and significance of political geography
Historical development of political geography
- Unit –II Development of Geopolitik (nature and approaches)
Concept of Organic state: Ratzel
- Unit –III Concepts: nation, state; Frontiers and boundary, core and periphery region
- Unit –IV Global strategic models: The Heartland theory;
Mahan Sea Power concept
- Unit –V World organisation –United Nations
Regional Associations: EU and SAARC

Books Recommended

1. Dikshit, R.D. (1987): Political Geography and Geopolitics. Tata McGraw Hill, New Delhi.
2. Dikshit, R.D. (2000): Political Geography: A Contemporary Perspective. Prentice-Hall, New Delhi.
3. Siddiq, M. (1997): Indian in the Indian Ocean: A Geopolitical Study, Rawat Publications, Jaipur
4. Pounds, N.J.G. (1972): Political Geography. McGraw Hill Publication., New York.
5. Short, John R. (1982): An Introduction to Political Geography. Routledge, London
6. Sukhwai. B.L. (1987): Modern Political Geography of India. Sterling Publication, New Delhi.

SEMESTER -III
(Honours)
GEOG-304/ Practical

Contact Hours: 30

- Unit –I a) Importance of surveying in geography; Instrument handling and care.
 b) Prismatic compass survey to plot a part of a college building.
- Unit –II Triangulation Survey by Theodolite to plot a part of the college building.
- Unit –III Contouring by Theodolite or Dumpy level
- Unit –IV Practical Note-Book and Viva-voce

Books Recommended

1. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.
2. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.

SEMESTER –IV
(Pass and Honours)
GEOG-401/ Economic Geography

Contact Hours: 60

Objectives:

To acquaint the students with the dynamic aspect of economic geography, transformation of economic activities from primary to secondary and tertiary stage and with various factors responsible for economic development.

- Unit –I Meaning, scope and approaches to study economic geography. Concept and classification of economic activity.
- Unit –II Primary activities: Agriculture- factors influencing agriculture, types of agriculture, forestry, fishing and mining.
- Unit –III Secondary activities: Basis of world industrial location; distribution and production of iron and steel, cotton textile industries.
- Unit –IV Tertiary activities: Transport and communication services; geographical factors in the development of water, land and air transport.
- Unit –V Bases of international trade; major trade blocs: EEC and ASEAN; Effects of globalisation on developing countries.

Books Recommended

1. Bryson, J., Henry, N., Keeble, D. and Martin, R. (eds.) (1999): The Economic Geography Reader: Producing and Consuming Global Capitalism. John Wiley and Sons, Inc, New York.
2. Coe, N. (2007): Economic Geography: A Contemporary Introduction. Blackwell Publishers, Inc., Massachusetts.
3. Guha, J. S. and Chatteraj, P.R.(2002): A New Approach to Economic Geography: A Study of Resources. The World Press Private Limited, Kolkata.
4. Hanink, D. M. (1997): Principles and Applications of Economic Geography: Economy, Policy, Environment. John Wiley and Sons, Inc, New York.
5. Leong, G. C. and Morgan, G. C.(1982): Human and Economic Geography, Oxford University Press, Singapore .
6. Roy, P.K. (2005): Economic Geography, A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.

SEMESTER -IV
(Pass and Honours)
GEOG-402/ Practical

Contact Hours: 30

- Unit –I a) Statistical methods: Measures of central tendency (Mean, Median and Mode);
 b) Measures of dispersion (Mean deviation, Quartile deviation and Standard deviation).
- Unit –II a) Representation of data by Line, Bar, Pie, and Block Pile diagram.
 b) Time series analysis of temporal data.
- Unit –III Map projection: Polar Zenithal (Stereographic, Orthographic and Equidistant) with outline maps drawn
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Bhagwathi, V. and Pillai, R.S.N. (2003): Practical Statistics, Sultan Chand and Company, New Delhi
2. Gupta, S.P. (1998): Advanced Practical Statistics, Sultan Chand and Company, New Delhi
3. Mahmood, A. (1986): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
4. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Zamir, A. (2002): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur.
7. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -IV
(Honours)
GEOG-403/ Advanced Geomorphology

Contact Hours: 45

Objective:

The primary objective is to introduce the latest concepts in geomorphology.

- Unit –I Nature and scope of Geomorphology
- Unit –II Development of geomorphology: Geomorphological school in USA, Europe and India.
- Unit –III Earth's interior; Wegner's theory of continental drift, plate tectonics.
- Unit –IV Weathering: meaning and types; Concept and classification of mass wasting; Types and patterns of drainage.
- Unit –V Concept of cycle of erosion. Fluvial, Arid, Glacial, Karst and Coastal landscapes.

Books Recommended

1. Bloom, A. L. (1992): Geomorphology-A Systematic Analysis. Prentice-Hall India, New Delhi.
2. Stoddard, D. R. (ed.)(1996): Process and Form in Geomorphology. Routledge, London,.
3. Kale, V. and Gupta, A. (2001): Elements of Geomorphology. Oxford University Press, Delhi.
4. Thornbury, W. D. (1990): Principles of Geomorphology. Wiley Eastern Edition, New York,.
5. Singh, S. (2004): Geomorphology, Prayag Pustak Bhawan, Allahabad
6. Skinner, B. J. and Porter, S.C. (1996): The Dynamic Earth. John Wiley and Sons, New York,.

SEMESTER -IV
(Honours)
GEOG-404/ Practical

Contact Hours: 30

- Unit –I a) Sampling- Types and their Uses;
 b) Correlation and Regression analysis: Karl Pearson method.
- Unit –II Average slope map and Block diagram (from same area)
- Unit –III a) Cylindrical Map Projection (Gall’s and Mercator’s) with outline maps drawn.
 b) Conventional Projection (Mollweid’s and Sinusoidal) outline maps drawn.
- Unit –IV Practical Note-Book and Viva-voce

Books Recommended

1. Bhagwathi, V. and Pillai, R.S.N. (2003): Practical Statistics, Sultan Chand and Company, New Delhi
2. Gupta, S.P. (1998): Advanced Practical Statistics, Sultan Chand and Company, New Delhi
3. Mahmood, A. (1986): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
4. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
5. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
6. Zamir, A. (2002): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur.
7. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -V
(Pass and Honours)
GEOG-501/ Regional Geography of India

Contact Hours: 60

Objectives:

Aims at presenting a comprehensive, integrated and empirically based profile of India so as to understand its geopolitical personality and its relations with other countries.

- Unit –I Locational significance, unity and diversity. Physical environment: physiographic characteristics –Climate, soil and natural vegetation.
- Unit –II Population characteristics: population growth, distribution, density, structure and composition.
- Unit –III Agriculture: agricultural development and Indian economy, modernization of Indian agriculture, agro-climatic regions and special characteristics, agricultural trade.
- Unit –IV Transport: Roads and railways, air transport and pipe transport.
- Unit –V Industry: industrial development and Indian economy, distribution of major industries (iron and steel, cotton textile, petrochemicals, sugar, paper and cement industries) industrial policies and industrial trade.

Books Recommended

1. Gautam, A. (2006): Advanced Geography of India, Sharda Pustak Bhawan, Allahabad
2. Khullar, D.R. (2007): India: A Comprehensive Geography, Kalyani Publishers, New Delhi
3. Nag, P. and Gupta, S. S. (1992): Geography of India, Concept Publishing Company, New Delhi.
4. Singh , J. (2003): India: A Comprehensive Systematic Geography. Gyanodaya Prakashan, Gorakhpur
5. Singh, R.L. (ed.) (1971): India: A Regional Geography. National Geographical Society of India, Varanasi,.
6. Tiwari, R.C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad.

SEMESTER –V
(Pass and Honours)
GEOG-502/ Practical

Contact Hours: 30

- Unit –I Thematic mapping: Population, Resources and Industries of India.
Unit –II Conical projection (One and Two Standard parallel) with outline maps drawn.
Unit –III Polyconic Projection and Bonne’s Projection with outline maps drawn.
Unit –IV Viva voce and Practical note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
3. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
4. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -V
(Honours)
GEOG-503/ Applied and Resource Geography

Contact Hours: 45

Objectives:

To understand the prevalent issues relating to environment, society and economy and to provide a geographical interpretation with special reference to Nagaland. Further, it aims at sensitising the students to the concept of sustainable development.

- Unit –I Definition, nature and scope of resource geography: types of resources.
Evaluation and exploration of resources through Remote Sensing technique.
- Unit –II Spatial distribution of resources: Water, Energy and Forest.
- Unit –III Number, density, growth and distribution of population pressure and resource utilization.
- Unit –IV Nature, scope and content of applied geography: identification of problems of interdisciplinary nature (like environment resource base, resource use, development and disparity)
- Unit –V Issues Related to Human resources: Social and demographic issues; Carrying capacity of the land; Human resource use; Sustainable development with focus on man environment relationship.

Books Recommended

1. Bryson, J., Henry, N., Keeble, D. and Martin, R. (eds.) (1999): The Economic Geography Reader: Producing and Consuming Global Capitalism. John Wiley and Sons, Inc, New York.
2. Coe, N. (2007): Economic Geography: A Contemporary Introduction. Blackwell Publishers, Inc., Massachusetts.
3. Guha, J. S. and Chattoraj, P.R.(2002): A New Approach to Economic Geography: A Study of Resources. The World Press Private Limited, Kolkata.
4. Hanink, D. M. (1997): Principles and Applications of Economic Geography: Economy, Policy, Environment. John Wiley and Sons, Inc, New York.
5. Leong, G. C. and Morgan, G. C.(1982): Human and Economic Geography, Oxford University Press, Singapore .
6. Roy, P.K. (2005): Economic Geography, A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.

SEMESTER -V
(Honours)
GEOG-504/ Practical

Contact Hours: 30

- Unit –I Remote Sensing: Visual Interpretation of aerial photographs and/or satellite imagery by using photo/image interpretation keys. Delineation and mapping of various physical and cultural features from photographs/ images.
- Unit -II Basics of Computer application and Geographical Information System (GIS):
Data types of for GIS:
a) Non-spatial data: entry, tabulation, and charting bar graph, pie graph) etc. using any Spreadsheet programme.
b) Spatial data: Raster and Vector data entry and creation of layers for point, line and area into system using open source GIS software (i.e. ILWIS).
- Unit –III a) Road profile by Dumpy level;
b) Determination of height: accessible and inaccessible objects by using Theodolite or Telescopic alidade.
- Unit -IV Practical Notebook and Viva-voce.

Books Recommended

1. Campell, J. B. (2003): Introduction to Remote Sensing. 4th edition. Taylor and Francis, London.
2. Curran, P.J. (1985): Principles of Remote Sensing. Longman, London.
3. Lillesand, T.M. and Kiefer, R.W. (2000): Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
4. Nag, P. (ed.) (1992): Thematic Cartography and Remote Sensing. Concept Publishing Company, New Delhi.
5. Rampal, K.K. (1999): Handbook of Aerial Photography and Interpretation. Concept Publishing. Company, New Delhi.
6. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.

SEMESTER -VI
(Pass and Honours)
GEOG-601/ Regional Geography -II
(Northeast India with Special Focus on Nagaland)

Contact Hours: 60

Objectives:

To focus on the regional study of Northeast India and Nagaland, and to prospect the region's potentiality for sustainable development.

- Unit –I Northeast India: Locational significance;
Physical characteristics: Physiography, drainage, climate, Soil and natural vegetation.
- Unit –II Population of Northeast India: Growth, Distribution and Density, Age-sex composition, Rural-urban composition and Religious composition.
- Unit –III Economic basis of Northeast India: Agriculture, Industries, Transport and communication system
- Unit -IV Disparity in socio-economic development; Socio-economic problems.
Demographic characteristics- Population distribution, Growth, Density
- Unit –V a) Nagaland - Physiography, Climate and Natural vegetation
b) Biodiversity and its conservation issues

Books Recommended

1. Bhagabati, A..K., Bora, A. K. and Kar, B.K. (2011): Geography of Assam, Rajesh Publications, New Delhi.
2. Bhagabati, A.K. (ed) : Biodiversity of Assam, Eastern Book House, Guwahati
3. Bhattacharya, P.(2006) : Trend in Tourism Potentiality, Bani Mandir, Guwahati
4. Bhattacharyya, N.N. (2005): North East India: A Systematic Geography, Rajesh Publication, New Delhi
5. Gopal Krishnan, R : Geography of North East India
6. Srivastava, S.C., : Demographic Profile of N.E. India, Mittal Publications
7. Taher, M. and Ahmed, P. (1998): Geography of North East India, Mani Manik Prakash, Guwahati.

SEMESTER -VI
(Pass and Honours)
GEOG-602/ Practical: Data based on North East India

Contact Hours: 30

- Unit –I Cartographic representation of economic data of Northeast India in spatial and temporal contexts: Histogram, Pie-graph, Age-sex pyramid.
- Unit –II Use of cartographic symbols and their uses: Iso-chronic cartograms, traffic flow diagrams and Choropleth mapping.
- Unit –III a) Survey: Plane Table (Radiation and Intersection)
 b) Use of Global Positioning System (GPS) for identifying a location (only demonstration of GPS device).
 c) Study of landscape by “Google Earth” through Internet enabled PCs.
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Monkhouse, F. J. (1985): Maps and Diagrams. Methuen, London.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.

SEMESTER –VI
(Honours)
GEOG-603/ Environmental Geography

Contact Hours: 45

Objectives:

Aims to provide understanding and awareness of environmental issues at global and regional level and to educate the students on the management of disasters and hazards.

- Unit –I Definition, nature and scope of Environmental Geography; Approach to Environmental development.
- Unit-II Emerging environmental problems: Deforestation, agriculture, population growth, Science and technology
- Unit –III Disaster- Meaning, concept and types; Case study of flood problems- Brahmaputra Valley; drought; Volcano- Pacific ring of fire
- Unit –IV Earthquake zoning in India: Himalayan region and N-E region of India; local storms- typhoons, hurricanes, tornadoes.
- Unit –V Response to disaster- Community, Non- governmental organizations, National and International organizations.

Books Recommended

1. Cantledge, B. (ed.), 1992: Monitoring the Environment, Oxford University Press, Oxford
2. Newson, M., 1992: Land, Water and Development, Routledge, London
3. Singh, S., 1991: Environmental Geography, Prayag Pustak Bhawan, Allahabad
4. Strahler, A.N. & A.H. Strahler, 1976: Geography and Man's Environment, John Wiley, New York

SEMESTER -VI
(Honours)
GEOG-604/ Project: Field Study and Report Writing

Contact Hours: 30

Objective:

Geography being a field oriented subject it has been designed to let the students acquire firsthand knowledge of the surroundings on various aspects.

Field works:

Meaning, types and objectives of fieldwork; field methods and techniques; importance of field work in geography, Fieldwork based report writing.

Field Study in local environment: Preparation of field report through fieldwork on any one of the following areas:

- A locality of the city/ town
- A village near the city/ town

Field trip: to any nearby region for comparative study with the study area.

Report Writing:

Books Recommended

1. Archer, J.E. and Dalton, T.H. (1968): FieldWork in Geography, William Clowes and Sons Ltd. London and Beccles
2. Bolton, T. and Newbury, P.A. (1968): Geography through Fieldwork, Blandford Press, London.
3. Jones, P. A. (1968): FieldWork in Geography, Longmans, Green and Company Ltd., London and Harlow.
4. Lousenbury, J. F. and Aldrich, F.T. (1986): Introduction to Geographic Field Methods and Techniques, Charles E. Merrill Publishing. Company, Columbus.

Syllabus of
BA Honours Course
in
History
for 2018-19 Session

B.A. SYLLABUS
(DEPARTEMENT OF HISTORY)

GENERAL PAPERS

Paper	Name of Papers
Paper I	History of India upto the Mauryas
Paper II	History of India (Post Maurya to 1526)
Paper III	History of India 1526-1857
Paper IV	Indian Nationalism
Paper V	History of Europe
Paper VI	Modern World

Honours Papers

Paper	Name of papers	Semester
Paper VII	History of North East India (1822-1972)	Ist
Paper VIII (Optional A)	East Asia (1840-1949)	2nd
Paper VIII (Optional B)	History of Modern South East Asia (1850-1946)	
Paper IX	History of India C.A.D. 1550-1750	3rd
Paper X	History of the United States of America	4th
Paper XI	History of Christianity in Nagaland	5th
Paper XII	Social and Economic History of Modern India (18 th -20 th Century)	5th
Paper XIII (Optional A)	Historiography	6th
Paper XIII (Optional B)	Introduction to Archaeology	
Paper XIV	Political History of the Naga	6th

GENERAL PAPERS

HIS-101 : HISTORY OF INDIA UPTO THE MAURYAS

Objectives: The purpose of this course is to familiarize students with social, economic, political and cultural developments in India from prehistory upto the post-Mauryas. The focus is on socio-economic developments and not on dynastic history. The intent is to introduce students to the elements of change and continuity in Indian history.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Survey of sources: Archaeological Sources, Literary Sources, Travellers Accounts; Epigraphical Sources. Prehistory: Paleolithic, Mesolithic and Neolithic Cultures in India.	14	14
II	Harappan Civilization: Origin, Extent, Urban Planning, Nature of Political and Economic Organization, Religion and Decline.	14	14
III	Vedic Cultures: Society, Polity, Economy and Religion.	13	14
IV	Rise of Religious Movements in India: Material Background; Teachings of Buddhism and Jainism.	13	14
V	Factors leading to the rise of Mahajanapadas; the Rise of Magadha. Maurya Empire: Ashoka's Dharma, Administration, Economy, Art and Architecture, Decline.	14	14

ESSENTIAL READING:

B. Allchin, and F.R Allchin, Rise of civilization in India and Pakistan

B. Allchin, and F.R Allchin R, Origin of a Civilization

Romila Thapar, A history of India Vol. I

Romila Thapar, From lineage to state

Irfan Habib, Pre History

Satish Chandra, Medieval India, Vol.

Kulke, H, and D. Rothermund, History of India

Burton Stein, Peasant State and Society in Medieval south India

A.L. Basham, The Wonder That Was India

B.K. Thapar, Recent Archaeological Discoveries in India

R.S.Sharma, Aspects of political Ideas and Institutions in Ancient India

P.N.Chopra & Co., A comprehensive History of Ancient India.

A.B.Pandey, Early Medieval India.

J. L. Mehta, Advanced Study in the History of Medieval India Vol.1 (1000-1526)

S.C. Raychoudhury, Social Cultural and Economic History of India.

Sir Mortimer Wheeler, The Indus Civilization

HIS-201: HISTORY OF INDIA (Post Maurya to Delhi Sultanate)

Objectives: The purpose of this course is to familiarize students with Social, Economic, Political and Cultural Developments in India. The focus is on Socio-Economic Developments and not on Dynastic History. The intent is to introduce students to the elements of Change and Continuity in Indian History.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Development in the post Mauryas times with special reference to the Kushans, Satavahanas and Harsha.	14	14
II	The Gupta Empire: Administrations, Economy, Society, Literature, Development in Science, Art and Architecture.	14	14
III	Sangam Literature; Chola Empire: Local Self-Government and Cultural Life; the Pallavas; Tripartite Struggle.	14	14
IV	Bhakti and Sufi movements: Origin, Doctrines, Spread, Impact on Indian Society	13	14
V	Delhi sultanate: Administrative and Economic Reforms of the Khaljis and Tughlaqs. Decline	13	14

ESSENTIAL READING:

Romila Thapar, A History of India Vol. I

Romila Thapar, From Lineage to State

Satish Chandra, Medieval India, Vol.

Kulke, H, and D. Rothermund, History of India

Burton Stein, Peasant State and Society in Medieval South India

A.L. Basham, The Wonder That Was India

K.A.Nikanta Sastri, History of South India from Pre-historic times to the fall of Vijayanagar

R.S.Sharma, Aspects of political Ideas and Institutions in Ancient India

P.N.Chopra & Co., A comprehensive History of Ancient India.

A.B.Pandey, Early Medieval India.

J. L. Mehta, Advanced Study in the History of Medieval India Vol.II (1000-1526)

S.C. Raychoudhury, Social, Cultural and Economic History of India.

R.P. Tripathi, Some aspects of Muslim Administration

HIS-301: HISTORY OF INDIA (1526 to the 19th century

Objectives: The objective of this course is to introduce students to the trends and developments in India during the Mughal and the British periods. The emphasis is on Socio- Economic and Cultural Patterns in understanding the Polity and Society.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Advent of the Mughals: Growth of Mughal Empire AD 1526 -1556 Expansion and Consolidation AD1556 – 1707 Decline of the Mughal Empire.	14	14
II	Mughal polity, economy and society: Mansabdari and Jagirdari system; Sher Shah's Administration; Economy, Religion and Architecture.	13	14
III	Advent of European powers: Portuguese, Dutch, French and English British Expansion and Consolidations under Clive; Warren Hastings; Cornwallis; Wellesley; Dalhousie.	14	14
IV	Colonial Economy: Commercial Policies; Land Revenue Systems and its Impact; De-industrialization; Drain of Wealth and Growth of Modern Industries; Foreign Trade.	13	14
V	Social and cultural changes: Spread of Western Education Growth of Intelligentsia and Press Socio-Religious Movements: Rammohan Roy; Ramakrishna and Vivekananda; Swamy Dayanand and the Arya Samaj; Sayyid Ahmad Khan and the Aligarh School.	14	14

ESSENTIAL READING:

H. Kulke and D. Rothermund, History of India
Satish Chandra, Medieval India
R.P. Tripathi, Rise and fall of the Mughal Empire
Bipan Chandra, India's struggle for independence, 1857-1947
Bipan Chandra, History of Modern India
Bipan Chandra, Nationalism and Colonialism in Modern India.
Sekhat Bandopandhya, Plassey to Partition.

J. L. Mehta, Advanced Study in the History of Medieval India Vol.II
Yogendra Singh, Modernisation of Indian Tradition.
C.A Bayly, Indian Society and the Making of the British Empire.
A.R.Desai, Social Background of Indian Nationalism
Dhama Kumar & Tapan Raychaudhuri,ed.,Cambridge Economic History of India, Vol.II
Irfan Habib, The Agrarian system of Mughal India

HIS- 401: Indian Nationalism

Objective: The objective of this course is to introduce students to the trends and developments in India during the National Movement from 1850 to 1950.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Popular resistance to colonial rule: Peasants and Tribal Movements- Indigo Workers; Santhal; Moplahs. Revolt of 1857	14	14
II	Rise of Nationalism: Emergence of Nationalism; Origin of INC; Moderates; Extremist; Partition of Bengal; Swadeshi Movement; Home Rule League.	14	14
III	Constitutional development: Government of India Acts- 1909, 1919, 1935.	13	14
IV	National movement: Rise of Gandhi; Non-cooperation Movement; Civil Disobedience Movement; Quit India; INA.	13	14
V	Towards Independence: Communalism; Partition; Transfer of Power; Integration of the Indian States; Making of the Constitution.	14	14

ESSENTIAL READING:

Bipan Chandra, India's struggle for independence, 1857-1947

Bipan Chandra, History of modern India

Bipan Chandra, Nationalism and colonialism in modern India.

Sekhat Bandopandhya, Plassey to Partition.

Yogendra Singh, Modernisation of Indian Tradition.

C.A Bayly, Indian Society and the Making of the British Empire.

A.R.Desai, Social Background of Indian Nationalism

Dhama Kumar & Tapan Raychaudhuri,ed.,Cambridge Economic History of India, Vol.II

HIS- 501: History of Europe

OBJECTIVE: The purpose of this course is to introduce students to some of the major developments in the world from the decline of the feudal age to the French revolution.

Unit	Detailed Syllabus	Contact Hours	Marks/Weight
I	Feudalism: Meaning, Features and Decline. Rise of new Monarchies: England, France, Spain.	13	14
II	Renaissance: Meaning and Origin; Development in Literature, Art and Science. Geographical Discoveries in the 15 th and 16 th Centuries: Portugal and Spain. Reformation- Martin Luther	14	14
III	Economic Origins of the Modern Western World: Mercantilism; Beginnings of Colonialism. Features of the Absolutist States	14	14
IV	Era of Revolution: Industrial Revolution; Glorious Revolution (1688); American War of independence (1776)	13	14
V	French Revolution: Causes and Results; Rise of Napoleon and Reforms; Congress of Vienna and the concert of Europe	14	14

ESSENTIAL READING:

Perry Anderson, Lineages of the Absolutist State

D.K. Fieldhouse, The Colonial Empires-A comparative Survey from 18th Century

C. Hayes, Contemporary Europe since 1870

Eric J. Hobsbawn, Industry and Empire: The Birth of the Industrial Revolution

James Joll, Europe since 1870: An International History.

Meenaxi Phukan, Rise of the Modern West: Social and Economic History of Early Modern Europe

T. C. W. Blanning, The Oxford History of Modern Europe

M. M. Postan (ed.al.ed.), Cambridge Economic History of Europe Vol.I

M.M. Postan (et.al.ed.), Cambridge Economic History of Europe, Vol.III

E.E.Rich & Wilson, C.H.Wilson (ed.), Cambridge Economic History of Europe Vol.V

David Thompson, Europe since Napoleon,

David Thompson, World History, 1914-1968

Charles Downer Hazen, Modern Europe upto 1945

HIS- 601: Modern World

OBJECTIVE: The purpose of this course is to introduce students to some of the major developments in the Modern World during the two World Wars that led to the emergence of the Cold War Era.

Unit	Detailed Syllabus	Contact Hours	Marks/Weight
I	Rise of New Imperialism: Partition of Africa; Opium wars; Taiping rebellion; Boxer uprising; Meiji Restoration; Militarism in Japan.	14	14
II	Rise of Liberalism and Nationalism: Liberalism in England; German unification; Italian Unification. The Russian Revolution of 1917.	14	14
III	World War I: Causes and Results; the Treaty of Versailles; League of Nation.	13	14
IV	Economic and Social Crisis in the Inter-war years: The Great Depression. Emergence of new Ideologies- Nazism and Fascism.	13	14
V	World War II: causes and Consequences; UNO. Decline of Imperialism and the concept of Decolonization. Emergence of Cold War.	14	14

ESSENTIAL READING:

D.K. Fieldhouse, The Colonial Empires-A comparative Survey from 18th Century

C. Hayes, Contemporary Europe since 1870

James Joll, Europe since 1870: An International History.

E.E.Rich & Wilson, C.H.Wilson (ed.), Cambridge Economic History of Europe Vol.V

A.J.P. Taylor, Origins of the Second World War

A.J.P. Taylor, The struggle for mastery in Europe 1848-1918

David Thompson, Europe since Napoleon

David Thompson, World History, 1914-1968

Charles Downer Hazen, Modern Europe upto 1945

C.D.M. Ketelbey, A history of Modern times.

H.M. Vinache, History of Far East

Kenneth B. Pyle, The Making of Modern Japan

HONOURS PAPERS

HIS- 102: HISTORY OF NORTH EAST INDIA (1822-1972)

OBJECTIVE; The objective of this course is to familiarize the students with the major trends of the Political, Social and Economic Developments in North East India from 1822 to the reorganization of States 1972.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Early British Policy, Non-Regulation System; First Anglo-Burmese War and the Treaty of Yandaboo; Annexations of Assam, Cachar, Jaintia.	14	14
II	Consolidation of British Rule in the Hills-Khasi, Garo, Mizo Hills; Pattern of Administration; British relations with Arunachal tribes, Manipur and Tripura States.	14	14
III	Economic and social changes under British Rule: Land Revenue, Plantation industry, Trade and Communication, Western Education.	13	14
IV	Impact of Nationalist Movement in Assam: Partition of Bengal, Assam Association, Non-Co-Operation Movement, Civil Disobedience and Quit India Movements, Cabinet Mission and Independence.	14	14
V	Political Developments since Independence: Integration of Manipur, Khasi states and Tripura into the Indian Union; The Sixth Schedule; Reorganization of North Eastern States 1972.	13	14

ESSENTIAL READING:

H.K.Bapujari, Assam in the Days of the Company.

J.B. Bhattacharjee, The Garos and the English

A. Guha, Planter Raj to Swaraj 1826-1947.

H.K.Barpujari, The Comprehensive History of Assam, Vols, IV and V.

H.K.Barpujari & A.Bhuyan, S.P.Dey, Political History of Assam, Vols. I-III

R.M.Lahiri, Annexation of Assam.

S.K.Bhuyan, Anglo-Assamese Relations

S.K.Chaube, Hill politics in North East India

D.R.Syiemlieh, British Administration in Meghalaya, Policy and Pattern

E.Gait, History of Assam

Arun Bhuyan, Nationalist Upsurge in Assam

H.K.Barpujari: Problem of the Hill Tribes: North East India, Vol. I-III

J.B.Bhattacharjee, Trade and Colony

A.K Agarwal, North Eastern Economy Problems and Prospects

HIS- 202A: EAST ASIA (1840-1950)

OBJECTIVE: The objective of this paper is to introduce students to the political socio-economic developments, European expansion and the resultant nationalistic movements in the East Asia.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Political, Social, Economic condition in the Middle of the 19 th century: China; Japan and Korea.	13	14
II	European expansion: the opening of China; Opium wars and consequences. China's response to European challenge: Taiping Rebellion, Reform Movements: Boxer Rebellion.	14	14
III	Birth of the Republic: Career of Sun yat Sen; Revolution of 1911: Warlordism; Koemintang; the origin and Growth of the Chinese Communist party; Sino-Japanese War (1937); Civil War and the Communist seizure of power:	14	14
IV	Meiji Restoration; Russo-Japanese War; Rise of Militarism. Japan and the Western Powers; Japan and the Second World War.	13	14
V	Politics and Institution of Korea: Sino-Japanese Rivalry over Korea: Japanese Supremacy over Korea: Independence and Partition.	14	14

ESSENTIAL READING:

John King Fairbank & Merle Goldman, China A New History

Paul Clyde & B.F. Beers, The Far East

H.M. Vinache, History of Far East

Kenneth B. Pyle, The Making of Modern Japan

C.P. Fitzgerald, A Concise History of East Asia.

Scot Kenneth, The Chinese-their Culture & History

Lalouretto Tanage, Japan since Parry

Malcolm Kennedy, History of Japan

Michael Groonberg, British Trade on the Opening of China

Nathaniel Peffer, The Far East

HIS-202B: HISTORY OF MODERN SOUTH EAST ASIA (1850-1946)

OBJECTIVE: The course is designed to familiarize students with colonization of South East Asia by European Powers and related developments.

COURSE CONTENT:

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	South East Asia and the Western Expansion; The Dutch in the Archipelago; British in Burma and Malaya; Spanish and American Power in the Philippines.	14	14
II	The French in Indo-China; Siam and the West.	13	14
III	Main features of Colonial Policy; Social and Economic consequences.	14	14
IV	The South East Asian Response: Beginnings of Nationalism in South East Asia.	14	14
V	The Rise and Fall of Japanese power in South East Asia.	13	14

ESSENTIAL READING:

D.G.E. Hall, A History of South East Asia.

F. John Cady, South East Asia: its Historical Development.

Brian Harrison, South East Asia, A Short History

Nicholas Tarling, A History of Modern South East Asia

J. Kennedy, A History of Malaya

HIS-302: HISTORY OF INDIA c.A.D. 1550-1750

OBJECTIVE: The course is designed to familiarize students with the Social, Economic, Political and Cultural Developments during Mughal Period. The emphasis is on Socio-Economic conditions.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	The Mughals: Contemporary Historiography and Sources; Abul Fazl, Badauni, Abdul Hamid Lahori, Bernier.	14	14
II	Polity: Evolution of the Administrative System; Mansab; and Jagir. The Mughal Ruling Classes: Nobility and Zamindars. Aurangzeb's relations with religious groups and institutions	14	14
III	Rural Economy and Society: Agricultural Production; Cultivation and Irrigation; and Agricultural Manufactures. Agrarian Structure: Land Ownership; Revenue System; the Village Community and Peasantry; Agrarian Crisis.	13	14
IV	Trade, Commerce and the Monetary System: Trade Route and the pattern of Internal Commerce; Internal and External Trade; Monetary System. Urban Economy: Craft and Industries; Imperial Karkhanas. Urban Social Structure: Merchant Communities; Bankers; Artisans; craftsmen and Labourers.	14	14
V	Cultural Developments: Language and Literature; Architecture Formation of Religious Identities: Sikh; Kabirpanthis; and Dadupanthis. Regional Languages and Culture.	13	14

ESSENTIAL READING:

Irfan Habib, The Agrarian System of Mughal India

Shireen Moosvi, People, Taxation and Trade in Mughal India.

K.N. Chaudhuri, Trade and Civilization in the Indian Ocean: An Economic History from the Rise of Islam to 1750

Muzaffar Alam and Sanjay Subramanyam (ed), The Mughal State
Muzaffar Alam, The Crisis of Empire in Mughal North India: Awadh and the Punjab, 1701 - 1748
M.Thar Ali, The Mughal Nobility under Aurangzeb
Najif Haider, Economy during the Mughals
S. Arasaratnam, Maritime India in the Seventeenth Century
S. Arasaratnam, Maritime commerce and English Power (1750-1800)
Ashin Dasgupta, Indian Merchants and the Decline of Surat, c.1700- 1750
Richard M Eaton, The rise of Islam and the Bengal Frontier (1204- 1760)
K.M.Asraf, Life and conditions of the people of Hindustani 1200-1550 AD
R. Champakalakshmi, Trade, Ideology and Urbanisation: South India 300 BC to AD 1300
Simon Digby, War Horse and Elephant in the Delhi Sultanate: A study in Military Supplies
Dilbagh Singh, The State, Landlords and the Peasants :Rajasthan in the 18th Century
Hiroshi Fukazawa, The Medieval Deccan: Peasants, social systems and States- sixteenth to eighteenth centuries
Stewart Gordon, The Marathas 1600-1818

HIS-402: HISTORY OF THE UNITED STATES OF AMERICA

OBJECTIVE: The objective of this course is to familiarize the students with the major Political, Economic, Social and Military Forces that shaped the history of the USA from colonial days to the second world war.

Course content

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Exploration and Colonization of America; Colonial Economic System; British Economic Policy; the American War of Independence.	13	14
II	The Making of the Constitution; Philadelphia Convention, Federalists and Anti- Federalists; Thomas Jefferson and Alexander Hamilton; War of 1812; the Monroe Doctrine; Westward Expansion.	14	14
III	Jacksonian Democracy; the Civil War, Abraham Lincoln; The Reconstructions.	13	14
IV	The Economic Development of the South; Industrial Development; The rise of Big Business; Agrarian Discontent and Populist Movement; Social Change in the Industrial Era.	14	14
V	Rise of US Imperialism: Relations with the Far East; Spanish American War; Relations with Philippines; USA and First and the Second World War.	14	14

ESSENTIAL READING:

Charles seller, Henry May Neil R Mc Millen, A synopsis of American History Vol-I and II
H.B.Parks, The United States of America. A History

Michael Kraus, The Unities States to 1865

John Spencer Bassett, A short history of the United States 1492-1938.

Foster Rhea Dulles, The U.S. since 1865

Thomas A Bailey, The American pageant A History of the republic

Allan Nevins & Henry Steeler Commager, A Pocket history of the united states.

Frank Thistlewaite, the great experiment, An introduction to the history of the American people.

Louis M.Hacker, The course of American Economic growth and Development

H.U.Faulkner, American Economic History

Julius Prath, History of U.S. Foreign Policy

Oscar Handin, A New History of the people of U.S.

Stanley L. Engerman & Robert E. Gallman ed, The Cambridge Economic history of the United State Vol. I, II, III

HIS- 502: History of Christianity in Nagaland 1813-1972

Scope and objectives: The purpose of the course is to introduce the students the history of Christianity in Nagaland from its beginning in the nineteenth century upto 1972.

Course content

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Naga societies and religion before the Advent of Christianity; the Shan mission in Upper Assam; Namsang Naga mission	14	14
II	American Baptist Mission to the Nagas: Ao, Angami, Lotha, Chakhesang, Sema	14	14
III	Advent of Catholic mission: Among the Angamis and the Lothas; Tuensang and Zelianrong area.	13	14
IV	Nagas mission to the other Naga tribes: Konyak, Sangtam, Chang, Phom and Rengma	14	14
V	Christian Impact: Naga society and culture; humanitarian service; literature; medical; education.	13	14

ESSENTIAL READING:

Victor Hugo Sword, *Baptist in Assam: A Century of Missionary Service 1836-1936*
David R. Syiemlieh, *A Brief History of the Catholic Church in Nagaland*
C. Becker, *History of the Catholic Mission in North-East India*
F.S. Downs, *The Mighty works of God*
F.S Downs, *History of Christianity in India, Vol. V*
F.S. Downs, *Essays on Christianity in North East India*
William Gammell, *A History Of American Baptist Missions In Asia, Africa, Europe And North America Under The Care Of The American Baptist Missionary Union*
M. Alemchiba, *A Brief Historical Account of Nagaland*,
H.K. Barpujari, *The American Baptist Missionaries and North East India, 1836-1900*
Sebastian Karotemprel, (Ed.), *The Catholic Church in North East India 1890-1990*
Angeline Lotsüro, *The Nagas A Missionary Challenge*
Merriam, *A History of American Baptist Mission*
P. T. Philip, *The Growth of Baptist Churches in Nagaland*
Joseph Puthenpurakal, *Baptist Mission in Nagaland*
Joseph Puthenpurakal, *Impact of Christianity on North East India*
Joseph Puthenpurakal, *Bishop Orestes Marengo*
M. S. Sangma, *History of American Baptist Mission in North East India (1836-1950), Vol.I*
M. S. Sangma, *History of American Baptist Mission in North East India (1836-1950), Vol.II*
Bendangyabang Ao, *History of Christianity in Nagaland: Social Change 1872-1972*
Visier Sanyu, *History of Nagas and Nagaland*
J. H. Hutton, *The Sema Nagas*.
J. H. Hutton, *The Angami Nagas*
Mills, J. P., *The Ao Nagas*
Mills, J. P., *The Rengma Nagas*
W. C. Smith, *The Ao Naga Tribes of Assam*

HIS- 503: SOCIAL AND ECONOMIC HISTORY OF MODERN INDIA (18th-20th Century)

OBJECTIVE: This course is intended to provide a general understanding of social changes and Economic Developments in Modern India.

Course Content

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Survey of Pre-Colonial Society and Economic Conditions. Beginnings of Social Change and Awakening: Introduction of Modern Education; Emancipation of Women. Social Reform Movements	14	14
II	Charter Act of 1813 and Free-trade; Economic impact of the British: Trade; De-industrialization; Land Tenure Reforms and its Impact on Agriculture.	14	14
III	India under the Crown: Beginning of Industrialization; Transport; Agriculture; Finance; Rural-indebtedness; Foreign Trade.	13	14
IV	Impact of World War I and II on the Indian Economy: Industries; Finance Capital; Banking Drain theory; growth of Economic Nationalism; Swadeshi.	14	14
V	Gandhi-His Economic Views; Gandhi as a Social Reformer. Role of Women in the National Movement. Socio-Economic impact of the Partitions of India.	13	14

ESSENTIAL READING:

A.R-Desai : Social Background of Indian Nationalism.

B.Chandra : Rise and growth of Economic Nationalism in India.

P.Spear : History of India, Vol.II

S.Sarkar : Modern India.

R.P. Dutt, India Today

HIS-602: Political History of the Nagas

OBJECTIVE: The objective of the course is to familiarize the students on Political History of the Naga from Pre-Colonial to State Formation.

Course Content

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Pre-Colonial Naga Polity-The Chief of Village-Village Council-Function of the Council-The Executive Power-Administrative Power-Judicial Power-Law of inheritance.	14	14
II	Treaty of Yandabo 1826;-British contact with Naga;First Stage of Annexation; Second Stage of Annexation.	13	14
III	Consolidation of British Rule-The colonial administrative policy-Transformation of Naga Political System	13	14
IV	First World War; Formation of Club 1918 and Simon Commission, Formation of Tribal Council and Naga National Council-Role of NNC.	14	14
V	Naga Resistance Movement-1951 to 1953-Formation of Federal Government; and Naga People Convention-Emergence of Nagaland State.	14	14

ESSENTIAL READING:

S.K. Chanbe, Hill Politics in North East India

N.Venuh; British Colonization and Restructuring Naga Polity.

A.Mackenzie; The North-East Frontier of India.

Verrier Elwin; The Nagas in the Nineteenth Century.

M.Alemchiba;A Brief Historical Account of Nagaland.

M.Horam; Naga Polity

Yuno Yusoso; Rising Naga

H.K.Barpujari; Problem of the Hill Tribes; North East India, Vol-II.

HIS- 603A: HISTORIOGRAPHY

Objective: The course content of this paper should be able to introduce the students to the very basic concepts that go to make up the subject matter of history. The aim of the paper is not to raise very complex philosophical issues but to enable the students to understand that the very nature of the discipline of history is rooted in some fundamental concepts.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	History: Definitions; Nature and Scope. History as Science History as Literature	13	14
II	Causation and Objectivity History Periodisation in history	13	14
III	History and the other Social Sciences: Archaeology, Anthropology, Sociology, Economics, Political Science and Geography.	14	14
IV	Major trends in Historiography: Herodotus; Empiricism and L.V.Ranke; Historical Materialism; A.J.Toynbee; Marc Bloch.	14	14
V	Trends in modern Indian Historiography: Imperialist Historiography; Orientalist Historiography; Nationalist Historiography; Marxist Historiography; Subaltern Historiography.	14	14

ESSENTIAL READING:

E.H.Carr, What is History.

R.G.Collingwood, The idea of History.

Irfan Habib, Interpreting Indian History

Arthur Marwick, The Nature of History

Romila Thapar, Interpreting Early India.

John C.B.Webster, Studying History.

E. Sreedharan, A Text book of Historiography 500 BC Ad 2000.

B.Sheikh Ali, History: Its Theory and Method.

Keith Jenkins, Rethinking History

C.H.Phillips, Historians of India, Pakistan and Ceylon

Patrick Gardiner, Theories of History

Michael Bentley, Companion to Historiography

Aviezer Tucker, A companion to the philosophy of history and Historiography

Aviezer Tucker , Our Knowledge of the Past, A Philosophy of Historiography.

HIS- 603B: INTRODUCTION TO ARCHAEOLOGY

OBJECTIVE: The course is aimed at introducing the students of ancient history to the nature of archaeological data, its method and the multidisciplinary approaches to the study of past societies.

Course Content

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Definition of Archaeology, Aims and Scopes; Methods and Sources; Relationship of Archaeology and History. History of Archaeology from Antiquarian Stage to 20 th Century Developments; the Three Age System; Cultural-Historical Approach, Processual and Post-processual Schools.	14	14
II	Basic concepts in Archaeology: Concept of Culture; Definition of an Archaeological Site; Role of Stratigraphy in Archaeology; Typology and Classification; Classes of Archaeological Record; Temporal framework and context in Archaeology; Different branches of Archaeology.	14	14
III	Field methods: Types of exploration and location of Archaeological Sites; Excavation-vertical and horizontal method of excavation; Three-dimensional method of recording Archaeological finds.	13	14
IV	Reconstruction and Interpretation of evidence: The use of Environmental and Ethnographic Data; Experimental Techniques; Role of Ethnoarchaeology in the Reconstruction of Prehistoric Societies.	13	14
V	Archaeology in India: Establishment of the Asiatic Society; Alexander Cunningham and the establishment of the Archaeological Survey; Contributions of Lord Curzon and John Marshall; Mortimer Wheeler and the Introduction of Scientific Techniques in Indian Archaeology Difference between Relative and Absolute Dating Method; Typology, Stratigraphy and Geochronology; Radio Carbon and Thermoluminescence Dating Method.	14	14

ESSENTIAL READING:

B. Trigger, A History of Archaeological
D. K. Chakraborti, A History of Archaeological
Glyn E Daniel, 150 years of Archaeology
Glyn E. Daniel, A short History of Archaeology
J. P. Singh et al ((eds), Archaeology of Northeastern India
G. Clark, Archaeology and Society
F. Hole & R. Heizer, An Introduction to Pre-historic Archaeology

G. David, A Short History of Archaeology
K. Greene, Archaeology :An Introduction
M. Wheeler, Archaeology from the Earth
L. R. Binford, In pursuit of the past decoding the Archaeological Record.
L. R. Binford, An Archaeological Perspective
J. Hodder, Reading the Past: Current Approaches to Interpretation in Archaeology.
C.P. Bahn Renfrew, Archaeology: Theories and Methods and Practice
V. Gordon Childe, What Happened in History.

Syllabus of
BA Honours Course
in
Mathematics
for 2018-19 Session

B.Sc. (PASS & HONOURS) SYLLABUS IN MATHEMATICS.

Pass & Honours

	PASS		Credits	HONOURS		Credits
Semester I	MAT 101	Calculus I	5	MAT 102	Analysis	3
		Algebra I				
Semester II	MAT 201	Calculus II	5	MAT 202	Advanced Algebra I	3
		Algebra II			Elementary Number Theory	
Semester III	MAT 301	Advanced Calculus I	5	MAT 302	Advanced Algebra II	3
		Higher Trigonometry			Advanced Differential Equations	
Semester IV	MAT 401	Advanced Calculus II	5	MAT 402	Complex Analysis	3
		Analytical Geometry				
Semester V	MAT 501	Mechanics I (Dynamics)	5	MAT 502	Differential Geometry	3
		Numerical Methods				
Semester VI	MAT 601	Mechanics II (Statics)	5	MAT 602	CHOICE BASED (any one) a.Programming in C b.Mathematical Methods c.Special Theory of Relativity d.Advanced Mechanics	3
		Vector Analysis			PROJECT	2

MAT 101(P&H) (Calculus-I & Algebra-I)

CALCULUS I

Unit 1: Real variables. Continuous and discrete. Interval. Function. Domain of definition. Monotone functions. Inverse functions. Geometrical representations. Limit of a function on the real line. One-sided limits– right hand and left hand limits. Different types of limits. Theorems on limits. Continuous functions. Definitions. Discontinuous functions. Theorems. Properties. Uniform continuity (definition only).

Unit 2: Derivatives. Definition. Continuity of a derivable function. Algebraic and transcendental functions. General rules of differentiation. Function of a function. Chain rule. Inverse function. Logarithmic differentiation. Implicit functions. Parametric equations. Derivative as a rate measurer. Time rate of change. Rectilinear motion. Related rates. Geometric interpretation. Meaning of the sign of the derivative. Determination of multiple roots. Newton's method of approximating a root. Approximate calculations.

Unit 3: Basic methods of integration. Integration by substitution. Integration by parts. Integration of trigonometric and hyperbolic functions. Rational function of sine and cosine. Standard integrals. Integrals of the forms $1/(a + b\sin x + c \cos x)$, $1/(a \cos x + b\sin x)$, $(a + b\sin x + c \cos x) / (a' + b' \sin x + c' \cos x)$, $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$. Trigonometric substitutions.

ALGEBRA I

Unit 4: Theory of Equations

Division algorithm. Remainder theorem. Factor theorem. Fundamental theorem of algebra. Nature of the roots of an equation. Complex roots. Surd roots. Relation between roots and coefficients. Symmetric functions of roots. Transformation of equations. Cardan's method of solution of a cubic equation. Descartes' rule of signs.

Unit 5: Matrix Algebra

Matrices of real numbers. Operations on matrices. The transpose of a matrix. Properties of transposes. Special types of matrices. Rank of a matrix. Its determination. Determination of rank by considering minors. Determination of rank by elementary transformations. Consistency and solution of system of linear equations with not more than three variables.

Recommended Books:

1. Differential Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra – Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry – Thomas & Finney (Pearson Education)
2. Differential Calculus – Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus – Gorakh Prasad (Pothishala, Allahabad)
4. Theory of Equations – M L Khanna

MAT 201(P&H) (Calculus II & Algebra II)

CALCULUS II

Unit 1: Second and higher order derivatives. Use of partial fractions. Use of De Moivre's theorem. Leibnitz theorem. Differentiability and differentials. Rolle's theorem. Theorem of Darboux. Mean value theorem. Lagrange's and Cauchy's forms. Indeterminate forms. L'Hospital's rule. Taylor's theorem. Lagrange's, Cauchy's and generalized form of remainder. Taylor's infinite series. Maclaurin's theorem and infinite series. Maxima and minima. Applied problems.

Unit 2: Reduction formulae for $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$, $\cos^m x \sin^n x$, $1/(a + b \cos x)^n$, $1/(x^2 + a^2)^n$. Integration by special devices.

Definition of a definite integral as the limit of a sum. Definite integral as an area. Geometric interpretation. Calculations. Primitives. Fundamental theorem of calculus. Summation of series. Properties of definite integral.

ALGEBRA II

Unit 3: Sequences. Definition. Bounded and unbounded sequences. Limit of a sequence. Convergent sequences. Limits of combination of sequences (proofs not required). Examples and counter examples. Non-convergent sequences. Monotone sequences. Cauchy sequences. Infinite series. Convergence and divergence of infinite series. Positive series - criterion of convergence. General theorems on convergence. Tests for convergence - series of positive terms. Comparison tests. D'Alembert's ratio test. Cauchy's root test. Raabe's test.

Unit 4: Recap of sets and mappings. Equivalence relations. Equivalence classes. Binary operations Group. Definition Examples. Abelian Group. Order of a group (types of group). Elementary properties of groups using definition. Integral power of an element of a group. Subgroups. Intersection of two subgroups.

Unit 5: Cyclic groups. Groups of permutation (definition and examples). Even and odd permutations. Rings. Integral domains. Fields. Definition. Examples. Elementary theorems. Simple consequences of the definitions.

Note: In Units 4 & 5, definitions & examples only to be discussed. Simple consequences of the definitions and theorems to be discussed. (Detailed discussion to be done in Honours course only).

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Modern Algebra	-	A R Vasishtha

MAT 301(P&H) (Advanced Calculus I & Higher Trigonometry)

ADVANCED CALCULUS I

Unit 1: Tangents and Normals Analytic Representation of a plane curve. Tangent. Normal. Subtangent. Subnormal. Polarcoordinate system. Pedal equation. Differential of arc length. Curvature Measure of bending. Radius of curvature. Theorem on centre of curvature. Concept of curvature. Newton's approach. Curvature at the origin. Coordinates of centre of curvature. Equation of circle of curvature. Evolute and involute. Chord of curvature.

Unit 2: Functions of Several Variables Function of two variables. Domain of definition. Geometric representation. Limit and continuity. Theorems-partial derivatives. Higher order-homogenous functions. Euler's theorem. Total differential. Concept of differentiability. Composite functions. Chain rules. Implicit functions. Maxima and minima of function of two variables.

Unit 3: Improper Integrals Types of improper integrals (1) infinite intervals (2) integrand having discontinuities. Comparison test for convergence. Beta and Gamma functions. Definitions and Relations. Multiple Integrals Calculation of a double integral. Equivalence with repeated integrals. Double integrals over domains other than rectangles. Change of variable.

HIGHER TRIGONOMETRY

Unit 4: De Moivre's Theorem. Statement. Proof of De Moivre's theorem for integral indices. Alternative method. Proof for rational indices. All possible values of $(\cos x + i \sin x)^{p/q}$. Application of De Moivre's theorem for integral and fractional indices. Expansion of $\sin nx$, $\cos nx$, in series of $\sin x$, $\cos x$. Expansion of $\sin^n x$, $\cos^n x$ in terms of $\sin$ and cosine of multiple angles. Series expansion of $\sin x$, $\cos x$ and $\tan x$.

Unit 5: Exponential, sine, cosine and logarithms of a complex number. Definitions. Logarithmic, exponential and hyperbolic functions. Inverse functions - trigonometric and hyperbolic functions. Laws of logarithm. Summation of series.

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Trigonometry	-	Mazumdar & Dasgupta

MAT 401(P&H) (Advanced Calculus II & Geometry)

ADVANCED CALCULUS II

Unit 1: Envelopes Family of curves. Envelope. Definition. Relation between envelope and curves enveloped. Evolute. Arc. Involute. Related curves. Inversion. Pedal curves. Reciprocal polars. Concavity and convexity. Concavity and Convexity. Criterion - points of inflexion. Singular points - at the origin of an algebraic curve and at points other than the origin. Conditions for existence of double points. Discrimination of species of a cusp.

Unit 2: Evaluation of area Quadrature of plane areas - Cartesian coordinates, sign of area. Area in parametric forms. Area included between two curves. Area of a closed curve. Area in polar coordinates. Lengths of plane curves Cartesian, polar and pedal forms. Intrinsic equation to a curve. Volumes and surfaces of revolution. Solids of revolution. Volumes and areas of surfaces.

Unit 3: Differential equations of the first order and first degree - Equation reducible to homogenous form. Bernoulli's equation. Exact differential equations. Differential equation of the first order but not of the first degree. Equations solvable for p , x , y . General and singular solutions. Clairaut's equation Linear differential equations of higher order with constant coefficients. Complementary function and particular integrals. Orthogonal trajectories.

GEOMETRY

Unit 4: 2D Geometry

General equation of the 2nd degree. Chord of contact. Pole and Polar. Conjugate points. Chord in terms of its middle point. Diameter. Conjugate diameter. Intersection of two conics. Conics through the points of intersection of two given conics. Pair of tangents. Director circle. Asymptotes.

Polar equation of a conic. Derivations of polar equation of a conic.

Unit 5: 3D Geometry

Sphere. Equation. Section of a sphere by a plane. Equation of a circle in space. Intersection of two spheres. A sphere passing through a circle. Tangent and tangent plane to a sphere. Cone. Equation of a cone with its vertex at the origin. Right circular cone. Tangent plane to a cone. Reciprocal cone. Three mutually perpendicular generators. Cylinder. Equation. Right circular cylinder.

Recommended Books:

1) Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2) Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3) Analytical Geometry	-	B Das (Orient Book Company)

MAT 501(P&H) (Mechanics I & Numerical Methods)

MECHANICS I (DYNAMICS)

Unit 1: Fundamental definitions and principles. Motion in a straight line. Simple harmonic motion. Motion under earth's attraction. Uniplanar motion where the accelerations parallel to fixed axes are given. Composition of simple harmonic motion.

Unit 2: Uniplanar motion referred to polar coordinates. Central orbit. Apses. Apsidal distance. Uniplanar motion when the acceleration is central and varying as the inverse square of the distance. Kepler's laws. Time of describing any arc of the path. Planetary motion.

Unit 3: Tangential and normal accelerations. Constrained motion. Conservation of energy. The simple pendulum. Motion on a rough curve. Motion in a resisting medium. Motion where the mass moving varies.

NUMERICAL METHODS

Unit 4: Finite differences. The operators Δ and ∇ . Properties. Interpolation with equal intervals. Newton-Gregory formula for forward interpolation. Newton-Gregory formula for backward interpolation. Interpolation with unequal intervals. Divided differences. Properties. Newton's formula for unequal intervals. Lagrange's interpolation formula for unequal intervals. Lagrange's interpolation formula for equal intervals.

Unit 5: Central difference formula. Operators δ , ∇ , α and μ . Gauss's central difference formula. Inverse interpolation. Use of Lagrange's formula. Successive approximations. Roots of algebraic equation by inverse interpolation. Numerical differentiation. Approximate expression for the derivative of a function. Numerical integration. General quadrature formula. The trapezoidal rule. Simpson's $1/3$ and $3/8$ rule.

Recommended Books:

- 1) An Elementary Treatise of the Dynamics of a Particle and of Rigid Bodies - S L Loney (Surjeet)
- 2) Finite Differences and Numerical Analysis - H C Saxena (S Chand & Co)

References:

- 1) Dynamics - P N Chatterjee

MAT 601(P&H) (Mechanics II & Vector Analysis)

MECHANICS II (STATICS)

Unit 1: Coplanar forces. Moment of a system of coplanar forces. Equation of line of action of the resultant of a system of coplanar forces. Necessary and sufficient condition for the equilibrium of a system of coplanar forces acting on a rigid body. Astatic equilibrium. Equilibrium of a rigid body under three forces. (m, n) theorem.

Unit 2: Work. Work done by a system of concurrent forces. Virtual work. Principle of virtual work for a system of coplanar forces acting on a particle. Omission of forces. Stability of equilibrium. Stable, unstable and neutral equilibrium. Work function test for the nature of stability of equilibrium. Energy test for equilibrium.

Unit 3: Centre of gravity. Definition and general formulation. Centre of gravity of arc, plane area, area bounded by curve, solid of revolution, surface of revolution. Centre of gravity bounded area in polar coordinates. The theorem of Pappus. Friction. Statical, dynamical and limiting friction. Laws of friction. Limiting equilibrium. Coefficient of friction. Angle of friction. Cone of friction. Equilibrium of a body on a rough inclined plane.

VECTOR ANALYSIS

Unit 4: Recap of vectors preliminaries. Scalar triple product and vector triple product. Their geometrical meanings. Product of four vectors. Reciprocal system of vectors. Vectors function of a scalar variable. Limit and continuity. Vector differentiation. Directional derivatives. Level surfaces. Tangent plane and normal to a level surface. Gradient, divergence and curl.

Unit 5: Vector integration. Line integrals. Surface integrals. Volume integral. Statements of Green's theorem. Gauss' theorem and Stoke's theorems. (proof not necessary). Problems based on surfaces like spheres, cylinders, cone, parallelepiped.

Recommended Books:

- 1) Statics - Md Motihur Rahman (New Central Book Agency, Kolkata)
- 2) A Textbook of Vector Analysis - Shanti Narayan and P K Mittal (S Chand & Co)

References:

- 1) A Textbook on Statics - M Ray, R D Sanglik
- 2) Vector Algebra - G C Sharma A R Vasishtha Sharma & Vasishtha
- 3) Vector Calculus - G C Sharma A R Vasishtha Sharma & Vasishtha

MAT 102(H) (Analysis)

ANALYSIS

Unit 1: Closed intervals. Open intervals. Semi-closed or semi-open intervals. Sets bounded above and sets bounded below. Bounded sets. Limit points of a set. Closed sets. Compact sets. Heine - Borel theorem. Concept of real sequence - boundedness, convergence, non-convergence. Infinite series - convergence and sum.

Unit 2: Real valued functions of a single variable. Limits. Continuity. Uniform continuity. Properties of functions continuous in closed intervals. Monotonic function. Function of bounded variation.

Unit 3: Derivability of real valued function of a single variable. Sign of derivative at a point. Darboux's Theorem. Rolle's Theorem. Higher derivatives. Young's form of Taylor's theorem. Applications of Taylor's theorem. The indeterminate forms.

Unit 4: Riemann integrability. Integral of a bounded function over finite domain. Darboux's theorem. Conditions for integrability. Particular class of bounded integrable functions. Properties of integrable functions. Functions defined by definite integrals. Mean value theorem of integral calculus. Change of variable in an integral. Integration by parts.

Unit 5: Fourier Series. Preliminary and main theorem. Fourier series for odd and even functions. Half-range series. Definite integral as functions of a parameter. Uniform convergence of improper integrals. The test for uniform convergence. Properties of uniformly convergent integrals.

Recommended Books:

1) Mathematical Analysis - Shanti Narayan (S Chand & Co)

References:

1) Real Analysis - S C Malik (New Age Publishers)

2) Fundamental Concepts of Analysis - Alton Smith & Walter Albrecht (PHI)

MAT 202(H) (Advanced Algebra I & Elementary Number Theory)

ADVANCED ALGEBRA I

Unit 1: Groups. Subgroups. Cosets. Normal subgroups. Cyclic group. Lagrange's theorem. Homomorphism Isomorphism.. Quotient groups. Permutation groups. Conjugate classes. Cauchy's theorem. Sylow's theorems.

Unit 2: Rings. Integral domains. Homomorphism. Isomorphism. Quotient fields. Ideals. Quotient rings. Prime and maximal ideals.

Unit 3: Factorisation. Euclidean domain. Principal ideal domain. Unique factorisation domain. Polynomial rings. Roots of polynomials. Factorisation of polynomials.

ELEMENTARY NUMBER THEORY

Unit 4: Divisibility. Primes. Congruences. Solution of congruences. Congruences of degree 1. Chinese remainder theorem. The function $\phi(n)$.

Unit 5: Quadratic Residues. Quadratic reciprocity. The Jacobi symbol. Greatest integer function. Arithmetic functions.

Recommended Books:

- 1) University Algebra
- 2) An Introduction to the Theory of Numbers
Gopalakrishnan (New Age) Niven and Zuckerman (New Age)

References:

- 1) An Introduction to Number Theory
- Ajay Kr Chaudhuri (New Central Book Agency, Kolkata)
- 2) Elementary Number Theory
- David M Burton (UBS, Guwahati)

MAT 302(H) (Advanced Algebra II & Advanced Differential Equations)

ADVANCED ALGEBRA II

Unit 1: Vector spaces. Definition and examples. Subspaces. Definition and examples. Linear dependence, independence and basis. Dimension. Linear transformation. Kernel. Isomorphism. Quotient space. First Isomorphism Theorem. Non-singular linear transformation. Orthogonal complement.

Unit 2: Modules. Submodule. Definition and example. Isomorphism theorems. Generator. Annihilator. Preliminaries of matrices. Matrices and linear transformation. Trace and transpose. Symmetric and skew-symmetric.

Unit 3: Rank. Row and column rank. Linear equations. Homogeneous and non-homogeneous. Minimum polynomial. Characteristic vector and root. Characteristic polynomial. Cayley Hamilton theorem.

ADVANCED DIFFERENTIAL EQUATIONS

Unit 4: Linear equation of second order. Standard form. Complete solution. Complementary function. Particular integral. Reduction to normal form. Transformation by changing the independent variable. Method of variation of parameters. Solution by operators.

Unit 5: Simultaneous equations of the form $dx/P = dy/Q = dz/R$. Solution. Geometrical interpretation Total differential equations. Solution by inspection. Homogeneous case (homogeneous in x, y, z). Solution by taking one variable as constant. Linear partial differential equation of order one. Lagrange's method. Integral surfaces passing through a given curve. Surfaces orthogonal to a given system of surfaces.

Recommended Books:

- 1) University Algebra - Gopalakrishnan (New Age)
- 2) Ordinary and Partial Differential Equations - Raisinghania (S Chand & Co)

References:

- 1) Elements of Partial Differential Equations - I N Sneddon (McGraw Hill)
- 2) Linear Algebra - K P Gupta

MAT 402(H) (Complex Analysis)

COMPLEX ANALYSIS

Unit 1: Complex number. Definition. Algebraic operations. Modulus, amplitude and their properties. Conjugate of a complex number and related results. Triangle inequality. Polar form of a complex number. Euler's formula. Functions of a complex variable. Limits, continuity, derivative, and differentiation formulas.

Unit 2: Definition of analytic function. Cauchy-Riemann equations. Necessary and sufficient condition for a function to be analytic (to be discussed and proved). Cauchy-Riemann equations in polar coordinates. Harmonic functions. Finding of harmonic conjugate given an analytic function. Zeros and poles of analytic functions. Examples of analytic functions.

Unit 3: Definite integrals of complex function of a real variable. Contours. Line integrals. Examples. Statement of Cauchy-Goursat theorem and problems based on the theorem. Cauchy's integral formula. Derivatives of analytic functions.

Unit 4: Morera's theorem. Maximum moduli of functions. Liouville's theorem. Fundamental theorem of algebra. Convergence of sequences and series of complex numbers. Taylor, Maclaurin, Laurent series. Problems. Definition of power series. Circle of convergence. Radius of convergence of a power series (definitions only).

Unit 5: Residues. Residue theorem. Principal part of a function. Residues at poles. Quotients of analytic functions. Evaluation of improper real integrals. Improper integrals involving sines and cosines. Definite integrals involving sines and cosines. Integration through a branch cut.

Recommended Books:

- 1) Complex Variables and Applications - R V Churchill & J W Brown (McGraw Hill) References:
1) Complex Analysis - J N Sharma

MAT 502(H) Differential Geometry

DIFFERENTIAL GEOMETRY

Unit 1: Space curve. Tangent. Arc length. Order of contact between curve and surface.

Fundamental planes (osculating, normal and rectifying plane). Curvature. Torsion. Serret-Frenet formula. Direction cosines of the principal normal and binormal. Fundamental theorems for space curves (existence and uniqueness theorems).

Unit 2: Osculating circle. Osculating sphere. Involute. Evolute. Surface. Regular points and singularities on a surface. Curvilinear equation of the curve on the surface. Parametric curves. Tangent plane and normal and their Cartesian equation.

Unit 3: Family of surface. Envelope. The edge of regression. Ruled surface. Developable surface. Necessary and sufficient condition that any surface represents a developable surface. Theorems related to developable surfaces. Developable associated with space curve. Theorems and questions on osculating developables. Polar developables. Rectifying developables.

Unit 4: First fundamental form and its geometrical interpretation and properties. Second fundamental form and geometrical interpretation. Weingarten equations (derivative of N). Direction coefficients. Direction ratios. Differential equation of family of curves. Orthogonal trajectories. Condition for orthogonalities.

Unit 5: Normal curvature (curvature of normal section). Mensnier's theorem. Principal direction. Principal curvature. First curvature. Mean curvature. Gaussian curvature. Minimal surface. Necessary and sufficient condition for a surface to be developable. Lines of curvature. Rodrique's formula. Lines of curvature as parametric curves. Euler's theorem.

Recommended Books:

- 1) Differential Geometry of Three Dimensions
- C E Weatherburn (Radha Publishing House, Kolkata)
- 2) Differential Geometry : An Integral Approach
- Nirmala Prakash (Tata McGraw Hill)
- 3) Vector Calculus
- M D Raisinghania (S Chand & Co., Guwahati)

References:

- 1) Three Dimensional Differential Geometry
- Gupta and Malik (Pragati Prakashan, Meerut)
- 2) Differential Geometry
- Mittal and Agrawal (Krishna Prakashan Media Pvt. Ltd., Meerut)
- 3) Differential Geometry M L Khanna
-

MAT 602(H) Choice (a) Computer Programming in C

COMPUTER PROGRAMMING IN C (THEORY)

Unit 1: Introduction to Programming, Algorithms, Introduction to Modularity, Functions. The main() Function, the printf() function. Data types. Arithmetic operations, Displaying Numerical results, Variable and Declarations, integer qualifiers, Common programming errors.

Unit 2: Assignment, Addresses, the scanf() function, scanf() function with buffered input, Symbolic constants, Relational expressions, the if - else statement , nested if statement, if - else chain, the switch statement, the while statement, scanf() within a while loop, break and continue statement. The for statement, scanf() within a for loop, nested loops. The do statement, validity checks.

Unit 3: Function definitions and Declarations, standard library functions (input, output, mathematical, string), variable scope, variable storage class, passing addresses, arrays (single and two dimensional), array names as pointers, pointer arithmetic, passing and using array addresses. String fundamentals (input, output, processing, character by character input). Formatting strings.

COMPUTER PROGRAMMING IN C (PRACTICAL)

Unit 4: Programs involving interactive input and formatted output are to be practiced involving all the functions discussed in the theory part. More emphasis will be laid on programs involving mathematical computations like finding the roots of quadratic, cubic polynomials, addition, subtraction, multiplication of matrices.

Unit 5: Simple numerical methods in finding roots of polynomials and Quadrature.

Recommended Books:

- 1) The C Programming Language
- Brian W Kernighan & Dennis M Ritchie (PHI)

MAT 602 (H)Choice (b) Mathematical Methods

MATHEMATICAL METHODS

Unit 1: Hypergeometric functions. General solutions. Elementary functions. Confluent hypergeometric functions. Derivative of confluent hypergeometric functions. Integral representation of confluent hypergeometric functions.

Unit 2: Bessel's function. Bessel's differential equation. Bessel's function in terms of hypergeometric functions. Recurrence relations. Generating function of Bessel's functions. Bessel's function of second kind. Orthogonality of Bessel's functions.

Unit 3: Legendre functions. Legendre's differential equation. Generating function. Legendre's polynomials. Recurrence relations. Orthogonality of Legendre's polynomials. Associated Legendre's function.

Unit 4: Fourier transforms. Definition. Fourier sine and cosine series. Properties of Fourier transforms. Fourier transforms for functions of two variables. Parseval's relations. Evaluation of integrals. Fourier transforms of derivatives. Fourier sine and cosine transforms of derivatives.

Unit 5: Laplace transforms. Definition. Existence. Properties. Laplace transform of derivatives. Laplace transforms of integrals. Laplace transforms using power series, differentiation. Inverse Laplace transforms. Properties. Application.

Recommended Books:

1) Mathematical Physics - Binoy Bhattacharya (New Central Book Agency, Kolkata)

MAT 602(H)Choice (c) Special Theory of Relativity

Special Theory of Relativity

Unit 1: Review of Newtonian mechanics. Inertial frames. Speed of light and Galilean relativity. Michelson-Morley experiment. Lorentz-Fitzgerald hypothesis.

Unit 2: Relative character of space and time. Postulates. Special Theory of relativity. Lorentz transformation equations. Group properties of Lorentz transformations.

Unit 3: Length contraction. Time dilation. Lorentz contraction factor. Four dimensional Minkowskian space-time of special relativity.

Unit 4: Time-like, light-like and space-like intervals. Null cone. Proper time. World line of a particle.

Unit 5: Four vectors tensor in Minkowskian space-time relativistics mechanics. Variation of mass with velocity. Equivalence of mass and energy.

Recommended Books:

1. Theory of Relativity - J K Goyal & K P Gupta
2. Introduction to the Theory of Relativity - P G Bergmann

:

MAT 611: Choice (d) Advanced Mechanics HYDROSTATICS

Unit 1: Fluid pressure under gravity. Related theorems. Differential equation of pressure.

Conditions of equilibrium. Homogeneous fluids. Equi-pressure surface. Lines of force. Curves of equi-pressure and equi-density. Pressures on plane surfaces (simple cases only) Centre of pressure. Centre of pressure of a parallelogram, triangular area, vertical circular area, etc (simple cases only)

Unit 2: Thrusts on curved surfaces. Resultant vertical thrust Resultant horizontal thrust. Buoyancy.

Force of Buoyancy. Centre of Buoyancy.

Equilibrium of floating bodies. Bodies floating in more than one liquid. Stability of floating bodies. Meta centre. Surface of Buoyancy. Plane of floatation. Surface of floatation.

DYNAMICS OF RIGID BODIES

Unit 3: Moment and product of inertia. Momental ellipsoid. Principal axes. D'Alembert's

principle. The general equations of motion. Independence of the motions of translation and rotation. Impulsive forces.

Unit 4: Motion about a fixed axis. Moment of momentum. The compound pendulum. Reactions of the axis of rotation. Motion about a fixed axis (impulsive forces). Centre of percussion.

Unit 5: Motion in two dimensions (Finite forces). Kinetic energy in two dimensions. Moment of momentum in two dimensions. Varying mass.

Recommended Books:

- 1) A Textbook of Hydrostatics - Ray and Sharma (S Chand)
- 2) Rigid Dynamics - Md Motiur Rahman (New Central Book Agency, Kolkata)

Syllabus of
BA Honours Course
in
Philosophy
for 2018-19 Session

DEPARTMENT OF PHILOSOPHY
DISTRIBUTION OF SEMESTER-WISE COURSES.

COURSE OUTLINE

Semester	General Papers Code No & Title	Compulsory Honours Papers Code No & Title	Honours Papers With Options Code No & Title
I	PHI-101: Western Philosophy-I	PHI-I02: Logic-I	
II	PHI-201: Western Philosophy-II	PHI-202: Logic-II	
III	PHI-301: Outlines of Indian Philosophy-I	PHI-302: Philosophy of Religion	
IV	PHI-401: Outlines of Indian Philosophy-II	PHI-402: Existentialism	
V	PHI-501: Ethics (Western and Indian)	PHI-502: Philosophy of Mind	Choose any one : a. PHI-503(a) Philosophy of Natural Sciences b. PHI-503(b) Christian Theology c. PHI-503(c) Contemporary Indian Philosophy
VI	PHI-601: Social and Political Philosophy	PHI-602: Applied Ethics	Choose any one: a. PHI-603(a) Philosophy of Human Rights b. PHI-603(b) Contemporary Indian Christian Thought c. PHI-603(c) Project Paper

SE
ME
ST
ER
I
(G
EN

ERAL)

PHI- 101: WESTERN PHILOSOPHY- I Marks:100 Cr:4**Objectives:**

- To introduce the student to the study of Western Philosophy
- Make them acquainted with the origins of the subject and give them an understanding of the chief Epistemological theories of Philosophy

Unit	Topic	Contact Hours	Weightage
UNIT- I	a. Meaning, Nature and Scope of Philosophy. b. The Pre-Socratics: Thales; Pythagoras; Heraclitus. c. Socrates: Method of Refutation.	14	20
UNIT- II	Plato: Theory of Forms; Theory of Knowledge.	13	20
UNIT-III	Aristotle: Form and Matter, Cause, Potentiality and Actuality.	14	20
UNIT- IV	a. Sources of Knowledge: Rationalism; Empiricism. b. Theories of Perception: Realism; Idealism.	14	20
UNIT- V	Theories of Truth: Correspondence; Coherence; Pragmatic.	13	20

Suggested Readings:

1. Burnet, History of Greek Philosophy. Macmillan.
2. Stace. W.T. Critical History of Greek Philosophy. Macmillan.
3. Flackenberg.R, History of Modern Philosophy. Progressive Publishers, Calcutta.
4. Thilly.F, A History of Philosophy. SBW Publishers,N.Delhi.
5. Mayer.F, A History of Modern Philosophy. Eurasia Publishing House. N.Delhi.
6. Russell.B, History of Western Philosophy. Simon & Schuster,INC. N.Y.
7. Copleston,F, History of Western Philosophy,relevant Volumes. Search Press, London.
8. Sharma, R.N, Problems of Philosophy. Kedar Ram Nath & Co, Meerut.
9. Encyclopaedia of Philosophy: Relevant Volumes

SEMESTER II (GENERAL)**PHI-201: WESTERN PHILOSOPHY - II****Marks: 100 Cr :4****Objectives:**

- To introduce the students to Modern Western philosophers
- Give them a foundation of classical philosophical problems through the study of these philosophers

Unit	Topics	Contact Hours	Weightage
UNIT- I	Descartes: Method of doubt; Substance; Cogito ergo sum	13	20
UNIT- II	a. Spinoza: Substance, Modes and Attributes. b. Leibnitz: Monads.	14	20
UNIT-III	Locke: Refutation of Innate Ideas; Ideas and their Classification; Substance; Primary and Secondary Qualities.	13	20
UNIT- IV	a. Berkeley: Esse est percipii. b. David Hume: Causality.	14	20
UNIT- V	a. Immanuel Kant: Analytic and Synthetic a priori judgment; Space and Time. b. Hegel: Dialectics	14	20

Suggested Readings :

1. Burnet, History of Greek Philosophy. Macmillan.
2. Stace. W.T. Critical History of Greek Philosophy. Macmillan.
3. Flackenberg.R, History of Modern Philosophy. Progressive Publishers, Calcutta.
4. Thilly.F, A History of Philosophy. SBW Publishers,N.Delhi.
5. Mayer.F, A History of Modern Philosophy. Eurasia Publishing House. N.Delhi.
6. Russell.B, History of Western Philosophy. Simon & Schuster,INC. N.Y.
7. Copleston,F, History of Western Philosophy,relevant Volumes. Search Press, London.
8. Sharma, R.N, Problems of Philosophy. Kedar Ram Nath & Co, Meerut.
9. Encyclopaedia of Philosophy: Relevant volumes

SEMESTER III (GENERAL)**PHI-301: OUTLINES OF INDIAN PHILOSOPHY-I** **Marks: 100 Cr: 4****Objectives:**

- To give a clear, comprehensive and critical account of the various systems of Indian Philosophy
- To showcase ancient philosophical texts and relate them to contemporary issues of philosophy and religion

Unit	Topics	Contact Hours	Weightage
UNIT- I	Nature, Common Characteristics and Distinctive Features of Indian philosophy	13	20
UNIT- II	a. Carvakas: Epistemology and Metaphysics b. Jainism: Pramanas; Anekantavada; Syadvada	14	20
UNIT-III	Buddhism: Pramanas; Anityavāda; theory of Dependent Origination	14	20
UNIT- IV	Samkhya: Prakriti and Purusa; Theory of Evolution; Plurality of Purusas; Satkāryavāda	13	20
UNIT- V	Nyaya: Pramanas; Asatkaryavada	14	20

Suggested Readings

- 1.S.Radhakrishnan, Indian Philosophy, (Volume I & II)
2. Hiriyana, Outline of Indian Philosophy
3. C.D.Sharma, Critical survey of Indian Philosophy
4. D.M. Datta, *The Six Ways of Knowing*, University of Calcutta, (1972),
5. K.Potter, Encyclopaedia of Indian Philosophy
6. J. Sanyal: Guide to Indian Philosophy.
7. DM Dutta, SC Chatterjee, Introduction to Indian Philosophy.

SEMESTER IV (GENERAL)**PHI-401: OUTLINES OF INDIAN PHILOSOPHY-II** **Marks: 100 Cr:4****Objective:**

- To present the essential meaning and significance of individual texts and philosophies and also draw parallels between Indian and Western philosophical traditions

Unit	Topics	Contact Hours	Weightage
UNIT- I	Vaisesikha: Categories; Atomism.	14	20
UNIT- II	Mimamsa: Pramanas; Causation; Arthāpati and Anupalabdhi	13	20
UNIT-III	Vedanta of Sankara: Brahman, Atman, Maya, World.	14	20
UNIT- IV	Theories of Error: Nyaya-Vaisesika, Buddhist, Sankhya , Mimamsa and Advaita Vedanta	14	20
UNIT- V	Validity of Knowledge: Svataḥ pramāṇya and Parataḥ pramāṇya.	13	20

Suggested Readings

- 1.S.Radhakrishnan, Indian Philosophy, (Volume I & II)
2. Hiriyana, Outlines of Indian Philosophy
3. C.D.Sharma, Critical survey of Indian Philosophy
4. D.M. Datta, *The Six Ways of Knowing*, University of Calcutta, (1972),
5. K.Potter, Encyclopaedia of Indian Philosophy
6. J. Sanyal: Guide to Indian Philosophy.
7. DM Dutta, SC Chatterjee, Introduction to Indian Philosophy.

SEMESTER V (GENERAL)**PHI-501: ETHICS (Western and Indian)****Marks:100 Cr:4****Objective:**

- For students to acquire a foundational understanding of Moral philosophy
- To learn about ethical theories and ideas of morality which are found in both Western and Indian traditions so as to obtain a balanced knowledge of the subject matter
- To acquaint the students with some basic issues in bio-ethics that will help them to understand the importance of ethical choices and responsibilities in life

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Nature of Morality and Moral philosophy b. Nature of Moral Judgment	13	20
UNIT- II	a. Freedom and Social responsibility b. Concept of Good, Right and Virtue	14	20
UNIT-III	Kant: Good Will; the Categorical Imperative	13	20
UNIT- IV	Utilitarianism: Jeremy Bentham and J.S.Mill	14	20
UNIT- V	a. Purusarthas and Varnashrama Dharma b. Bhagavad Gita : Niskama Karma c. MK Gandhi : Ahimsa	14	20

Suggested Readings:

1. Beauchamp, T.L.: Philosophical Ethics: An Introduction to Moral Philosophy.
2. Warnock, M.: Ethics Since 1900.
3. DD Raphael, Moral Philosophy.
4. W Lillie, Introduction to Ethics, Allied Publishers, Delhi.
5. W Frankena, Ethics, Prentice Hall of India, N. Delhi.
6. IC Sharma, Ethical Philosophies of India, George Allen & Unwin, London.
7. M Hiriyana, The Indian Concept of Values.
8. Bhagavad Gita.
9. Dr.R.K.Behera, Moral Philosophy (A book with a difference)
10. Dr.N.C.Padhi, S.C.Panigrahi, Basic Principles of ethics, Santosh publications, cuttack-753001

SEMESTER VI (GENERAL)**PHI-601: SOCIAL AND POLITICAL PHILOSOPHY** **Marks:100** **Cr:4****Objectives:**

- To introduce the students to the area of Social and Political thought and ideals
- To acquaint the students with concepts of the various political and social Ideologies and Action

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Meaning and scope of Social and Political philosophy; Relation to Sociology and Politics. b. Concept of Individual; Society; State; Nation	14	20
UNIT- II	Social Ideals: Liberty; Equality; Justice	14	20
UNIT-III	Political Ideologies: Democracy; Socialism; Communism	13	20
UNIT- IV	Political Action: Revolution; Terrorism; Constitutionalism	13	20
UNIT- V	a. M.K.Gandhi: Sarvodaya b. National Integration	14	20

Suggested Readings:

1. Raphael,DD, Problems of Political Philosophy. Macmillan.
2. Quinton, A. Political Philosophy. OUP.
3. Ebenstein, W, Modern Political Thought: The Great Issues.
4. Gandhi, M.K, The Voice of Truth.Relevant volume.
5. Gandhi, MK, Hind Swaraj, Navajivan Publishing House, Ahmedabad.
6. Skoble,A.J.,Machan,TR. Political Philosophy: Essential Selections.
7. NV Joshi, Social and Political Philosophy.
8. Ram Chandra Gupta, Great political thinkers(East & west), Lakshmi Narain Agarwal, Agra

SEMESTER I (HONOURS)**PHI-102 : LOGIC-I****Marks:100 Cr :4****Objectives:**

- To introduce the students to the study of deductive and traditional Logic
- Provide the students with the basics for logical reasoning

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Introduction: Meaning of Logic, difference between Deductive and Inductive Logic b. Truth and Validity	14	20
UNIT- II	a. Sentence and Proposition b. Aristotelian classification of Propositions, Distribution of terms	13	20
UNIT-III	a. Immediate Inference: Aristotle's Square of Opposition b. Edution: Conversion, Obversion	14	20
UNIT- IV	Syllogism: Figures; Valid moods	14	20
UNIT- V	Formal Rules and Fallacies	13	20

Recommended books:

1. Patrick Suppes: Introduction to Logic, Affiliated East-West press private Ltd., New Delhi
2. A.H.Basson, D.J.O'Connor: Introduction to Symbolic Logic, Oxford University Press,
3. A.Ambrose, M.Lazerowiz: Fundamentals of Symbolic Logic, new York
4. H.Reichenbach: Elements of symbolic logic, new York
5. P.F.Strawson: Introduction to Logical theory, London
6. B.A.W.Russell: Introduction to Mathematical Philosophy. London
7. A.C.Stebbing: Introduction to Modern Logic, S.A.Publishing house, Calcutta
8. F.B.Fitch: Symbolic Logic, New York
9. Irving Copi: Introduction to Logic and symbolic Logic, Macmillan company.
10. Roy,BN. :Text Book of Deductive Logic.
11. Roy, BN : Text Book of Inductive Logic.
12. Cohen & Nagel: Introduction to Logic and Scientific Method.
13. Dr.N.C.Padhi, Deductive logic, Grantha mandir, Cuttack-753001

SEMESTER II (HONOURS)**PHI-202: LOGIC-II****Marks:100 Cr:4****Objectives:**

- To introduce the students to Modern or Mathematical Logic
- To equip the students with the tools for sound reasoning

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. What is Logical appraisal b. Laws of Thought	14	20
UNIT- II	Using Venn diagrams to test syllogisms	13	20
UNIT-III	Non-formal fallacies: Ad Ignorantium; Ad Hominem; Petitio Principii; Ad Populum; Ad Baculum; Ignoratio Elenchi	14	20
UNIT- IV	Symbolic logic: Truth functions; Symbolization	14	20
UNIT- V	Construction of Truth Tables to test validity	13	20

Recommended books:

1. Patrick Suppes: Introduction to Logic, Affiliated East-West press private Ltd., New Delhi
2. A.H.Basson, D.J.O'Connor: Introduction to Symbolic Logic, Oxford University Press,
3. A.Ambrose, M.Lazerowiz: Fundamentals of Symbolic Logic, new York
4. H.Reichenbach: Elements of symbolic logic, new York
5. P.F.Strawson: Introduction to Logical theory, London
6. B.A.W.Russell: Introduction to Mathematical Philosophy. London
7. A.C.Stebbing: Introduction to Modern Logic, S.A.Publishing house, Calcutta
8. F.B.Fitch: Symbolic Logic, New York
9. Irving Copi: Introduction to Logic and symbolic Logic, Macmillan company.
10. Roy,BN. :Text Book of Deductive Logic.
11. Roy, BN : Text Book of Inductive Logic.
12. Cohen & Nagel: Introduction to Logic and Scientific Method.

SEMESTER III (HONOURS)**PHI-302: PHILOSOPHY OF RELIGION****Marks:100 Cr: 4****Objectives:**

- To introduce the students to the major topics and debates in the field of philosophy of religion
- To study dominant problems and concepts of the existence and idea of God in the major world religions as well as tribal religion
- Learn classical and contemporary relevant issues so the students will gain familiarity with foundational issues in religion

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Definition of Religion, Nature of Philosophy of Religion and distinction from Theology b. Reason, Faith and Revelation	14	20
UNIT- II	a. The idea of God - Christianity, Hinduism, Buddhism, Islam b. Tribal religion - Concept of God among the Naga tribes	14	20
UNIT-III	Classical arguments for God's existence - Ontological, Cosmological, Teleological and Moral	13	20
UNIT- IV	a. Religious experience - Mysticism and Numinous experience b. Religious Pluralism - Inter religious dialogue; Globalization of religion	13	20
UNIT- V	Problem of Evil and Suffering - Christianity, Hinduism, Buddhism and Islam	14	20

Suggested Readings:

1. W.D. Hudson, *A Philosophical Approach to Religion*, MacMillan, 1974.
a. PHI 402
2. Mircea Eliade, *The Sacred and the Profane*, MacMillan, 1979.
3. Mircea Eliade, *The Encyclopedia of Religion*, MacMillan, 1987.
4. R. Panikkar, *The Intra-Religious Dialogue*, ATE, 1984.
5. P. Tillich, *What is Religion*, Harper and Row, 1969.
6. J.Hicks, *An Interpretation of Religion*.
7. William James, *Varieties of Religious Experience*.
8. Steven M.Cahn(ed), *The Essential texts to the Philosophy of Religion* (Oxford University Press, 2005)
9. R.K.Behera, *Philosophical concept of God*, Akankhya publishing House, New Delhi.
10. J.Hicks, *Philosophy of Religion*, Eaglewood Cliffs, Prentice Hall.
11. N. Smart, *The World's Religions*, Cambridge University Press.
12. R Swinburne, *Faith and Reason*.
13. Y Maseeh, *Introduction to Religious Philosophy*.
14. C Meister, (2007) *Introducing Philosophy of Religion*.

SEMESTER IV (HONOURS)**PHI-402: EXISTENTIALISM****Marks:100****Cr:4****Objective:**

- To introduce the students to contemporary philosophy of existentialist thought
- To provide the students an insight into the theistic and atheistic implications of the existentialists

Unit	Topics	Contact Hours	Weightage
UNIT- 1	a. General characteristics of Existentialism b. Existentialism and Humanism	14	20
UNIT- 11	Kierkegaard : Subjectivity as Truth; Stages of life	14	20
UNIT-111	Sartre: Authenticity and Bad faith; Freedom	14	20
UNIT- 1V	Martin Heidegger: Analysis of human existence; Dasein	13	20
UNIT- V	Neitzche: Will to power; Superman; Death of God	13	20

Suggested Readings

1. Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson, Basil Blackwell, Oxford, 1978.
2. Sartre,JP: *Being and Nothingness*, Tr. Hazel Barness, New York: Philosophical Library, 1956.
3. Sartre,JP: *Existentialism and Humanism*, Eyre Methuen Ltd., London, 1977.
4. Mrinal K. Bhadra: *A Critical Survey of Phenomenology and Existentialism*, New Delhi: ICPR, 1990
5. H.J. Blackham, *Six Existentialist Thinkers*, New York, 1959
6. John Macquarrie, *Existentialism*, Penguin Books, 1973
7. William A. Luitfen, *Existentialist Phenomenology*, Tr. Henry J. Koren, Pittsburgh: Duquesne University Press, 1960
8. J.J. Kockelmans, *A First Introduction to Husserl's Phenomenology*, Pittsburgh: Duquesne University Press, 1967
9. J.L. Mehta, *The Philosophy of Martin Heidegger*, Varanasi: Banaras Hindu University, 1967
10. Mark C. Taylor, *Kierkegaard's Pseudonymous Authorship*, Princeton: Princeton University Press, 1971
11. Routledge Encyclopedia of Philosophy, London & New York: Routledge (1998).
12. M.Warnock, *Existentialism*, Oxford University Press.

SEMESTER V (HONOURS)**PHI-502: PHILOSOPHY OF MIND****Marks: 100****Cr: 4****Objectives:**

- To introduce the students to the study of the nature and problem of mind from both the Western and Indian perspectives

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Philosophy of Mind and Psychology b. Cartesian dualism, Identity theory	14	20
UNIT- II	Behaviorism; Functionalism; Artificial Intelligence	14	20
UNIT-III	a. Concept of Self and Privacy b. Minds without programmes (John Searle)	13	20
UNIT- IV	a. Concept of Manas: Nyaya, Vaisheshika, Samkhya b. Mandukya Upanishads: Four states of Consciousness	14	20
UNIT- V	a. Concept of dreams, Freudian concept of dreams b. Concept of Emotions; Feelings	13	20

Suggested Readings:

1. Swami Lokeshwarananda , Mandukya Upanishad: Translated and with notes based on Sankara's Commentary.
2. Mehta, R, The call of the Upanishads.
3. Routledge Encyclopedia of Philosophy, London & New York: Routledge (1998).
4. VC Chapell, The Philosophy of Mind, Prentice Hall.
5. J Shaeffer, Philosophy of Mind, Eaglewood Cliffs, Prentice Hall.
6. G Ryle, The Concept of Mind, Penguin Books.
7. M Hiriyana, Outlines of Indian Philosophy, George Allen and Unwin.

SEMESTER V (HONOURS)Choose any one from the following options.**PHI-503(a): PHILOSOPHY OF NATURAL SCIENCES (Option A) Marks:100 Cr:4****Objective:**

- To introduce the students to the Methodology of the Sciences leading towards understanding of science and philosophy.

Unit	Topics	Contact Hours	Weightage
UNIT- I	Distinctive Characteristic of Science and Philosophy of Science a. The Nature and Function of Science b. Nature and function of Philosophy of Sciences c. Distinction between Science and Philosophy of Science	14	20
UNIT- II	Logic and Patterns of Scientific Explanation a. Deductive Explanation b. Probabilistic Explanation c. Genetic Explanation. d.Teleological/Functional Explanation	14	20
UNIT-III	Laws and Theories a. Distinction between Laws and Theories b. Cognitive status of Laws and Theories: (i) Descriptivism (ii) Instrumentalism (iii) Realism	14	20
UNIT- IV	Induction and Probability a.Problem of Induction b.Confirmation	13	20
UNIT- V	Interpretation of Probabilities: a. Frequency Theory b. Classical Theory c. Subjective Theory	13	20

Suggested Readings:

- Feigl, H. Brodbeck, M. (Ed.) *Readings in the Philosophy*, Appleton Century, 1953.
- Nagel, E., *The Structure of Science*. Routledge and Kegan Paul, 1961.
- Hempel, C.G., *Philosophy of Natural Science*, Prentice Hall, 1966.
- Robert Baum, *Logic*, Holt, Rinehart and Winston, Inc. 1975.
- Haward Kahane, *Logic and Philosophy*, Wadsworth Publishing Company, Inc., California, 1973.
- Karl Popper, *The Logic of Scientific Discovery*, New York Basic books, 1959.
- P.K.Feyerabend. "Explanation, Reduction and Empiricism" in Herbert Feigl and G.Maxwell (Eds) *Minnesota Studies on the Philosophy of Science*, University of Minnesota Press, Vol.3, 1962.

PHI-503(b): CHRISTIAN THEOLOGY (Option B) Marks:100 Cr: 4**Objectives:**

- To introduce the subject to those students who have an interest in taking up theological studies as a vocation
- Acquaint the students with the theological interpretation of philosophical ontology

Unit	Topics	Contact Hours	Weightage
UNIT- I	What is Theology; Philosophy and Christian Theology.	13	20
UNIT- II	Reformation; Martin Luther; John Calvin	14	20
UNIT-III	Karl Barth: Christology; Crises theology	14	20
UNIT- IV	Paul Tillich: Existential theology; New Being/Christ.	14	20
UNIT- V	Feminist Theology: Theories-Revolution, Culture, Gender; Characteristics; Epistemology.	13	20

Suggested Readings:

1. J Macquarrie, Principles of Christian Thought (London: SCM Press)
2. OC Thomas, Introduction to Theology (Bangalore: ITL,1989)
3. JL Neve, A History of Christian Thought Vol.1 (Philadelphia: The United Lutheran Publication House, 1943)
4. K Barth, Church Dogmatics Vols. 1-13. (Relevant Volumes).
5. G Hunsinger, Disruptive Grace: Studies in Theology of Karl Barth (Cambridge: William B. Eerdmans 1973 4th Edition).
6. P Tillich, Systematic Theology Vols 1-111. (Relevant Volumes)
7. P Tillich, The Philosophy of Existence (Chicago, 1952)
8. P Tillich, The Courage to be (New Haven: 1952)
9. Serene Jones: Feminist Theory and Christian Theology.
10. Clifford, Anne M: Introducing Feminist Theology. Maryknoll, NY. Orbis books
11. Dictionary of Feminist Theology, Eds. Letty M Russell & J. Shannon Clarkson, Louisville, Westminster Press, 1996.

PHI-503 (c):CONTEMPORARY INDIAN PHILOSOPHY (Option C) Marks :100 Cr: 4**Objective:**

- To introduce the students the general characteristics of Indian philosophy and discuss the development of philosophical thought, the impact of the West and the future prospects and possibilities

Unit	Topics	Contact Hours	Weightage
UNIT- I	Swami Vivekananda: The Nature of God; Practical Vedanta	13	20
UNIT- II	Sri Aurobindo: Involution and Evolution; Mind and Supermind	13	20
UNIT-III	RN Tagore: The Nature of God; Religion of man; Humanism	14	20
UNIT- IV	MK Gandhi: God and Truth; Swaraj; Ideal State	14	20
UNIT- V	. S RadhaKrishnan: Religious experience and Sense experience; Intellect and Intuition	14	20

Suggested Readings:

1. TMP Mahadevan & CV Saroja, Contemporary Indian Philosophy.
2. BK Lal, Contemporary Indian Philosophy.
3. VS Narvane, Modern Indian Thought.
4. Swami Vivekananda, Practical Vedanta.
5. RN Tagore, Religion of Man.
6. S Radhakrishnan, An Idealist View of Life.
7. MK Gandhi, Hind Swaraj.
8. B Parekh, Gandhi's Political Philosophy.
9. Dr.R.N.Shama, Philosophy and sociology of education, Surjeet publications, delhi-110007

SEMESTER VI (HONOURS)**PHI-602: APPLIED ETHICS****Marks:100 Cr: 3****Objectives:**

- To learn about the significant problems and issues in applied ethics
- Identify ethical issues in the context of the value of life and bio-technology
- Understand the relevance of philosophy to social policy and to environmental concerns
- Make the students more aware and appreciative of the moral choices and responsibilities of human beings

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Meaning and purpose of Applied Ethics b. Types of Applied Ethics- Environmental, Medical and Legal	13	20
UNIT- II	Value of life: Euthanasia, Abortion, Suicide	14	20
UNIT-III	Bio-Ethics: Cloning, Organ transplantation	14	20
UNIT- IV	Punishment: Reformatory, Retributive, Preventive	13	20
UNIT- V	Environment: Various Approaches; Deep Ecology; Land Ethic	14	20

Suggested Readings:

1. Peter Singer, Applied Ethics, Oxford Univ Press.
2. Peter Singer, Practical Ethics, Cambridge Univ. Press, 1993.
3. Peter Winch, *Applied Ethics*, Oxford University Press, 1986.
4. Beauchamp & Walters (eds.), *Contemporary Issues in Bio-ethics*
5. E.R. Winkler & J.R. Combe (eds) *Applied Ethics: A Reader*
6. Light and Rolston, *Environmental Ethics: An Anthology*
7. Feinberg Joel (Ed), *The Problem of Abortion*, Belmont CA Wadsworth, 1973.
8. Jane English, "Abortion and the Concept of a Person", *Canadian Journal of Philosophy*, Vol.2, October, 1975:235
9. Ecology and spirituality: India peace Centre, Lucknow.
10. R.S. Desanto, *Concepts of applied ecology*, Springer-Verlag, New York
11. D.M. Dworkin, *Environment and development*, John Wiley, New York.
12. H.D. Kumar; *modern concepts of ecology*, Vikas publishing house, New Delhi
13. Mappes, T.A., Zembaty, J.S.: *Social Ethics: Morality and Social Policy*.
14. AP Dubey, *Applied Ethics*, Northern Book Centre, N. Delhi, 2004.
15. K Saxena, *Readings in Applied Philosophy*, Shekhar Prakashan, Allahabad, 1999.
16. GC Graber & DC Thomasma, *Theory and Practice in Medical Ethics*.
17. Holmes Rolston, *Environmental Ethics: Duties to and Values to Natural World*, Temple University Press, Philadelphia, 1988.
18. Dr. R.K. Behera, *Moral Philosophy (A book with a difference)*

SEMESTER V1 (Honours)**Choose any one from the following options.****PHI-603 (a): Philosophy of Human Rights (Option A) Marks:100 Cr: 3****Objective:**

- To introduce concepts and create awareness among the students the emerging issues concerning Human rights

Unit	Topics	Contact Hours	Weightage
UNIT- I	The Concept of Human Right, Human Rights in Indian Context	14	20
UNIT- II	Theories of Human Rights	13	20
UNIT-III	Declarations and Covenants; Foundations of the Idea of the United Nations; Standard Rules on the Equalization of opportunities for Persons with Disabilities(1993)	14	20
UNIT- IV	Human Rights and Fundamentalism, Terrorism, Gender; Minorities and Human Rights	14	20
UNIT- V	Rights of the Disabled- Issues and Theories	13	20

Suggested Readings:

1. Micheline R. Ishay (Ed.), *The Human Rights Reader*, Routledge, New York, 1997
2. David Boucher and Paul Kelley (Eds.), *The Social Contract from Hobbes to Rawls*, Routledge, London, 1994.
3. Eugene Kamenka and Alice Erh-Soon Tay (Eds.), *Human Rights*, Edward Arnold Pub. Ltd., London, 1993.
4. Jeremy Waldron, *Liberal Rights*, Cambridge University Press, Cambridge, 1993.
5. Johan Galtung, *Human Rights in another Key*, Polity Press, Cambridge, 1994.
6. Mathew H. Kramer, *Debate over Rights: Philosophical Enquiries*, Clarendon Press, Oxford, 1998.
7. C.J. Nirmal, *Human Rights in India*, Oxford University Press, Oxford, 2000.
8. N. Jayapalan, *Women and Human Rights*, Atlantic Publishers, New Delhi, 2001.
9. B.P. Singh Sehgal, *Human Rights in India: Problems and Perspectives*, Deep and Deep Pub., New Delhi, 1995.
10. M.A. Khan, *Human Rights and the Dalits*, Uppal Pub. House, New Delhi, 1995.
11. P.C. Mehra, *Tribal Rights*, Shiva Publishers, Udaipur, 1996.
12. Lennard I Davis (eds.) *The Disability Studies Reader*, Routledge, London, 1997.
13. Satish Chandra, *International Documents on Human Rights*, Mittal Publications, New Delhi, 1990.

PHI-603 (b): Contemporary Indian Christian Thought (Option B) Marks:100 Cr: 3**Objectives:**

- To create awareness among the students the contribution of Indian theologians and their thoughts to the wider theological body of study which was predominantly European
- Provide understanding regarding the contextualizing of an hitherto alien faith

Unit	Topics	Contact Hours	Weightage
UNIT- I	Introduction: Indian Christian Thought, Fabric of the Indian Society Kinds of Pluralism, Inculturation, Intra-religious and Inter-religious Dialogues	14	20
UNIT- II	M.M. Thomas: Christ and the Indian Renaissance, Secular Ideologies and the Secular Meaning of Christ, Salvation and Humanization, Concept of Mission	14	20
UNIT-III	Sebastian Kappen: Liberation in the Indian Context, Tradition and Counter-culture,	13	20
UNIT- IV	Raimundo Panikkar: Intra-religious Dialogue, Philosophy of Pluralism, Cosmo-Theandric Vision	13	20
UNIT- V	Textual Studies: Salvation and Humanization (or) Jesus and Freedom (or) The Inter-religious Dialogue	14	20

Reading Materials (Primary Sources):**M.M. Thomas:**

1. The Christian Response to the Asian Revolution (1966),
2. The Acknowledged Christ of the Indian Renaissance (1970),
3. The Salvation and Humanization (1971),
4. The Secular Ideologies of India and the Secular Meaning of Christ (1976),
5. Risking Christ for Christ's Sake: Towards an Ecumenical Theology of Pluralism (1987),
6. A Diaconal Approach to Indian Ecclesiology (1995)

Sebastian Kappen:

1. Jesus and Freedom (1977),
2. Tradition, Modernity and Counter-culture: An Asian Perspective (1994),
3. Selected Writings of Sebastian Kappen, SJ, ed. S. Painadath, SJ, (2002), a) Jesus and Culture, Vol.1, b) Jesus and Society, Vol.2,
4. Jesus Today

Raimundo Panikkar:

1. The Intra-religious Dialogue (1978),
2. Myth, Faith and Hermeneutics: Cross-cultural Studies (1979),
3. The Cosmotheandric Experience: Emerging Religious Consciousness (1993)

Reading Materials (Secondary Sources):

1. Sunand Sumithra, Revolution as Revelation (1984),
2. Michael Amaladass, Faith, Culture and Inter-religious Dialogue (1985),
3., Becoming Indian: The Process of Inculturation (1992),
..., Beyond Inculturation: Can the Many Be One? (1998)
4. Felix Wilfred, From the Dusty Soil: Contextual Reinterpretation of Christianity (1995)
5., Beyond Settled Foundations: The Journey of Indian Theology (1993)
6. . Raimundo Panikkar: The vedic experience, Pondicherry, All India Books.
7. Murry Rogers: Spirituality in Inter-faith dialogue (in an article entitled "The pilgrim faith"; W.C.C, Geneva).
8. Wasley Ganberg-Michaelson; A worldly spirituality: Harper and row, San Francisco.

PHI-603 (c) : Project Paper (Option C) Marks: 100 Cr: 3**Objectives:**

This course aims to train the students in familiarizing the methods and techniques of art of writing philosophy on the selected topics/themes.

Guidelines: Project-work in philosophy will be "topics-based" in essay style. Instead of working through the history of philosophy focusing on great historical figures and their views on different topics; focus will be on great philosophical topics and look at what historical and contemporary writers have said about them. Any topic/theme of philosophical concern may be addressed.

The course in charge will give detailed instructions keeping in view that every student learns the fundamentals of doing philosophical writings/practical works. Finalization of topic should be done well in advance and presentation of project work should be completed within the stipulated period fixed by the Department/Course in charge. Start early, be specific, employ a dissertation, use only what is necessary, examples may be used where needed, discuss counter-arguments, be original, strive for clarity, conclusion should be consistent with introduction. Add foot notes and references in support of your discussion/dissertation.

Example of a well organized piece of writing: a. Introduction and statement of thesis b. filling in background, clarifying terminology, spelling out others' views, arguments c. developing own position and arguments d. refuting counter-arguments and conclusion.

Dissertation should be submitted to the Course in charge/instructors well typed in double space in A/4 size paper in 12 point font and minimum number of pages will be 25.

* * * * *

Syllabus of

BA Honours Course

in

Political Science

for 2018-19 Session

SYLLABUS FOR
UNDERGRADUATE COURSE
(B.A PASS & HONOURS)

POLITICAL SCIENCE

NAGALAND UNIVERSITY
Hqs: LUMAMI
2012

POLITICAL SCIENCE B.A (Pass & Honours)

COURSE STRUCTURE

COMPULSORY PAPERS FOR B.A (General& Honours)			
Semester	Code No	Title	General/Honours
Semester- I	POL-101	Political Theory: Ideas and Concepts (A)	General
	POL-102	Indian Political Thinkers	Honours
Semester-II	POL-201	Political Theory: Ideas and Concepts (B)	General
	POL-202	Western Political Thought	Honours
Semester-III	POL-301	Indian Government and Politics (A)	General
	POL-302	International Organisation	Honours
Semester-IV	POL-401	Indian Government and Politics (B)	General
	POL-402	International Politics	Honours
Semester-V	POL-501	Comparative Government and Politics	General
	POL-502	Issues in World Politics and ,one optional from Group (A)	Honours
	POL-503	Local Self Govt. in India	Honours
	POL-504	Human Rights	Honours
	POL-505	Women and Politics in India	Honours
Semester-VI	POL-601	Public Administration	General
	POL-602	Indian Administration and , one optional from Group (B)	Honours
	POL-603	Govt. and Politics of North-East India.	Honours
	POL-604	Conflict and Peace Studies	Honours
	POL-605	International Law	Honours
	POL-606	Project Paper	Honours

Note:

In the 5th Semester, the students will take one Compulsory Honours Paper i.e

POL-502: Issues in World Politics and one optional Honours Paper from Group (A), they are:

POL-503: Local Self Govt. in India.

POL-504: Human Rights.

POL-505: Women and Politics in India.

In the 6th Semester the students will take one Honours Compulsory Paper i.e

POL-602: Indian Administration Compulsory and one from Group (B), they are:

POL-603: Govt. and Politics of North-East India.

POL-604: Conflict and Peace Studies.

POL-605: International Law.

POL-606: Project Paper

In place of Optional Papers, College/Dept. may ask the student to do the project work relating to local/regional/national/international political issues. The report will be submitted well in advance before the end semester examination. The minimum pages of the report in form of dissertation should be at least 25 pages types in double space in A/4 size paper in 12 point font size

DEPARTMENT OF POLITICAL SCIENCE

POL/EL-101 POLITICAL THEORY: IDEAS & CONCEPTS (A)

Course Rationale: The course is designed to acquaint the students with the basic normative concepts and ideas of Political Theory.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	MEANING,NATURE& SCOPE OF POLITICAL THEORY	13	20
UNIT-II	STATE: MEANING, ELEMENTS & ORIGIN	13	20
UNIT-III	LIBERTY, EQUALITY,RIGHTS MEANING, TYPES,THEORIES	16	20
UNIT-IV	LAW,JUSTICE,SOVEREIGNTY:MEANING,TYPES	13	20
UNIT-V	DEMOCRACY MEANING DIMENSIONS	13	20
	Total	68	100

References

1. A. Appadorai, *Substance of Politics* World Press Ltd, 1989.
2. Amal Ray and Mohit Bhattacharya,*Political Theory: Institutions and Ideas -* The World Press Private Ltd.,Calcutta, 1988.
3. Baradat, *Political Ideologies: Their origins and impact.* PHI Publications, New Delhi.
4. H.J Laski, *A Grammar of Politics.* S. Chand & Company Ltd.New Delhi, 2000.
5. John Hoffman and Paul Grialiam, *Introduction to political theory,* Pearson Education Ltd, 2007.
6. O.P Gauba, *An Introduction to Political theory,* Macmillan India Ltd, 2008.
7. Perter Harris, *Foundations of Political Science,*Oxford University press.
8. Prof. A.C. Kapoor, *Principles of Political Science,* Sterling Publishers PVT. Ltd.New Delhi, 2005.
9. R.C Agarwal, *Political Theory: Principles of Political Science,* S. Chand & Company Ltd. New Delhi, 2000.
10. Rajeev Bhargava and Asok Acharya, *Political Theory: An Introduction,* Pearson Education, 2008.

POL/HONS-102- INDIAN POLITICAL THINKERS

Course Rationale: The paper highlights the main sources of the political tradition an ancient India and its development in modern times. It critically assesses the contribution of key ancient and modern Indian political thinkers and explains their relevance to contemporary times.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	MANU, KAUTILYA	13	20
UNIT-II	MAHATMA GANDHI, JAWAHARLAL NEHRU	16	20
UNIT-III	V.D SAVARKAR, SIR SYED AHMED KHAN	13	20
UNIT-IV	BHIM RAO AMBEDKAR, M.N ROY	13	20
UNIT-V	VINOBA BHAVE, JAI PRAKASH NARIAN	13	20
	Total	68	100

References

1. A Raghuramaraju, *Debating Gandhi: A Reader*. Ed, South Asia Books, 2005.
2. A.Appadorai, *Indian Political Thinking through the Ages*, Khama Publishers, 1992
3. Anne Vergati, *Gandhian Philosophy: Its Relevance Today*, South Asia Books, 2008
4. B.N.Ray, *Gandhigiri: Satyagraha After Hundred Years*, South Asia Books, 2005
5. Bidyut Chakravarty & Pandey, Rajendra Kumar, *Modern Indian Political Thought: Text and Context*, Sage Publications, Delhi, 2010
6. D.G. Dalton, *India's Idea of Freedom: Political Thought of Swami Vivekanand, Aurobindo Ghose, Mahatma Gandhi, Ravindra Nath Tagore*, Delhi Academic Press, 1982. Delhi 1991 explorations(eds) Sage publications New Delhi-2006
7. Iyer, Raghavan, *The Moral and Political Thought of Mahatma Gandhi*, Oxford University Press, 1978.
8. Mehta, V. R. and Thomas Pantham, *Political Ideas in Modern India: Thematic*
9. P.K. Jose, *Foundation of Gandhian Thought*, GPH Calicut.

10. Rodrigues, Valarian, (eds), the Essential Writings of B. R. Ambedkar, Oxford.
11. S. Narayanasamy, *The Sarvodaya Movement: Gandhian Approach to Peace and Non-Violence*, Mittal Publications, 2003
12. Thomas Pantham & Deutsch, Kenneth L, *Political Thought in Modern India*, Sage Publications, 1996.
13. Urmila Sharma & Sharma, S.K, *Indian Political Thought*, Atlantic Publishers, Delhi, 1996
14. V.P.Verma, *Modern Indian Political Thought*, Lakshmi Narain Aggarwal, 1996.
15. V.R.Mehta, *Foundations of Indian Political Thought*, Manohar Publications, 1992
16. Wendy, Donigar and Brain K. Smith, the Laws of Manu, Penguin Publications,

POL/EL-201 POLITICAL THEORY: IDEAS & CONCEPTS (B)

Course Rationale: The course is intended at acquainting the students with the contemporary concepts of Political Theory. **(Total Marks-100)**

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	LIBERALISM, MARXISM, SOCIALISM	16	20
UNIT-II	: POWER, LEGITIMACY AND AUTHORITY	13	20
UNIT-III	REVOLUTION, POLITICAL OBLIGATION AND RESISTANCE	12	20
UNIT-IV	NATION, NATIONALISM, IMPERIALISM	14	20
UNIT-V	GLOBALISATION: MEANING, AGENTS & IMPACT	13	20
	Total	68	100

References

1. Adrian Leftwich (ed.) *Political Theory Today*, Cambridge: Polity Press, 1991.
2. Adrian Leftwich (ed.) *What is Politics: The Activity and its Study*, Oxford, Basil Blackwell
3. Andrew Hacker, *Political Theory: Philosophy, Ideology and Science*, Toronto, Macmillan, 1961.
4. David Held, *Political Theory and the Modern State*, London, Polity, 1994.
5. Norman P Barry, *An Introduction to Modern Political Theory*, London, Macmillan, 1988.
6. O. P. Gauba, *An Introduction to Political Theory*, New Delhi, Macmillan, 1981.
7. Rajeev Bhargava & Ashok Acharya (ed.) *Political Theory: An Introduction*, New Delhi, Pearson Education, 2008.
8. Rajeev Bhargava, *What is Political Theory and Why do We need it*, New Delhi, OUP, 2010.
9. Sushila Ramaswamy, *Political Theory: Ideas and Concepts*, New Delhi, Macmillan, 2003.
10. Will Kymlicka, *Contemporary Political Philosophy: An Introduction*, Oxford, Clarendon, 1990.

POL/HONS-202- WESTERN POLITICAL THOUGHT

Course Rationale: The objective of the paper is to provide the students with a comprehensive view about the various political philosophies of ancient, medieval, and modern thinkers.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	PLATO, ARISTOTLE	14	20
UNIT-II	St.AUGUSTINE, MACHIAVELLI	12	20
UNIT-III	THOMAS HOBBS, ROUSSEAU	16	20
UNIT-IV	JEREMY BENTHAM, J.S.MILL	12	20
UNIT-V	HEGAL, KARL MARX	14	20
	Total	68	100

References

1. Bertrand Russell, *History of Western Philosophy*, London 1955
2. Brian R Nelson, *Western Political Thought: From Socrates to the Age of Ideology* (2edt), Pearson Education, 1995.
3. C.C. Maxey, *Political Philosophies*, Surjeeth Publications, 2007.
4. C.L.Wayper, *Political Thought*, English Universities Press, 1969
5. D.R.Bhandari, *History of European Political Philosophy*, OUP; New Delhi, 1962.
6. Ebenstein, *Great Political Thinkers (Plato to Present)*, Sterling Publishers PVT. Ltd., New Delhi 2007.
7. Ernest Barker, *The Political Thought of Plato and Aristotle*, Dover Publications, 1959.
8. G. Sabine, *History of Political Theory*, PHI- New Delhi, 2004.
9. J.C. Johari, *Ancient Political Thought*, Sterling Publishers PVT. Ltd., New Delhi 2004.
10. J.S .McClelland, *A History of Western Political Thought*, Routledge, 1998
11. Lanadamas and R.W Dyson, *Fifty Great Political Thinkers*, Sterling Publishers PVT. Ltd., New Delhi, 2007.
12. M.G. Gupta, *History of Political Thought*, Macmillan India Ltd.1998
13. M.Judel Harmen, *Political Thought: From Plato to the Present*, McGraw - Hill Book company New York, 1964.
14. Shefali Jha, *Western Political Thought from Plato to Marx*, Pearson Publications, Delhi, 2009
15. Subrata Mukherjee and Sushila Ramaswamy, *A history of Political Thought: Plato to Marx*, PHI Learning Pvt. Ltd., 2004.

POL/EL-301 -INDIAN GOVERNMENT AND POLITICS (A)

Course Rationale:

The objective of this course is to familiarize the students with the legal and philosophical framework of the political system in India. It simultaneously studies in detail the political structure both Constitutional and Administrative. It also intends to strengthen the understanding and appreciation of the rights and privileges granted by the the Indian Constitution. The paper also focuses on the political processes and the actual functioning of the political system.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	: MAKING OF THE INDIAN CONSTITUTION: BASIC FEATURES	14	20
UNIT-II	PREAMBLE, FUNDAMENTAL RIGHTS, DIRECTIVE PRICIPLES OF STATE POLICY	14	20
UNIT-III	PARLIAMENT, PRESIDENT, COUNCIL OF MINISTERS	12	20
UNIT-IV	STATE LEGISLATURE, GOVERNOR, CHIEF MINISTER	12	20
UNIT-V	JUDICIARY: SUPREME COURT, HIGH COURT, JUDICIAL REVIEW	16	20
	Total	68	100

References

1. Brij Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall, New Delhi, 2005.
2. C. P. Bhambri, *The Indian State: Fifty Years*, New Delhi, Shipra, 1999.
3. Chakrabarti, Bidyut & Pandey Rajendra Kumar, *Indian Government & Politics*, Sage, New Delhi-2008.
4. D.D. Basu, *An Introduction to the Constitution of India*, New Delhi, Prentice Hall, 2008.
5. Dr. B.L. Fadia, *Indian Government and Politics*, Sahitya Bhawan Publications, Agra, 2007.
6. G. Austin, *Working a Democratic Constitution: The Indian Experience*, Delhi, Oxford Uni. Press, 2000.
7. Jojo Mathew & Manish K Gautam, *Indian Polity and Constitution*, Career Classics, Delhi, 2009.
8. M. V. Pylee, *An Introduction to Constitution of India*, New Delhi, Vikas, 1998.
9. Moin Shakir, *State and Politics in Contemporary India*, Delhi, Ajanta, 1986.
10. N .V. Normani, *Constitutional Question in India. The President, Parliament and the State*, Oxford University Press, 2000.

11. Neera Chandhoke & Praveen Priyadarshini (edited) *Contemporary India: Economy, Society, Politics*, Pearson 2009.
12. P. R. Brass: *Politics of India since Independence*, 2nd Ed. Cambridge Uni. Press, 1992.
13. S. Kaviraj, *Politics in India*, Delhi, Oxford University Press, 1998.
14. S. P. Sathe, *Judicial Activism in India*, OUP, 2001.
15. Subhash C. Kashyap, *Constitution of India: Review and Reassessment*, New Delhi, Universal Law Publishing Co. Pvt., 2010.
16. T. R. Andhyarujina, *Judicial Activism and Constitutional Democracy in India*, Bombay, N. P. Tirupathi, 1992.

POL/HONS-302 **INTERNATIONAL ORGANISATIONS**

Course Rationale: This course has its central objective to provide a comprehensive introduction to the most important multilateral political organization in international relations. It also deals with the major global issues and challenges and their ramifications for the international society. It also acquaints the students with the growing significance of regional groupings.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	DEVELOPMENT, NATURE AND SCOPE OF INTERNATIONAL ORGANISATIONS	14	20
UNIT-II	LEAGUE OF NATIONS: ACHIEVEMENTS AND FAILURES	12	20
UNIT-III	UN: ORIGIN, STRUCTURE AND FUNCTIONS	12	20
UNIT-IV	ISSUES AND CHALLENGES BEFORE THE UN: POVERTY, TERRORISM, ETHNIC CONFLICTS ,ENVIRONMENT	16	20
UNIT-V	REGIONAL ORGANISATIONS: NATO,EU, ASEAN ,SAARC.	14	20
	Total	68	100

References

1. C. V. Narasimhan, *United Nations: An Inside View*, South Asia Books; 1 edition, 1988.
2. F.S. Northedge and M.J. Grieve, *A Hundred Years of International Relations*, New York, Praeger, 1971.
3. Inis L. Claude Jr., *Swords Into Plowshares: The Problems and Progress of International Organization*, New York, Random House, 4th edition, 1984.
4. J. Baylis, S. Smith, *The Globalization of World Politics An introduction to International Relations*, Oxford University Press, New York, 2005.
5. James E. Dougherty and Robert L. Pfaltzgraff, jr. *Contending Theories of International Relations: A Comprehensive Survey* (5th Edition), Longman, 2000.
6. Lousie Fawcett, *Regionalism in World Politics: Regional organization and International order*, 2008.
7. M.S. Rajan , *United Nations at Fifty and Beyond*, New Delhi : Lancers Books, 1996.

8. Robert Jackson and George Sorenson, *Introduction to International Relations*, Oxford University Press, USA, 1999.
9. Gareis, Steven Bernhard and Johannes Varwik, *The United Nations: An Introduction*, Basingstoke: Palgrave Macmillan, 2005, pp. 1-40
10. Gareis, Steven Bernhard and Johannes Varwik, *The United Nations: An Introduction*, Basingstoke: Palgrave Macmillan, 2005, pp. 15-21
11. John Allphin Moore, Jr. and Jerry Pubantz, *The New United Nations*, Delhi: Pearson Education, 2008, pp. 119-135.
12. Armstrong, David, Lorna Lloyd and John Redmond (Third Edition), *International Organizations in World Politics*, New York: Palgrave Macmillan, 2004.
13. M.S. Rajan, V.S. Mani and C.S. R. Murthy (eds), *The Nonaligned and the United Nations*, New Delhi: South Asian Publishers, 1987.

POL/EL-401 -INDIAN GOVERNMENT & POLITICS-(B)

Course Rationale:

This paper attempts to acquaint the students with the processes and the functioning of Indian political system. It focuses on the Centre-State relations within the Indian federal system. It also emphasises on issues such as caste, communalism and regionalism and critically assesses its impact on the political processes.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	WORKING OF INDIAN FEDERALISM: CENTRE- STATE RELATIONS	14	20
UNIT-II	AMENDMENT PROCEDURES	12	20
UNIT-III	ELECTORAL PROCESS, ELECTORAL REFORMS, ELECTION COMMISSION, PARTY SYSTEM	14	20
UNIT-IV	COALITION GOVERNMENT, DEFECTION, POLITICAL STABILITY	14	20
UNIT-V	ISSUES IN INDIAN POLITICS: CASTE, COMMUNALISM, REGIONALISM	14	20
	Total	68	100

References

1. Anuradha Dingwaney Needham and Rajeswari Sunder Rajan (ed.) *The Crisis of Secularism in India*, Permanent Black, 2007
2. Atul Kohli, *India's Democracy : An Analysis of Changing State Society Relations* Princeton N. J. Princeton Uni. Press, 1988.
3. Atul. Kohli, *The Success of India's Democracy*, Cambridge Uni. Press, 2001.
4. Bidyut Chakrabarty and Rajendra Kumar Pandey, *Indian Government and Politics*, Sage, 2008
5. C. P. Bhambri, *The Indian State, Fifty Years*, New Delhi, Shipra, 1999.
6. D. D. Basu & B. Parekh (ed.) *Crisis and Change in Contemporary India*, New Delhi, Sage, 1994.
7. F. R. Frankel & et. al (ed.) *Transforming India : Social and Political Dynamics of Democracy*, New Delhi, OUP, 2000.
8. F. R. Frankel & M. S. A. Rao (Ed.) *Dominance and State Power in Modern India : Decline of a Social order*, Delhi, OUP, 1989.
9. Ghanshyam Shah (ed.) *Caste and Democratic Politics in India*, Permanent Black, 2002.

10. M.P. Singh & Rekha Sexena, *Indian Politics: Contemporary Issues and Concerns*, Prentice Hall, New Delhi, 2008.
11. Manoranjan Mohanthy (Ed) *Class, Caste, Gender*, Sage Publication, New Delhi, 2004
12. Mynor. Weiner, *The Indian Paradox: Essays in Indian Politics*, New Delhi, 1999.
13. N. Chandoke, *Beyond Secularism : The Rights of Religious Minorities*, Delhi, OUP, 1999.
14. P. R. Brass, *Language, Religion and Politics in North India*, Cambridge Uni. Press, 1994.
15. Rajendra Vora and Suhas Palshikar (ed.) *Indian Democracy Meanings and Practices*, 2004
16. Rajesh M. Basrur (ed.) *Challenges to Democracy in India*, Oxford 2009
17. T.N. Srinivasan (ed.) *The Future of Secularism*, Oxford 2007

POL/HONS-402 **INTERNATIONAL POLITICS**

Course Rationale:

This paper deals with concepts and dimensions of International Politics and makes an analysis of different theories highlighting the major debates and differences within the different theoretical paradigms.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	MEANING, NATURE AND SCOPE.	14	20
UNIT-II	IDEALISM, REALISM AND NEO-REALISM	14	20
UNIT-III	BALANCE OF POWER, COLLECTIVE SECURITY, PACIFIC SETTLEMENT OF DISPUTES	14	20
UNIT-IV	FORIEGN POLICY AND DIPLOMACY.	12	20
UNIT-V	INTERNATIONAL MONETARY FUND, WORLD BANK, WORLD TRADE ORGANISATION	14	20
	Total	68	100

References

1. Aneek Chatterjee, *International Relations Today: Concepts and Applications*, Pearson Education ,2008.
2. Art & Jervis, *International Politics: Enduring Concepts and Contemporary Issues*, Longman, 2009
3. Baylis John and Smith Steve, *The Globalization of World Politics: An Introduction to World Politics*,Oxford University Press, 1994.
4. E.H. Carr, *International Relations between the Two World Wars 1919- 1939*, Palgrave Macmillan, 2004.
5. John Baylis, Steve Smith and Patricia Owens (Edited), *The Globalization of World Politics*, Fourth Edition, OUP, USA 2008
6. John W. Young and John Kent, *International Relations since 1945 A Global History*, OUP, USA, 2004.
7. Kelleher & Klein, *Global Perspectives: A Handbook for Understanding Global Issues*, Longman, 2009
8. Kenneth Waltz, *Theory of International Politics*, McGraw-Hill Humanities/Social Sciences/Languages, 1979 .
9. Morgenthau, *Politics Among Nations*, Sterling Publishers Pvt.Ltd.
10. Palmer & Perkins, *International Relations*, PHI Learning Pvt.ltd,Delhi
11. Paul R.Viotti and Mark V.Kauppi, *International Relations and World Politics: Security, Economy, Identity*, 3rd edt, Pearson Education 2007

12. R.Stubbs & Underhills GRD (eds),Political Economy and The Changing Global order, London, Macmillan,1994.
13. Robert Jackson and Georg Sorenson,Introduction to International Relations,Oxford University Press, USA,1999.
14. Said & Lerche, *Concepts of International Politics in Global Perspective*, Longman, 1995
15. V N Khanna, *International Relations*, Vikas Publishing House,2008
16. Viotti & Kauppi, *International Relations Theory*, Longman,2009
17. Zeigler David, *War, Peace and International Politics*,Boston:Little Brown & Co, 1981.

POL/EL-501 COMPARATIVE GOVERNMENT & POLITICS

Course Rationale: The paper intends to highlights on the evolution and approaches to the study of Comparative Politics. It studies the major political systems of the World by adopting a comparative approach. The comparative perspective enables the students to understand the differences and similarities between the various constitutional arrangements. It also analyses in a comparative way the political systems in the third world countries.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	MEANING, NATURE , SCOPE AND SIGNIFICANCE	14	20
UNIT-II	APPROACHES TO COMPARATIVE POLITICS	12	20
UNIT-III	: FUNCTIONING OF POLITICAL SYSTEMS IN PRESIDENTIAL (US), PARLIAMENTARY (UK) AND COMMUNIST (CHINA	14	20
UNIT-IV	INSTITUTIONAL ARRANGEMENT: EXECUTIVE, LEGISLATURE, JUDICIARY, POLITICAL PARTIES AND PRESSURE GROUPS	16	20
UNIT-V	FUNCTIONING OF POLITICAL SYSTEMS IN THE THIRD WORLD COUNTRIES	12	20
	Total	68	100

References

1. A. Stephan, *Arguing Comparative Politics*, Oxford University Press, 2001.
2. A.C. Kapoor, *Select Constitutions*, S. Chand & Company Ltd., New Delhi 2002
3. Almond and Powell, *Comparative Politics Today*, Pearson Publications, New Delhi,2004.
4. Diamond, Larry, J., & Lipset, S.M., (eds), *Democracy in Developing Countries*, Vol. I-IV, Lynne Reiner, Boulder, Colorado, 1988.
5. G.S.Mahler, *Comparative politics: An institutional and cross-national approach* (4th ed.). New Jersey: Prentice Hall,2003.
6. Hari Hara Das, *Comparative Politics*, National Publishing house, Jaipur, 2003.
7. Haynes, J. *Politics in the Developing World:A Concise Introduction* Blackwell, Oxford 2002, Chapter 1:Politics, Economics and Societies in the Developing World War at the New Millennium,pp1-24.
8. Haynes J. *Third World Politics:A concise introduction* Blackwell, Oxford, 1996, Chapter 2: State and Society pp.20-32.
9. J.C.Johari, *Comparative Politics*, Sterling Publishers PVT. Ltd., New Delhi 2004

10. James H.Mittlemann & Pasha, Mustapha Kamal, *Out From Underdevelopment Revisited: Changing Global Structures and the Remaking of the Third World*, Macmillan, Houndmills, 1998.
11. K.R.Bombwall, *Major Governments*, S. Chand & Company Ltd., New Delhi 2002
12. M.Curtis, *Comparative Government & Politics*: London,Rutledge, 2000.
13. Mehran Kamrava, *Politics and Society in the Developing World*, Routledge, London, 2009. (Second Edition).
14. Robert Dahl & Bruce Stinebrickner, *Modern Political Analysis*, PHI Learning Pvt.ltd, Delhi,2002.
- 13.S.N. Ray, *Modern Comparative Politics: Approaches, Methods and Issues*, Prentice Hall of India, New Delhi,2005
- 14.S.R. Maheswari, *Comparative Government and Politics*, Agra, 2002
15. V.D.Mahajan, *Foreign Governments*, Oxford University Press, 2004.

Course Rationale:

The course offers a brief survey of the contemporary international issues in the context of the changing global political environment.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	TERRORISM: MEANING, NATURE, ORIGIN AND IMPACT	14	20
UNIT-II	HUMAN RIGHTS: MEANING, ORIGIN AND DIMENSIONS	12	20
UNIT-III	ENVIRONMENTAL ISSUES: GLOBAL WARMING AND CLIMATE CHANGE	14	20
UNIT-IV	NEO-COLONIALISM: MEANING, NATURE, SOURCES AND IMPACT.	12	20
UNIT-V	BIPOLAR, UNIPOLAR AND MULTIPOLAR WORLD ORDER	16	20
	Total	68	100

References

1. Ackerly, Brooke A., *Universal Human Rights in a World of Difference*, Cambridge, U.K. ; New York : Cambridge University Press, 2008.
2. Baylis John and Smith Steve, *The Globalization of World Politics: An Introduction to World Politics*, Oxford University Press, 1994.
3. Chris Brown , *Understanding International Relations*, Palgrave 2009.
4. Coloumbis, *Introduction to International Relations*, Longman,1990
5. Fareed Zakaria, *The Post-American World*, W. W. Norton & Company; 1 edition ,April 17, 2008.
6. Francis Fukuyama,*The End of History and the Last Man*, Harper Perennial ,February 1, 1993.
7. Gearty, C.A., *Essays on Human Rights and Terrorism :Comparative Approaches to Civil Liberties in Asia, the EU and North America* , London : Cameron May, 2008.
8. Goldstein & Pevehouse, *Principles of International Relations*,Longman, 2009
9. Goldstein Joshua, *International Relations*,New York: Harper Collins College Publications, 1994.
10. Michael Nicholson,*International Relations: A concise introduction* (2edt), Palgrave Macmillan 2005.
11. Motilal, Shashi., *Human Rights, Gender, and Environment*, New Delhi : Allied Publishers, 2009.

12. Palmer N.D and Perkins H. C. *International Relations*, Calcutta: Scientific Book Agency
13. Samuel P. Huntington, *The Clash of Civilizations and the Remaking of World Order*, Touchstone Books; New Ed edition, 1998.
14. Scott Burchill (ed), *Theories of International Relations* (2ed), Palgrave 2005
15. Upendra Baxi, *The Future of Human Rights*, Oxford University Press,
16. Viotti & Kauppi, *International Relations Theory*, Longman, 2009.

Course Rationale:

This paper deals with the grassroot level democratic units and their significance to our democracy and governance, their composition and powers and relevance of decentralization in contemporary set up. The course adds to the understanding of the students of the process and politics of building institutions, capacities of safeguards under the ongoing decentralization campaign.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	MEANING, ORIGIN, NATURE AND CHARACTERISTICS	16	20
UNIT-II	CONSTITUTIONAL PROVISIONS: 73 rd AND 74 th AMENDMENT ACTS.	12	20
UNIT-III	PANCHAYATI RAJ: STRUCTURE, FUNCTION AND SIGNIFICANCE	12	20
UNIT-IV	URBAN ADMINISTRATION: STRUCTURE, FUNCTION AND SIGNIFICANCE	12	20
UNIT-V	CHALLENGES BEFORE LOCAL SELF GOVERNMENT: FINANCIAL AND ADMINISTRATIVE	16	20
	Total	68	100

References

1. B S Baviskar, *Inclusion and Exclusion in Local Governance*, Sage Publications, New Delhi, 2009
2. Democracy in India in Zoya Hasan, E. Sridharan and R. Sudharan (ed.), *India's Living Constitution: Ideas, Practices and Controversies*, Permanent Black, 2002, pp.370-404
3. Desmond S King, *Challenges to Local Government*, Sage Publications, New Delhi, 1991
4. Desouza, Peter, 'Decentralization and Local Government: The Second Wind of
5. Jan Kooiman, *Modern Governance: New Government-Society Interactions*, Sage Publications, New Delhi, 2008
6. Janice Morphet, *Modern Local Government*, Sage Publications, New Delhi, 2008
7. M. Alam, 2007, *Panchayati Raj in India*, National Book Trust, New Delhi
8. M.P. Dube, and M. Padalia, (Ed.) 2002, *Democratic Decentralization and Panchayati Raj in India*, Anamika Publishers, New Delhi
9. R.P. Joshi, and G.S. Narwani, 2002, *Panchayati Raj in India*, Rawat Publication, Jaipur
10. Ray, B. Dutta, and Das, G. (Ed) *Dimensions of Rural Development in North East India*, Akansha, New Delhi

11. S N Jha, *Decentralization and Local Politics*, Sage Publications, New Delhi, 1999
12. S.R.Maheshwari, 2006 *Local Governance in India*, Lakshjmi Naraian Agarwal,Agra.
13. T.M. Joseph, *Local Governance in India: Ideas, Challenges, and Strategies*, Concept Pub. Co- 2007.

POL/HONS/OPT-504-HUMAN RIGHTS

Course Rationale:

This course is intended to highlight the concept of human rights, its origin and importance in our society. This course aims at familiarizing students with awareness about various categories and dimensions of rights, including political, civil, social, economic and cultural rights.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHTAGE
UNIT-I	MEANING, ORIGIN AND DIMENSIONS OF HUMAN RIGHTS.	12	20
UNIT-II	UNO AND HUMAN RIGHTS; UNIVERSAL DECLARATION OF HUMAN RIGHTS, INTERNATIONAL COVENANT ON HUMAN RIGHTS-CIVIL, POLITICAL, ECONOMIC, SOCIAL AND CULTURAL	14	20
UNIT-III	HUMAN RIGHTS IN INDIA: CONSTITUTIONAL PROVISIONS (PREAMBLE, FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES OF STATE POLICY); HUMAN RIGHTS PROTECTION ACT 1993 NATIONAL HUMAN RIGHTS COMMISSION (NHRC)- CONSTITUTION, POWER AND FUNCTIONS; RIGHT TO INFORMATION ACT, 2005.	16	20
UNIT-IV	CHALLENGES TO HUMAN RIGHTS: TERRORISM; HUMAN RIGHTS AND MARGINALISED GROUPS (WOMEN AND CHILDREN AND INDIGENOUS PEOPLE)	14	20
UNIT-V	HUMAN RIGHTS EDUCATION AND AWARENESS: GLOBAL AND NATIONAL EFFORTS.	12	20
	Total	68	100

Reference:

1. Akerly, Brooke A. Universal Human Rights in a World of Difference, Cambridge, U. K. New York: Cambridge University Press, 2008
2. Aldershot, Hants, Keane, David, Caste-based Discrimination in International Human Rights Law, England; Burlington, VT: Ashgate Pub. 2007.
3. Andrew Clapham, Human Rights: A very short Introduction, Oxford University Press, New York, 2007.

4. Charvet, John, *The Liberal Project and Human Rights: The Theory and Practice of a New World Order*, New York: Cambridge University Press 2008.
5. Chauhan, S.R & N.S Chauhan (ed) *International Dimension of Human Rights (vol.I,II,III)* Global Vision Publishing House, New Delhi, 2006.
6. Chiranjeevi Nirmal, *Human Rights In India*, Oxford University press, New Delhi 1997.
7. D.D Basu, *Human Rights in Constitutional Law*, PHI, India , 2004.
8. Darren J.O Byrne (ed) *Human Right: An Introduction*, Pearson Education Pvt. Ltd, New Delhi, 2004.
9. Dr. Subramanian, *Human Rights: International Challenges*: Manas Publication, New Delhi.
10. Gearty, C.A. *Essays on Human Rights and Terrorism: Comparative Approaches to Civil Liberties in Asian, the EU and North America*, London: Cameron May, 2008.
11. Griffin, James, *On Human Rights*, Oxford; New York: Oxford University Press 2008.
12. Ian Brownlie, *Basic documents on Human Rights*, OUP, 2004.
13. Januszsymonides (ed), *New Dimensions and Challenges on Human Rights*, Rawat Publications, Jaipur 2006.
14. Krishna Iyer . V. R. *Minorities , Civil Liberties and Criminal Justice*, Peoples Publications House, New Delhi 1980.
15. Mahmood Monshipouri (ed) *Constructing Human Rights in the age of Globalization* , Prentice Hall of India 2004.
16. Motilal, Shashi, *Human Rights, Gender and Environment* New Delhi: Allied Publishers 2009.
17. Normand,, Roger, *Human Rights at the UN: The Political History of Universal Justice*, Bloomington: Indiana University Press 2008.
18. Saksena, K. P, (ed), *Human Rights: Fifty Years of India's Independence*, Gyan Publishing House, New Delhi, 1999.
19. Shashi Motilal and Bijayalaxmi, *Human Rights, Gender and Environment*, Allied Publishers, New Delhi, 2006.
20. South Asia Human Rights Documentation Centre: *Introducing Human Rights*, Oxford University Press , New Delhi 2006.
21. Symondies, Janusz (ed), *Human Rights: Concepts and Standards*, UNESCO Publishing, 2000.
22. Ujjwal Kumar Singh (ed), *Human Rights and Peace: Ideas, Laws, Institutions and Movements*, Sage, New Delhi, 2009.

23. Upendra Baxi: Inhuman Wrongs and Human Rights, Har Anand, New Delhi, 1994.
24. Upendra Baxi: The Right to be Human, Lancer International , New Delhi 1987.

POL/HONS/OPT/-505-WOMEN AND POLITICS IN INDIA**Course Rationale:**

The goal of the course is to create an understanding of women as emerging political players in society- their participation as voter, as party activists, and as candidates for elective office, strategies for gaining political power, the evolution of policies that effect the political lives and opportunities of women, and the present political status women in India.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	WOMEN AND POLITICAL PROCESS: CONSTITUTIONAL PROVISIONS; WOMEN AND POLITICAL PARTICIPATION.	14	20
UNIT-II	UNIT II: WOMEN AND ELECTORAL POLITICS IN INDIA: WOMEN AS VOTERS AND CONTESTANTS	12	20
UNIT-III	WOMEN IN PARLIAMENT AND STATE LEGISLATURES; DEBATE ON RESERVATION FOR WOMEN IN PARLIAMENT AND STATE LEGISLATURES; OBSTACLES TO WOMENS ENTRY INTO POLITICS.	16	20
UNIT-IV	UNIT IV: WOMEN IN PANCHAYATI RAJ INSTITUTIONS AND URBAN LOCAL BODIES WITH SPECIAL REFERENCE TO 73 rd AND 74 th CONSTITUTIONAL AMENDMENTS	12	20
UNIT-V	: POLITICAL PARTIES AND THE WOMENS QUESTION IN INDIA: RECRUITMENT AND WOMEN DECISION MAKERS IN POLITICAL PARTIES, BJP,CPI, CPI(M), BSP, AKALI,DAL.	14	20
	Total	68	100

References:

1. Abhilasha Kumari and Sabina Kidwai, Crossing the Sacred Line, Women's Search for Political Power, Orient Longman, New Delhi, 1998.
2. Agnes. F. Law and Gender Inequality, New Delhi: Oxfor University Press, 1999.
3. Ahmed, Imtiaz, Women in Politics, in Devaki Jain (ed) Indian Women, Publication Division, New Delhi,1975.
4. Bhagwar, Vidyut, Gender Equality: Text and Context, New Delhi: IGNOU,2000.
5. Bhasin Kamla. 1998, What is Patriarchy? New Delhi: Kali for Women.

6. Bhasin Kamla. 2000. Understanding Gender. New Delhi : Kali for Women.
7. Chopra, J. K. Women in the Indian Parliament, Mittal Publication, New Delhi 1993.
8. Chowdhury, Najma and Nelson, Barbara, J. Redefining Politics: Patterns of Women's Political Engagement from a Global Perspective in Nelson and Desai, Neers and Maithreyi Krishna,. Women and Society in India. New Delhi: Ajanta Publications 1987.
9. Chowdhury, (eds), Women and Politics Worldwide. Yale University Press, New Haven and London,1994.
10. Forbes , Geraldine, Indian Women and the Freedom Movement: a Historian's Perspective, RCWS Gender Series, Gender and Politics: Book 2, Research Center for Women's Studies, SNDT Women's Studies, Mumbai,1997.
11. Fourth World Conference on Women, Beijing, 1995, Country Report, Deptt. of Women and Child Development, HRD, Govt. of India, New Delhi, 1995.
12. Gandhi, N. and N. Shah. Issues at Stake: Theory and Practice in Contemporary Women's Movement in India 1991.
13. Gill, Rajesh, Empowering Women through Panchayats- Stories of Success and Struggle from India, Man and Development, Vol. XXVIII, No. 4 December 2006, 83-104.
14. Hasan, Z. (ed) Forgoing Identities : Gender Communities and the State, New Delhi: Kali for Women: 1994.
15. Kabeer, N. and Subrahmanian, R. (eds), Institutions , Relations and outcomes. New Delhi: Kali for Women 2002.
16. Mazumdar, Vina(ed). Symbols of Power : Studies on the Political Statuses of Women in India. Allied, New Delhi,1979.
17. Mehta, Usha M and Billimoria Rosebh, Political Status of Women in India ICSSR, New Delhi, 1986.
18. Menon, N. (ed.) Gender and Politics in India New Delhi,:OUP, 1999.
19. National Policy for the Empowerment of Women, Govt. of India, New Delhi,2001. Patel, Vibhuti et al (eds) women in Politics:Forms and Process, new Delhi, Friedrich Ebert Stiftung , 1992.
20. Peterson V Spike and Runyan A.S Global Gender Issues, Boulder:West View Press 1993.
21. Poonacha, Veena.gender within the Human Rights Discourse,Bombay: SNDT,1995.
22. Shah, Nandita and N.Gandhi. The Quota Question:Women and Electoral Seats, Mumbai: Akshara Publication,1991.
23. Sinha,Niroj,Empowerment of Women through Political Participation, Kalpaz Pub, Delhi,2007.
24. Srinivas M.A, The Changing Position of Indian Women, Rawat Publications Mumbai,2001.

25. Towards Equality: The Report of the Committee on the Status of Women in India, December 1974, Govt. of India, Deptt. of Social Welfare, Ministry of Education and Social Welfare , New Delhi,1975. www.ipu.org.

POL/EL-601 PUBLIC ADMINISTRATION

Course Rationale: The course provides an introduction to the discipline of public administration. It is intended to cater to the needs of students in understanding the basic elements of administration. The paper covers Public Administration in its historical context. It seeks to embody a detailed discussion on Organization and Personnel Administration. The importance of administrative, legislative, executive and judicial control over administration is also highlighted

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHTAGE
UNIT-I	MEANING, NATURE, SCOPE & SIGNIFICANCE	12	20
UNIT-II	EVOLUTION OF PUBLIC ADMINISTRATION, PUBLIC AND PRIVATE ADMINISTRATION	12	20
UNIT-III	PRINCIPLES OF ORGANISATION	12	20
UNIT-IV	PERSONNEL ADMINISTRATION: RECRUITMENT, TRAINING, PROMOTION, ROLE OF PUBLIC SERVICE COMMISSION (UPSC) AND STATE PUBLIC SERVICE COMMISSION	16	20
UNIT-V	CONTROL OVER ADMINISTRATION: ADMINISTRATIVE, LEGISLATIVE, EXECUTIVE AND JUDICIAL	16	20
	Total	68	100

References

1. .A.R Tyagi AND Atma ram *Public Administration*, Company, New Delhi, 2002.
2. Avasthi and Maheshwari, *Public Administration*, Laxmi Narayan Agarwal, 2009
3. B.L.Fadia and Kuldeep, *Public Administration*, Sahitya Bhawan Publication, Agra, 2008
4. Bidyut Chakrabarty and Mohit Bhattacharya, *Public Administration: A Reader*, Oxford University Press, 2003
5. Bidyut Chakravarty and Mohit Bhattacharya, *Advanced Public Administration*, The World Press, Calcutta, 2007.
6. C.L.Baghel and Y.Kumar, *Public Administration* (two volumes), Kanishka Publishers, New Delhi, 2005
7. C.P. Bhambri, *Public Administration*, Sterling Publishers Pvt. Ltd, New Delhi, 1990.
8. L.D White, *Introduction to the study of Public Administration*, Mac Millan, New York, 1998.
9. M.P. Sharma & B. L. Sadana, *Public Administration Theory and Practice*, Kitab Mahal, Allahabad, 1999.

10. Mohit Bhattacharya, *Public Administration*, World Press, 2007
11. R.K .Sapru, *Administrative Theories and Management Thought*, Prentice Hall of India,Pvt. Ltd., 2008
12. Rukmi Basu, *Public Administration Concepts and Theories*, Sterling Publishers Pvt. Ltd, New Delhi,2004.
13. S.L. Goel, *Public Administration*, Sterling Publishers Pvt. Ltd, New Delhi,1991.
- 14.** S.P Naidu, *Public Administration; Concepts and Theories*, S. Chand & Company, New Delhi,1998.
15. S.R.Maheshwari, *Administrative Theory*, Macmillan India Ltd.
16. V.N. Viswanathan, *Comparative Public Administration*, Sterling Publishers Pvt. Ltd, New Delhi, 1997.

Course Rationale:

The main purpose of the paper is to acquaint the students with the dynamics of Indian Administration. The course is intended to provide a comprehensive analysis of the Union State administrative structures. Public Service Commission and the contemporary issues and challenges before Indian administrative.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHTAGE
UNIT-I	DEVELOPMENT OF INDIAN ADMINISTRATION COLONIAL TO WELFARE ADMINISTRATION	14	20
UNIT-II	UNION ADMINISTRATION: COUNCIL OF MINISTERS, CABINET SECRETARY, PRIME MINISTER'S OFFICE (PMO)	14	20
UNIT-III	STATE ADMINISTRATION: GOVERNOR, CHIEF MINISTER AND HIS SECRETARIAT	12	20
UNIT-IV	PUBLIC SERVICE COMMISSION: STRUCTURE AND FUNCTION OF UPSC AND STATE PUBLIC SERVICE COMMISSION	14	20
UNIT-V	ISSUES AND CHALLENGES BEFORE INDIAN ADMINISTRATION: ADMINISTRATIVE REFORMS AND REMOVAL OF CORRUPTION. (ROLE OF CVC, LOK AYUKTA AND LOK PAL)	14	20
	Total	68	100

References

1. A.R.Tyagi, *Public Administration*, Atma Ram and Sons, Delhi
2. Avasthi and Maheswari, *Public Administration*, Laxmi Narayan Agarwal, 2009
3. B.L.Fadia, and Kuldeep, *Public Administration*, Sahitya Bhawan Publication, Agra, 2008
4. Bidyut Chakrabarty and Mohit Bhattacharya, *Public Administration: A Reader*, Oxford University Press, 2003
5. Mohit Bhattacharya, *Public Administration*, World Press, 2007
6. R.K.Sapru, *Development Administration*, Sterling Publishers Pvt. Ltd, 1994
7. R.K.Sapru, *Administrative Theories and Management Thought*, Prentice Hall of India Pvt. Ltd., 2008
8. Rumki Basu, *Public Administration: Concepts and Theories*, Sterling Publishers Pvt. Ltd, 2004
9. S.R.Maheshwari, *Administrative Theory*, Macmillan India Ltd.

POL/HONS/OPT-603- GOVERNMENT & POLITICS OF NORTHEAST INDIA

Course Rationale:

The objective of this course is to familiarize students with the society and politics of Northeast India. It provides a comprehensive analysis of the traditional and social organisations of the Hill people of Northeast India. It also highlights the administrative provisions made for the Hill people during the British rule. The reorganisation of the Hills areas under the Indian constitution after independence and the contemporary issues and challenges in Northeast is emphasised.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHTAGE
UNIT-I	NORTHEAST: GEOGRAPHICAL, ECONOMIC, SOCIAL AND CULTURAL PROFILE.	16	20
UNIT-II	TRADITIONAL POLITICAL INSTITUTIONS: NAGALAND, MIZORAM, MEGHALAYA.	14	20
UNIT-III	ADMINISTRATIVE STRUCTURE: IMPACT OF BRITISH COLONIAL RULE	12	20
UNIT-IV	REORGANISATION OF STATES IN NORTHEAST IN POST INDEPENDENCE PERIOD.	12	20
UNIT-V	CONTEMPORARY ISSUES AND CHALLENGES IN NORTHEAST INDIA: ETHNICITY, SEPARATIST MOVEMENT AND UNDERDEVELOPMENT	14	20
	Total	68	100

References

1. Andre Gunder Frank , *The development of underdevelopment*, New England Free Press, University of Texas
2. B. P. Singh ,*The Problem of Change:A Study of North-East India* ,1996,Oxford University Press
3. Barpujari H. K. the Problem of the Hill Tribes of North-East India Vol.I, II and III, Basuwati Prakashan, Guwahati, 1976.
4. Chattopadhyaya S. K. Tribal Institutions of Meghalaya, Guwahati,1985
5. Gerin Phukon (ed) Political Dynamics of North east India, South Asian Publisher, 2000.
6. Jaideep Saikia,2007, *Frontiers in Flames: North-East India in Turmoil*,Viking,New Delhi.
7. Ray,B. Datta and S.P. Agarwal,1996, *Reorganisation of North-East India since 1974* Concept Publishing Company.

8. Sajal Nag, *Contesting Marginality: Ethnicity, Insurgence and Subnationalism in North-East India*, Manohar Publishers and Distributors, 2002,
9. Sajal Nag, *Roots of Ethnic Conflict: Nationality Question in North-East India*, Manohar Publishers and Distributors; 1st edition (July 1, 1990) 1990
10. Sanjib Baruah, *Ethnonationalism in India*, Oxford University Press, 2010
11. Sanjib Baruah, *Beyond Counter-Insurgency: Breaking the Impasse in Northeast India*, Oxford University Press, USA (July 15, 2009)
12. Sanjib Baruah, *India Against Itself: Assam and the Politics of Nationality*, University of Pennsylvania Press (June 1, 1999)
13. Sanjib Baruah, 2007, *Durable Disorder*, Oxford University Press.
14. Udayon Misra, 1991, *Nation Building and Development in North-East India*, Purbanchal Prakash, Guwahati
15. V. Venkata Rao and Niru Hazarika, *A century of government and politics in North East India, 1874-1980*, Volume 1, S. Chand, 1983.

POL/ HONS/OPT/-604- CONFLICT AND PEACE STUDIES.**Course Rationale:**

This paper seeks to introduce to the students the meaning and contending approaches in the discipline of Peace and conflict resolution from an academic perspective. It is also brings into boarder context the different strategies and techniques of non-violent conflict resolution.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	CONCEPTS OF PEACE, VIOLENCE AND CONFLICT.	14	20
UNIT-II	ANATONOMY AND SOURCES OF CONFLICT:SOCIAL, CULTURAL, ECONOMIC AND POLITICAL; NATURE OF CONTEMPORARY CONFLICT.	14	20
UNIT-III	CONFLICT MANAGEMENT AND RESOLUTION :CONFLICT SUPPRESSION, CONFLICT RESOLUTION AND RECONCIALITION	12	20
UNIT-IV	GANDHIAN TECHNIQUES: NON-VIOLENT TECHINQUES OF CONFLICT RESOLUTION; METHODS AND PRACTICE OF SATYAGRAHA.	14	20
UNIT-V	THE ROLE OF THE UNO AND CIVIL SOCIETY IN PEACE BUILDING AND CONFLICT RESOLUTION.	14	20
	Total	68	100

Reference :

1. Bondurant, J.V;Conquest of Violence (London, princeton Uni. Press, 1958).
2. Boulding, Elise (ed), New Agenda for Peace Research (Boulder and London, Lynee Reimer,1992)
3. Boutras, Boutros Ghali, An agenda for Peace (New York, United Nations, 1992).
4. Burton, J.Dukes, frank, Conflict:Practice in Management, Settlement and Resolution (London, Macmillan, 1990).
5. Coser, L., The Foundation of Social Conflict (N.Y, the free Press , 1956)
6. Galtung ,Peace by Peaceful means (london , Sage, 1996).
7. Galtung, J. The way is the Goal: Gandhi Today 9Ahmedabad, Gujarat, Vidyapeeth, 1992.)
8. Holsti, K.J” Paths to Peace? Theories of Conflict Resolution and Realities of International Politics.” In Thakur, Ramesh (ed) International Conflict Resolution (Boulder and London, Westview Press, 1998).

9. Jeong, Ho Won, *Peace and Conflict Studies: An Introduction*, Ashgate, 2000, Sydney.
10. Mark Juergensmeyer, *Gandhi's Way: A handbook of Conflict Resolution*, Oxford, 2004.
11. Miall Hugh, et.al, *Contemporary Conflict Resolution: The Prevention Management and Transformation of Deadly Conflict*, Polity press, UK, 1999.
12. Sandole, Dennis, J.D and Merwe, Hugo Van der (ed.) *Conflict Resolution Theory and Practice* New York, Manchester University Press 1993.
13. Simmel, G., *Conflict and the Web of Group-Affiliation* (New York) 1955.
14. Steger, Manfred B. & Nancy S. Lind, *Violence and Its Alternative: An Interdisciplinary Reader*, St. Martin's Press, New York 2001.
15. Upadhyaya P. et al (ed) *Jai Jagat Sandesh (Peace Ideas of Gandhi, JP & Vinoba)*, Institute of Tibetan Higher Learning, Sarnath, 2001.
16. Wallensteen, Peter (ed) *Peace Research: Achievements and Challenges* (Boulder & London, Westview Press, 1988).
17. Weber, Thomas, "Gandhian Philosophy, Conflict Resolution Theory and Practical Approaches to Negotiation", *Journal of Peace Research*, Vol. 38 No. 4, Sage, 2001 pp 493-513.
18. Weber, Thomas, "Conflict Resolution and Gandian Ethics" (New Delhi, Gandhi Peace Foundation, 1991.).
19. Wehr, Paul, *Conflict Regulation*, Westview Special Studies in Peace, Conflict and Conflict Resolution, Westview Press/Boulder, Colorado, 1989.

POL/HONS/OPT-605-INTERNATIONAL LAW

Course Rational:

The paper is designed to introduce students to the basic concepts and significance of International Law, the current state of the International Legal order and the ever-present tension between theory and practice that arises in the application of international law to real- world situations.

(Total marks-100)

UNIT	TITLE	CONTACT HRS	WEIG HTAG E
UNIT-I	INTERNATIONAL LAW:CONCEPT,NATURE AND SIGNIFIGANCE; INTERNATIONAL LAW AND MUNICIPAL LAW; SOURCES OF INTERNATIONAL LAW.	16	20
UNIT-II	STATE AS SUBJECT OF INTERNATIONAL LAW:ESSENTIAL OF STATEHOOD, RIGHTS AND DUTIES OF STATES, MODES OF ACQUISITION AND LOSS OF STATE TERRITORY	14	20
UNIT-III	INDIVIDUAL AS SUBJECT OF INTERNATIONAL LAW: NATIONALITY, EXTRADITION.	12	20
UNIT-IV	:EQUITABLE RESOURCE UTILISATION AND JUSTIFICATION :LAW OF SEA, LAW OF AIR SPACE, LAW OF OUTER SPACE, COMMON HERITAGE	13	20
UNIT-V	PEACEFUL SETTLEMENT OF DISPUTES:UNSC,ICIJ AND ITS POLITCAL LIMITS, INTERNATIONAL ARBITRATION, CONCIALITION COMMISSIONS	13	20
	Total	68	100

References:

1. Anand, R.P Asian States and the Development of Universal Interantional Law Vikas, 1972.
2. Anand, R.P., New States and international Law Vikas, 1972.
3. D.P. O' Connell, International Law,Stevens and Sons, 1965, 2 vols.
4. Gerhard Von Glahn, Law Among Nations:An Introduction to Public Internatioal Law, Longman, 1966.
5. Grigory Tunkin, Contemporary International Law, Progress Publishers,1969.
6. H.O Agarwal, International Law and Human Rights, Central Law Publications Allahabad.
7. Ian Brownlie, principles of Public International Law, Oxford University Press, 1973.
8. J.G Starke, Introduction to International Law, Aditya books, New Delhi.
9. Malcom N Shaw, International Law, Cambridge Publication.
10. Quincy Wright, Contemporary International Law:A Balance Sheet, Random House, 1963.

11. Richard A. Falk, The Status of Law in International Society, Princeton University Press, 1970.
12. S.K. Kapoor, Public International Law, Central Law Agency.
13. S.K. Verma, An introduction to International Law, Printice hall of India, New Delhi.
14. Stark, J.G Introduction to International Law, Butterwoths, 1963.
15. Wolfgang Friedmann, The Changing Structure of International Law, Columbia University Press, 1964. Journal: Indian Journal of International Law.

Syllabus of
BA Honours Course
in
Sociology
for 2018-19 Session

Department of Sociology

***Reviewed UG Syllabus (of selected papers) approved by 22nd School Board
Meeting held on 18.05.2016***

SEMESTER-WISE DISTRIBUTION OF COURSES

Elective

Soc 101	Introduction to Sociology	4	0	4	4

Honours

Soc 102	Social Research Methods – I	4	0	4	4

Semester - II

Elective

Soc 201	Social Stratification and Social Mobility	4	0	4	4

Honours

Soc 202	Social Research Methods –II	4	0	4	4

Semester – III

Elective

Soc 301	Foundations of Sociological Thought	4	0	4	4

Honours

Soc 302	Population and Society	4	0	4	4

Semester – IV

Elective

Soc 401	Modern Sociological Theories	4	0	4	4

Honours

Soc 402	Social Movements	4	0	4	4

Semester - V

Elective

Soc 501	Marriage, Family and Kinship	4	0	4	4

Honours

Soc 502	Rural Sociology	4	0	4	4

Honours Optional (Any One)

Soc 503	Industrial Sociology	4	0	4	4

Soc 504	Contemporary Indian Society	4	0	4	4

Soc 505	Gender and Society	4	0	4	4

Soc 506	Crime and Society	4	0	4	4

Semester – VI

Elective

Soc 601	Indian Society	4	0	4	4

Honours

Soc 602	Urban Sociology	4	0	4	4

Honours Optional (Any One)

Soc 603	Indian Sociological Thinkers	5	0	5	5

Soc 604	Sociology of Tribal Society	5	0	5	5

Soc 605	Sociology of Culture and Mass Media	5	0	5	5

Soc 606	Project Paper	-	-	-	5

Optional Paper

Soc 607	Child Rights and Protection				

[Note: L = Lecture, T = Tutorials, CH = Contact Hour, CR = Credit

A minimum of 12-14 contact hours will be required per unit in every course keeping in view that a minimum of 68 contact hours is maintained in each paper throughout the semester.

COURSE NO SOC 101: INTRODUCTION TO SOCIOLOGY

Objectives:

The basic idea for the introduction of this course is to introduce the subject of sociology to the students. It is intended to acquaint the students with the discipline as a social science and its distinctive approaches.

Course Outline:

UNIT I: SOCIOLOGY AS A DISCIPLINE

- a. Meaning, Origin and Growth
- b. Nature, Scope and Significance of Sociology

UNIT II: SOCIOLOGY AND ITS RELATIONSHIP WITH OTHER SOCIAL SCIENCES

- a. Sociology and History
- b. Sociology and Political science
- c. Sociology and Economics
- d. Sociology and Social Anthropology

UNIT III: BASIC CONCEPTS

- a. Society and Culture
- b. Social Structure and Social System
- c. Community, Association and Social Organization

UNIT IV: SOCIAL INSTITUTIONS

- a. Family
- b. Marriage and Kinship
- c. Religion

UNIT V: SOCIAL CHANGE

- a. Meaning and Nature
- b. Theories of Social Change
- c. Factors of Social Change

Essential Readings:

1. Bottomore, T.B; 1971; *Sociology: A Guide to Problems and Literature*; Bombay; Blackie and Son Publication Pvt. Ltd.
2. Gisbert, P; 1989; *Fundamentals of Sociology*; Bombay; Orient Longman.
3. Haralambos, M; 1991; *Sociology, Themes and Perspectives*; New Delhi; Oxford University Press.
4. Inkeles, Alex; 2003; *What is Sociology? An Introduction to the Discipline and Profession*; New Delhi; Prentice Hall of India Private Limited.
5. Jayaram, N; 1990; *Introducing Sociology*; New Delhi; MacMillan India Ltd.
6. Johnson, Harry M; 1995; *Sociology: A Systematic Introduction*; New Delhi; Allied Publishers.
7. Kikhi, Kedilezo et.al; 2010; *Introduction to Sociology*; Dimapur; Heritage Publishing House.
8. Schaefer, Richard T. and Robert P. Lamm; 1999; *Sociology*; New Delhi; Tata McGraw Hill.
9. Sharma, R.N; 1982; *Principles of Sociology*; London; J.K. Publishers.
10. Turner, Jonathan H; 1994; *Sociology: Concepts and Uses*; New York; McGraw Hill Inc.

COURSE NO SOC 102: SOCIAL RESEARCH METHODS - I

Objectives:

This course intends to train the students in the applicability of research procedures, tools and techniques of social science research.

Course Outline:

UNIT I: CONCEPTUAL ASPECTS

- a. Meaning and Scope
- b. Significance of social research

UNIT II: NATURE AND PROCESS

- a. Steps in Scientific Research
- b. Ethical issues in Social Research

UNIT III: HYPOTHESIS

- a. Meaning and Types
- b. Formulation of hypothesis

UNIT IV: RESEARCH DESIGN AND SAMPLING

- a. Formation of Research Design
- b. Sampling Techniques

UNIT V: TECHNIQUES OF DATA COLLECTION

- a. Sources of Data: Primary and Secondary
- b. Research Tools: Observation, Schedule, Questionnaire and Interview

Essential Readings:

1. Ahuja, Ram; 2009; *Research Methods*; Jaipur; Rawat Publications.
2. Beteille, A. and T. N. Madan; 1975; *Encounters and Experience: Personal Accounts of Fieldwork*; New Delhi; Vikas Publishing House.
3. Cauvery, R et.al; 2003; *Research Methodology*; New Delhi; S. Chand and Company Ltd.
4. Dooley, David; 2007; *Social Research Methods (Fourth edition)*; New Delhi; Prentice Hall of India.
5. Ghosh, B. N; 1985; *Scientific Methods and Social Research*; New Delhi; Sterling Publishers Pvt. Ltd.
6. Goode, William J. and Paul K. Hatt; 1987; *Methods in Social Research*; London: Mc Graw Hill Books Company
7. Kothari, C.R; 2005; *Research Methodology. Methods and Techniques*; New Delhi; New Age International (P) Limited Publishers.
8. Kumar, Ranjit; 1999; *Research Methodology: A step by Step Guide for Beginners*; New Delhi; Sage Publications.
9. Misra, R.P; 2001; *Research Methodology: A Hand Book*; New Delhi; Concept Publishing Company.
10. Punch, Keith F; 2005; *Introduction to Social Research: Quantitative and Qualitative Approaches (Second edition)*; New Delhi; Sage publications.
11. Young, P.V; 1988; *Scientific Social Surveys and Research*; New Delhi; Prentice Hall of India.

COURSE NO SOC 201: SOCIAL STRATIFICATION AND SOCIAL MOBILITY

Objectives:

The objective of this course is to impart knowledge to the students the existing theories of social stratification and its relevance in contemporary society.

Course Outline:

UNIT I: NATURE AND BASES

- a. Meaning and Features
- b. Stratification and Differentiation

UNIT II: APPROACHES TO SOCIAL STRATIFICATION

- a. Functional
- b. Conflict

UNIT III: FORMS OF SOCIAL STRATIFICATION

- a. Slavery, Estates
- b. Caste and Class

UNIT IV: SOCIAL MOBILITY

- a. Types of Social Mobility
- b. Functions of Social Mobility

UNIT V: SOCIAL MOBILITY IN INDIA

- a. Modernization and Secularization
- b. Emerging Trends of Caste Mobility

Essential Readings:

1. Beteille, Andre; 1965; *Caste, Class and Power: Changing Patterns of Stratification in a Tanjore Village*; Berkeley; Penguin books.
2. Beteille, A. (ed.); 1969; *Social Inequality*; Harmondsworth; Penguin Books.
3. Bottomore, T.B; 1971; *Sociology: A Guide to Problems and Literature*; Bombay; Blackie and Son Publication Pvt. Ltd.
4. Davis, Kingsley and Wilbert E. Moore; 1945; 'Some Principles of Stratification', in *American Sociological Review*; April 1945.
5. Gupta D. (ed.); 1991; *Social Stratification*; Delhi; Oxford University Press.
6. Haralambos, M; 1991; *Sociology, Themes and Perspectives*; New Delhi; Oxford University Press.
7. Rao, C.N. Shankar; 2004; *Sociology of Indian Society*; New Delhi; S. Chand and Company Ltd.
8. Sharma, K.L; 1997; *Social Stratification in India: Issues and Themes*; New Delhi; Sage Publications.
9. Singh, Yogendra; 2002; *Social Stratification and Change in India*; New Delhi, Manohar.
10. Srinivas, M.N; 1965; *Caste in Modern India and Other Essays*; Bombay; Orient Longman.
11. Tumin, Melvin M; 1987; *Social Stratification: The forms and Functions of Inequality*; New Delhi; Prentice Hall of India.

COURSE NO SOC 202: SOCIAL RESEARCH METHODS-II

Objectives:

This course is designed to introduce various approaches to scientific research and its techniques to enable the students carry out research with confidence.

Course Outline:

UNIT I: APPROACHES TO RESEARCH

- a. Quantitative
- b. Qualitative
- c. Ethnography

UNIT II: METHODS OF RESEARCH

- a. Social Survey
- b. Case study

UNIT III: TYPES OF RESEARCH

- a. Basic and Applied
- b. Historical and Empirical
- c. Descriptive

UNIT IV: DATA PROCESSING AND ANALYSIS

- a. Methods of Data Processing
- b. Analysis of Data

UNIT V: REPORT WRITING

- a. Interpretation of Data
- b. Techniques of Report Writing

Note: Field visit and report writing may be conducted as part of the syllabus for 20 marks. Students should be made to do exercise in the class room such as construction of questionnaires, schedules, etc and also test them in the fields so as to sharpen their research skills.

Essential Readings:

1. Ahuja, Ram; 2009; *Research Methods*; Jaipur; Rawat Publications.
2. Beteille, A. and T. N. Madan; 1975; *Encounters and Experience: Personal Accounts of Fieldwork*; New Delhi; Vikas Publishing House.
3. Cauvery, R et.al; 2003; *Research Methodology*; New Delhi; S. Chand and Company Ltd.
4. Dooley, David; 2007; *Social Research Methods (Fourth edition)*; New Delhi; Prentice Hall of India.
5. Ghosh, B. N; 1985; *Scientific Methods and Social Research*; New Delhi; Sterling Publishers Pvt. Ltd.
6. Goode, William J. and Paul K. Hatt; 1987; *Methods in Social Research*; London: Mc Graw Hill Books Company
7. Kothari, C.R; 2005; *Research Methodology. Methods and Techniques*; New Delhi; New Age International (P) Limited Publishers.
8. Kumar, Ranjit; 1999; *Research Methodology: A step by Step Guide for Beginners*; New Delhi; Sage Publications.
9. Misra, R.P; 2001; *Research Methodology: A Hand Book*; New Delhi; Concept Publishing Company.
10. Punch, Keith F; 2005; *Introduction to Social Research: Quantitative and Qualitative Approaches (Second edition)*; New Delhi; Sage publications.
11. Young, P.V; 1988; *Scientific Social Surveys and Research*; New Delhi; Prentice Hall of India.

COURSE NO SOC 301: FOUNDATIONS OF SOCIOLOGICAL THOUGHT

Objectives:

This course is designed to introduce to the students the main ideas of the founding fathers of sociology and their contributions.

Course Outline:

UNIT I: AUGUSTE COMTE

- a. Social Static and Social Dynamics
- b. Law of the Human Progress

UNIT II: HERBERT SPENCER

- a. Organic Analogy
- b. Spencer and Functionalism

UNIT III: KARL MARX

- a. Historical Materialism
- b. Class and Class Struggle

UNIT IV: EMILE DURKHEIM

- a. Social Facts-Rules of Sociological Method-Social Facts
- b. Theories of Suicide

UNIT V: MAX WEBER

- a. Social Action-Types of Action
- b. Protestant Ethic and the Spirit of Capitalism

Essential Readings:

1. Abraham, Francis and John Henry Morgan; 1987; *Sociological Thought*; Delhi; McMillan India Limited.
2. Aron, Raymond; 1982; *Main Currents in Sociological Thought* (Vol. 1 and 2); New York; Penguin Books.
3. Barnes, H.E; 1967; *Introduction to the History of Sociology*; Chicago; The University of Chicago Press.
4. Coser, Lewis A; 1996; *Mastes of Sociological Thought* (2nd edition); Jaipur; Rawat Publications.
5. Fletcher, Ronald; 1994; *The Making of Sociology (Vol 1 and 2)*; Jaipur; Rawat Publications.
6. Kikhi, Kedilezo et.al; 2010; *Foundations of Sociological Thought*; Dimapur; Heritage Publishing House.
7. Morrison, Ken; 1995; Marx, Durkheim, Weber: *Formation of Modern Social Thought*; London; Sage Publications.
8. Ritzer, George; 1986; *Sociological Theory*; New Delhi; Tata McGraw Hill.
9. Sharma, R.N. and R.K. Sharma; 1994; *History of Social Thought*; Bombay; Media Promoters and Publishers Pvt. Ltd.
10. Srivastava, R.S; 1991; *Traditions in Sociological Theory*; Jaipur; Rawat Publications.
11. Turner, Jonathan H; 1987; *The Structure of Sociological Theory*; Jaipur; Rawat Publications.
12. Zeitlin, Irving M; 1987; *Rethinking Sociology: A Critique of Contemporary Theory*; Jaipur; Rawat Publications.

COURSE NO SOC 302: POPULATION AND SOCIETY

Objectives:

This course is proposed to acquaint the students the demographic features and trends of Indian society vis-à-vis world population. It also aims to make students understand population control in terms of social needs.

Course Outline:

UNIT 1: DEMOGRAPHY

- a. Concepts
- b. Scope
- c. Importance

UNIT II: THEORIES OF POPULATION

- a. Malthusian theory
- b. Optimum theory
- c. Demographic transition theory

UNIT III: POPULATION TRENDS

- a. Population Trends in India
- b. Trends of World Population

UNIT IV: MIGRATION

- a. Causes of Migration
- b. Problems of Immigration in North-East India

UNIT V: POPULATION PLANNING AND CONTROL

- a. Family planning programmes in India
- b. Women's Reproductive Health
- c. Population and Education

Essential Readings:

1. Ashish, B. 1991; *Demographic Diversity in India*; Delhi; B.R. Publishing Corporation.
2. Chandrasekar, S. (ed.); 1974; *Infant Mortality, Population Growth and Family Planning in India*; London; George Allen and Unwin Ltd.
3. Finkle, Jason L. and C. Alison McIntosh (eds); 1994; *The New Policies of Population*; New York; The Population Council.
4. Hatcher, Robert et.al; 1997; *The Essentials of Contraceptive Technology*; Baltimore; John Hopkins School of Public Health.
5. Jhingam, M.L. et.al; 2008; *Demography*; Delhi; Virinda Publications (P) Ltd.
6. Premi, M.K. et.al; 1983; *An Introduction to Social Demography*; Delhi; Vikas Publishing House.
7. Sharma, Rajendra; 1997; *Demography and Population Problems*; New Delhi; Atlantic Publishers.
8. Srivastava, O.S; 1994; *Demography and Population Studies*; New Delhi; Vikas Publishing House.
9. Census of India Reports; Government of India.

COURSE NO SOC 401: MODERN SOCIOLOGICAL THEORIES

Objectives:

The main objective of this course is to familiarize the students with some of the modern sociological thinkers and their contributions.

Course Outline:

UNIT I: A.R. RADCLIFFE BROWN

- a. Structure and Function
- b. Science and Society

UNIT II: BRONISLAW K. MALINOWSKI

- a. Theory of Needs
- b. Magic, Science and Religion

UNIT III: TALCOTT PARSONS

- a. Pattern variables
- b. Functional Pre-Requisites of Social System

UNIT IV: R. K. MERTON

- a. Manifest and Latent Function
- b. Reference Group

UNIT V: C. WRIGHT MILLS

- a. Sociological Imagination
- b. Power Elite

Essential Readings:

1. Brown, A.R. Radcliffe; *Structure and Function in Primitive Society* (1952)
2. Brown, A.R. Radcliffe; *A Natural Science of Society* (1957)
3. Malinowski, B.K; *Crime and Custom in Savage Society* (1926)
4. Malinowski, B.K; *Coral gardens and their Magic* (1935)
5. Merton, Robert K; 1968; *Social Theory and Social Structure*; New York; Free Press.
6. Mills, C.W; *The Power Elite* (1956)
7. Mills, C.W; *Sociological Imagination* (1959)
8. Parsons, Talcott; 1949; *The Structure of Social Action*; New York; McGraw Hill.
9. Parsons, Talcott. 'The Social System', The Free Press, Glencoe, Illinois, 1951
10. Parsons, Talcott; 1967; *Sociological Theory and Modern Society*; New York; Free Press.
11. Turner, J.H; 1987; *Structure of Sociological Theory*; Jaipur; Rawat Publications.

COURSE NO SOC 402: SOCIAL MOVEMENTS

Objectives:

The objective of this paper is to dwell on social movements, types, causes and analyze possible solutions, as a purely academic exercise. The paper aims to throw light on the futility of the use of violence for achieving one's desire; it instead, hopes to highlight the path for peaceful sociological solutions.

Course Outline:

Unit I: INTRODUCTION

- a. Concept, Nature and Dynamics
- b. Classifications

Unit II: THEORIES OF SOCIAL MOVEMENT

- a. Functionalist
- b. Conflict

Unit III: PEASANT MOVEMENTS

- a. Telangana Movement
- b. Naxalite Movement

Unit IV: CONTEMPORARY SOCIAL MOVEMENT

- a. Environment Movement
- b. Women's Movement

Unit V: TRIBAL MOVEMENTS IN NORTH EAST INDIA

- a. Naga Movement
- b. Bodo Movement

Essential Readings:

1. Ao, A. Lanunungsang; 2002; *From Phizo to Muivah: The Naga National Question in North East India*; New Delhi; Mittal Publications.
2. Coser, Lewis A; 1956; *The function of Social Conflict*; New York; Free Press.
3. Desai, A.R; 1979; *Peasant Struggles in India*; Bombay; Oxford University Press.
4. Dube, S.C (ed.); 1977; *Tribal Heritage of India*; New Delhi; Vikas Publishing House.
5. Rao, M.S.A; 1979; *Social Movements in India*; Delhi; Manohar.
6. Raza, Moonis and A. Ahmad; 1990; *An Atlas of Tribal India*; Delhi; Concept Publishing House.
7. Sharma, Suresh; 1994; *Tribal Identity and Modern World*; New Delhi; Sage Publications.
8. Singh, K.S; 1972; *Tribal Situation in India*; Dehra Dun; Indian Institute of Advanced Study.
9. Singh, K.S; 1984; *Economies of the Tribes and their Transformation*; New Delhi; Concept Publishing House.
10. Singh, K.S; 1985; *Tribal Society*; New Delhi; Mahohar.
11. Von Furer-Haimendorf, C; 1982; *Tribes in India: The Struggle for Survival*; Delhi; Oxford University Press.

COURSE NO SOC 501: MARRIAGE, FAMILY AND KINSHIP

Objectives:

This course is prepared to acquaint student with the basic concepts in family and kinship studies and to demonstrate structural principles used by societies in a consistent logical way to organize groups and categorize and infuse them with cultural meanings so that the societal objectives of social integration, social reproduction and social continuity are realized.

Course Outline:

UNIT I: MARRIAGE

- a. Rules
- b. Transactions
- c. Challenges

UNIT II: FAMILY

- a. Developmental cycle
- b. Changing trends

UNIT III: PERSPECTIVES ON THE FAMILY

- a. Inter-actionist
- b. Functionalist
- c. Conflict

UNIT IV: KINSHIP

- a. Terminologies
- b. Genealogical Methods

UNIT V: KINSHIP SYSTEMS WITH REFERENCE TO NORTH EAST

- a. Patrilineal
- b. Matrilineal

Essential Readings:

1. Ahmad, Imtiaz (ed.): 1976; *Family, Kinship and Marriage among Muslims in India*; New Delhi: Manohar.
2. Dube, Leela; 1974; *Sociology of Kinship: An Analytical Survey of Literature*; Bombay; Popular Prakashan.
3. Dube, Leela; 1997; *Women and Kinship: Comparative Perspectives on Gender in South and South –East Asia*; New Delhi; Sage Publications.
4. Fox, Robin; 1967; *Kinship and Marriage: An anthropological Perspective*; Harmondsworth; Penguin Books.
5. Karve, Iravati; 1968; *Kinship Organization in India*; Bombay; Asia Publishing House.
6. Madan, T.N; 1989; *Family and Kinship: A Study of Pandits of Rural Kashmir*. Delhi; Oxford University Press.
7. Shah, A.M; 1998; *The Family in India: Critical Essays*; New Delhi; Orient Longman.
8. Tali, N and A. Lanunungsang Ao; 2005; *Naga Society and Culture*; Nagaland University; Tribal Research Centre; Hqrs: Lumami.
9. Trautman, T.R; 1981; *Dravidian Kinship*; Cambridge, Cambridge University Press.
10. Uberoi, Patricia (ed.); 1993; *Family, Kinship and Marriage in India*; New Delhi; Oxford University Press.
11. Weston, K; 1991; *Families we choose: Lesbians, Gays, Kinship*; New York; Columbia University Press.

COURSE NO SOC 502: RURAL SOCIOLOGY

Objectives:

The course provides sociological understanding of rural social structure, change and development in India. It also aims to impart sociological skills to reconstruct rural institution and rural development programmes, to plan, monitor and evaluate rural development programmes.

Course Outline:

UNIT I: INTRODUCTORY CONCEPTS

- a. Origin and Development
- b. Nature and Scope

UNIT II: APPROACHES

- a. Community
- b. Regional

UNIT III: RURAL SOCIAL STRUCTURE

- a. Features of Rural Society
- b. Occupational Structure

UNIT IV: LOCAL GOVERNANCE SYSTEM

- a. Panchayati Raj
- b. Village Council System with Special Reference to Nagaland.

UNIT V: CHANGING TRENDS

- a. Role of Women
- b. Impact of Science and Technology

Essential Readings:

1. Berch, Berberogue (ed.); 1992; *Class, State and Development in India*; New Delhi; Sage Publication.
2. Beteille, Andre; 1974; *Six Essays in Comparative Sociology*; New Delhi; Oxford University Press.
3. Desai, A.R; 1977; *Rural Sociology in India*; Bombay; Popular Prakashan.
4. Dhanagare, D.D; 1988; *Peasant Movements in India*; New Delhi; Oxford University Press.
5. Mencher, J.P; 1983; *Social Anthropology of Peasantry - Part III*; Oxford; Oxford University Press.
6. Mukherjee, Ramkrishna; 1979; *Sociology of Indian Sociology*; Bombay; Allied Publications.
7. Nandy, Ashish; 1999; *Ambiguous Journey to the City*; New Delhi; Oxford University Press.
8. Radhakrishna. P; 1989; *Peasant Struggles: Land Reforms Social change in Malabar 1836-1892*; Delhi; Sage Publications.
9. Singh, Yogendra; 2000; *Culture Change in India: Identity and Globalisation*; Jaipur; Rawat Publications.
10. Thorner, Daniel and Alice Thorner; 1962; *Land and Labour in India*; Bombay; Asia Publications.

COURSE NO SOC 503: INDUSTRIAL SOCIOLOGY

Objectives:

The objective of this course is to make students learn the organizational structure of industries, industrial leadership and industrial relations.

Course Outline:

UNIT I : INTRODUCTION

- a. Meaning , Subject matter and Scope
- b. Contemporary Theories of Management: Systems Theory, Contingency Theory

UNIT II: INDUSTRIAL ORGANIZATION

- a. Formal and Informal Structure and Function
- b. Production Process

UNIT III: INDUSTRIAL LEADERSHIP

- a. Types
- b. Conditions of effective leadership

UNIT IV: INDUSTRIAL RELATIONS

- a. Human Relations
- b. Authority Relations
- c. Trade Unions

UNIT V: INDUSTRIAL CONFLICT

- a. Causes and Types, Resolution of Conflict
- b. New Industrial Policy, India

Essential Readings:

1. Burns, T. (ed.); 1969; *Industrial Man: Selected Readings*; Harmondsworth; Penguin Books.
2. Giri, P.K; 2005; *Industrial Sociology*; Jaipur; Sublime Publication.
3. Gisbert, P; 1985; *Fundamentals of Industrial Sociology*; Bombay; Tata McGraw Hill.
4. Kumar, K; 1973; *Prophecy and Progress*; London; Allen Lane.
5. Moore, W; 1965; *Impact of Industry*; New York; Prentice Hall.
6. Poole, M; 1982; *Theories of Trade Unionism: A Sociology for Industrial Relations*; London; Routledge and Kegan Paul.
7. Ramaswamy, E.A; 1988; *Industry and Labours*; New Delhi; Oxford University Press.
8. Rao, P. Subba; 2005; *Essentials of Human Resource Management and Industrial Relations*; Delhi; Himalaya Publishing House.
9. Sen, Ratna; 2010; *Industrial Relations*; Delhi; Macmillan Publishers India Ltd.
10. Sury, M.M; 2004; *Indian Economy in the 21st Century: Prospects and Challenges*; New Delhi; New Century Publications.
11. Watson, K.T; 1995; *Sociology, Work and Industry*; London; Routledge and Kegan Paul.

COURSE NO SOC 504: CONTEMPORARY INDIAN SOCIETY

Objectives:

This course attempts to understand some of the main issues and challenges in contemporary Indian society.

Course Outline:

UNIT I: IMPACT OF ECONOMIC LIBERALISATION

- a. Higher Education
- b. Women empowerment

UNIT II: TECHNOLOGY AND SOCIETY

- a. Industrialization and Rural Transformation
- b. Information Technology

UNIT III: SOCIAL PROBLEMS

- a. Corruption and Crime
- b. Unemployment
- c. Poverty

UNIT IV: ENVIRONMENTAL ISSUES

- a. Ecological Degradation
- b. Policy Measures and Implications

UNIT V: ETHNICITY IN NORTHEAST INDIA

- a. Identity Crisis
- b. Naga ethnicity: a case study

Essential Readings:

1. Ahuja, Ram; 1997; *Social Problems in India*; Jaipur; Rawat Publications.
2. Chandra, Bipan; 1994; *Ideology and Politics in Modern India*; Delhi; Har Anand Publications.
3. Chandrashekhar, S; 1950; *India's Population: Fact and Policy*; Chidambaram; Indian Institute for Population Studies, Annamalai University.
4. Gupta, Dipankar; 2000; *Mistaken Modernity, India between Worlds*; New Delhi;; Harper Collins Publishers India.
5. Oommen, T.K; 1997; *Citizenship and Nationality and Ethnicity*; Cambridge; Polity Press.
6. Redcliff, Michael; 1984; *Development and the Environmental Crisis*; New York; Methuen Co. Ltd.
7. Saxena, N.S; 1985; *Terrorism: History and Facets in the World and in India*; New Delhi; Abhinav Publications.
8. Singh, Yogendra; 2003; *Culture Change in India, Identity and Globalization*; Jaipur; Rawat Publications.
9. Sharma, S.L and T.K. Oommen (eds.); 2000; *National and National Identity in South Asia*; Delhi; Orient Longman.
10. Journals, Magazines, and News Papers (local, National and International) can be use as a source of Information for this particular course.

COURSE NO SOC 505: GENDER AND SOCIETY

Objectives:

The main objective for the introduction of this course is to highlight the issues of gender and gender sensitization and to relate it to the contemporary society. This course will also look into the issues of violence against women in relation to domestic abuse, crimes against women, infanticide etc.

Course Outline:

UNIT I: CONCEPTS

- a. Sex and Gender
- b. Gender Roles

UNIT II: PERSPECTIVES

- a. Functionalist
- b. Conflict
- c. Gandhian

UNIT III: GENDER VIOLENCE

- a. Violence Against Women
- b. Gender Discriminations

UNIT IV: WOMEN EMPOWERMENT

- a. Social Legislations
- b. Education
- c. Economic

UNIT V: CHALLENGES OF WOMEN IN MODERN SOCIETY

- a. Occupation
- b. Women in Decision-Making

Essential Readings:

1. Acharya, S; 1996; 'Women in the Indian Labour Force: A Temporal and Spatial Analysis,' in Susan Horton (ed.), *Women and Industrialization in Asia*; New York; Routledge Publications.
2. Agarwal, B; 1988; *Structures of Patriarchy: State, Community and Household in Modernizing Asia*; New Delhi; Kali for Women.
3. De Beauvoir S; 1983; *The Second Sex*, Harmondsworth; Penguin Books.
4. Desai, N and M. Krishnaraj; 1987; *Women and Society in India*; Delhi; Ajanta.
5. Engels, F; 1972; *The Origin of Family, Private Property and the State*; London; Lawrence and Wishart.
6. Forbes, G; 1998; *Women in Modern India*; Delhi; Cambridge University Press.
7. Oakley, A; 1972; *Sex, Gender and Society*; New York; Harper and Row.
8. Kuumba, M. Bahati; 2003; *Gender and Social Movements*; Jaipur; Rawat Publications.
9. Rosalso, M.Z and L. Lamphere (ed.); 1974; *Women, Culture and Society*; Delhi, Stanford University Press.
10. Whelham, I; 1997; *Modern Feminist Thought*; Edinburgh; Edinburgh University Press.

COURSE NO SOC 506: CRIME AND SOCIETY

Objectives: The course is designed to acquaint the students with the changing profile of crime and criminals and prepare them for professional roles of correctional agents in agencies of criminal justice administration system, particular in prison and other reformatory institutions.

Course Outline:

UNIT I: INTRODUCTORY CONCEPTS

- a. Meaning and concept
- b. Legal and Sociological

UNIT II: APPROACHES

- a. Classical
- b. Positivist
- c. Marxian perspective

UNIT III: TYPES OF CRIME

- a. White-Collar Crime
- b. Terrorism- Related Crime
- c. Organized Crime

UNIT IV: FACTORS OF CRIME

- a. Personal
- b. Psychological and
- c. Environmental

UNIT V: PUNISHMENT AND CORRECTIVE MEASURES

- a. Retributive, Deterrent, Reformatory
- b. Prison-based, Probation, Parole, Open-prison
- c. Naga Customary and Crimes Control

Essential readings:

1. Ahuja, Ram; 2004; Social Problems in India; New Delhi; Rawat Publishers.
2. Bedi, Kiran; 1998; It is always possible; New Delhi: Sterling Publication Pvt. Ltd.
3. Gill, S.S.; 1998; The Pathology of Corruption; New Delhi; Harper Collins Publishers (India)
4. Merton, R.K.; 1972; Social Theory and Social Structure; New Delhi; Emerind Publishing.
5. Ministry of Home Affairs; 1998; Crime in India; New Delhi; Government of India.
6. Parsonage, William H.; 1979; Perspectives on Criminology; London Sage Publication.
7. Reid, Suetitus; 1976; Crime and Crimoriology; Illinois; Deyden Press.
8. Sutherland, Edwin. H. and Donald R. Cressey; 1968; Principles of Criminology; Bombay; Times of India Press.
9. Teeters, Negley and Harry Elmer Barnes; 1959 New Horizons in Criminology; New Delhi; Prentice Hall of India.
10. William, Frank P. and Marilyn D. Mesher; 1998; Criminology Theory; New Delhi
11. Williamson, Herald E.; 1990; The Correction Profession; New Delhi; Sage Publication.

COURSE NO SOC 601: INDIAN SOCIETY

Objectives:

This paper intends to present a comprehensive and integrated profile of Indian society.

Course Outline:

UNIT I: NATURE AND CHARACTERISTICS

- a. Unity in Diversity
- b. Caste Hierarchy

UNIT II: THE COMPOSITION OF INDIAN SOCIETY

- a. Rural and Urban
- b. Minorities and Weaker Sections

UNIT III: SOCIO-ECONOMIC SYSTEM

- a. Economy-Agrarian economy and mixed economy
- b. Religion-Pluralism, multiculturalism, secularism.

UNIT IV: CHALLENGES OF NATION BUILDING

- a. Poverty, Unemployment
- b. Communalism

UNIT V: CHANGE AND CONTINUITY

- a. Tradition and Modernity
- b. Globalization

Essential Readings:

1. Ahuja, Ram; 1999; *Society in India*; Jaipur; Rawat Publications.
2. Bose, N.K; 1967; *Culture and Society in India*; New Delhi; Asia Publishing House.
3. Bose, N.K; 1975; *Structure of Hindu Society*; New Delhi; Asia Publishing House.
4. Dube, S.C; 1958; *India's Changing Villages*; London; Routledge and Kegan Paul.
5. Dube, S.C; 1990; *Indian Society*; New Delhi; National Book Trust of India.
6. Dube, S.C; 1995; *Indian Village*; London; Routledge.
7. Ghurye, G.S; 1969; *Caste and Race in India*; Bombay; Popular Prakashan.
8. Kumar, Anand (ed.); 2000; *Nation Building in India*; New Delhi; Radiant.
9. Mandelbaum, D.G; 1970; *Society in India*; Bombay; Popular Prakashan.
10. Singh, Yogendra; 1973; *Modernization of Indian Tradition*; New Delhi; Thomson Press.
11. Srinivas, M.N; 1963; *Social Change in India*; Berkeley; University of California Press.

COURSE NO SOC 602: URBAN SOCIOLOGY

Objectives:

This course intends to provide sociological understanding of the nature and scope of urban sociology and urban social structure in India. It also aims to make students read and understand the emerging issues and challenges in urban centers.

Course Outline:

UNIT I: INTRODUCTION

- a. Origin and Development
- b. Nature and Scope
- c. Urbanism and Urbanization

UNIT II: GROWTH OF CITIES

- a. Western Model
- b. Indian Model

UNIT III: URBAN SOCIAL STRUCTURE

- a. Characteristics
- b. Rural and Urban continuum

UNIT IV: URBAN CIVIC BODIES

- a. Metropolitans
- b. Municipalities

UNIT V: PROBLEMS AND CHALLENGES

- a. Congestion and Pollution
- b. Welfare and Security Measures
- c. Emerging Issues and challenges

Essential Readings:

1. Abrahamson, M; 1976; *Urban Sociology*; Englewoodcliff; Prentice Hall.
2. Bharadwaj, R.K; 1974; *Urban Development in India*; New Delhi; National Publishing House.
3. Bose, Ashish; 1978; *Studies in India Urbanisation 1901 – 1971*; New York; Tata McGraw Hill.
4. Desai, A.R and S. D. Pillai (eds.); 1970; *Slums and Urbanisation*; Bombay; Popular Prakashan.
5. D'souza, Alfred; 1978; *The Indian City: Poverty, Ecology and Urban Development*; New Delhi; Manohar.
6. Gold, Harry; 1982; *Sociology of Urban Life*; Englewoodcliff; Prentice Hall.
7. Quinn, J.A; 1995; *Urban Sociology*; New Delhi; S. Chand and Co.
8. Ramachandran, R; 1991; *Urbanisation and Urban Systems in India*; Delhi; Oxford University Press.
9. Rao, M.S.A; 1974; *Urban Sociology in India*; New Delhi; Orient Longman.
10. Rao, M.S.A, C. Bhat and L.N. Kadekar; 1991; *A Reader in Urban Sociology*; New Delhi, Orient Longman.

COURSE NO SOC 603: INDIAN SOCIOLOGICAL THINKERS

Objectives:

It aims to introduce to the students about the major contributions of the Indian Sociological thinkers.

Course Outline:

UNIT I: G.S. GHURYE

- a. Caste and Race
- b. Indology

UNIT II: R.K. MUKERJEE

- a. Society and Values
- b. Social Ecology

UNIT III: M.N. SRINIVAS

- a. Sanskritization and Westernization
- b. Field Work

UNIT IV: A.R. DESAI

- a. Marxist Interpretation of Indian Society
- b. Agrarian Economy

UNIT V: YOGENDRA SINGH

- a. Tradition and Modernity
- b. Relevance of Social Sciences in India

Essential Readings:

1. Beteille, Andre; 1975; *Inequality and Social Change*; Delhi; Oxford University Press.
2. Desai, A.R; 1971; *Social Background of Indian Nationalism*; Bombay; Popular Prakashan.
3. Dhanagare, D. N; 2004; *Themes and Perspectives in Indian Sociology*; Jaipur; Rawat Publications.
4. Ghurye, G.S; 1969; *Caste and Race in India*; Bombay; Popular Prakashan.
5. Singh, Y; 1973; *Modernization of Indian Tradition*; Delhi; Thomson Press.
6. Singh, Y; 2007; *Ideology and Theory in Indian Sociology*; Jaipur, Rawat Publications.
7. Shah, A.M and I.P. Desai; 1988; *Division and Hierarchy: An Overview of Caste in Gujarat*; Delhi; Hindustan Publishing Corporation.
8. Srinivas, M.N; 1966; *Social Change in Modern India*; Bombay; Allied Publishers.
9. Mukerjee, Radha Kamal; 1965; *The Sociologist and Social Change in India Today*; Delhi; Prentice Hall of India.
10. Mukherjee, D.P; 1958; *Diversities*; Delhi; People's Publishing House.
11. Oommen, T.K. and P.N. Mukerjee, (eds.); 1986; *Indian Sociology: Reflection and Introspections*; Bombay; Popular Prakashan.
12. Dumont, L; 1970; *Religion, Politics and History in India*; Paris/The Hague; Mouton.
13. Frykenberg, R.E. (ed.); 1969; *Land Control and Social Structure in Indian History*; Madison; University of Wisconsin Press.

COURSE NO SOC 604: SOCIOLOGY OF TRIBAL SOCIETY

Objectives:

The objective of this course is to provide a comprehensive profile of tribal people in terms of their distribution and concentration, demographic features, social structure and cultural patterns.

Course Outline:

UNIT I: CONCEPTS

- a. Meaning and Definition
- b. Features

UNIT II: DEMOGRAPHIC PROFILE

- a. Distribution and concentration of tribal people
- b. Religious beliefs and practices

UNIT III: TRIBAL ECONOMY

- a. Shifting cultivation
- b. Terrace cultivation

UNIT IV: TRIBAL PROBLEMS

- a. Poverty and Illiteracy
- b. Land Alienations

UNIT V: CHANGING SCENARIO

- a. Impact of Modern Education
- b. Emerging Classes

Essential Readings:

1. Bose, N.K; 1967; *Culture and Society in India*; Bombay; Asia Publishing House.
2. Desai, A.R; 1979; *Peasant Struggles in India*; Bombay; Oxford University Press. Dube, S.C (ed.); 1977; *Tribal Heritage of India*; New Delhi; Vikas Publishing House.
3. Hasnain, N; 1983; *Tribes in India*; New Delhi; Harnam Publications.
4. Rao, M.S.A; 1979; *Social Movements in India*; Delhi; Manohar.
5. Raza, Moonis and A. Ahmad; 1990; *An Atlas of Tribal India*; Delhi; Concept Publishing House.
6. Sharma, Suresh; 1994; *Tribal Identity and Modern World*; New Delhi; Sage Publications.
7. Singh, K.S; 1972; *Tribal Situation in India*; Dehra Dun; Indian Institute of Advanced Study.
8. Singh, K.S; 1982; *Tribal Movements in India (Vol. I and II)*; New Delhi; Manohar.
9. Singh, K.S; 1984; *Economies of the Tribes and their Transformation*; New Delhi; Concept Publishing House.
10. Singh, K.S; 1985; *Tribal Society*; Delhi; Mahohar.
11. Singh, K.S; 1995; *The Scheduled Tribes*; New Delhi; Oxford University Press.
12. Von Furer-Haimendorf, C; 1982; *Tribes in India: The Struggle for Survival*; Delhi; Oxford University Press.

COURSE NO SOC 605: SOCIOLOGY OF CULTURE AND MASS MEDIA

Objectives:

This course intends to impart to the students the role of media in connecting an individual to the outside world. Media can break down barriers and can also create barriers among different cultures. Hence, the study of mass media and its impact on culture should be helpful for students in getting awareness about the world around them.

Course Outline:

UNIT 1: CONCEPTS

- a. Meaning and Types
- b. Agencies of Mass Communication

UNIT II: CULTURE

- a. Folk culture
- b. Popular culture
- c. Mass culture

UNIT III: MASS MEDIA

- a. Print Media
- b. Electronic Media

UNIT IV: ABUSE OF MEDIA

- a. Cyber Crimes
- b. Effect on Indigenous Culture

UNIT V: IMPACT OF MASS MEDIA

- a. Fashion
- b. Global Culture
- c. Social Networking

Essential Readings:

1. Curran, J and M. Gurevitch (eds.); 1991; *Mass Media and Society*; London; Edward Arnold.
2. Featherstone, M; 1995; *Undoing Culture: Globalisation, Post-Modernism and Identity*; London; Sage Publications.
3. Fiske, J; 1989; *Understanding Popular Culture*; Boston; Unwin and Hyman.
4. Golding, P; 1974; *The Mass Media*; London; Orient Longman.
5. Leach, E; 1976; *Culture and Communication*; Cambridge; Cambridge University Press.
6. McLuhan, M; 1994; *Understanding Media: The Extension of Man*; London; Routledge.
7. McQuail, Dennis; 1994; *Mass Communication Theory*; London; Sage Publications.
8. Mowlana, Hamid; 1997; *Global Information and World Communication*; London; Sage Publications.
9. Robertson, R; 1992; *Globalisation, Social Theory and Global Culture*; London; Sage Publications.
10. Stevenson, N; 1996; *Understanding Media Cultures*; New Delhi; Sage Publications.

COURSE NO SOC 606: PROJECT PAPER

In continuation of the Course No. SOC 102 and SOC 202, this paper aims to facilitate the students in the fundamentals of social research. In consultation with the course instructor, every student will identify a relevant topic of their interest/area of research for this purpose. The department will assign supervisor/guide as per the chosen topics/area of specialization. All efforts should be made by the Department concerned to maintain a standard size of samples/area of study to make the exercise meaningful. In case of an empirical study, at least a minimum sample size of 50 respondents should be taken into consideration. The project work in form of dissertation with a minimum of 25 pages in A4 size paper typed in double space 12 point font size should be submitted within the stipulated period fixed by the Department/College authority.

OPTIONAL PAPER

COURSE NO: SOC-607: CHILD RIGHTS AND PROTECTION

UNIT-I: NATURE OF CHILD RIGHTS AND PROTECTION

- a) Meaning, Nature and Concept of Child Rights and Protection
- b) Importance of Child Rights and Protection

UNIT-II: NATURE OF CHILD LABOUR

- a) Meaning, Nature and Concept Child Labour
- b) Causes of Child Labour

UNIT-III: ROLE OF EDUCATION

- a) Significance of Education in Mitigation child Labour
- b) Directive Principles of State Policy and Right to Education Act (RTE)

UNIT-IV: SOCIAL LEGISLATIONS

- a) Socio- Economic Policies for Child Rights
- b) Constitutional Provision for Child Rights

UNIT-V: CHILD REHABILITATION

- a) Role of Government
- b) Role of Non- Governmental Agencies

Essential readings:

1. Banerjee S (1979) Child Labour in India. The Anti -Slavery Society
2. Balton, David A (1990) The Convention on the rights of the child: Prospects for international Enforcement
3. Byrne, I (1998) The Human Rights of street and working children. London. International Technology Publications
4. Holt, J (1975) Escape from childhood: Pelican

Syllabus of
BA General Course
in
Ao (MIL)
for 2018-19 Session

B.A SYLLABUS

MIL OPTIONAL PAPER IN AO LANGUAGE FOR B.A. DEVELOPED AND PRESCRIBED BY AO SENDEN LITERATURE BOARD & APPROVED BY NAGALAND UNIVERSITY

Vide No : 16th Academic Council AC: 16:9 (12)

Dated 19th August, 2013

Paper 1 :

Course No. Ao 301: AOR SOBALIBA ASER
LOKTILIBAREN (100 marks) Paper I (3 Credits)

*Lesson nükjiding: Aor sobaliba aser loktilibaren
angazükdaktsüba den külemi tatishitsü aketba taküm otsü,
kaketkeno aser oshioben renloka aruba otsü aser kentenmenü
angazükba ajanga tsüngchi nisung ka kümdaktsütsü asoshi.*

SHILEM I: SOBALIBAASER TEMZÜNG OZÜNG

14 marks

- a) Aor Putipuin aser Sobalibaren,
- b) Amungtsümung, Külemküja aser Yartsüngsang
- c) Temzüng Ozüng
- d) Aksümensü

SHILEM II: LOKTILIBAREN 14 marks

- a) Lokti Tarensen
- b) Tim Kibalenbubaren
- c) Tim Jayajako
- d) Senmangtsühmang
- e) Wainshin

Shisa Jen

263

SHILEM III: TAKÜM OTSÜ 14 marks

- a. Dr. E.W. Clark (1830-1913)
- b. Imkongmeren (1900 - 1979)
- c. Dr. Renthly Keitzar (1936 - 2000)

**SHILEM IV: KAKETKENO ASER OSHIOYIM KIMUNG
TENZÜKBA OTSÜREN- 14 marks**

- a. Dr. E.W. Clark mapang Ao Kaketkeno tenzüka ainba
- b. Mezüng kaketkeno nükmen tenzüksürtem:
 - 1) Supongmeren
 - 2) Edijungba aser
Suponglemba
 - 3) Aokilep aser
Imnasama
- c) Kaketkeno renlokba

SHILEM V: SANGRO ASER KEN (7 + 7) = 14 marks

- a) **Sangro:**
 - 1) Yimjung
 - 2) Aor Khonang
 - 3) Aor Salang,
 - 4) Meimchir Taküm
 - 5) Temetetba Shisatsü,
- b) **Kensüoyim:**
 - 1). Ken tentepba
 - 2). Kensen mejemba

c) Ojang kasa saka tetezü balala

Internal assessment: Item rongnungi asembosa shimteta inyaktsüla (30 marks)

- a. Tom Tatidang agiba (Mid-Term exam)
- b. Ken mejemba aser atenba (composition of song and singing)
- c. Sangro mejemba (composition of poems)
- d. O meyipzük, (translation)
- e. Jayajako (teknonymical terms)
- f. Otsünü züluba (essay writing)
- g. Teka mapa balala inyaktepba (crafts making)
- h. Jembishinü aser libaliru yimya (Art of speaking & Etiquette)

Paper 2:

COURSE NO. 401. TAKÜM SOYIMREN (Total marks =100) PAPER II (3 Credits)

Lesson nükjidong: Kin ka tejakleni aotsü atema rongsen, shisaluyim rongsenluyim dak keta lir. Iba den putipuin aser oshioben rajem meteta alitsü nüngdak. Iba lesson nung item teratet indang sayua angazükdaktsütsü.

SHILEM I: RONGSENKETSÜNG (14 marks)

- a) Tapet aluyimbaren,
- b) Rongsenketsüng
- c) Shisaluyimren

SHILEM II: PUTIPUIN (14 marks)

- a) Putu menden aser Yimden yimli

Shisa Jen

- b) Tsükaoka aser Semchimenchi
- c) Lenpitzüla aser Kisüjensü
- d) Tetsür Jenjang

SHILEM III: OTSÜOLEM (14 marks)

- a) Tar nunger otsü
- b) Tansütsü otsü
- c) Jilushi
- d) Anembong, Ashibang, tatakrutsü aser Aor Shin o.

SHILEM IV: AOR RONGNUNG MEZÜNG KAKET ZÜLURTEM (14 marks)

- 1) Imtilepden
- 2) Nokdenlemba
- 3) W. Chubanungba,
- 4) I. Ben Wati,
- 5). Imtisüpong Aier
- 6) N. Talitemjen Jamir

SHILEM V: ZÜLUREN (14 marks)

- a) Zülumen aser Züluyim Tasa
- b) Yimdangjem
- c) O meyipzük
- d) Otsünu Zülü Inyakyim

Internal assessment: Item rongnungi asembosa shimteta inyaktsüla (30 marks)

- a. Tom Tatidang agiba (Mid-Term exam)
- b. Ken mejemba aser atenba (composition of song and singing)
- c. Sangro mejemba (composition of poems)

- d. O meyipzük(translation)
- e. Jayajako (teknonymical terms)
- f. Otsünü züluba (essay writing)
- g. Teka mapa balala inyaktepba (crafts making)
- h. Jembishinü aser libaliru yimya (Art of speaking & Etiquette)

End- Term =70 marks.

Syllabus of
BA General Course
in
Economics
for 2018-19 Session

**SYLLABUS FOR
UNDERGRADUATE COURSE
(B.A PASS & HONOURS)**

ECONOMICS

**NAGALAND UNIVERSITY
HQS. LUMAMI**

2012

ECONOMICS B.A (Pass & Honours)

COURSE STRUCTURE

COMPULSORY PAPERS FOR B.A (General & Honours)			
Semester	Code No	TITLE	General/Honours
Semester-I	ECO-101	Micro Economics-I	General/Honours
	ECO-102	Quantitative Technique-I (Mathematics)	Honours
Semester-II	ECO-201	Micro Economics-II	General/Honours
	ECO-202	Quantitative Technique-II (Statistics)	Honours
Semester-III	ECO-301	Macro Economics-I	General/Honours
	ECO-302	Public Finance and Banking	Honours
Semester-IV	ECO-401	Macro Economics-II	General/Honours
	ECO-402	International Economics	Honours
Semester- V	ECO-501	Indian Economy-I	General/Honours
	ECO-502	Economics of Growth and Development	Honours
		Optional-I for Honours	
	ECO-503(a)	Agricultural Economics	Honours
	ECO-503(b)	Mathematical Economics	Honours
	ECO-503(c)	Econometric Methods	Honours
	ECO-503(d)	Industrial Economics	Honours
Semester-VI	ECO-601	Indian Economy-II	General/Honours
	ECO-602	Economics of Environment	Honours
		Optional-II for Honours	
	ECO-603(a)	Demography	Honours
	ECO-603(b)	Financial Institutions and Markets	Honours
	ECO-603(c)	History of Economic Thought	Honours
	ECO-603(d)	Regional Economics	Honours
	ECO-603(e)	Project	Honours

SEMESTER WISE PAPER DISTRIBUTION (Pass and Honours)

COURSE	FIRST YEAR		SECOND YEAR		THIRD YEAR	
	SEMESTER I	SEMESTER II	SEMESTER III	SEMESTER IV	SEMESTER V	SEMESTER VI
B.A (Pass and Honours)	ECO 101 Micro Economics-I	ECO 201 Micro Economics-II	ECO 301 Macro Economics-I	ECO 401 Macro Economics-II	ECO 501 Indian Economy-I	ECO 601 Indian Economy-II
B.A (Honours)	ECO 102 Quantitative Technique-I (Mathematics)	ECO 202 Quantitative Technique-II (Statistics)	ECO 302 Public Finance and Banking	ECO 402 International Economics	ECO 502 Economics of Growth and Development	ECO 602 Economics of Environment
					*OPTIONAL (I) ECO- 503 (a)-(d)	**OPTIONAL (II) ECO - 603 (a)- (d) or ***ECO 603(e) PROJECT

* Students can choose any one of the optional papers [ECO-503 (a to d)] during V Semester

**Students can opt for an optional papers [ECO-603 (a to d)] or ECO 603 (e) Project during semester VI.

*** For course “ECO 603(e) PROJECT”, the department shall decide the topics which will be assigned to the student at the beginning of the semester. The project report should be submitted one month before the end semester examinations. The report shall contain a minimum of 5000 words, including tables and annexure.

SEMESTER I
(General & Honours)
Eco-101: MICRO ECONOMICS-I

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Nature and Scope of Economics: Basic economic problem. Definition of Economics. Methodology of economics. Concept of Equilibrium. Economic models-its application. Concept of demand and supply-measurement and elasticity	12	20
Unit II	Theories of Consumer Demand: Utility approach (cardinal and ordinal). Indifference curves approach; Consumer equilibrium-Hicks and Slutsky's theorem, Compensated demand, Engel curve. Consumer surplus.	15	20
Unit III	Theory of Production: Importance of the theory of production; Returns to a factor: total, average and marginal products; Laws of returns to scale. Laws of variable proportions. Production functions-short and long run. Cobb-Douglas production functions. Least cost combination of input. Factor substitution.	15	20
Unit IV	Theory of Cost: Cost functions; Concept of cost. Traditional and Modern theory of cost. Derivation of long and short run cost curves and their relationship, Recent development in cost theory. Analysis of Economics of scale-Real and Pecuniary.	13	20
Unit V	Welfare Economics: Nature, scope and concept. Problems in measuring social welfare. Role of value judgment. Criteria of social welfare-Growth of GNP, Bentham's, Cardinalist and Pareto.	13	20
	Total contact hours and Marks	68	100

Basic Reading List.

- Ahuja, H L. (1990) Advance economic Theory, S. Chand & Co, New Delhi.
- Henderson, J and R.E Quandt (1980), Microeconomic Theory: A Mathematical Approach, McGraw Hill, New Delhi.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan.
- Sen. A. (1999), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
- Varian, H.R. (2000), Microeconomics Analysis: W.W. Norton, New York.

- Varian, H.H. (2000), Intermediate Microeconomics: A Modern Approach, East West Press, New Delhi.
- Satya, R. Chakraborty, Micro Economics, Allied Publishers, New Delhi.
- Samuelson P.A and W.D . Nordhus (1998), Economics, Tata McGraw Hills.
- Raj, N.C. (1975), An Introduction to Micro Economics, Macmillan Corporation Ltd India.

SEMESTER II
(General & Honours)
Eco-201: MICRO ECONOMICS-I

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Market Structure and Pricing: Perfect and Imperfect markets. Equilibrium of a firm. Perfect Competition-short and long run equilibrium of the firm and industry. Monopoly-short and long run equilibrium. Price Discrimination, Measure of Monopoly Power. Monopoly control and regulation.	14	20
Unit II	Monopolistic Competition: Concepts. General and Chamberlin approach to short and long run equilibrium.	12	20
Unit III	Oligopoly: Characteristics of Oligopoly. Models of Oligopoly-Sweezy, Cournot and Edgeworth.	14	20
Unit IV	Theories of Wages and Rent: Wages and Collective Bargaining. Wage Differential. Marginal Productivity theory. Modern theory of Wage. Rent - Concepts. Scarcity Rent. Differential Rent. Quasi Rent. Ricardian theory of Rent.	14	20
Unit V	Theories of Interest and Profits: Interest-Classical and Neo-Classical. Profits -Innovation, Risk and Uncertainty.	14	20
	Total contact hours and Marks	68	100

Basic Reading List.

- Ahuja, H L. (1990) Advance economic Theory, S. Chand & Co, New Delhi.
- Henderson, J and R.E Quandt (1980), Microeconomic Theory: A Mathematical Approach, McGraw Hill, New Delhi.
- Koutsoyiannis, A. (1990), Modern Microeconomics, Macmillan.
- Sen. A. (1999), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
- Varian, H.R. (2000), Microeconomics Analysis: W.W. Norton, New York.
- Varian, H.H. (2000), Intermediate Microeconomics: A Modern Approach, East West Press, New Delhi.
- Satya, R. Chakraborty, Micro Economics, Allied Publishers, New Delhi.
- Samuelson P.A and W.D Nordhus (1998), Economics, Tata McGraw Hills.
- Raj, N.C. (1975), An Introduction to Micro Economics, Macmillan Corporation Ltd India.

SEMESTER III
(General & Honours)
ECO-301: MACRO ECONOMICS- I

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	National Income and Social Accounting: Concepts and measurement of National Income, factors determining N.I, difficulties in the calculation of N.I, importance of N.I. Social accounting- Meaning, the development of National accounting ; Technique of social accounting, preparation of accounts, nature of double entry, purpose of each accounts. Flow of funds accounts, BOP account, Green accounting.	18	20
Unit II	Output and Employment: Say's law of market and the Classical theory of employment; Keynes objection to the Classical theory; Aggregate demand and aggregate supply functions; The principle of effective demand, Keynes determination of income and employment.	15	20
Unit III	Consumption Function: Consumption. Short and Long run. Factors influencing average and marginal propensity to consume, Keynes psychological law of consumption spending and Relative Income Hypothesis.	15	20
Unit IV	Theories of Interest: Classical view on interest, Neo-Classical theories of interest, Keynesian theory of interest and Modern theory of interest.	10	20
Unit V	Investment Theory: Theory of investment- Autonomous and Induced investment; marginal efficiency of capital; General equilibrium- IS and LM curve. Investment multiplier and its effectiveness in LDCs.	10	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Branson W.A (1989), Macro Economic Theory and Policy, Harper and Row, New York.
- Gupta, R.D and A.S. Rana, Keynes and Post Keynesian Economics, Kalyani Publishers, Ludhiana.
- Maria John Kennedy.M (2011), Macroeconomic Theory, PHI Learning Pvt. Ltd, New Delhi.
- Seth, M.L and Lakshmi Narian Agarwal (2010) Macroeconomics.
- H.L. Ahuja (2010) Macroeconomics: Theory and Practices, S Chand & Co, New Delhi.
- Shapiro. E (1996), Macroeconomics Analysis, Galgodia Publications, New Delhi.
- Gregory, N. Mankiw (2000), Macro Economics, Macmillan, New Delhi.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.

SEMESTER IV
(General & Honours)
ECO-401: MACRO ECONOMICS- II

Total Marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Theory of Demand for Money: Concept of money, functions; Quantity theories of money – Cash Transaction, Cash Balances Approach, Keynesian approach.	12	20
Unit II	Banking: Commercial banking – functions, Credit Creation – purpose and limitations. Central banking – functions. Methods of Credit control.	12	20
Unit III	Supply of money: Definition, components and definition of supply of money. Money multiplier and high powered money. RBI policies and money supply.	12	20
Unit IV	Inflation: Inflation, definition, types, causes, effects of inflation on different Sectors of economy; Demand – pull inflation and cost – push inflation. Measures to control Inflation. Trade off between inflation and unemployment.	16	20
Unit V	Trade cycle: Nature and characteristics; Hawtrey's monetary theory; Keynes view on trade cycle, Concept of accelerator; Samuelson and Hicks multiplier and accelerator interaction Model, control of trade cycle.	16	20
Total contact hours and Marks		68	100

Basic Reading List:

- Branson W.A (1989), Macro Economic Theory and Policy, Harper and Row, New York.
- Gupta, R.D and A.S. Rana, Keynes and Post Keynesian Economics, Kalyani Publishers, Ludhiana.
- Maria John Kennedy.M (2011), Macroeconomic Theory, PHI Learning Pvt.Ltd, New Delhi.
- Seth, M.L and Lakshmi Narian Agarwal (2010) Macroeconomics.
- H.L. Ahuja (2010) Macroeconomics: Theory and Practices, Advance Analysis, S Chand & Co, New Delhi.
- Shapiro. E (1996), Macroeconomics Analysis, Galgodia Publications, New Delhi.
- Gregory, N. Mankiw (2000), Macro Economics, Macmillan, New Delhi.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.

SEMESTER V
(General & Honours)
ECO-501: INDIAN ECONOMY-I

Total marks: 100

Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Structure of the Indian Economy : Basic feature; Natural resources; Population-size and growth rates, sex composition, rural-Urban migration, occupational distribution, population policy.	13	20
Unit II	Areas of Concern: Poverty and inequality, unemployment, prices and inflation.	13	20
Unit III	National Income: Growth performance, measures for growth performance, National income by industrial origin and occupational structure.	13	20
Unit IV	Planning in India: Objectives, strategy broad achievements and failures, current five year plan- objectives, allocation and targets. New economic reforms - liberalization, privatization, rational behind economic reforms; progress of privatization and globalization.	16	20
Unit V	Banking in India: Growth and performance of nationalized banks, Reserved bank and monetary regulation in India.	13	20
	Total Contact Hours and Marks	68	100

Basic Reading List:

- Agarwal, A.N, Indian Economy, Vikas Publishers, New Delhi.
- Datt,R. and K.P.M.Sundaram , Indian Economy, S.Chand and company Ltd, New Delhi.
- Misra,S.K and V.K .Puri, Indian economy-Its Development and experience, Himalaya publishing house, Mumbai.
- Kapila Uma, Indian Economy, Academic Foundation, New Delhi.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.
- Dhingra, I.C (2001). Indian Economy: Environment and Policy, Sultan Chand & Sons, New Delhi.

SEMESTER VI
(General & Honours)
ECO-601: INDIAN ECONOMY II

Total Marks: 100
Credit: 4

UNITS	TOPICS	CONTACT HOURS	WEIGHTAGE
Unit I	Agriculture: Nature and importance ;trends in agricultural production and productivity, factors determining productivity, Land reforms, Green Revolution, Rural credit, agricultural marketing.	13	20
Unit II	Industry: Industrial development during the planning period; Industrial policies. Industrial licensing policies- MRTP Act, FERA and FEMA. Growth and problems of small scale industries; Role of public sector enterprises.	16	20
Unit III	External sector: Role of foreign trade, trends in exports and imports, composition and direction of India's foreign trade, BOP crisis and the new economic reforms - export promotion measures and the new trade policies. Foreign capital - FDI and MNC	13	20
Unit IV	Economy of Nagaland : Natural resources; Population, Infrastructure and Structural change in Nagaland Economy.	13	20
Unit V	Industry and Agricultural Sectors of Nagaland: Industrial development, prospects and problems. Agricultural systems, production, productivity and problems.	13	20
Total Contact Hours and Marks		68	100

Basic Reading List:

- Agarwal, A.N, Indian Economy, Vikas Publishers, New Delhi.
- Datt,R. and K.P.M.Sundaram , Indian Economy, S.Chand and company Ltd, New Delhi.
- Misra,S.K and V.K .Puri, Indian Economy-Its Development and Experience, Himalaya Publishing House, Mumbai.
- Gupta, S.B (1983), Monetary Economics, S Chand & Co, New Delhi.
- Dhingra, I.C (2001). Indian Economy: Environment and Policy, Sultan Chand & Sons, New Delhi.
- Joshua Thomas & Gurudas Das (eds 2002), Dimensions of Development in Nagaland, Regency Publications, New Delhi.
- Joshua Thomas & Gurudas Das (eds), Structural change in North East India: Resource Industry Linkages, Akansha Publishing house, New Delhi.
- Borthagur, Dharendra Nath (1992), Agricultural Development of North East Region with special reference to hill agriculture, Bee Cee Prakashen, Guwahati.
- NUTA, Economic Development in Nagaland: Prospects and Constraints.
- Statistical Hand Books, GON; Economic Surveys (Various Issues), Government of India

Syllabus of
BA General Course
in
Education
for 2018-19 Session

NAGALAND UNIVERSITY
Department of Education, Kohima Campus: Meriema
EDUCATION SYLABI FOR BA HONOURS AND GENERAL 2012

General information:

1. All papers are of 100 marks: External Examination 70 marks and Internal Assessment: 30 marks
2. For Internal Assessment: Programs/activities such as assignments, class tests and group activity in terms of seminars/debate/quiz may be taken up. At least two programs/activities shall be mandatory.
3. There will be fourteen papers in all for honours and six for pass/general students. Each paper will comprise of five units. Each unit will be of 14 marks (14x5 units = 70 marks). Out of the 70 marks, 45 marks shall be for descriptive questions and 25 for objective type/short descriptive questions in case of general course.
4. For General papers the teacher will be required to set 5 essay type questions of 9 marks each with internal option (9x5=45), 1 short answer question of 3 marks each one from each unit (3x5) and two extra questions from any unit (total 7 questions) and 10 multiple type questions of 1 mark each (1x10) two from each unit ie., (9+3+2=14 marks per unit).
5. For Honours there should be 5 essay type questions with internal options (14 x5=70)
6. Care should be taken to see to it that every unit is covered whether it is in the essay type or short questions.
7. Honours students may opt for a Project work of 100 marks in the sixth semester in lieu of one paper ie., 604 or 605.
8. Credits: Every paper has a value of 4 credits each for electives and Honours except in the 6th semester where the last optional paper or project work is of 5 credits as illustrated below.

List of papers for BA in Education (General & Honours) spread over six semesters:

Course No & Code	Course title	Contact hour/no of lectures	Weightage marks	credits
Semester 1			14x5=70	
Gen/Hons BA/EDN-101	Psychological bases of education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
2.Hons BA/EDN- 102	Pedagogy	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester II			14x5=70	
Gen/Hons BA/EDN-201	Sociological Foundations of Education	4 hours per week x17 weeks/semester	14 marks per unit	4x1
Hons - BA/EDN-202	Educational Management	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester III			14x5=70	
Gen/Hons BA/EDN-301	Development of Education in	4 hours per week x 17	14 marks per unit	4x1

	India –	weeks/semester		
Hons BA/EDN-302 (optional)	- Trends & Issues in Indian Education or Structure	4 hours per week x17 weeks/semester	14 marks per unit	4x1
Hons BA EDN-303 (optional)	Issues of Education in Contemporary India	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester IV			14x5=70	
Gen/Hons BA/EDN-401	Philosophical Foundations of Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN-402	Educational Measurement & Evaluation	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester V			14x5=70	
Gen/Hons BA/EDN-501	Education in Modern India	4 hours per week x17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN-502	Statistics in Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
BA/EDN- 503 or	Educational Thoughts & Practices or	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
BA/EDN-504	Peace & Human Rights Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Semester VI			14x5=70	
Gen/Hons BA/EDN-601	Educational Technology	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN 602 or	Guidance and Counseling in Education or	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN 603	Inclusive Education	4 hours per week x 17 weeks/semester	14 marks per unit	4x1
Hons BA/EDN-604 or (optional)	Curriculum Development & Construction or	4 hours per week x 17 weeks/semester	14 marks per unit	5x1
Hons BA/EDN- 605	Education in the Northeast India	4 hours per week x 17 weeks/semester	14 marks per unit	5x1
Project work in lieu of 604 or 605 in 6 th semester.	Project work on any relevant topic	4 hours per week x 17 weeks/semester	100	5x1

COURSE CODE – BA/EDU -101
SEMESTER I
PSYCHOLOGICAL BASES OF EDUCATION

Course Objectives

1. To enable the students to understand the meaning and concept of Psychology.
2. To enable them to understand the dimensions of Growth and Development.
3. To familiarize students with knowledge of Learning and Motivation.
4. To acquaint them with the knowledge of Intelligence and Creativity.
5. To enable them to understand the different aspects of personality and means of developing an integrated personality.

Course Contents

- UNIT I Concept of Educational Psychology**
a. Concept of Psychology and Educational Psychology
b. Methods of Educational Psychology - Experimental, Differential & Clinical
c. Application of Educational Psychology in teaching-learning process.
- UNIT II Meaning of Growth and Development**
a. Principles of Development
b. Stages of Development with special reference to adolescence period – physical, social, emotional and intellectual
c. Concept of individual difference – aptitude, interest and attention
- UNIT III Intelligence and Creativity: Concept and Theories**
a. Meaning and Characteristics of Intelligence and Creativity
b. Concept of IQ & Factors of Creativity
c. Theories of Intelligence- Two factor theory, Group Factor Theory and Structure of Intellect (SoI)
- UNIT IV Theories of learning**
a. Meaning and Nature of Learning
b. Factors affecting Learning.
c. Theories of Learning- Trial and Error, Insightful Learning, Transfer of Learning.
- UNIT V Personality and its nature, determinants and approaches**
a. Meaning and Nature of Personality.
b. Determinants of Personality Development (Home & School).
c. Type and Trait approaches of Personality (Jung and Cattell).
d. Freud's theory of Personality.

Suggested Readings

1. Educational Psychology – S.K.Mangal, Prakash Brothers Educational Publishers.
2. Advanced Educational Psychology- S.S.Chauhan, Vikas Publishing House.
3. Essentials of Educational Psychology- J.C.Aggarwal, Vikas Publishing House.

COURSE CODE-BA/EDU-201
SEMESTER-II

SOCIOLOGICAL FOUNDATIONS OF EDUCATION

Course Objectives

1. To develop an understanding of the role of sociology in education
2. To acquaint with the sociological foundations of education
3. To understand the role of education in relation to social change, social interaction and culture
4. To understand and appreciate the role of community in resolving social issues and educational inequalities

Course Contents

UNIT-I Introduction

- a. Meaning of Educational Sociology & Sociology of Education
- b. Relationship between Sociology and Education
- c. Sociological determinants of education

UNIT-II Social Change

- a. Meaning of social change.
- b. Factors affecting social change (Political, Educational and Technological)
- c. Education as an instrument of social change.

UNIT-III Education and Social Group

- a. Primary and Secondary groups
- b. Social interaction and its educational implications
- c. Concept & forms of social stratification

UNIT-IV Education and Culture

- a. Concept & components of culture
- b. Role of education in preservation and transmission of culture
- c. Cultural heritage of India with special reference to Nagaland

UNIT-V Current Social Problems in India with special reference to North-East

- a. Equalization of educational opportunities
- b. Role of community in solving social problems in the field of education
- c. Concept of Communitization of elementary education in Nagaland

Suggested Readings

1. C. N Shankar Rao. Sociology. 1995. S Chand & Company Ltd. New Delhi
2. S.S Mathur. Sociological Approach to Indian education.
3. S.S Chandra.2002. Sociological Foundation of Education.
4. N.R Saxena. Philosophical & Sociological Foundations of Education.
5. Yogendra K Sharma. Sociological Philosophy of Education.

COURSE CODE-BA/EDU-301
SEMESTER-III

DEVELOPMENT OF EDUCATION IN INDIA

Course Objectives

1. To understand the historical development of education in India
2. To understand the salient features of ancient & medieval education
2. To acquaint with the genesis of the Modern Indian Education

Course Contents

UNIT-I Ancient India

- a. Vedic Education: aims, curriculum and organization of education.
- b. Buddhist Education: aims, curriculum and organization.

UNIT-II Medieval India

- a. Islamic Education: its salient features, objectives and curriculum.
- b. State patronage in education.

UNIT-III Education in British India

- a. Contributions of Christian Missionaries for the development of education in India.
- b. Significance of Charter Act of 1813.

UNIT-IV Growth of Modern System of Education

- a. Macaulay's Minutes, 1835.
- b. Wood's Despatch, 1854.
- c. Hunter Commission, 1882.

UNIT-V Movement for Compulsory Education in India

- a. Gokhale's Bill, 1910.
- b. Calcutta University Commission, 1917.
- c. Hartog Committee Report, 1929.
- d. Basic Education, 1937.

Suggested Readings

1. J.C Agarwal. Landmarks in the History of Modern Indian Education.
2. Lal and Sinha. Development of Indian Education and its Problem.
3. S.P. Chaube. History and Development of Indian Education.
4. J.C. Agarwal. Landmark in the History of Modern Indian education

COURSE CODE-BA/EDU-401
SEMESTER-IV

PHILOSOPHICAL FOUNDATIONS OF EDUCATION

Course Objectives

1. To understand the meaning, aims and function of education
2. To develop an understanding of the role of major schools of philosophy in education
3. To acquaint with the philosophical foundations of education.

Course Contents

UNIT-I Introduction

- a. Meaning of Educational Philosophy
- b. Relationship between Philosophy and Education
- c. Aims of education: Individual, Social, Vocational

UNIT-II Functions of Education

- a. Self-actualization
- b. Human Resource Development
- c. National integration and International understanding

UNIT-III Some Major Schools of Philosophy

- a. Idealism, Naturalism and Pragmatism
- b. Their contributions to present day education towards aims, curriculum, methods of teaching and discipline

UNIT-IV Development of Values

- a. Meaning of values
- b. Classification of values (Social, Moral and Aesthetic)
- c. Strategies for inculcation of values through co-curricular and extra-curricular activities in schools and colleges

UNIT-V Freedom and Discipline

- a. Meaning of Freedom and Discipline
- b. Types of discipline
- c. Importance of discipline in social life

Suggested Readings

1. B.N Dash- Principles of Education and Education in the Emerging Indian Society. Ajanta Prakashan, 2768, Gali Samaj Bazar Sita Ram, Delhi-110006.
2. V. R Taneja. Educational Thought & Practices.
3. A.S Thakur. The Philosophical Foundations of Education.

**COURSE CODE-BA/EDU-501
SEMESTER-V**

EDUCATION IN MODERN INDIA

Course Objectives

1. To acquire adequate knowledge of the recommendations of various education commissions
2. To understand the issues and problems of education at various levels of education

Course Contents

- UNIT-I Development of Indian Education post Independence period with special reference to :**
- a. University Education Commission (1948-49)
 - b. Secondary Education Commission (1952-53).
 - c. Kothari Commission (1964-66).
- UNIT-II National Policy on Education (NPE 1986) and its revised formation 1992**
- UNIT III Educational Provisions**
- a. Constitutional provisions in relation to Education
 - b. Right to Education 2009
 - c. Provisions for education of the disabled children with special reference to the Integrated Education for Disabled Children
- UNIT-IV Studies on some national commissions relevant to education**
- a. National Knowledge Commission, 2006 (Sam Pitroda) with special reference to Higher Education
 - b. Salient Features of Yash Pal Committee Report.
- UNIT-V Studies on Regulatory Bodies and training Institutions, Literacy status and problems of education**
- a. Functions of University Grants Commission, National Council of Educational Research and Training, National Assessment and Accreditation Council
 - b. Literacy status of India and Nagaland
 - c. Problems of primary, secondary and higher education in the North-East with special reference to Nagaland.

Suggested Readings

1. S.P Chaube. History and Development of Indian Education
2. J. C Aggarwal. Landmark in the History of Modern Indian Education.
3. ---- Development & Planning of Modern Education
4. R.S Pandey. Development of Indian System of Education.
5. Ministry of Education, New Delhi. Challenges of Education. A Policy Perspective 1985.

COURSE CODE-BA/EDU-601
SEMESTER-VI

EDUCATIONAL TECHNOLOGY

Course Objectives

1. To understand the meaning, nature and scope of educational technology
2. Create an understanding of the application of basics of technology in the process of education
3. To familiarize with the technological advances made and to develop a positive attitude toward the use of ICT in the educational process.

Course Contents

UNIT I Educational Technology

- a. Meaning, nature and scope
- b. Types - Hardware and software

UNIT II Communication Process

- a. Meaning & nature
- b. Process & components
- c. Types of classroom communication
- d. Mass media approach in educational technology

UNIT III System Approach & Instructional System

- a. Systems Approach to instructional process
- b. Instructional system designing - concept, component, physical & human resources

UNIT IV Innovation in Educational Technology

- a. Programmed learning
- b. Micro and macro teaching
- c. Team teaching

UNIT V Personalized System of Instruction (PSI)

- a. Computerized Assisted Instruction
- b. Simulated Teaching
- c. Information Communication Technology (ICT) in distance education

Suggested Readings

1. R. A Sharma. Advanced Educational Technology.
2. J. Mohanty. Educational Technology.
3. S.K Mangal. Educational Technology.

Syllabus of
BA General Course
in
English
for 2018-19 Session



Nagaland University
Department of English
Kohima Campus, Meriema

ENGLISH SYLLABI FOR BA / B.COM/BBA / B.SC./BCA& FUNCTIONAL ENGLISH 2012

General Guidelines:

1. All papers are of 100 marks for 3 hours : External exams 70 marks (pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5).
2. For Internal Assessment: 30 marks may be divided according to convenience into: Assignments: 10 marks; Group activity (debate/seminars etc): 10 marks; class tests:10 marks).
3. Only English Honours students will do Elective English papers.
4. Those who drop out of English Honours, their marks of Elective English papers will be taken in lieu of B.A. General English papers.
5. English Honours students do not take General English; Alternative English & Functional English.
6. English Honours students have to offer an additional Elective subject in lieu of General & Alt. English in the I, II, III, IV Semesters.

COURSE STRUCTURE FOR BA/BSc/BCA/BCom/GENERAL ENGLISH/ALTERNATIVE ENGLISH/FUNCTIONAL ENGLISH

Course /type of papers/credits assigned	First Year Course/Papers and credit value		Second Year Course/Papers and credit value		Third Year Course/Papers and credit value		Total Credit value
	I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	
Other courses B B.Com/BBA	ENG(G)101 ENG(BCM/BBA)104 3 credits each	ENG(G)201 ENG(BCM/BBA)204 3 credits each	ALTE(BA)301 ALTE(BCM/BBA)304 3 credits each	ALTE(BA)401 ALTE(BCM/BBA)404 3 credits each			12
Other courses (Science)	ENG(BSC/BCA) 105 2 credits each	ENG(BSC/BCA) 205 credits each					4

COURSE STRUCTURE FOR ELECTIVE ENGLISH/HONOURS

Course /type of papers/credits assigned		First Year Course/Papers and credit value		Second Year Course/Papers and credit value		Third Year Course/Papers and credit value		Total Credit value
		I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	
English for Pass & Hons Courses	Elective Papers	ELENG 102 4 credits	ELENG 202 4 credits	ELENG 302 4 credits	ELENG 402 4 credits	ELENG 501 4 credits	ELENG 601/602/603/604 4 credits	24 credits
	English Honours Papers	ENG(H)103 4 credits	ENG(H)203 4 credits	ENG(H)303 4 credits	ENG(H)403 4 credits	ENG(H)502 4 credits ENG(H)503 4 credits	ENG(H)605 3 credits ENG(H)606/607/608/609 3 credits	30 credits
Total Credits		8	8	8	8	12	10	54

CREDIT DISTRIBUTION FOR FUNCTIONAL ENGLISH

Course /type of papers/credits assigned		First Year Course/Papers and credit value		Second Year Course/Papers and credit value		Third Year Course/Papers and credit value		Total Credit value
		I Sem	II Sem	III Sem	IV Sem	V Sem	VI Sem	
Eng for Pass & Hons Courses	Elective papers	FUNENG 106 4 credits	FUNENG 206 4 credits	FUNENG 305 4 credits	FUNENG 405 4 credits	FUNENG 504 4 credits	FUNENG 610 4 credits	
Total Credits		4	4	4	4	4	4	24

COURSE CODES: ENG(G): General English ; ELENG: Elective English; ENG(BCM): B.Com English;
 ALTE(BCM); B.Com Alt. English; ENG(BSC/BCA): B.Sc/BCA English; FUNENG: Functional English

1. ENG(G)101 B.A. GENERAL ENGLISH PAPER I

POETRY, BASIC ENGLISH USAGE & LANGUAGE SKILLS

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FIRST SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the students to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value / moral in the literary writings, and to teach and revise remedial grammar/ structural approach to language learning and skills of composition, compilation and communication.

Unit I: Poetry - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. John Donne : Song: Sweet Love, I do not Goe
2. John Milton : On His Blindness
3. Alexander Pope: Extract from An Essay on Man

Unit II: Poetry – 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. William Wordsworth : The Solitary Reaper
2. S.T. Coleridge: Youth and Age
3. John Keats : To Autumn

Unit III: Poetry – 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Tennyson : Lotus Eaters
2. Browning : My Last Duchess
3. Arnold : Dover Beach

Unit IV: Grammar and Usages – 14 marks: (Objective questions for 14 marks)

1. Verbs: Auxiliaries and Modals, Person and Number, infinitive and participle, subject verb agreement.
2. Tenses
3. Transformation of Sentences
4. Preposition: Simple, Compound & Phrase
5. Adjective –possessive & definite
6. Adverbs

Unit V: Language Skills – 14 marks: 1question of 10 marks; 2 short answer questions of 2 marks each.

1. Letter/ Application writing along with a CV /Business Communications
2. Assignment Writing: Assignments and term papers; scholarly style of writing; writing assignments and term papers; making notes and working bibliography; footnotes/end notes.

Recommended Books:

NU Anthology of Poetry, Published by Macmillan 2012.

E.Albert, *History of English Literature*, OUP.

G.C Thornley & Gwyneth Roberts, *An Outline of English Literature*, Orient Longman, 1991.

Wood, F.T, *A Remedial English Grammar for Foreign Students*, Macmillan.

Thomson & Martin, *Practical English Grammar*, OUP.

C.A. Shepherd & David Reid Thomas, *Grammar and Composition*, Orient Longman, 1977.

Vandana R.Singh. *The Written Word*. New Delhi: OUP, 2007.

R.K. Madhukar. *Business Communication*. New Delhi: Vikas Publishing House, 2005.

Liz Hamp-Lyons & Ben Heasley. *Study Writing: A Course in Writing Skills for Academic Purposes*. New Delhi: Cambridge University Press: 2006.

Geetha Nagaraj. *Write to Communicate*. New Delhi: Cambridge University Press (Foundation Books), 2009.

Dhanavel, S.P. *English and Soft Skills*. Hyderabad: Orient Blackswan, 2010.

Suresh Kumar,E & P. Sreehari. *Communicative English*. Hyderabad: Orient Blackswan, 2007.

Das, Bikram K. *Functional Grammar & Spoken and Written Communication in English*. Hyderabad: Orient Longman, 2010.

Synergy: Communication in English and Study Skills. Hyderabad: Orient Blackswan.

Joseph Gibaldi. *MLA Handbook for Writers of Research Papers*. Sixth edition. Delhi: First East- West Press Edition, 2004.

+++++

2. ENG(G)201 B.A. GENERAL ENGLISH PAPER II DRAMA, PROSE & LANGUAGE SKILLS

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE SECOND SEMESTER

3 credits

Descriptive & objective/short answer type questions as indicated : 70 marks

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the students to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works, interpret the didactic value / moral in the literary writings, teach and revise remedial grammar/ structural approach to language learning and to teach theory and practice of creative writing, essay writing etc.

Unit I: Drama – 14 marks : 1 questions of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Shakespeare : *Twelfth Night*

Unit II: Prose- 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. C.F. Lamb : Albert Schweitzer
2. E.R. Braithwaite : Job Hunting
3. George Orwell : Shooting an Elephant
4. Marcel Jusod : The First Atom Bomb

Unit III: Language Skills - 14 marks : 1 question of 14 marks

1. Comprehension

Unit IV: Language Skills – 14 marks : 1 question of 14 marks

2. Essay

Unit V: - Creative Writing: 14 marks : 1 question of 14 marks

1. Writing Stories
2. Writing Poems

Recommended for Background reading :

C.A. Shephard & David Reid Thomas, *Grammar and Composition*, Orient Longman, 1977.

Michael Swan, *Basic English Usage*,

Vandana R. Singh. *The Written Word*. New Delhi: OUP, 2007.

David Morley. *Cambridge Introduction to creative writing*. New Delhi: Cambridge University Press,2010.

+++++

3. ALTE(BA) 301 B.A. ALTERNATIVE ENGLISH PAPER I (Poetry, Short Story & Composition)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE THIRD SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks

3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works, interpret the didactic value/ moral in the literary writings, etc, teach and revise remedial grammar/ structural approach to language learning along with skills of composition like paragraph writing.

Unit I: Poetry - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. William Blake : The Tyger
2. P.B. Shelly: Ode to the West Wind
3. G.M. Hopkins : God's Grandeur

Unit II: Poetry - 14 marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. W.B. Yeats : A Prayer for My Daughter
2. T.S. Eliot : Journey of the Magi
3. Robert Frost: Stopping by the Woods on a Snowy Evening

Unit III: Short Story - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Leo Tolstoy : The Imp and the Peasant's Bread
2. O' Henry : The Gift of the Magi

Unit IV: Short Story - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Arthur Conan Doyle : A Case of Identity
2. Anton Chekov : The Bet

Unit V: Composition - 14marks: 1question of 14 marks

1. Paragraph Writing

Recommended Texts :

NU Anthology of Poetry, Published by Macmillan 2012.

Vandana R. Singh. *The Written Word*. Delhi: OUP, 2007.

+++++

4. ALTE(BA)401 .B.A. ALTERNATIVE ENGLISH PAPER II (Prose, Poetry, Play & Language Skills)

100 marks: External exams 70 marks (Pass mark 31.5); Internal Assessment: 30 marks (Pass mark=13.5) Time: 3 hours

TO TEACH IN THE FOURTH SEMESTER

Descriptive & objective/short answer type questions as indicated : 70 marks
3 credits

Objectives: The teachers are to give the students the bio-details of the authors, the background of the age/ time and elucidate the works of the prescribed authors in simple language, give meanings of the words/ allusions and teach the scholars to write reference to contexts, prepare glossary from the text and find out the philosophy of life in the works and interpret the didactic value/ moral in the literary writings, etc. and to teach and revise remedial grammar/ structural approach to language learning along with the principles and practice of précis writing.

Unit I: Prose - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Osbert Sitwell : The Best Years of Life
2. George Bernard Shaw : The Religion of the Future

Unit II: Prose - 14marks : 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Somerset Maugham : Visit to the Pagodas
2. A.G. Macdonell: A Village Cricket Match

Unit III: One Act Play - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Fritz Karinthy : *Refund*

Unit IV: Poetry - 14 marks: 1 question of 10 marks; 2 objective/short answer questions of 2 marks each.

1. Nissim Ezekiel: Night of the Scorpion
2. Sarojini Naidu: Indian Weavers

Unit V: Language Skills – 14 marks : 1question of 14 marks

1. Précis Writing

Recommended Texts:

NU Anthology of Prose & Short Stories, Published by Macmillan, 2012.

NU Anthology of Poetry, Published by Macmillan, 2012.

Satyanarayan Singh, ed. *Selected One Act Plays*. Macmillian, 2009.

+++++

-

Syllabus of

BA General Course

in

Functional English

(Voc)

for 2018-19 Session

VOCATIONAL SUBJECT OF FUNCTIONAL ENGLISH

1. To be Covered in Six Semesters
2. This is an elective Subject, however an individual college may restrict its combination with some other subjects depending on the institution's daily routine structure.
3. This subject can be taken by students of any stream (Arts, Commerce & Science). However, for Science Students, only those who do not have Honours in their subject combination may be allowed to take this Subject.
4. Students who graduate with this subject combination will be awarded a *Diploma in Vocational Subject of Functional English*
5. Mark Allotment :
 - a. Semester I – V : Theory 50% , Practical 50%
 - b. Semester VI: Entirely Practical 100%
 - c. In Semester I – IV all Exams and assessments for the 50% marks in Practical will be conducted in respective institutions (internally) .
 - d. In Semester VI (entirely Practical) 70% of marks is reserved for internal assessment and 30% for the Project Reports to be sent to University for external evaluation where, the Pass mark for both the evaluations (internal & external will be 40% i.e. 28 for internal and 12 for the external (Further details about Semester-VI is provided along with its course structure later)
 - e. Marks for each unit in all the 6 semesters is 20 Marks (inclusive of external & internal). Out of this, the Marks for the External and Internal assessment is 10:10. Since the entire Practical marks is under Internal Assessment, only the other 10 marks for Theory is divided into 7:3 for External and Internal respectively (i.e. in 70% : 30% division formula so that the total marks for External Examination in a Semester is 35 only (7marks x 5 units).
6. Each Semester has 4 credits
7. Individual College may offer certain portions of this syllabus to non collegiate persons for English proficiency as Extension service and thereafter award them testimonial certificates.
8. Practical Examination: Except for Semester VI, all practical exams can be internally conducted in respective colleges in consultation with the University authority. However External Invigilator(s) may be invited by the institution in consultation with the university or sent by the university for certain semester examination as and when deemed necessary.

SEMESTER ONE
FUNENG 106: FUNCTIONAL ENGLISH PAPER I
Communicative English - 1

- **Objective:** *To enable the learners to be fluent in English pronunciation and to acquire a sound knowledge of major style and regional varieties of English*
- **Mark allotment : Full Marks : 100**
 Theory : 50 (70% for External and 30% for Internal Assessment)
 Practical : 50 (Entirely Internal)
 Pass mark : 40 % in every category of Assessment (i.e. Theory, Practical, External, Internal)
- **4 credits**
- **Duration of External Examination (i.e. 70% of theory) : 3 Hours**
- **To obtain the Degree/Diploma Students will have to secure the pass marks in all the categories of assessment**

Unit –I
English Phonetics-1
(20 Marks = Theory 10 + Practical 10)

Theory: 10 Marks (7 for external + 3 for internal)

- a) Organs of Speech and Speech mechanism
- b) Sounds & symbols of Vowels, Consonants & Diphthongs

Practical: 10 Marks (to conduct internally)

- a) Reading for fluency
- b) Intensive drilling for production of individual sounds, words & sentences in English
- c) Phonetic transcription (of simple and individual words/characters)

Unit – II
English phonetics-2

Theory: 10 Marks (7 for external + 3 for internal)

- a) Assimilation, elision, stress
- b) The Syllable
- c) Description and analysis of Sounds in English

Practical: 10 Marks (to conduct internally)

- a) Proper Application and use of Assimilation, Elision, Stress, the Syllable and the Sounds of English in speaking
- b) Advance Phonetic transcription (of Sentences and paragraphs) in written

Unit – III
English phonetics-3

Theory: 10 Marks (7 for external + 3 for internal)

- a) Intonation
- b) Rhythm in connected sentences
- c) Common errors

Practical: 10 Marks (to conduct internally)

- a) Proper Application and use of Intonation, Rhythm in connected sentences
- b) Explanation and correction of Common errors in pronouncing English words

Unit – IV
Style and Varieties of English-1

Theory: 10 Marks (7 for external + 3 for internal)

- a) Varieties of English: *British, American and Indian English*
- b) Standard English (as opposed to non standard variety e.g. slang, cockney etc.)

Practical: 10 Marks (to conduct internally)

- a) Differentiating and applying varieties of English discussed in theory section

Unit – V
Style and Varieties of English-2

Theory: 10 Marks (7 for external + 3 for internal)

- a) Written and Spoken English
- b) Formal and Informal English
- c) Figures of Speech : (*Anticlimax, Antithesis, climax, Euphemism, pun, paradox, simile, synecdoche, irony, metaphor, metonymy, oxymoron, allegory, archaism, hyperbole, alliteration, rhyme, rhetorical question, anaphora, epiphora, tautology, enallage, ellipsis, syllepsis, inversion, hysteron, proteron*)

Practical: 10 Marks (to conduct internally)

- a) Practice & Application of the inputs provided in theory section

Reading list for First Semester

1. Adams, Royce. *Reading Skills: A Guide for Better Reading.*
2. Balasubramaniam, T. *A Textbook of English Phonetics for India Students.*
3. Balasubramaniam, T. *English Phonetics for Indian Students: A Work Book.*
4. Bansal, R. K & Harrison, J. B *Spoken English: A Manual of Speech & Phonetics.*
5. Jones, Daniel. *The Pronunciation of English.*
6. O'Connor, J. D. *Better English Pronunciation.*
7. Roach, Peter. *English Phonetics & Phonology.*
8. Warner, Alan. *A Short Guide to English Style.*
9. Fowler, H. W. *The King's English, 3rd ed.*
10. Gimson, A. C. *An Introduction to the Pronunciation of English, 2nd ed.*
11. Nicholson, Margaret. *A Dictionary of American-English Usage: Based on Fowlers' Modern English Usage.*
12. Wood, Frederick T. *Current English Usage: A Concise Dictionary.*

SEMESTER TWO
FUNENG 206: FUNCTIONAL ENGLISH PAPER II
Remedial Grammar

1. **Objective:** To enable learners to use English language grammatically and confidently especially in those areas where non native users of English face problems
2. **Mark allotment : Full Marks : 100**
Theory : 50 (70% for External and 30% for Internal Assessment)
Practical : 50 (Entirely Internal)
Pass mark : 40 % in every category of Assessment (i.e. Theory, Practical, External, Internal)
3. **4 credits**
4. **Duration of External Examination (i.e. 70% of theory) : 3 Hours**
5. **To obtain the Degree/Diploma Students will have to secure the pass marks in all the categories of assessment**

Unit –I
Remedial Grammar -1

Theory: 10 Marks (7 for external + 3 for internal))

- a) Verb – *Main verb, auxiliary verb, modal auxiliary, finite, non finite, anomalous finite, transitive, intransitive*

Practical: 10 Marks (to conduct internally)

- a) Analysis and application of Verb – its kinds and varieties as discussed in the theory section

Unit –II
English Grammar -2

Theory: 10 Marks (7 for external + 3 for internal))

- a) Tenses – *their forms & different functions*
- b) Concord/ Agreement of Verb and Subject in Number and Person

Practical: 10 Marks (to conduct internally)

- a) Intensive training for correct application of knowledge gained in theory class.

Unit –III
English Grammar -3

Theory: *10 Marks (7 for external + 3 for internal)*
 a) Articles
 b) Question tags
 c) Confusion between Adjective & Adverb

Practical: *10 Marks (to conduct internally)*
 Intensive training for correct application of items done in theory class.

Unit-IV
English Grammar -4

Theory: *10 Marks (7 for external + 3 for internal)*
 a) Case
 b) Active & passive voice
 c) Preposition (of positions, Place relations and other relations)

Practical: *10 Marks (to conduct internally)*
 a) Intensive training for correct application of items done in theory class.

Unit –V
English Grammar -5

Theory: *10 Marks (7 for external + 3 for internal)*
 a) Simple, compound and Complex Sentence
 b) Punctuation
 c) Common errors
 d) Anglicisation of loan words in English (current and common items only)

Practical: *7 hrs. 10 Marks (to conduct internally)*
 Intensive training for correct application of knowledge gained in theory class.

READING LIST FOR SECOND SEMESTER

1. Carey, G. V. *Punctuation.*
2. Christopheren, Paul & Arthur O. Sandved. *An Advanced English Grammar.*
3. Fries, Charles Carpenter. *The Structure of English: An Introduction to the Construction of English Sentences.*
4. Green, David. *Contemporary English Grammar.*
5. Krishnaswamy, N. *Modern English: A book of Grammar, Usage & Composition.*
6. Kumar, A. K. *Golden English Guide (A Guide with a Difference.)*
7. Leech, Geoffrey & Svartvik, Jan. *A Communicative Grammar of English.*
8. Morenberg, Max. *Doing Grammar.*
9. Strang, Barbara M. H. *Modern English Structure.*
10. Thomson, A. J & Martinet, A. V. *A practical English Grammar.*
11. Tregidgo, P. S. *Practical English Usage: for Overseas Students.*
12. Wood, Frederick T. *English Prepositional Idioms*
13. Wood, Frederick T. *A Remedial English Grammar for Foreign Students.*

SEMESTER THREE

FUNENG 305: FUNCTIONAL ENGLISH PAPER III Writing Skills

Objective: To enable learners to write in English effectively for various specific purposes

- **Mark allotment : Full Marks : 100**
Theory : 50 (70% for External and 30% for Internal Assessment)
Practical : 50 (Entirely Internal)
Pass mark : 40 % in every category of Assessment (i.e. Theory, Practical, External, Internal)
- **4 credits**
- **Duration of External Examination (i.e. 70% of theory) : 3 Hours**
- **To obtain the Degree/Diploma Students will have to secure the pass marks in all the categories of assessment**

Unit –I Foundations of Writing Skills

Theory: 10 Marks (7 for external + 3 for internal)

- a) Planning and writing paragraphs
- b) Art & Style of Writing : Cohesion & Coherence, Idioms and phrases,
- c) Creative Writing (Short story writing & Expansion of ideas)

Practical: 10 Marks (to conduct internally)

- a) Intensive practice of various forms of writing on the basis of theoretical inputs.

Unit –II Writing for Media

Theory: 10 Marks (7 for external + 3 for internal)

- a) Writing for News : *Elements of news, Characteristics of news, Types of news, Difference between Newspaper and Radio & TV with reference to language*
- b) Feature Writing
- c) Advertisement : *Banners, Posters, pamphlets, Hoardings, Captions, invitations & Titles etc.*

Practical: 10 Marks (to conduct internally)

- a) Intensive training in and practice of writing the items taught in the theory section; write the same in real life situations and maintain copies and clippings.

Unit –III Academic and Review Writing

Theory: 10 Marks (7 for external + 3 for internal)

- a) English for specific purposes (Introduction and a general overview) & Register
- b) Report writing
- c) Academic writing (Types and structure)

Practical: 10 Marks (to conduct internally)

- a) Intensive training and practice of various types of writing as taught in theory section and also maintain copies/clippings of actual writings in real life situations i.e. in Journals, newspapers etc.

Unit –IV Writing Letters and taking Minutes Theory: 10 Marks (7 for external + 3 for internal) - Letter writing : <i>Business, Official, Personal (their nature, structure, features and format)</i> - Letters to Editors : <i>Importance & Structure of the letters</i> - Taking minutes and recording meeting proceedings Practical: 10 Marks (to conduct internally) - Intensive training and practice write out as taught in the theory section and also write them in real life situations and maintain copies/clippings of published items.	
Unit –V Publication and Reviewing Theory: 10 Marks (7 for external + 3 for internal) - Types of book and Parts of a book - Book reviews: (Nature of Book review, Characteristics and purpose of book review, critical analysis of book contents) - Critical analysis of various writings Practical: 10 Marks (to conduct internally) - Training and practice writing reviews and critical analysis of various written texts.	
READING LIST FOR THIRD SEMESTER - Ahuja, B. N. <i>Theory & Practice of Journalism: Set to Indian Context.</i> - Ahuja, B. N. <i>A Concise Course in Reporting for Newspapers, Magazines, Radio and the T.V.</i> - Chander, Jagdish (ed.). <i>Creative English.</i> - Collins, V. H. <i>A Book of English Idioms.</i> - Collins, V. H. <i>Right Word, Wrong Word.</i> - Gowers, Ernest. <i>The Complete Plain Words.</i> - Hakemulder, Jan R & Jonge, Fay Ac de. <i>News Reporting & Editing.</i> - Hicks, Wynford & Holmes, Tim. <i>Subediting for Journalists.</i> - Hill, L. A & May, D. J. <i>Advanced Comprehension & Appreciation Pieces for Overseas Students.</i> - Kamath, M. V. <i>Professional Journalism.</i> - Kumar, A. K. <i>Golden English Guide (A Guide with a Difference).</i> - McNair, Brian. <i>News & Journalism in U.K: A Textbook.</i> - Neal, James M & Brown, Suzanne S <i>News writing & reporting</i> - Rau, M. Chalapathi. <i>Journalism & Politics.</i> - Shrivastava, K. M . <i>New reporting & Editing</i> - Vandana R Singh. <i>The Written Word.</i> - A Ashley. <i>The Oxford Handbook of Commercial Correspondence.</i> - Raman M & Sharma S. <i>Technical Communication.</i> - Jane Dorner. <i>Writing for the Internet.</i> - Judith Leigh. <i>CVs and Applications.</i> - MAK Halliday. <i>Spoken and Written Language.</i> - MAK Halliday, Ruqaiya Hasan. <i>Cohesion in English.</i> (English Language Series 9).	

SEMESTER FOUR

FUNENG 405: FUNCTIONAL ENGLISH PAPER IV
Oral Communication

Objective: To enable learners to use English fluently in oral communications

- **Mark allotment : Full Marks : 100**
Theory : 50 (70% for External and 30% for Internal Assessment)
Practical : 50 (Entirely Internal)
Pass mark : 40 % in every category of Assessment (i.e. Theory, Practical, External, Internal)
- **4 credits**
- **Duration of External Examination (i.e. 70% of theory) : 3 Hours**
- **To obtain the Degree/Diploma Students will have to secure the pass marks in all the categories of assessment**

Unit –I
Conversational English

Theory: 10 Marks (7 for external + 3 for internal)

- a) Conversation (on formal & informal occasions - *Nature, role, characteristics, techniques, procedures and decorum*)
- b) Oral Communication in various situations (*Nature, role, characteristics, techniques, procedures and decorum*)–
In the Post Office, at the bank, at the worship place, receiving and seeing off a guest, at the travel agency, at the customs, at the international port, asking to pay, catching a train, booking a room at a hotel, making a telephone call, asking the time –time expression, buying & selling, at the air port, at the police station, making an apology, taking a taxi, at the clinics, making an appointment, at the chemists, at a dinner party, In the beauty parlour, at the restaurant, etc.

Practical: 10 Marks (to conduct internally)

- a) Practice the items taught in theory class through Role Play, Simulation, Mock Programmes and apply them in Real Life Situations

Unit –II
Public Speaking 1: Group Dynamics and Meetings

Theory: Mark : 10 (7 for external + 3 for internal)

- a) Group discussion (*Nature, role, characteristic, techniques, procedures, elements and decorum*)
- b) Debate(*Nature, role, characteristic, techniques, procedures, elements and decorum*)
- c) Chairing and moderating meetings, group discussion etc. (*Nature, role, characteristic, techniques, procedures, elements and decorum*)

Practical: 10 Marks (to conduct internally)

- a) Practice and perform activities in theory class through Role Play, Simulation, Mock Programmes and apply them in Real Life Situations

Unit –III
Public Speaking 2: Seminars & Symposia

Theory Mark : 10 (7 for external + 3 for internal)

- a) Seminars : *Importance, nature, role, characteristic, techniques, procedures, elements and decorum*
- b) Symposia: *Importance, nature, role, characteristic, techniques, procedures, elements and decorum*

Practical: 10Marks (to conduct internally)

- a) Practice and perform activities in theory class through Role Play, Simulation, Mock Programmes and apply them in Real Life Situations

Unit –IV
Public Speaking 3: Teaching and Speech presentation

Theory: 10 Marks (7 for external + 3 for internal)

- a) Teaching: *Importance, role, techniques, procedures & essential elements*
- b) Speech presentation (Prepared & extempore, of various types) : *Importance, role, techniques, procedures & essential elements*

Practical: 10 Marks (to conduct internally)

- a) Practice and perform activities in theory class through Role Play, Simulation, Mock Programmes and apply them in Real Life Situations

Unit –V
Public Speaking-4: Hosting and attending

Theory: 10 Marks (7 for external + 3 for internal)

- a) Programme/function hosting : *Importance, role, techniques, procedures & essential elements*
- b) Performing as receptionist in firms: *Importance, role, techniques, procedures & essential elements* .

Practical: 10 Marks (to conduct internally)

- a) Practice and perform activities in theory class through Role Play, Simulation, Mock Programmes and apply them in Real Life Situations

READING LIST FOR THIRD SEMESTER

1. Wood, Frederick T. *English Colloquial Idioms.*
2. G. K. Puri . *English Conversation Course For All.*
3. Krishna Mohan, Meera Banerji. *Developing Communication Skills.*
4. Krishna Mohan, N P Singh . *Speaking English Effectively.*
5. Mukti Sanyal, Promodini Varma. *English at the Workplace.*
6. Grant Taylor. *English Conversation Practice.*
7. Attarde I P. *Art Of English Conversation.*
8. Tina Kasloff Carver , Sandra Douglas Fotinos. *A Conversation Book 1: English in Everyday Life.*
14. Judith Leigh. *Organising and Participating in Meetings.*
15. Steven A. Beebe. *Public Speaking: An Audience-Centered Approach.*
16. Joseph A. DeVito. *Essential Elements of Public Speaking.*
17. Charles W. Koller. *How to Preach without Notes.*
18. James Edward Vaux. *Preaching: What to Preach, and How to Preach.*
19. Mark Bowden. *Winning Body Language.*
20. Oren Klaff . *Pitch Anything: An Innovative Method for Presenting, Persuading, and Winning the Deal.*
21. Lawrence S. Munson. *How to Conduct Training Seminars: A Complete Reference Guide for Training Managers and Professionals*

SEMESTER FIVE
FUNENG 504: FUNCTIONAL ENGLISH PAPER V
Mass Communication and Broadcasting

Objective: To provide the learners with an intensified training in the English language applying career avenues of Mass Communication and Broadcasting.

- **Mark allotment : Full Marks : 100**
 Theory : 50 (70% for External and 30% for Internal Assessment)
 Practical : 50 (Entirely Internal)
 Pass mark : 40 % in every category of Assessment (i.e. Theory, Practical, External, Internal)
- **4 credits**
- **Duration of External Examination (i.e. 70% of theory) : 3 Hours**
- **To obtain the Degree/Diploma Students will have to secure the pass marks in all the categories of assessment**

Unit –I
Radio & TV Broadcasting

Theory Mark : 10 (7 for external + 3 for internal)

- a) Introduction to Mass Communication
- b) TV Broadcasting : *Introduction, Importance, Role, nature & essential elements*
- c) Radio broadcasting : *Introduction, Importance, Role, nature & essential elements*

Practical: 10 Marks (to conduct internally)

- a) Visit to TV Studios and Radio stations to familiarise the students with the functioning of studios with special reference to the role of Programme Presenters and write Reports thereof.

Unit –II
News casting

Theory: 10 Marks (7 for external + 3 for internal)

News casting on TV : Importance, role, requisite traits and qualities of a Newscaster

Practical: 10 Marks (to conduct internally)

- b) Practice TV News casting

Unit –III
TV Programme Presentation

Theory: 10 Marks (7 for external + 3 for internal)

- a) TV Programme presentation: Anchoring, Interviews & Interviewing, Talk Show - *Role, importance, techniques, procedure & requisite traits, personality*

Practical: 10 Marks (to conduct internally)

- a) Practice Anchoring, Interviews & Interviewing, Talk Show for TV shows subsequently perform in real life situations

Unit –IV
Radio Programme Presentation

Theory: 10 Marks (7 for external + 3 for internal)

- a) Radio programme Presentation-1 : *News Reading, Radio talk*

Practical: 10 Marks (to conduct internally)

- a) Practice and act out *Radio News Reading, Radio talk*

Unit –V
Radio Programme Presentation

Theory: 10 Marks (7 for external + 3 for internal)

- a. Radio programme Presentation-2 : Radio drama, Disc Jokey (Role, Importance and requisite traits and elements)

Practical: 10 Marks (to conduct internally)

- a) Practice performing Radio drama, and as Disc Jokey

READING LIST FOR THIRD SEMESTER

1. Joshua Meyrowitz. *No Sense of Place-The Impact of Electronic Media on Social Behaviour.*
2. Wilpy, P & Conroy, A . *The Radio Handbook.*
3. S P Dhanavel. *English and Soft Skills.*
4. Fast Julius. *Body Language.*
5. Bleak M. *Journalistic Work and Television.*
6. Hagerman W L. *Broadcast Announcing.*
7. Hyde Stuart. *Television and Radio Announcing.*
8. Amal Datta. *Effects of Television and Viewers.*
9. Neeru Kapoor. *Television Advertising and Consumer Response.*
10. Sharda Kaushik. *Script to Screen: An Introduction to TV Journalism*
11. H.R Luthra. *Indian Broadcasting , New Delhi : Publications Division, 1986.*
12. Baruah, U.L. *This is All India Radio, Publications Division, New Delhi, 1983.*
13. Benson, W.A. *The Impact of Television.*
14. Halloran' J.D (Ed). *The Effects of Television.*
15. Masani, Mehra, *Broadcasting and People*
16. Ewbank Henry, Lawton Sherman P. *Broadcasting: Radio and Television.*

SEMESTER SIX
FUNENG 610: FUNCTIONAL ENGLISH PAPER VI
English in On the job Training
4 credits
Entirely practical for full Mark of 100

- a) Objective: To prepare the students for entering job markets according to their aptitude and interest
- b) In Unit I, II, III, and IV each student will be placed to work in one occupational job area under an established firm/ business establishment where English language is used/applied.
- c) The specific job may be to perform as one of the following: Tourist guide, Receptionist, Telephone attendant, Teacher, Programme/function Host/ Anchoring, Radio Announcer, Organising and presenting Talk Shows, Sports Commentator, Reporting etc.)
- d) This on the job training project will be carried out under the supervision of a teacher assigned by the Authority of concerned Institution.
- e) Each student is to submit a Report of the on the Job training so performed.
- f) The Project Report should be supported by authentication certificate from the concerned firm.
- g) If an appropriate firm cannot be found for a student to work in, the teacher-supervisor concerned will assign a suitable work for the student in question where the allotted credit hours will be wholly used.
- h) Under each unit a differed job should be assigned to each student.
- i) In Unit V each student will be required to write a Project Report in not less than 2000 words on a proposed occupation he/she would like/ plan to carry out after graduation. This report should contain, among other things, a proper discussion of rationale of the project, procedure for implementation, how the learning and training obtained in Vocational subject of Functional English is to be applied and how he/ she is to make an earning out of it.
- j) The Teacher-supervisor of each student will maintain a log book where the progress, participation and other comments on the performance of the student will be recorded.
- k) Examination/Evaluation : 70% of the marks is reserved for internal assessment and 30% for the Project Reports sent to University for external evaluation. The Pass mark for both the evaluations (internal & external will be 40% i.e. 28 for internal and 12 for the external
- l) Students will have to obtain pass marks in both internal and external assessment to pass the course.

Choice Based Credit System Course (C.B.C.S) Optional Paper “PROFICIENCY IN ENGLISH”

PROFENG 137: PROFICIENCY IN ENGLISH (C.B.C.S Optional Paper)

This is for non collegiate people and professionals who desire to improve their communicative skills in English. Any Affiliated Colleges of the University having the necessary infrastructure can offer this course.

Mark allotment : Full Marks : 100

Theory : 50 (70% for External and 30% for Internal Assessment)

Practical : 50 (Entirely Internal)

Pass mark : 40 % in every category of Assessment (i.e. Theory, Practical, External, Internal)

- 2 credits
- Duration of External Examination (i.e. 70% of theory) : 3 Hours

To obtain the Degree/Diploma Students will have to secure the pass marks in all the categories of assessment

Unit I Phonetics: (theory & practical) 20 marks

Speech mechanism

Sounds & symbols of Vowels, Consonants & Diphthongs

Assimilation, elision, stress

The Syllable

Intonation

Unit II Regional Varieties of English: (theory & practical) 10 marks

Varieties of English: British, American and Indian English

Standard and non standard English;

Written and Spoken English; Formal and Informal English

Unit III Remedial Grammar: (theory & practical) 10 marks

To infinitive, transitive and intransitive verb

Tenses – their forms & different functions

Concord/ Agreement of Verb and Subject in Number and Person

Articles

Question tags

Forms and Functions in respect of few important/selected words/ phrases sentences (e.g. Confusion between Adjective & Adverb) etc

Proper application of Passive sentences

Unit IV: Recent trends in English language development : (theory & practical) 10 marks

Anglicisation of loan words, etc

Etiquette and Techniques in oral communication

Common errors

Unit V Conversational English: (theory & practical) 20 marks

Theory

In the Post Office, at the bank, at the worship place, receiving and seeing off a guest, at the travel agency, at the customs, at the international port, asking to pay, catching a train, booking a room at a hotel, making a telephone call, asking the time – time expression, buying & selling, at the air port, at the police station, making an apology, taking a taxi, at the clinics, making an appointment, at the chemists, at a dinner party, In the beauty parlour, at the restaurant, etc.

Practical:

- b) Practice the items taught in theory class through Role Play, Simulation, Mock Programmes and apply them in Real Life Situations

Reading List :

Balasubramaniam, T. *A Textbook of English Phonetics for India Students*

Balasubramaniam, T. *English Phonetics for Indian Students: A work book*

Bansal, R. K & Harrison, J. B *Spoken English: A Manual of Speech & Phonetics*

Jones, Daniel. *The Pronunciation of English.*

O'Connor, J. D. *Better English Pronunciation.*

Roach, Peter. *English Phonetics & Phonology.*

Gimson, A. C. *An Introduction to the Pronunciation of English, 2nd ed.*

Nicholson, Margaret. *A Dictionary of American-English usage: Based on Fowlers' Modern English Usage*.
 Wood, Frederick T. *Current English usage: A Concise Dictionary*.
 Christopheren, Paul & Arthur O. Sandved. *An Advanced English Grammar*.
 Fries, Charles Carpenter. *The Structure of English: An Introduction to the Construction of English Sentences*.
 Green, David. *Contemporary English Grammar*.
 Krishnaswamy, N. *Modern English: A book of Grammar, Usage & Composition*.
 Leech, Geoffrey & Svartvik, Jan. *A Communicative Grammar of English*.
 Wood, Frederick T. *A Remedial English Grammar for Foreign Students*.
 Krishna Mohan, Meera Banerji. *Developing Communication Skills*.
 Krishna Mohan, N P Singh. *Speaking English Effectively*.
 Grant Taylor. *English Conversation Practice*.
 Attarde I P. *Art Of English Conversation*.
 Steven A. Beebe. *Public Speaking: An Audience-Centered Approach*.
 Joseph A. DeVito. *Essential Elements of Public Speaking*.

+++++THE END+++++

Syllabus of
BA General Course
in
Geography
for 2018-19 Session

**DEGREE SYLLABUS
FOR SEMESTER SYSTEM**

GEOGRAPHY

B.A./B.Sc. (*PASS & HONOURS*)

ACADEMIC SESSION 2016-



**DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY
LUMAMI**

PROPOSED COURSE OUTLINE FOR B.A./ B.Sc. SEMESTER SYSTEM
DEPARTMENT OF GEOGRAPHY
NAGALAND UNIVERSITY

Semester	I (Code/Paper)	II (Code/Paper)	III (Code/Paper)	IV (Code/Paper)	V (Code/Paper)	VI (Code/Paper)	Total Credit
Theory (P & H)	GEOG-101/ (Physical basis of Geography)	GEOG-201/ (Climatology & Oceanography)	GEOG-301/ Human Geography	GEOG-401/ Economic Geography	GEOG-501/ Regional Geography of India	GEOG-601/ Regional Geography of North East India	
Credit/CH*	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	4/ 60	24
Practical (P & H)	GEOG-102/ Practical	GEOG-202/ Practical	GEOG-302/ Practical	GEOG-402/ Practical	GEOG-502/ Practical	GEOG-602/ Practical	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6
Theory (H)	GEOG-103/ Geographical Thought	GEOG-203/ Regional Geography of World	GEOG-303/ Political Geography	GEOG-403/ Advanced Geomorphology	GEOG-503/ Applied and Resource Management	GEOG-603/ Environment and Disaster Management	
Credit/CH*	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	3/ 45	18
Practical (H)	GEOG-104/ Practical	GEOG-204/ Practical	GEOG-304/ Practical	GEOG-404/ Practical	GEOG-504/ Practical	GEOG-604/ Project	
Credit/CH*	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	1/ 30	6

*Abbreviation: P & H = Pass & Honours, H= Honours

*CH = Contact Hours

Each semester would be of 90 working days

Credit=Contact Hours per week (double for practical)

SEMESTER -I
(Pass and Honours)
GEOG-101/ PAPER –I
Physical basis of Geography -I

Contact Hours: 60

Objectives:

The objective of this course is to introduce students to physical geography, in a brief but adequate manner, and to enlighten the students on career opportunities for geographers.

- Unit –I Nature and scope of Physical Geography, Branches of Physical Geography and their interrelations; Linkages of geography with physical sciences and social sciences like geology, biology, economics and sociology.
- Unit –II Origin of Solar System and Earth (Tidal Hypothesis of Jeans and Jeffrey, Gaseous Theory by Kant, Nebular Hypothesis of Laplace and Big-Bang Theory).
- Unit –III Major landforms: Mountains, Plateau and Plains;
Forces affecting earth's crust (endogenetic and exogenetic forces).
- Unit –IV Origin, composition and types of rocks, Soil profile: Processes of soil formation and soil types.
- Unit –V Meaning and Scope of Biogeography,
Ecosystem: Components and functioning, factors influencing plant growth
Major Biomes of the world.

Books Recommended

1. Bryant, H. Richard (2001): Physical Geography Made Simple, Rupa and Company. New Delhi
2. Bunnett, R.B. (2003): Physical Geography in Diagrams, Fourth GCSE edition, Pearson Education (Singapore) Private Ltd.
3. Garrison, T. (1998): Oceanography, Wordsworth Company, Belmont.
4. Lake, P. (1979): Physical Geography, Cambridge University Press, Cambridge.
5. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
6. Monkhouse, F.J. (1979): Physical Geography. Methuen, London
7. Singh, S. (2003): Physical Geography. Prayag Pustak Bhawan, Allahabad;
8. Strahler, A.N. and Stahler, A.M. (1992): Modern Physical Geography. John Wiley and Sons, New York.

SEMESTER -I
(Pass and Honours)
GEOG-102/ Practical

Contact Hours: 30

- Unit –I a) Types of scale; preparation of scale: simple, comparative and diagonal;
 b) Enlargement and Reduction of map by graphical method.
- Unit –II Interpretation of Toposheet: Topography (relief, plain, plateau, mountain etc.),
 Drainage (pattern)
- Unit –III Representation of different landforms and their profile (Cliff, Oxbow lake,
 Waterfall, Ria Coast, Fjord Coast, Cirque, Meander, River terrace)
- Unit –IV Viva voce and Practical Note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
4. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi.

SEMESTER -II
(Pass and Honours)
GEOG-201/Physical Geography –II

Contact Hours: 60

Objectives:

This paper on physical geography is structured into components of climatology and oceanography as these are closely interrelated. Course content leads to the identification of climatic differentiation on the earth, and the consequences of human activities on the atmospheric processes.

Section –I (Climatology)

- Unit –I Definition and significance of climatology; elements of weather and climate; Composition and structure of atmosphere; Insolation and Heat budget.
- Unit -II Vertical and Horizontal distribution of temperature; Pressure and Pressure belts; Winds: Planetary periodic and Local winds; jet streams; Air masses and fronts; temperate and tropical Cyclones.
- Unit –III Major climatic types (Koppen’s and Thornthwaite’s classification of world climate); Global Climate change; role and response of man in climatic changes.

Section –II (Oceanography)

- Unit –IV Surface configuration of the ocean floor, continental shelf, continental slope, abyssal plain, mid-oceanic and oceanic trenches
Movement of Ocean Water: waves, tides and currents
- Unit –V Coral reefs: factors affecting formation of coral reefs, types; Types of marine deposits; Distribution of temperature and salinity of oceans and seas.

Books Recommended

1. Chorley, R.J. (2001): Atmosphere, Weather and Climate. Methuen, London.
2. Critchfield, H.J. (2002): General Climatology. Prentice-Hall of India, New Delhi.
3. Finch, J. C. and Trewartha, G. T.: Elements of Weather and Climate. Prentice-Hall, London.
4. Lal, D.S.(1986): Climatology. Chaitanya Publications, Allahabad.
5. Oliver, J.E. and Hidore, J.J. (2003): Climatology: An Atmospheric Science, Pearson Education Private Ltd, Delhi.
6. Singh, S. (2005): Climatology. Prayag Pustak Bhawan, Allahabad.

SEMESTER -II
(Pass and Honours)
GEOG-202/ Practical

Contact Hours: 30

- Unit –I a) Handling and use of weather instruments (Max-Min thermometer, Hygrometer, Barometer, Rain gauge, Anemometer).
 b) Interpretation of weather maps published by the Indian Meteorological Department.
- Unit –II Representation of weather data: Temperature, rainfall and humidity data by line and bar graph. Construction and significance of Hythergraph and Climograph.
- Unit –III Hypsometric and Bathymetric curve.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Monkhouse, F. J. and Wilkinson, F.J. (1985): Maps and Diagrams. Methuen, London.
2. Raisz, E. (1962): Principles of Cartography, McGraw Hill, New York.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Singh, R.L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, New Delhi,.

* * *

SEMESTER -III
(Pass and Honours)
GEOG-301/ Human Geography

Contact Hours: 60

Objectives:

To acquaint the students with the nature of man-environment relationship and to make them understand human capability to adopt and modify the environment in its varied conditions from primitive lifestyle to modern living.

- Unit –I Meaning, nature and scope of Human geography; development and branches of Human geography
- Unit –II Man-environment dynamic relationships; determinism and Possibilism
- Unit –III Evolution of man; classification of races; characteristics of races and their broad distribution. Human adaptation to environment; Eskimos, Masai Bushman, Gujjars.
- Unit –IV Physical, economic and social factors influencing spatial distribution of world population, distribution and density of population; Concept of over population, under population and optimum population; Migration: types and consequences;
- Unit –V Settlement: Geographical factors influencing human settlement. Origin and growth of rural and urban settlement. Types and patterns of rural settlement. Urban settlement: morphology and functional classification.

Books Recommended

1. Husain, M. (1994): Human Geography, Rawat Publications, Jaipur.
2. Leong Goh Cheng (2003): Certificate Physical and Human Geography, Oxford University Press, New Delhi.
3. Norton, W. (1995): Human Geography, Oxford University Press, New York.
4. Singh, L.R. (2005): Fundamentals of Human Geography, Sharda Pustak Bhawan, Allahabad
5. Stoddard, R.H., Wishart, D.J. and Blouet, B.W. : Human Geography. Prentice-Hall, Englewood Cliffs, New Jersey.

SEMESTER –III
(Pass and Honours)
GEOG-302/ Practical

Contact Hours: 30

- Unit –I a) Representation of population data: Distribution, density and growth by: Point (dots, proportionate circles and spheres), Line (isopleths and flow lines) and area (choropleth), line and bar graphs; Age-sex pyramid.
 b) Toposheet interpretation (settlement, transport and land use)
- Unit –II a) Definition and classification of map projection;
 b) Map Projection: Cylindrical (Simple and Equal area) with outline maps drawn.
- Unit –III Surveying: Chain and tape to plot a part of college building.
- Unit –IV Viva voce and Practical Note book

Books Recommended

1. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.
2. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
3. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
4. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER –IV
(Pass and Honours)
GEOG-401/ Economic Geography

Contact Hours: 60

Objectives:

To acquaint the students with the dynamic aspect of economic geography, transformation of economic activities from primary to secondary and tertiary stage and with various factors responsible for economic development.

- Unit –I Meaning, scope and approaches to study economic geography. Concept and classification of economic activity.
- Unit –II Primary activities: Agriculture- factors influencing agriculture, types of agriculture, forestry, fishing and mining.
- Unit –III Secondary activities: Basis of world industrial location; distribution and production of iron and steel, cotton textile industries.
- Unit –IV Tertiary activities: Transport and communication services; geographical factors in the development of water, land and air transport.
- Unit –V Bases of international trade; major trade blocs: EEC and ASEAN; Effects of globalisation on developing countries.

Books Recommended

1. Bryson, J., Henry, N., Keeble, D. and Martin, R. (eds.) (1999): The Economic Geography Reader: Producing and Consuming Global Capitalism. John Wiley and Sons, Inc, New York.
2. Coe, N. (2007): Economic Geography: A Contemporary Introduction. Blackwell Publishers, Inc., Massachusetts.
3. Guha, J. S. and Chattoraj, P.R.(2002): A New Approach to Economic Geography: A Study of Resources. The World Press Private Limited, Kolkata.
4. Hanink, D. M. (1997): Principles and Applications of Economic Geography: Economy, Policy, Environment. John Wiley and Sons, Inc, New York.
5. Leong, G. C. and Morgan, G. C.(1982): Human and Economic Geography, Oxford University Press, Singapore .
6. Roy, P.K. (2005): Economic Geography, A Study of Resources, New Central Book Agency (P) Ltd, Kolkata.

SEMESTER -IV
(Pass and Honours)
GEOG-402/ Practical

Contact Hours: 30

- Unit –I a) Statistical methods: Measures of central tendency (Mean, Median and Mode);
 b) Measures of dispersion (Mean deviation, Quartile deviation and Standard deviation).
- Unit –II a) Representation of data by Line, Bar, Pie, and Block Pile diagram.
 b) Time series analysis of temporal data.
- Unit –III Map projection: Polar Zenithal (Stereographic, Orthographic and Equidistant) with outline maps drawn
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Bhagwathi, V. and Pillai, R.S.N. (2003): Practical Statistics, Sultan Chand and Company, New Delhi
2. Gupta, S.P. (1998): Advanced Practical Statistics, Sultan Chand and Company, New Delhi
3. Mahmood, A. (1986): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
4. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
5. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
6. Zamir, A. (2002): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur.
7. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -V
(Pass and Honours)
GEOG-501/ Regional Geography of India

Contact Hours: 60

Objectives:

Aims at presenting a comprehensive, integrated and empirically based profile of India so as to understand its geopolitical personality and its relations with other countries.

- Unit –I Locational significance, unity and diversity. Physical environment: physiographic characteristics –Climate, soil and natural vegetation.
- Unit –II Population characteristics: population growth, distribution, density, structure and composition.
- Unit –III Agriculture: agricultural development and Indian economy, modernization of Indian agriculture, agro-climatic regions and special characteristics, agricultural trade.
- Unit –IV Transport: Roads and railways, air transport and pipe transport.
- Unit –V Industry: industrial development and Indian economy, distribution of major industries (iron and steel, cotton textile, petrochemicals, sugar, paper and cement industries) industrial policies and industrial trade.

Books Recommended

1. Gautam, A. (2006): Advanced Geography of India, Sharda Pustak Bhawan, Allahabad
2. Khullar, D.R. (2007): India: A Comprehensive Geography, Kalyani Publishers, New Delhi
3. Nag, P. and Gupta, S. S. (1992): Geography of India, Concept Publishing Company, New Delhi.
4. Singh , J. (2003): India: A Comprehensive Systematic Geography. Gyanodaya Prakashan, Gorakhpur
5. Singh, R.L. (ed.) (1971): India: A Regional Geography. National Geographical Society of India, Varanasi,.
6. Tiwari, R.C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad.

SEMESTER –V
(Pass and Honours)
GEOG-502/ Practical

Contact Hours: 30

- Unit –I Thematic mapping: Population, Resources and Industries of India.
Unit –II Conical projection (One and Two Standard parallel) with outline maps drawn.
Unit –III Polyconic Projection and Bonne’s Projection with outline maps drawn.
Unit –IV Viva voce and Practical note book.

Books Recommended

1. Mishra, R.P. and Ramesh A. (1989): Fundamentals of Cartography, Concept Publishing Company, New Delhi.
2. Singh, L.R. (2006): Fundamentals of Practical Geography, Sharda Pustak Bhawan, Allahabad.
3. Steers, J. A. (1965): An Introduction to the Study of Map Projection. University of London Press, London.
4. Talukdar, S. (2008): Introduction to Map Projection. EBH Publishers, Guwahati.

SEMESTER -VI
(Pass and Honours)
GEOG-601/ Regional Geography -II
(Northeast India with Special Focus on Nagaland)

Contact Hours: 60

Objectives:

To focus on the regional study of Northeast India and Nagaland, and to prospect the region's potentiality for sustainable development.

- Unit –I Northeast India: Locational significance;
Physical characteristics: Physiography, drainage, climate, Soil and natural vegetation.
- Unit –II Population of Northeast India: Growth, Distribution and Density, Age-sex composition, Rural-urban composition and Religious composition.
- Unit –III Economic basis of Northeast India: Agriculture, Industries, Transport and communication system
- Unit -IV Disparity in socio-economic development; Socio-economic problems.
Demographic characteristics- Population distribution, Growth, Density
- Unit –V a) Nagaland - Physiography, Climate and Natural vegetation
b) Biodiversity and its conservation issues

Books Recommended

1. Bhagabati, A..K., Bora, A. K. and Kar, B.K. (2011): Geography of Assam, Rajesh Publications, New Delhi.
2. Bhagabati, A.K. (ed) : Biodiversity of Assam, Eastern Book House, Guwahati
3. Bhattacharya, P.(2006) : Trend in Tourism Potentiality, Bani Mandir, Guwahati
4. Bhattacharyya, N.N. (2005): North East India: A Systematic Geography, Rajesh Publication, New Delhi
5. Gopal Krishnan, R : Geography of North East India
6. Srivastava, S.C., : Demographic Profile of N.E. India, Mittal Publications
7. Taher, M. and Ahmed, P. (1998): Geography of North East India, Mani Manik Prakash, Guwahati.

SEMESTER -VI
(Pass and Honours)
GEOG-602/ Practical: Data based on North East India

Contact Hours: 30

- Unit –I Cartographic representation of economic data of Northeast India in spatial and temporal contexts: Histogram, Pie-graph, Age-sex pyramid.
- Unit –II Use of cartographic symbols and their uses: Iso-chronic cartograms, traffic flow diagrams and Choropleth mapping.
- Unit –III a) Survey: Plane Table (Radiation and Intersection)
 b) Use of Global Positioning System (GPS) for identifying a location (only demonstration of GPS device).
 c) Study of landscape by “Google Earth” through Internet enabled PCs.
- Unit –IV Viva voce and Practical note book.

Books Recommended

1. Monkhouse, F. J. (1985): Maps and Diagrams. Methuen, London.
2. Sarkar, A. K. (1997): Practical Geography: A Systematic Approach. Orient Longman, Kolkata.
3. Kanetker, T.P. and Kulkarni, S.V.(1967): Surveying and Levelling, Vol I and II V.G. Prakashan, Poona.

Syllabus of
BA General Course
in
History
for 2018-19 Session

B.A. SYLLABUS
(DEPARTEMENT OF HISTORY)

GENERAL PAPERS

Paper	Name of Papers
Paper I	History of India upto the Mauryas
Paper II	History of India (Post Maurya to 1526)
Paper III	History of India 1526-1857
Paper IV	Indian Nationalism
Paper V	History of Europe
Paper VI	Modern World

Honours Papers

Paper	Name of papers	Semester
Paper VII	History of North East India (1822-1972)	Ist
Paper VIII (Optional A)	East Asia (1840-1949)	2nd
Paper VIII (Optional B)	History of Modern South East Asia (1850-1946)	
Paper IX	History of India C.A.D. 1550-1750	3rd
Paper X	History of the United States of America	4th
Paper XI	History of Christianity in Nagaland	5th
Paper XII	Social and Economic History of Modern India (18 th -20 th Century)	5th
Paper XIII (Optional A)	Historiography	6th
Paper XIII (Optional B)	Introduction to Archaeology	
Paper XIV	Political History of the Naga	6th

GENERAL PAPERS

HIS-101 : HISTORY OF INDIA UPTO THE MAURYAS

Objectives: The purpose of this course is to familiarize students with social, economic, political and cultural developments in India from prehistory upto the post-Mauryas. The focus is on socio-economic developments and not on dynastic history. The intent is to introduce students to the elements of change and continuity in Indian history.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Survey of sources: Archaeological Sources, Literary Sources, Travellers Accounts; Epigraphical Sources. Prehistory: Paleolithic, Mesolithic and Neolithic Cultures in India.	14	14
II	Harappan Civilization: Origin, Extent, Urban Planning, Nature of Political and Economic Organization, Religion and Decline.	14	14
III	Vedic Cultures: Society, Polity, Economy and Religion.	13	14
IV	Rise of Religious Movements in India: Material Background; Teachings of Buddhism and Jainism.	13	14
V	Factors leading to the rise of Mahajanapadas; the Rise of Magadha. Maurya Empire: Ashoka's Dharma, Administration, Economy, Art and Architecture, Decline.	14	14

ESSENTIAL READING:

B. Allchin, and F.R Allchin, Rise of civilization in India and Pakistan

B. Allchin, and F.R Allchin R, Origin of a Civilization

Romila Thapar, A history of India Vol. I

Romila Thapar, From lineage to state

Irfan Habib, Pre History

Satish Chandra, Medieval India, Vol.

Kulke, H, and D. Rothermund, History of India

Burton Stein, Peasant State and Society in Medieval south India

A.L. Basham, The Wonder That Was India

B.K. Thapar, Recent Archaeological Discoveries in India

R.S.Sharma, Aspects of political Ideas and Institutions in Ancient India

P.N.Chopra & Co., A comprehensive History of Ancient India.

A.B.Pandey, Early Medieval India.

J. L. Mehta, Advanced Study in the History of Medieval India Vol.1 (1000-1526)

S.C. Raychoudhury, Social Cultural and Economic History of India.

Sir Mortimer Wheeler, The Indus Civilization

HIS-201: HISTORY OF INDIA (Post Maurya to Delhi Sultanate)

Objectives: The purpose of this course is to familiarize students with Social, Economic, Political and Cultural Developments in India. The focus is on Socio-Economic Developments and not on Dynastic History. The intent is to introduce students to the elements of Change and Continuity in Indian History.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Development in the post Mauryas times with special reference to the Kushans, Satavahanas and Harsha.	14	14
II	The Gupta Empire: Administrations, Economy, Society, Literature, Development in Science, Art and Architecture.	14	14
III	Sangam Literature; Chola Empire: Local Self-Government and Cultural Life; the Pallavas; Tripartite Struggle.	14	14
IV	Bhakti and Sufi movements: Origin, Doctrines, Spread, Impact on Indian Society	13	14
V	Delhi sultanate: Administrative and Economic Reforms of the Khaljis and Tughlaqs. Decline	13	14

ESSENTIAL READING:

Romila Thapar, A History of India Vol. I

Romila Thapar, From Lineage to State

Satish Chandra, Medieval India, Vol.

Kulke, H, and D. Rothermund, History of India

Burton Stein, Peasant State and Society in Medieval South India

A.L. Basham, The Wonder That Was India

K.A.Nikanta Sastri, History of South India from Pre-historic times to the fall of Vijayanagar

R.S.Sharma, Aspects of political Ideas and Institutions in Ancient India

P.N.Chopra & Co., A comprehensive History of Ancient India.

A.B.Pandey, Early Medieval India.

J. L. Mehta, Advanced Study in the History of Medieval India Vol.II (1000-1526)

S.C. Raychoudhury, Social, Cultural and Economic History of India.

R.P. Tripathi, Some aspects of Muslim Administration

HIS-301: HISTORY OF INDIA (1526 to the 19th century

Objectives: The objective of this course is to introduce students to the trends and developments in India during the Mughal and the British periods. The emphasis is on Socio- Economic and Cultural Patterns in understanding the Polity and Society.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Advent of the Mughals: Growth of Mughal Empire AD 1526 -1556 Expansion and Consolidation AD1556 – 1707 Decline of the Mughal Empire.	14	14
II	Mughal polity, economy and society: Mansabdari and Jagirdari system; Sher Shah's Administration; Economy, Religion and Architecture.	13	14
III	Advent of European powers: Portuguese, Dutch, French and English British Expansion and Consolidations under Clive; Warren Hastings; Cornwallis; Wellesley; Dalhousie.	14	14
IV	Colonial Economy: Commercial Policies; Land Revenue Systems and its Impact; De-industrialization; Drain of Wealth and Growth of Modern Industries; Foreign Trade.	13	14
V	Social and cultural changes: Spread of Western Education Growth of Intelligentsia and Press Socio-Religious Movements: Rammohan Roy; Ramakrishna and Vivekananda; Swamy Dayanand and the Arya Samaj; Sayyid Ahmad Khan and the Aligarh School.	14	14

ESSENTIAL READING:

H. Kulke and D. Rothermund, History of India
Satish Chandra, Medieval India
R.P. Tripathi, Rise and fall of the Mughal Empire
Bipan Chandra, India's struggle for independence, 1857-1947
Bipan Chandra, History of Modern India
Bipan Chandra, Nationalism and Colonialism in Modern India.
Sekhat Bandopandhya, Plassey to Partition.

J. L. Mehta, Advanced Study in the History of Medieval India Vol.II
Yogendra Singh, Modernisation of Indian Tradition.
C.A Bayly, Indian Society and the Making of the British Empire.
A.R.Desai, Social Background of Indian Nationalism
Dhama Kumar & Tapan Raychaudhuri,ed.,Cambridge Economic History of India, Vol.II
Irfan Habib, The Agrarian system of Mughal India

HIS- 401: Indian Nationalism

Objective: The objective of this course is to introduce students to the trends and developments in India during the National Movement from 1850 to 1950.

Unit	Detailed syllabus	Contact Hours	Marks/Weight
I	Popular resistance to colonial rule: Peasants and Tribal Movements- Indigo Workers; Santhal; Moplahs. Revolt of 1857	14	14
II	Rise of Nationalism: Emergence of Nationalism; Origin of INC; Moderates; Extremist; Partition of Bengal; Swadeshi Movement; Home Rule League.	14	14
III	Constitutional development: Government of India Acts- 1909, 1919, 1935.	13	14
IV	National movement: Rise of Gandhi; Non-cooperation Movement; Civil Disobedience Movement; Quit India; INA.	13	14
V	Towards Independence: Communalism; Partition; Transfer of Power; Integration of the Indian States; Making of the Constitution.	14	14

ESSENTIAL READING:

Bipan Chandra, India's struggle for independence, 1857-1947

Bipan Chandra, History of modern India

Bipan Chandra, Nationalism and colonialism in modern India.

Sekhat Bandopandhya, Plassey to Partition.

Yogendra Singh, Modernisation of Indian Tradition.

C.A Bayly, Indian Society and the Making of the British Empire.

A.R.Desai, Social Background of Indian Nationalism

Dhama Kumar & Tapan Raychaudhuri,ed.,Cambridge Economic History of India, Vol.II

HIS- 501: History of Europe

OBJECTIVE: The purpose of this course is to introduce students to some of the major developments in the world from the decline of the feudal age to the French revolution.

Unit	Detailed Syllabus	Contact Hours	Marks/Weight
I	Feudalism: Meaning, Features and Decline. Rise of new Monarchies: England, France, Spain.	13	14
II	Renaissance: Meaning and Origin; Development in Literature, Art and Science. Geographical Discoveries in the 15 th and 16 th Centuries: Portugal and Spain. Reformation- Martin Luther	14	14
III	Economic Origins of the Modern Western World: Mercantilism; Beginnings of Colonialism. Features of the Absolutist States	14	14
IV	Era of Revolution: Industrial Revolution; Glorious Revolution (1688); American War of independence (1776)	13	14
V	French Revolution: Causes and Results; Rise of Napoleon and Reforms; Congress of Vienna and the concert of Europe	14	14

ESSENTIAL READING:

Perry Anderson, Lineages of the Absolutist State

D.K. Fieldhouse, The Colonial Empires-A comparative Survey from 18th Century

C. Hayes, Contemporary Europe since 1870

Eric J. Hobsbawn, Industry and Empire: The Birth of the Industrial Revolution

James Joll, Europe since 1870: An International History.

Meenaxi Phukan, Rise of the Modern West: Social and Economic History of Early Modern Europe

T. C. W. Blanning, The Oxford History of Modern Europe

M. M. Postan (ed.al.ed.), Cambridge Economic History of Europe Vol.I

M.M. Postan (et.al.ed.), Cambridge Economic History of Europe, Vol.III

E.E.Rich & Wilson, C.H.Wilson (ed.), Cambridge Economic History of Europe Vol.V

David Thompson, Europe since Napoleon,

David Thompson, World History, 1914-1968

Charles Downer Hazen, Modern Europe upto 1945

HIS- 601: Modern World

OBJECTIVE: The purpose of this course is to introduce students to some of the major developments in the Modern World during the two World Wars that led to the emergence of the Cold War Era.

Unit	Detailed Syllabus	Contact Hours	Marks/Weight
I	Rise of New Imperialism: Partition of Africa; Opium wars; Taiping rebellion; Boxer uprising; Meiji Restoration; Militarism in Japan.	14	14
II	Rise of Liberalism and Nationalism: Liberalism in England; German unification; Italian Unification. The Russian Revolution of 1917.	14	14
III	World War I: Causes and Results; the Treaty of Versailles; League of Nation.	13	14
IV	Economic and Social Crisis in the Inter-war years: The Great Depression. Emergence of new Ideologies- Nazism and Fascism.	13	14
V	World War II: causes and Consequences; UNO. Decline of Imperialism and the concept of Decolonization. Emergence of Cold War.	14	14

ESSENTIAL READING:

D.K. Fieldhouse, The Colonial Empires-A comparative Survey from 18th Century

C. Hayes, Contemporary Europe since 1870

James Joll, Europe since 1870: An International History.

E.E.Rich & Wilson, C.H.Wilson (ed.), Cambridge Economic History of Europe Vol.V

A.J.P. Taylor, Origins of the Second World War

A.J.P. Taylor, The struggle for mastery in Europe 1848-1918

David Thompson, Europe since Napoleon

David Thompson, World History, 1914-1968

Charles Downer Hazen, Modern Europe upto 1945

C.D.M. Ketelbey, A history of Modern times.

H.M. Vinache, History of Far East

Kenneth B. Pyle, The Making of Modern Japan

Syllabus of
BA General Course
in
Mathematics
for 2018-19 Session

B.Sc. (PASS & HONOURS) SYLLABUS IN MATHEMATICS.

Pass & Honours

	PASS		Credits	HONOURS		Credits
Semester I	MAT 101	Calculus I	5	MAT 102	Analysis	3
		Algebra I				
Semester II	MAT 201	Calculus II	5	MAT 202	Advanced Algebra I	3
		Algebra II			Elementary Number Theory	
Semester III	MAT 301	Advanced Calculus I	5	MAT 302	Advanced Algebra II	3
		Higher Trigonometry			Advanced Differential Equations	
Semester IV	MAT 401	Advanced Calculus II	5	MAT 402	Complex Analysis	3
		Analytical Geometry				
Semester V	MAT 501	Mechanics I (Dynamics)	5	MAT 502	Differential Geometry	3
		Numerical Methods				
Semester VI	MAT 601	Mechanics II (Statics)	5	MAT 602	CHOICE BASED (any one) a.Programming in C b.Mathematical Methods c.Special Theory of Relativity d.Advanced Mechanics	3
		Vector Analysis			PROJECT	2

MAT 101(P&H) (Calculus-I & Algebra-I)

CALCULUS I

Unit 1: Real variables. Continuous and discrete. Interval. Function. Domain of definition. Monotone functions. Inverse functions. Geometrical representations. Limit of a function on the real line. One-sided limits– right hand and left hand limits. Different types of limits. Theorems on limits. Continuous functions. Definitions. Discontinuous functions. Theorems. Properties. Uniform continuity (definition only).

Unit 2: Derivatives. Definition. Continuity of a derivable function. Algebraic and transcendental functions. General rules of differentiation. Function of a function. Chain rule. Inverse function. Logarithmic differentiation. Implicit functions. Parametric equations. Derivative as a rate measurer. Time rate of change. Rectilinear motion. Related rates. Geometric interpretation. Meaning of the sign of the derivative. Determination of multiple roots. Newton's method of approximating a root. Approximate calculations.

Unit 3: Basic methods of integration. Integration by substitution. Integration by parts. Integration of trigonometric and hyperbolic functions. Rational function of sine and cosine. Standard integrals. Integrals of the forms $1/(a + b\sin x + c \cos x)$, $1/(a \cos x + b\sin x)$, $(a + b\sin x + c \cos x) / (a' + b' \sin x + c' \cos x)$, $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$. Trigonometric substitutions.

ALGEBRA I

Unit 4: Theory of Equations

Division algorithm. Remainder theorem. Factor theorem. Fundamental theorem of algebra. Nature of the roots of an equation. Complex roots. Surd roots. Relation between roots and coefficients. Symmetric functions of roots. Transformation of equations. Cardan's method of solution of a cubic equation. Descartes' rule of signs.

Unit 5: Matrix Algebra

Matrices of real numbers. Operations on matrices. The transpose of a matrix. Properties of transposes. Special types of matrices. Rank of a matrix. Its determination. Determination of rank by considering minors. Determination of rank by elementary transformations. Consistency and solution of system of linear equations with not more than three variables.

Recommended Books:

1. Differential Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus – Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra – Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry – Thomas & Finney (Pearson Education)
2. Differential Calculus – Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus – Gorakh Prasad (Pothishala, Allahabad)
4. Theory of Equations – M L Khanna

MAT 201(P&H) (Calculus II & Algebra II)

CALCULUS II

Unit 1: Second and higher order derivatives. Use of partial fractions. Use of De Moivre's theorem. Leibnitz theorem. Differentiability and differentials. Rolle's theorem. Theorem of Darboux. Mean value theorem. Lagrange's and Cauchy's forms. Indeterminate forms. L'Hospital's rule. Taylor's theorem. Lagrange's, Cauchy's and generalized form of remainder. Taylor's infinite series. Maclaurin's theorem and infinite series. Maxima and minima. Applied problems.

Unit 2: Reduction formulae for $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\operatorname{cosec}^n x$, $\cos^m x \sin^n x$, $1/(a + b \cos x)^n$, $1/(x^2 + a^2)^n$. Integration by special devices. Definition of a definite integral as the limit of a sum. Definite integral as an area. Geometric interpretation. Calculations. Primitives. Fundamental theorem of calculus. Summation of series. Properties of definite integral.

ALGEBRA II

Unit 3: Sequences. Definition. Bounded and unbounded sequences. Limit of a sequence. Convergent sequences. Limits of combination of sequences (proofs not required). Examples and counter examples. Non-convergent sequences. Monotone sequences. Cauchy sequences. Infinite series. Convergence and divergence of infinite series. Positive series - criterion of convergence. General theorems on convergence. Tests for convergence - series of positive terms. Comparison tests. D'Alembert's ratio test. Cauchy's root test. Raabe's test.

Unit 4: Recap of sets and mappings. Equivalence relations. Equivalence classes. Binary operations Group. Definition Examples. Abelian Group. Order of a group (types of group). Elementary properties of groups using definition. Integral power of an element of a group. Subgroups. Intersection of two subgroups.

Unit 5: Cyclic groups. Groups of permutation (definition and examples). Even and odd permutations. Rings. Integral domains. Fields. Definition. Examples. Elementary theorems. Simple consequences of the definitions.

Note: In Units 4 & 5, definitions & examples only to be discussed. Simple consequences of the definitions and theorems to be discussed. (Detailed discussion to be done in Honours course only).

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Modern Algebra	-	A R Vasishtha

MAT 301(P&H) (Advanced Calculus I & Higher Trigonometry)

ADVANCED CALCULUS I

Unit 1: Tangents and Normals Analytic Representation of a plane curve. Tangent. Normal. Subtangent. Subnormal. Polarcoordinate system. Pedal equation. Differential of arc length. Curvature Measure of bending. Radius of curvature. Theorem on centre of curvature. Concept of curvature. Newton's approach. Curvature at the origin. Coordinates of centre of curvature. Equation of circle of curvature. Evolute and involute. Chord of curvature.

Unit 2: Functions of Several Variables Function of two variables. Domain of definition. Geometric representation. Limit and continuity. Theorems-partial derivatives. Higher order-homogenous functions. Euler's theorem. Total differential. Concept of differentiability. Composite functions. Chain rules. Implicit functions. Maxima and minima of function of two variables.

Unit 3: Improper Integrals Types of improper integrals (1) infinite intervals (2) integrand having discontinuities. Comparison test for convergence. Beta and Gamma functions. Definitions and Relations. Multiple Integrals Calculation of a double integral. Equivalence with repeated integrals. Double integrals over domains other than rectangles. Change of variable.

HIGHER TRIGONOMETRY

Unit 4: De Moivre's Theorem. Statement. Proof of De Moivre's theorem for integral indices. Alternative method. Proof for rational indices. All possible values of $(\cos x + i \sin x)^{p/q}$. Application of De Moivre's theorem for integral and fractional indices. Expansion of $\sin nx$, $\cos nx$, in series of $\sin x$, $\cos x$. Expansion of $\sin^n x$, $\cos^n x$ in terms of $\sin$ and cosine of multiple angles. Series expansion of $\sin x$, $\cos x$ and $\tan x$.

Unit 5: Exponential, sine, cosine and logarithms of a complex number. Definitions. Logarithmic, exponential and hyperbolic functions. Inverse functions - trigonometric and hyperbolic functions. Laws of logarithm. Summation of series.

Recommended Books:

1. Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2. Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3. Higher Algebra	-	Ghosh & Maity (New Central Book Agency, Kolkata)

References:

1. Calculus and Analytical Geometry	-	Thomas & Finney (Pearson Education)
2. Differential Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
3. Integral Calculus	-	Gorakh Prasad (Pothishala, Allahabad)
4. Trigonometry	-	Mazumdar & Dasgupta

MAT 401(P&H) (Advanced Calculus II & Geometry)

ADVANCED CALCULUS II

Unit 1: Envelopes Family of curves. Envelope. Definition. Relation between envelope and curves enveloped. Evolute. Arc. Involute. Related curves. Inversion. Pedal curves. Reciprocal polars. Concavity and convexity. Concavity and Convexity. Criterion - points of inflexion. Singular points - at the origin of an algebraic curve and at points other than the origin. Conditions for existence of double points. Discrimination of species of a cusp.

Unit 2: Evaluation of area Quadrature of plane areas - Cartesian coordinates, sign of area. Area in parametric forms. Area included between two curves. Area of a closed curve. Area in polar coordinates. Lengths of plane curves Cartesian, polar and pedal forms. Intrinsic equation to a curve. Volumes and surfaces of revolution. Solids of revolution. Volumes and areas of surfaces.

Unit 3: Differential equations of the first order and first degree - Equation reducible to homogenous form. Bernoulli's equation. Exact differential equations. Differential equation of the first order but not of the first degree. Equations solvable for p , x , y . General and singular solutions. Clairaut's equation Linear differential equations of higher order with constant coefficients. Complementary function and particular integrals. Orthogonal trajectories.

GEOMETRY

Unit 4: 2D Geometry

General equation of the 2nd degree. Chord of contact. Pole and Polar. Conjugate points. Chord in terms of its middle point. Diameter. Conjugate diameter. Intersection of two conics. Conics through the points of intersection of two given conics. Pair of tangents. Director circle. Asymptotes.

Polar equation of a conic. Derivations of polar equation of a conic.

Unit 5: 3D Geometry

Sphere. Equation. Section of a sphere by a plane. Equation of a circle in space. Intersection of two spheres. A sphere passing through a circle. Tangent and tangent plane to a sphere. Cone. Equation of a cone with its vertex at the origin. Right circular cone. Tangent plane to a cone. Reciprocal cone. Three mutually perpendicular generators. Cylinder. Equation. Right circular cylinder.

Recommended Books:

1) Differential Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
2) Integral Calculus	-	Ghosh & Maity (New Central Book Agency, Kolkata)
3) Analytical Geometry	-	B Das (Orient Book Company)

MAT 501(P&H) (Mechanics I & Numerical Methods)

MECHANICS I (DYNAMICS)

Unit 1: Fundamental definitions and principles. Motion in a straight line. Simple harmonic motion. Motion under earth's attraction. Uniplanar motion where the accelerations parallel to fixed axes are given. Composition of simple harmonic motion.

Unit 2: Uniplanar motion referred to polar coordinates. Central orbit. Apses. Apsidal distance. Uniplanar motion when the acceleration is central and varying as the inverse square of the distance. Kepler's laws. Time of describing any arc of the path. Planetary motion.

Unit 3: Tangential and normal accelerations. Constrained motion. Conservation of energy. The simple pendulum. Motion on a rough curve. Motion in a resisting medium. Motion where the mass moving varies.

NUMERICAL METHODS

Unit 4: Finite differences. The operators Δ and ∇ . Properties. Interpolation with equal intervals. Newton-Gregory formula for forward interpolation. Newton-Gregory formula for backward interpolation. Interpolation with unequal intervals. Divided differences. Properties. Newton's formula for unequal intervals. Lagrange's interpolation formula for unequal intervals. Lagrange's interpolation formula for equal intervals.

Unit 5: Central difference formula. Operators δ , ∇ , σ and μ . Gauss's central difference formula. Inverse interpolation. Use of Lagrange's formula. Successive approximations. Roots of algebraic equation by inverse interpolation. Numerical differentiation. Approximate expression for the derivative of a function. Numerical integration. General quadrature formula. The trapezoidal rule. Simpson's $1/3$ and $3/8$ rule.

Recommended Books:

- 1) An Elementary Treatise of the Dynamics of a Particle and of Rigid Bodies - S L Loney (Surjeet)
- 2) Finite Differences and Numerical Analysis - H C Saxena (S Chand & Co)

References:

- 1) Dynamics - P N Chatterjee

MAT 601(P&H) (Mechanics II & Vector Analysis)

MECHANICS II (STATICS)

Unit 1: Coplanar forces. Moment of a system of coplanar forces. Equation of line of action of the resultant of a system of coplanar forces. Necessary and sufficient condition for the equilibrium of a system of coplanar forces acting on a rigid body. Astatic equilibrium. Equilibrium of a rigid body under three forces. (m, n) theorem.

Unit 2: Work. Work done by a system of concurrent forces. Virtual work. Principle of virtual work for a system of coplanar forces acting on a particle. Omission of forces. Stability of equilibrium. Stable, unstable and neutral equilibrium. Work function test for the nature of stability of equilibrium. Energy test for equilibrium.

Unit 3: Centre of gravity. Definition and general formulation. Centre of gravity of arc, plane area, area bounded by curve, solid of revolution, surface of revolution. Centre of gravity bounded area in polar coordinates. The theorem of Pappus. Friction. Statical, dynamical and limiting friction. Laws of friction. Limiting equilibrium. Coefficient of friction. Angle of friction. Cone of friction. Equilibrium of a body on a rough inclined plane.

VECTOR ANALYSIS

Unit 4: Recap of vectors preliminaries. Scalar triple product and vector triple product. Their geometrical meanings. Product of four vectors. Reciprocal system of vectors. Vectors function of a scalar variable. Limit and continuity. Vector differentiation. Directional derivatives. Level surfaces. Tangent plane and normal to a level surface. Gradient, divergence and curl.

Unit 5: Vector integration. Line integrals. Surface integrals. Volume integral. Statements of Green's theorem. Gauss' theorem and Stoke's theorems. (proof not necessary). Problems based on surfaces like spheres, cylinders, cone, parallelepiped.

Recommended Books:

- 1) Statics - Md Motihur Rahman (New Central Book Agency, Kolkata)
- 2) A Textbook of Vector Analysis - Shanti Narayan and P K Mittal (S Chand & Co)

References:

- 1) A Textbook on Statics - M Ray, R D Sanglik
- 2) Vector Algebra - G C Sharma A R Vasishtha Sharma & Vasishtha
- 3) Vector Calculus - G C Sharma A R Vasishtha Sharma & Vasishtha

Syllabus of
BA General Course
in
Philosophy
for 2018-19 Session

DEPARTMENT OF PHILOSOPHY
DISTRIBUTION OF SEMESTER-WISE COURSES.

COURSE OUTLINE

Semester	General Papers Code No & Title	Compulsory Honours Papers Code No & Title	Honours Papers With Options Code No & Title
I	PHI-101: Western Philosophy-I	PHI-I02: Logic-I	
II	PHI-201: Western Philosophy-II	PHI-202: Logic-II	
III	PHI-301: Outlines of Indian Philosophy-I	PHI-302: Philosophy of Religion	
IV	PHI-401: Outlines of Indian Philosophy-II	PHI-402: Existentialism	
V	PHI-501: Ethics (Western and Indian)	PHI-502: Philosophy of Mind	Choose any one : a. PHI-503(a) Philosophy of Natural Sciences b. PHI-503(b) Christian Theology c. PHI-503(c) Contemporary Indian Philosophy
VI	PHI-601: Social and Political Philosophy	PHI-602: Applied Ethics	Choose any one: a. PHI-603(a) Philosophy of Human Rights b. PHI-603(b) Contemporary Indian Christian Thought c. PHI-603(c) Project Paper

SE
ME
ST
ER
I
(G
EN

ERAL)

PHI- 101: WESTERN PHILOSOPHY- I Marks:100 Cr:4**Objectives:**

- To introduce the student to the study of Western Philosophy
- Make them acquainted with the origins of the subject and give them an understanding of the chief Epistemological theories of Philosophy

Unit	Topic	Contact Hours	Weightage
UNIT- I	a. Meaning, Nature and Scope of Philosophy. b. The Pre-Socratics: Thales; Pythagoras; Heraclitus. c. Socrates: Method of Refutation.	14	20
UNIT- II	Plato: Theory of Forms; Theory of Knowledge.	13	20
UNIT-III	Aristotle: Form and Matter, Cause, Potentiality and Actuality.	14	20
UNIT- IV	a. Sources of Knowledge: Rationalism; Empiricism. b. Theories of Perception: Realism; Idealism.	14	20
UNIT- V	Theories of Truth: Correspondence; Coherence; Pragmatic.	13	20

Suggested Readings:

1. Burnet, History of Greek Philosophy. Macmillan.
2. Stace. W.T. Critical History of Greek Philosophy. Macmillan.
3. Flackenberg.R, History of Modern Philosophy. Progressive Publishers, Calcutta.
4. Thilly.F, A History of Philosophy. SBW Publishers,N.Delhi.
5. Mayer.F, A History of Modern Philosophy. Eurasia Publishing House. N.Delhi.
6. Russell.B, History of Western Philosophy. Simon & Schuster,INC. N.Y.
7. Copleston,F, History of Western Philosophy,relevant Volumes. Search Press, London.
8. Sharma, R.N, Problems of Philosophy. Kedar Ram Nath & Co, Meerut.
9. Encyclopaedia of Philosophy: Relevant Volumes

SEMESTER II (GENERAL)**PHI-201: WESTERN PHILOSOPHY - II****Marks: 100 Cr :4****Objectives:**

- To introduce the students to Modern Western philosophers
- Give them a foundation of classical philosophical problems through the study of these philosophers

Unit	Topics	Contact Hours	Weightage
UNIT- I	Descartes: Method of doubt; Substance; Cogito ergo sum	13	20
UNIT- II	a. Spinoza: Substance, Modes and Attributes. b. Leibnitz: Monads.	14	20
UNIT-III	Locke: Refutation of Innate Ideas; Ideas and their Classification; Substance; Primary and Secondary Qualities.	13	20
UNIT- IV	a. Berkeley: Esse est percipii. b. David Hume: Causality.	14	20
UNIT- V	a. Immanuel Kant: Analytic and Synthetic a priori judgment; Space and Time. b. Hegel: Dialectics	14	20

Suggested Readings :

1. Burnet, History of Greek Philosophy. Macmillan.
2. Stace. W.T. Critical History of Greek Philosophy. Macmillan.
3. Flackenberg.R, History of Modern Philosophy. Progressive Publishers, Calcutta.
4. Thilly.F, A History of Philosophy. SBW Publishers,N.Delhi.
5. Mayer.F, A History of Modern Philosophy. Eurasia Publishing House. N.Delhi.
6. Russell.B, History of Western Philosophy. Simon & Schuster,INC. N.Y.
7. Copleston,F, History of Western Philosophy,relevant Volumes. Search Press, London.
8. Sharma, R.N, Problems of Philosophy. Kedar Ram Nath & Co, Meerut.
9. Encyclopaedia of Philosophy: Relevant volumes

SEMESTER III (GENERAL)**PHI-301: OUTLINES OF INDIAN PHILOSOPHY-I** **Marks: 100 Cr: 4****Objectives:**

- To give a clear, comprehensive and critical account of the various systems of Indian Philosophy
- To showcase ancient philosophical texts and relate them to contemporary issues of philosophy and religion

Unit	Topics	Contact Hours	Weightage
UNIT- I	Nature, Common Characteristics and Distinctive Features of Indian philosophy	13	20
UNIT- II	a. Carvakas: Epistemology and Metaphysics b. Jainism: Pramanas; Anekantavada; Syadvada	14	20
UNIT-III	Buddhism: Pramanas; Anityavāda; theory of Dependent Origination	14	20
UNIT- IV	Samkhya: Prakriti and Purusa; Theory of Evolution; Plurality of Purusas; Satkāryavāda	13	20
UNIT- V	Nyaya: Pramanas; Asatkaryavada	14	20

Suggested Readings

- 1.S.Radhakrishnan, Indian Philosophy, (Volume I & II)
2. Hiriyana, Outline of Indian Philosophy
3. C.D.Sharma, Critical survey of Indian Philosophy
4. D.M. Datta, *The Six Ways of Knowing*, University of Calcutta, (1972),
5. K.Potter, Encyclopaedia of Indian Philosophy
6. J. Sanyal: Guide to Indian Philosophy.
7. DM Dutta, SC Chatterjee, Introduction to Indian Philosophy.

SEMESTER IV (GENERAL)**PHI-401: OUTLINES OF INDIAN PHILOSOPHY-II** **Marks: 100 Cr:4****Objective:**

- To present the essential meaning and significance of individual texts and philosophies and also draw parallels between Indian and Western philosophical traditions

Unit	Topics	Contact Hours	Weightage
UNIT- I	Vaisesikha: Categories; Atomism.	14	20
UNIT- II	Mimamsa: Pramanas; Causation; Arthāpati and Anupalabdhi	13	20
UNIT-III	Vedanta of Sankara: Brahman, Atman, Maya, World.	14	20
UNIT- IV	Theories of Error: Nyaya-Vaisesika, Buddhist, Sankhya , Mimamsa and Advaita Vedanta	14	20
UNIT- V	Validity of Knowledge: Svataḥ pramāṇya and Parataḥ pramāṇya.	13	20

Suggested Readings

- 1.S.Radhakrishnan, Indian Philosophy, (Volume I & II)
2. Hiriyana, Outlines of Indian Philosophy
3. C.D.Sharma, Critical survey of Indian Philosophy
4. D.M. Datta, *The Six Ways of Knowing*, University of Calcutta, (1972),
5. K.Potter, Encyclopaedia of Indian Philosophy
6. J. Sanyal: Guide to Indian Philosophy.
7. DM Dutta, SC Chatterjee, Introduction to Indian Philosophy.

SEMESTER V (GENERAL)**PHI-501: ETHICS (Western and Indian)****Marks:100 Cr:4****Objective:**

- For students to acquire a foundational understanding of Moral philosophy
- To learn about ethical theories and ideas of morality which are found in both Western and Indian traditions so as to obtain a balanced knowledge of the subject matter
- To acquaint the students with some basic issues in bio-ethics that will help them to understand the importance of ethical choices and responsibilities in life

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Nature of Morality and Moral philosophy b. Nature of Moral Judgment	13	20
UNIT- II	a. Freedom and Social responsibility b. Concept of Good, Right and Virtue	14	20
UNIT-III	Kant: Good Will; the Categorical Imperative	13	20
UNIT- IV	Utilitarianism: Jeremy Bentham and J.S.Mill	14	20
UNIT- V	a. Purusarthas and Varnashrama Dharma b. Bhagavad Gita : Niskama Karma c. MK Gandhi : Ahimsa	14	20

Suggested Readings:

1. Beauchamp, T.L.: Philosophical Ethics: An Introduction to Moral Philosophy.
2. Warnock, M.: Ethics Since 1900.
3. DD Raphael, Moral Philosophy.
4. W Lillie, Introduction to Ethics, Allied Publishers, Delhi.
5. W Frankena, Ethics, Prentice Hall of India, N. Delhi.
6. IC Sharma, Ethical Philosophies of India, George Allen & Unwin, London.
7. M Hiriyana, The Indian Concept of Values.
8. Bhagavad Gita.
9. Dr.R.K.Behera, Moral Philosophy (A book with a difference)
10. Dr.N.C.Padhi, S.C.Panigrahi, Basic Principles of ethics, Santosh publications, cuttack-753001

SEMESTER VI (GENERAL)**PHI-601: SOCIAL AND POLITICAL PHILOSOPHY** **Marks:100** **Cr:4****Objectives:**

- To introduce the students to the area of Social and Political thought and ideals
- To acquaint the students with concepts of the various political and social Ideologies and Action

Unit	Topics	Contact Hours	Weightage
UNIT- I	a. Meaning and scope of Social and Political philosophy; Relation to Sociology and Politics. b. Concept of Individual; Society; State; Nation	14	20
UNIT- II	Social Ideals: Liberty; Equality; Justice	14	20
UNIT-III	Political Ideologies: Democracy; Socialism; Communism	13	20
UNIT- IV	Political Action: Revolution; Terrorism; Constitutionalism	13	20
UNIT- V	a. M.K.Gandhi: Sarvodaya b. National Integration	14	20

Suggested Readings:

1. Raphael,DD, Problems of Political Philosophy. Macmillan.
2. Quinton, A. Political Philosophy. OUP.
3. Ebenstein, W, Modern Political Thought: The Great Issues.
4. Gandhi, M.K, The Voice of Truth.Relevant volume.
5. Gandhi, MK, Hind Swaraj, Navajivan Publishing House, Ahmedabad.
6. Skoble,A.J.,Machan,TR. Political Philosophy: Essential Selections.
7. NV Joshi, Social and Political Philosophy.
8. Ram Chandra Gupta, Great political thinkers(East & west), Lakshmi Narain Agarwal, Agra

Syllabus of

BA General Course

in

Political Science

for 2018-19 Session

SYLLABUS FOR
UNDERGRADUATE COURSE
(B.A PASS & HONOURS)

POLITICAL SCIENCE

NAGALAND UNIVERSITY
Hqs: LUMAMI
2012

POLITICAL SCIENCE B.A (Pass & Honours)

COURSE STRUCTURE

COMPULSORY PAPERS FOR B.A (General& Honours)			
Semester	Code No	Title	General/Honours
Semester- I	POL-101	Political Theory: Ideas and Concepts (A)	General
	POL-102	Indian Political Thinkers	Honours
Semester-II	POL-201	Political Theory: Ideas and Concepts (B)	General
	POL-202	Western Political Thought	Honours
Semester-III	POL-301	Indian Government and Politics (A)	General
	POL-302	International Organisation	Honours
Semester-IV	POL-401	Indian Government and Politics (B)	General
	POL-402	International Politics	Honours
Semester-V	POL-501	Comparative Government and Politics	General
	POL-502	Issues in World Politics and ,one optional from Group (A)	Honours
	POL-503	Local Self Govt. in India	Honours
	POL-504	Human Rights	Honours
	POL-505	Women and Politics in India	Honours
Semester-VI	POL-601	Public Administration	General
	POL-602	Indian Administration and , one optional from Group (B)	Honours
	POL-603	Govt. and Politics of North-East India.	Honours
	POL-604	Conflict and Peace Studies	Honours
	POL-605	International Law	Honours
	POL-606	Project Paper	Honours

Note:

In the 5th Semester, the students will take one Compulsory Honours Paper i.e

POL-502: Issues in World Politics and one optional Honours Paper from Group (A), they are:

POL-503: Local Self Govt. in India.

POL-504: Human Rights.

POL-505: Women and Politics in India.

In the 6th Semester the students will take one Honours Compulsory Paper i.e

POL-602: Indian Administration Compulsory and one from Group (B), they are:

POL-603: Govt. and Politics of North-East India.

POL-604: Conflict and Peace Studies.

POL-605: International Law.

POL-606: Project Paper

In place of Optional Papers, College/Dept. may ask the student to do the project work relating to local/regional/national/international political issues. The report will be submitted well in advance before the end semester examination. The minimum pages of the report in form of dissertation should be at least 25 pages types in double space in A/4 size paper in 12 point font size

DEPARTMENT OF POLITICAL SCIENCE

POL/EL-101 POLITICAL THEORY: IDEAS & CONCEPTS (A)

Course Rationale: The course is designed to acquaint the students with the basic normative concepts and ideas of Political Theory.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	MEANING,NATURE& SCOPE OF POLITICAL THEORY	13	20
UNIT-II	STATE: MEANING, ELEMENTS & ORIGIN	13	20
UNIT-III	LIBERTY, EQUALITY,RIGHTS MEANING, TYPES,THEORIES	16	20
UNIT-IV	LAW,JUSTICE,SOVEREIGNTY:MEANING,TYPES	13	20
UNIT-V	DEMOCRACY MEANING DIMENSIONS	13	20
	Total	68	100

References

1. A. Appadorai, *Substance of Politics* World Press Ltd, 1989.
2. Amal Ray and Mohit Bhattacharya, *Political Theory: Institutions and Ideas* - The World Press Private Ltd., Calcutta, 1988.
3. Baradat, *Political Ideologies: Their origins and impact*. PHI Publications, New Delhi.
4. H.J Laski, *A Grammar of Politics*. S. Chand & Company Ltd. New Delhi, 2000.
5. John Hoffman and Paul Grahnam, *Introduction to political theory*, Pearson Education Ltd, 2007.
6. O.P Gauba, *An Introduction to Political theory*, Macmillan India Ltd, 2008.
7. Perter Harris, *Foundations of Political Science*, Oxford University press.
8. Prof. A.C. Kapoor, *Principles of Political Science*, Sterling Publishers PVT. Ltd. New Delhi, 2005.
9. R.C Agarwal, *Political Theory: Principles of Political Science*, S. Chand & Company Ltd. New Delhi, 2000.
10. Rajeev Bhargava and Asok Acharya, *Political Theory: An Introduction*, Pearson Education, 2008.

POL/EL-201 POLITICAL THEORY: IDEAS & CONCEPTS (B)

Course Rationale: The course is intended at acquainting the students with the contemporary concepts of Political Theory. **(Total Marks-100)**

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	LIBERALISM, MARXISM, SOCIALISM	16	20
UNIT-II	: POWER, LEGITIMACY AND AUTHORITY	13	20
UNIT-III	REVOLUTION, POLITICAL OBLIGATION AND RESISTANCE	12	20
UNIT-IV	NATION, NATIONALISM, IMPERIALISM	14	20
UNIT-V	GLOBALISATION: MEANING, AGENTS & IMPACT	13	20
	Total	68	100

References

1. Adrian Leftwich (ed.) *Political Theory Today*, Cambridge: Polity Press, 1991.
2. Adrian Leftwich (ed.) *What is Politics: The Activity and its Study*, Oxford, Basil Blackwell
3. Andrew Hacker, *Political Theory: Philosophy, Ideology and Science*, Toronto, Macmillan, 1961.
4. David Held, *Political Theory and the Modern State*, London, Polity, 1994.
5. Norman P Barry, *An Introduction to Modern Political Theory*, London, Macmillan, 1988.
6. O. P. Gauba, *An Introduction to Political Theory*, New Delhi, Macmillan, 1981.
7. Rajeev Bhargava & Ashok Acharya (ed.) *Political Theory: An Introduction*, New Delhi, Pearson Education, 2008.
8. Rajeev Bhargava, *What is Political Theory and Why do We need it*, New Delhi, OUP, 2010.
9. Sushila Ramaswamy, *Political Theory: Ideas and Concepts*, New Delhi, Macmillan, 2003.
10. Will Kymlicka, *Contemporary Political Philosophy: An Introduction*, Oxford, Clarendon, 1990.

POL/EL-301 -INDIAN GOVERNMENT AND POLITICS (A)

Course Rationale:

The objective of this course is to familiarize the students with the legal and philosophical framework of the political system in India. It simultaneously studies in detail the political structure both Constitutional and Administrative. It also intends to strengthen the understanding and appreciation of the rights and privileges granted by the the Indian Constitution. The paper also focuses on the political processes and the actual functioning of the political system.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	: MAKING OF THE INDIAN CONSTITUTION: BASIC FEATURES	14	20
UNIT-II	PREAMBLE, FUNDAMENTAL RIGHTS, DIRECTIVE PRICIPLES OF STATE POLICY	14	20
UNIT-III	PARLIAMENT, PRESIDENT, COUNCIL OF MINISTERS	12	20
UNIT-IV	STATE LEGISLATURE, GOVERNOR, CHIEF MINISTER	12	20
UNIT-V	JUDICIARY: SUPREME COURT, HIGH COURT, JUDICIAL REVIEW	16	20
	Total	68	100

References

1. Brij Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall, New Delhi, 2005.
2. C. P. Bhambri, *The Indian State: Fifty Years*, New Delhi, Shipra, 1999.
3. Chakrabarti, Bidyut & Pandey Rajendra Kumar, *Indian Government & Politics*, Sage, New Delhi-2008.
4. D.D. Basu, *An Introduction to the Constitution of India*, New Delhi, Prentice Hall, 2008.
5. Dr. B.L. Fadia, *Indian Government and Politics*, Sahitya Bhawan Publications, Agra, 2007.
6. G. Austin, *Working a Democratic Constitution: The Indian Experience*, Delhi, Oxford Uni. Press, 2000.
7. Jojo Mathew & Manish K Gautam, *Indian Polity and Constitution*, Career Classics, Delhi, 2009.
8. M. V. Pylee, *An Introduction to Constitution of India*, New Delhi, Vikas, 1998.
9. Moin Shakir, *State and Politics in Contemporary India*, Delhi, Ajanta, 1986.
10. N .V. Normani, *Constitutional Question in India. The President, Parliament and the State*, Oxford University Press, 2000.

11. Neera Chandhoke & Praveen Priyadarshini (edited) *Contemporary India: Economy, Society, Politics*, Pearson 2009.
12. P. R. Brass: *Politics of India since Independence*, 2nd Ed. Cambridge Uni. Press, 1992.
13. S. Kaviraj, *Politics in India*, Delhi, Oxford University Press, 1998.
14. S. P. Sathe, *Judicial Activism in India*, OUP, 2001.
15. Subhash C. Kashyap, *Constitution of India: Review and Reassessment*, New Delhi, Universal Law Publishing Co. Pvt., 2010.
16. T. R. Andhyarujina, *Judicial Activism and Constitutional Democracy in India*, Bombay, N. P. Tirupathi, 1992.

POL/EL-401 -INDIAN GOVERNMENT & POLITICS-(B)

Course Rationale:

This paper attempts to acquaint the students with the processes and the functioning of Indian political system. It focuses on the Centre-State relations within the Indian federal system. It also emphasises on issues such as caste, communalism and regionalism and critically assesses its impact on the political processes.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	WORKING OF INDIAN FEDERALISM: CENTRE- STATE RELATIONS	14	20
UNIT-II	AMENDMENT PROCEDURES	12	20
UNIT-III	ELECTORAL PROCESS, ELECTORAL REFORMS, ELECTION COMMISSION, PARTY SYSTEM	14	20
UNIT-IV	COALITION GOVERNMENT, DEFECTION, POLITICAL STABILITY	14	20
UNIT-V	ISSUES IN INDIAN POLITICS: CASTE, COMMUNALISM, REGIONALISM	14	20
	Total	68	100

References

1. Anuradha Dingwaney Needham and Rajeswari Sunder Rajan (ed.) *The Crisis of Secularism in India*, Permanent Black, 2007
2. Atul Kohli, *India's Democracy : An Analysis of Changing State Society Relations* Princeton N. J. Princeton Uni. Press, 1988.
3. Atul. Kohli, *The Success of India's Democracy*, Cambridge Uni. Press, 2001.
4. Bidyut Chakrabarty and Rajendra Kumar Pandey, *Indian Government and Politics*, Sage, 2008
5. C. P. Bhambri, *The Indian State, Fifty Years*, New Delhi, Shipra, 1999.
6. D. D. Basu & B. Parekh (ed.) *Crisis and Change in Contemporary India*, New Delhi, Sage, 1994.
7. F. R. Frankel & et. al (ed.) *Transforming India : Social and Political Dynamics of Democracy*, New Delhi, OUP, 2000.
8. F. R. Frankel & M. S. A. Rao (Ed.) *Dominance and State Power in Modern India : Decline of a Social order*, Delhi, OUP, 1989.
9. Ghanshyam Shah (ed.) *Caste and Democratic Politics in India*, Permanent Black, 2002.

10. M.P. Singh & Rekha Sexena, *Indian Politics: Contemporary Issues and Concerns*, Prentice Hall, New Delhi, 2008.
11. Manoranjan Mohanthy (Ed) *Class, Caste, Gender*, Sage Publication, New Delhi, 2004
12. Mynor. Weiner, *The Indian Paradox: Essays in Indian Politics*, New Delhi, 1999.
13. N. Chandoke, *Beyond Secularism : The Rights of Religious Minorities*, Delhi, OUP, 1999.
14. P. R. Brass, *Language, Religion and Politics in North India*, Cambridge Uni. Press, 1994.
15. Rajendra Vora and Suhas Palshikar (ed.) *Indian Democracy Meanings and Practices*, 2004
16. Rajesh M. Basrur (ed.) *Challenges to Democracy in India*, Oxford 2009
17. T.N. Srinivasan (ed.) *The Future of Secularism*, Oxford 2007

POL/EL-501 COMPARATIVE GOVERNMENT & POLITICS

Course Rationale: The paper intends to highlights on the evolution and approaches to the study of Comparative Politics. It studies the major political systems of the World by adopting a comparative approach. The comparative perspective enables the students to understand the differences and similarities between the various constitutional arrangements. It also analyses in a comparative way the political systems in the third world countries.

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHT AGE
UNIT-I	MEANING, NATURE , SCOPE AND SIGNIFICANCE	14	20
UNIT-II	APPROACHES TO COMPARATIVE POLITICS	12	20
UNIT-III	: FUNCTIONING OF POLITICAL SYSTEMS IN PRESIDENTIAL (US), PARLIAMENTARY (UK) AND COMMUNIST (CHINA	14	20
UNIT-IV	INSTITUTIONAL ARRANGEMENT: EXECUTIVE, LEGISLATURE, JUDICIARY, POLITICAL PARTIES AND PRESSURE GROUPS	16	20
UNIT-V	FUNCTIONING OF POLITICAL SYSTEMS IN THE THIRD WORLD COUNTRIES	12	20
	Total	68	100

References

1. A. Stephan, *Arguing Comparative Politics*, Oxford University Press, 2001.
2. A.C. Kapoor, *Select Constitutions*, S. Chand & Company Ltd., New Delhi 2002
3. Almond and Powell, *Comparative Politics Today*, Pearson Publications, New Delhi,2004.
4. Diamond, Larry, J., & Lipset, S.M., (eds), *Democracy in Developing Countries*, Vol. I-IV, Lynne Reiner, Boulder, Colorado, 1988.
5. G.S.Mahler, *Comparative politics: An institutional and cross-national approach* (4th ed.). New Jersey: Prentice Hall,2003.
6. Hari Hara Das, *Comparative Politics*, National Publishing house, Jaipur, 2003.
7. Haynes, J. *Politics in the Developing World:A Concise Introduction* Blackwell, Oxford 2002, Chapter 1:Politics, Economics and Societies in the Developing World War at the New Millennium,pp1-24.
8. Haynes J. *Third World Politics:A concise introduction* Blackwell, Oxford, 1996, Chapter 2: State and Society pp.20-32.
9. J.C.Johari, *Comparative Politics*, Sterling Publishers PVT. Ltd., New Delhi 2004

10. James H. Mittlemann & Pasha, Mustapha Kamal, *Out From Underdevelopment Revisited: Changing Global Structures and the Remaking of the Third World*, Macmillan, Houndmills, 1998.
11. K.R. Bombwall, *Major Governments*, S. Chand & Company Ltd., New Delhi 2002
12. M. Curtis, *Comparative Government & Politics*: London, Rutledge, 2000.
13. Mehran Kamrava, *Politics and Society in the Developing World*, Routledge, London, 2009. (Second Edition).
14. Robert Dahl & Bruce Stinebrickner, *Modern Political Analysis*, PHI Learning Pvt. Ltd., Delhi, 2002.
13. S.N. Ray, *Modern Comparative Politics: Approaches, Methods and Issues*, Prentice Hall of India, New Delhi, 2005
14. S.R. Maheswari, *Comparative Government and Politics*, Agra, 2002
15. V.D. Mahajan, *Foreign Governments*, Oxford University Press, 2004.

POL/EL-601 PUBLIC ADMINISTRATION

Course Rationale: The course provides an introduction to the discipline of public administration. It is intended to cater to the needs of students in understanding the basic elements of administration. The paper covers Public Administration in its historical context. It seeks to embody a detailed discussion on Organization and Personnel Administration. The importance of administrative, legislative, executive and judicial control over administration is also highlighted

(Total Marks-100)

UNIT	TITLE	CONTACT HRS	WEIGHTAGE
UNIT-I	MEANING, NATURE, SCOPE & SIGNIFICANCE	12	20
UNIT-II	EVOLUTION OF PUBLIC ADMINISTRATION, PUBLIC AND PRIVATE ADMINISTRATION	12	20
UNIT-III	PRINCIPLES OF ORGANISATION	12	20
UNIT-IV	PERSONNEL ADMINISTRATION: RECRUITMENT, TRAINING, PROMOTION, ROLE OF PUBLIC SERVICE COMMISSION (UPSC) AND STATE PUBLIC SERVICE COMMISSION	16	20
UNIT-V	CONTROL OVER ADMINISTRATION: ADMINISTRATIVE, LEGISLATIVE, EXECUTIVE AND JUDICIAL	16	20
	Total	68	100

References

1. .A.R Tyagi AND Atma ram *Public Administration*, Company, New Delhi, 2002.
2. Avasthi and Maheshwari, *Public Administration*, Laxmi Narayan Agarwal, 2009
3. B.L.Fadia and Kuldeep, *Public Administration*, Sahitya Bhawan Publication, Agra, 2008
4. Bidyut Chakrabarty and Mohit Bhattacharya, *Public Administration: A Reader*, Oxford University Press, 2003
5. Bidyut Chakravarty and Mohit Bhattacharya, *Advanced Public Administration*, The World Press, Calcutta, 2007.
6. C.L.Baghel and Y.Kumar, *Public Administration* (two volumes), Kanishka Publishers, New Delhi, 2005
7. C.P. Bhambri, *Public Administration*, Sterling Publishers Pvt. Ltd, New Delhi, 1990.
8. L.D White, *Introduction to the study of Public Administration*, Mac Millan, New York, 1998.
9. M.P. Sharma & B. L. Sadana, *Public Administration Theory and Practice*, Kitab Mahal, Allahabad, 1999.

10. Mohit Bhattacharya, *Public Administration*, World Press, 2007
11. R.K .Sapru, *Administrative Theories and Management Thought*, Prentice Hall of India,Pvt. Ltd., 2008
12. Rukmi Basu, *Public Administration Concepts and Theories*, Sterling Publishers Pvt. Ltd, New Delhi,2004.
13. S.L. Goel, *Public Administration*, Sterling Publishers Pvt. Ltd, New Delhi,1991.
- 14.** S.P Naidu, *Public Administration; Concepts and Theories*, S. Chand & Company, New Delhi,1998.
15. S.R.Maheshwari, *Administrative Theory*, Macmillan India Ltd.
16. V.N. Viswanathan, *Comparative Public Administration*, Sterling Publishers Pvt. Ltd, New Delhi, 1997.

Syllabus of
BA General Course
in
Sociology
for 2018-19 Session

Department of Sociology

***Reviewed UG Syllabus (of selected papers) approved by 22nd School Board
Meeting held on 18.05.2016***

SEMESTER-WISE DISTRIBUTION OF COURSES

Elective					
Soc 101	Introduction to Sociology	4	0	4	4
Honours					
Soc 102	Social Research Methods – I	4	0	4	4
Semester - II					
Elective					
Soc 201	Social Stratification and Social Mobility	4	0	4	4
Honours					
Soc 202	Social Research Methods –II	4	0	4	4
Semester – III					
Elective					
Soc 301	Foundations of Sociological Thought	4	0	4	4
Honours					
Soc 302	Population and Society	4	0	4	4
Semester – IV					
Elective					
Soc 401	Modern Sociological Theories	4	0	4	4
Honours					
Soc 402	Social Movements	4	0	4	4
Semester - V					
Elective					
Soc 501	Marriage, Family and Kinship	4	0	4	4
Honours					
Soc 502	Rural Sociology	4	0	4	4
Honours Optional (Any One)					
Soc 503	Industrial Sociology	4	0	4	4
Soc 504	Contemporary Indian Society	4	0	4	4
Soc 505	Gender and Society	4	0	4	4
Soc 506	Crime and Society	4	0	4	4
Semester – VI					
Elective					
Soc 601	Indian Society	4	0	4	4
Honours					
Soc 602	Urban Sociology	4	0	4	4
Honours Optional (Any One)					
Soc 603	Indian Sociological Thinkers	5	0	5	5
Soc 604	Sociology of Tribal Society	5	0	5	5
Soc 605	Sociology of Culture and Mass Media	5	0	5	5
Soc 606	Project Paper	-	-	-	5
Optional Paper					
Soc 607	Child Rights and Protection				

[Note: L = Lecture, T = Tutorials, CH = Contact Hour, CR = Credit

A minimum of 12-14 contact hours will be required per unit in every course keeping in view that a minimum of 68 contact hours is maintained in each paper throughout the semester.

COURSE NO SOC 101: INTRODUCTION TO SOCIOLOGY

Objectives:

The basic idea for the introduction of this course is to introduce the subject of sociology to the students. It is intended to acquaint the students with the discipline as a social science and its distinctive approaches.

Course Outline:

UNIT I: SOCIOLOGY AS A DISCIPLINE

- a. Meaning, Origin and Growth
- b. Nature, Scope and Significance of Sociology

UNIT II: SOCIOLOGY AND ITS RELATIONSHIP WITH OTHER SOCIAL SCIENCES

- a. Sociology and History
- b. Sociology and Political science
- c. Sociology and Economics
- d. Sociology and Social Anthropology

UNIT III: BASIC CONCEPTS

- a. Society and Culture
- b. Social Structure and Social System
- c. Community, Association and Social Organization

UNIT IV: SOCIAL INSTITUTIONS

- a. Family
- b. Marriage and Kinship
- c. Religion

UNIT V: SOCIAL CHANGE

- a. Meaning and Nature
- b. Theories of Social Change
- c. Factors of Social Change

Essential Readings:

1. Bottomore, T.B; 1971; *Sociology: A Guide to Problems and Literature*; Bombay; Blackie and Son Publication Pvt. Ltd.
2. Gisbert, P; 1989; *Fundamentals of Sociology*; Bombay; Orient Longman.
3. Haralambos, M; 1991; *Sociology, Themes and Perspectives*; New Delhi; Oxford University Press.
4. Inkeles, Alex; 2003; *What is Sociology? An Introduction to the Discipline and Profession*; New Delhi; Prentice Hall of India Private Limited.
5. Jayaram, N; 1990; *Introducing Sociology*; New Delhi; MacMillan India Ltd.
6. Johnson, Harry M; 1995; *Sociology: A Systematic Introduction*; New Delhi; Allied Publishers.
7. Kikhi, Kedilezo et.al; 2010; *Introduction to Sociology*; Dimapur; Heritage Publishing House.
8. Schaefer, Richard T. and Robert P. Lamm; 1999; *Sociology*; New Delhi; Tata McGraw Hill.
9. Sharma, R.N; 1982; *Principles of Sociology*; London; J.K. Publishers.
10. Turner, Jonathan H; 1994; *Sociology: Concepts and Uses*; New York; McGraw Hill Inc.

COURSE NO SOC 201: SOCIAL STRATIFICATION AND SOCIAL MOBILITY

Objectives:

The objective of this course is to impart knowledge to the students the existing theories of social stratification and its relevance in contemporary society.

Course Outline:

UNIT I: NATURE AND BASES

- a. Meaning and Features
- b. Stratification and Differentiation

UNIT II: APPROACHES TO SOCIAL STRATIFICATION

- a. Functional
- b. Conflict

UNIT III: FORMS OF SOCIAL STRATIFICATION

- a. Slavery, Estates
- b. Caste and Class

UNIT IV: SOCIAL MOBILITY

- a. Types of Social Mobility
- b. Functions of Social Mobility

UNIT V: SOCIAL MOBILITY IN INDIA

- a. Modernization and Secularization
- b. Emerging Trends of Caste Mobility

Essential Readings:

1. Beteille, Andre; 1965; *Caste, Class and Power: Changing Patterns of Stratification in a Tanjore Village*; Berkeley; Penguin books.
2. Beteille, A. (ed.); 1969; *Social Inequality*; Harmondsworth; Penguin Books.
3. Bottomore, T.B; 1971; *Sociology: A Guide to Problems and Literature*; Bombay; Blackie and Son Publication Pvt. Ltd.
4. Davis, Kingsley and Wilbert E. Moore; 1945; 'Some Principles of Stratification', in *American Sociological Review*; April 1945.
5. Gupta D. (ed.); 1991; *Social Stratification*; Delhi; Oxford University Press.
6. Haralambos, M; 1991; *Sociology, Themes and Perspectives*; New Delhi; Oxford University Press.
7. Rao, C.N. Shankar; 2004; *Sociology of Indian Society*; New Delhi; S. Chand and Company Ltd.
8. Sharma, K.L; 1997; *Social Stratification in India: Issues and Themes*; New Delhi; Sage Publications.
9. Singh, Yogendra; 2002; *Social Stratification and Change in India*; New Delhi, Manohar.
10. Srinivas, M.N; 1965; *Caste in Modern India and Other Essays*; Bombay; Orient Longman.
11. Tumin, Melvin M; 1987; *Social Stratification: The forms and Functions of Inequality*; New Delhi; Prentice Hall of India.

COURSE NO SOC 301: FOUNDATIONS OF SOCIOLOGICAL THOUGHT

Objectives:

This course is designed to introduce to the students the main ideas of the founding fathers of sociology and their contributions.

Course Outline:

UNIT I: AUGUSTE COMTE

- a. Social Static and Social Dynamics
- b. Law of the Human Progress

UNIT II: HERBERT SPENCER

- a. Organic Analogy
- b. Spencer and Functionalism

UNIT III: KARL MARX

- a. Historical Materialism
- b. Class and Class Struggle

UNIT IV: EMILE DURKHEIM

- a. Social Facts-Rules of Sociological Method-Social Facts
- b. Theories of Suicide

UNIT V: MAX WEBER

- a. Social Action-Types of Action
- b. Protestant Ethic and the Spirit of Capitalism

Essential Readings:

1. Abraham, Francis and John Henry Morgan; 1987; *Sociological Thought*; Delhi; McMillan India Limited.
2. Aron, Raymond; 1982; *Main Currents in Sociological Thought* (Vol. 1 and 2); New York; Penguin Books.
3. Barnes, H.E; 1967; *Introduction to the History of Sociology*; Chicago; The University of Chicago Press.
4. Coser, Lewis A; 1996; *Mastes of Sociological Thought* (2nd edition); Jaipur; Rawat Publications.
5. Fletcher, Ronald; 1994; *The Making of Sociology (Vol 1 and 2)*; Jaipur; Rawat Publications.
6. Kikhi, Kedilezo et.al; 2010; *Foundations of Sociological Thought*; Dimapur; Heritage Publishing House.
7. Morrison, Ken; 1995; Marx, Durkheim, Weber: *Formation of Modern Social Thought*; London; Sage Publications.
8. Ritzer, George; 1986; *Sociological Theory*; New Delhi; Tata McGraw Hill.
9. Sharma, R.N. and R.K. Sharma; 1994; *History of Social Thought*; Bombay; Media Promoters and Publishers Pvt. Ltd.
10. Srivastava, R.S; 1991; *Traditions in Sociological Theory*; Jaipur; Rawat Publications.
11. Turner, Jonathan H; 1987; *The Structure of Sociological Theory*; Jaipur; Rawat Publications.
12. Zeitlin, Irving M; 1987; *Rethinking Sociology: A Critique of Contemporary Theory*; Jaipur; Rawat Publications.

COURSE NO SOC 401: MODERN SOCIOLOGICAL THEORIES

Objectives:

The main objective of this course is to familiarize the students with some of the modern sociological thinkers and their contributions.

Course Outline:

UNIT I: A.R. RADCLIFFE BROWN

- a. Structure and Function
- b. Science and Society

UNIT II: BRONISLAW K. MALINOWSKI

- a. Theory of Needs
- b. Magic, Science and Religion

UNIT III: TALCOTT PARSONS

- a. Pattern variables
- b. Functional Pre-Requisites of Social System

UNIT IV: R. K. MERTON

- a. Manifest and Latent Function
- b. Reference Group

UNIT V: C. WRIGHT MILLS

- a. Sociological Imagination
- b. Power Elite

Essential Readings:

1. Brown, A.R. Radcliffe; *Structure and Function in Primitive Society* (1952)
2. Brown, A.R. Radcliffe; *A Natural Science of Society* (1957)
3. Malinowski, B.K; *Crime and Custom in Savage Society* (1926)
4. Malinowski, B.K; *Coral gardens and their Magic* (1935)
5. Merton, Robert K; 1968; *Social Theory and Social Structure*; New York; Free Press.
6. Mills, C.W; *The Power Elite* (1956)
7. Mills, C.W; *Sociological Imagination* (1959)
8. Parsons, Talcott; 1949; *The Structure of Social Action*; New York; McGraw Hill.
9. Parsons, Talcott. 'The Social System', The Free Press, Glencoe, Illinois, 1951
10. Parsons, Talcott; 1967; *Sociological Theory and Modern Society*; New York; Free Press.
11. Turner, J.H; 1987; *Structure of Sociological Theory*; Jaipur; Rawat Publications.

COURSE NO SOC 501: MARRIAGE, FAMILY AND KINSHIP

Objectives:

This course is prepared to acquaint student with the basic concepts in family and kinship studies and to demonstrate structural principles used by societies in a consistent logical way to organize groups and categorize and infuse them with cultural meanings so that the societal objectives of social integration, social reproduction and social continuity are realized.

Course Outline:

UNIT I: MARRIAGE

- a. Rules
- b. Transactions
- c. Challenges

UNIT II: FAMILY

- a. Developmental cycle
- b. Changing trends

UNIT III: PERSPECTIVES ON THE FAMILY

- a. Inter-actionist
- b. Functionalist
- c. Conflict

UNIT IV: KINSHIP

- a. Terminologies
- b. Genealogical Methods

UNIT V: KINSHIP SYSTEMS WITH REFERENCE TO NORTH EAST

- a. Patrilineal
- b. Matrilineal

Essential Readings:

1. Ahmad, Imtiaz (ed.): 1976; *Family, Kinship and Marriage among Muslims in India*; New Delhi: Manohar.
2. Dube, Leela; 1974; *Sociology of Kinship: An Analytical Survey of Literature*; Bombay; Popular Prakashan.
3. Dube, Leela; 1997; *Women and Kinship: Comparative Perspectives on Gender in South and South –East Asia*; New Delhi; Sage Publications.
4. Fox, Robin; 1967; *Kinship and Marriage: An anthropological Perspective*; Harmondsworth; Penguin Books.
5. Karve, Iravati; 1968; *Kinship Organization in India*; Bombay; Asia Publishing House.
6. Madan, T.N; 1989; *Family and Kinship: A Study of Pandits of Rural Kashmir*. Delhi; Oxford University Press.
7. Shah, A.M; 1998; *The Family in India: Critical Essays*; New Delhi; Orient Longman.
8. Tali, N and A. Lanunungsang Ao; 2005; *Naga Society and Culture*; Nagaland University; Tribal Research Centre; Hqrs: Lumami.
9. Trautman, T.R; 1981; *Dravidian Kinship*; Cambridge, Cambridge University Press.
10. Uberoi, Patricia (ed.); 1993; *Family, Kinship and Marriage in India*; New Delhi; Oxford University Press.
11. Weston, K; 1991; *Families we choose: Lesbians, Gays, Kinship*; New York; Columbia University Press.

COURSE NO SOC 601: INDIAN SOCIETY

Objectives:

This paper intends to present a comprehensive and integrated profile of Indian society.

Course Outline:

UNIT I: NATURE AND CHARACTERISTICS

- a. Unity in Diversity
- b. Caste Hierarchy

UNIT II: THE COMPOSITION OF INDIAN SOCIETY

- a. Rural and Urban
- b. Minorities and Weaker Sections

UNIT III: SOCIO-ECONOMIC SYSTEM

- a. Economy-Agrarian economy and mixed economy
- b. Religion-Pluralism, multiculturalism, secularism.

UNIT IV: CHALLENGES OF NATION BUILDING

- a. Poverty, Unemployment
- b. Communalism

UNIT V: CHANGE AND CONTINUITY

- a. Tradition and Modernity
- b. Globalization

Essential Readings:

1. Ahuja, Ram; 1999; *Society in India*; Jaipur; Rawat Publications.
2. Bose, N.K; 1967; *Culture and Society in India*; New Delhi; Asia Publishing House.
3. Bose, N.K; 1975; *Structure of Hindu Society*; New Delhi; Asia Publishing House.
4. Dube, S.C; 1958; *India's Changing Villages*; London; Routledge and Kegan Paul.
5. Dube, S.C; 1990; *Indian Society*; New Delhi; National Book Trust of India.
6. Dube, S.C; 1995; *Indian Village*; London; Routledge.
7. Ghurye, G.S; 1969; *Caste and Race in India*; Bombay; Popular Prakashan.
8. Kumar, Anand (ed.); 2000; *Nation Building in India*; New Delhi; Radiant.
9. Mandelbaum, D.G; 1970; *Society in India*; Bombay; Popular Prakashan.
10. Singh, Yogendra; 1973; *Modernization of Indian Tradition*; New Delhi; Thomson Press.
11. Srinivas, M.N; 1963; *Social Change in India*; Berkeley; University of California Press.