RAJIV GANDHI CENTRAL UNIVERISTY

RONO HILLS, ITANAGAR, PAPUM PARE

ARUNACHAL PRADESH

SYLLABUS

B.SC. PROGRAMME

(SEMESTER SYSTEM)

BOTANY

SEMESTER - I

BOT 111: Microbes and Cryptogams

Full Marks: 60 *Terminal Exam: 50 Marks* *Internal Assessment: 10 Marks*

UNIT I

Whittaker's five kingdom system classification; evolution and interrelationship of various plant groups, General characteristics, structure and multiplication of viruses and bacteria including Cyanobacteria (*Nostoc*, *Scytonema*).

UNIT II

General characters, systematic position, economic importance and life history of *Chlamydomonas, Volvox, Cladophora, Coleochaete, Vaucheria, Ectocarpus, Sargassum* and *Polysiphonia.*

UNIT III

General characters, classification, economic importance and life history of following genera: *Synchitrium, Saprolegnia, Albugo, Mucor, Penicillium, Peziza, Agaricus, Alternaria.*

UNIT IV

Comparative study of vegetative and reproductive structures of following genera of bryophytes: *Marchantia, Anthoceros* and *Polytrichum.*

UNIT V

Systematic position, salient features and life cycles of *Psilotum, Lycopodium, Selaginella* & *Marsilea.*

Suggested Readings

Bhatnagar, S. P. and Moitra A. Gymnosperms. New Age Publishers, New Delhi

Datta, A.C. : Botany for Degree Students, Oxford University Press, Kolkata.

Dube, H.C. : A Text Book of Fungi, Bacteria & Virus. Agrobios India

Dube., H.C. : A Text Book of Fungi. Vikas Publishing House (P) Ltd

Gangulee, et.al. : College Botany, Vol. II. , New Agency, Kolkata.

Kumar, H.D. & H.N. Singh : A Text Book of Algae, Affiliated East-West Press Pvt. Ltd., New Delhi.

Kumar, H.D. Introductory Phycology. Affiliated East-West Press, New Delhi.

Pandey, B.P. : A Text Book of Bryophyta, Pteridophyta and Gymnosperms, K.Nath & Co Meerut

Parihar , N.S. Bryophytes. Central Book Depot, Allahabad.

Parihar, N.S. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad

Sambamurty 2008 A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. IK International Publishers.

Sharma, O.P. : A Text Book of Algae, Tata-McGraw Hill Co., New Delhi.

Sharma, O. P. : Text Book of Fungi, Tata Mc Graw Hill Publishing Co., New Delhi.

Singh, S.K. & S. Srivastava : A Text Book of Algae. Gyan Books (P) Ltd.

Srivastava, A.K. : A Text Book of Fungi, Bacteria, Lichens & Viruses, Pragati Prakashan, Meerut.

SEMESTER - I

Paper 112 (Practical)

Full marks: 40 *Pass marks: 40%* *Terminal Examination: 30 marks* *Time: 3 hrs*

Internal Assessment: 10 Marks

Section- A : 7 marks

(i) Gram Staining and study of Root nodule bacteria & *Lactobacillus*

(ii) Morphological study of available algal specimens (minimum 5).

Section- B : 7 marks

(i) Study of Fungal specimens as given in the syllabus.

Section- C : 10 marks

(i) Work out Bryophytic specimens as given in the syllabus.

(ii) Work out Pteridophytic specimens as given in the syllabus.

Viva Voce : 3 marks

Practical Record : 3 marks

SEMESTER - II

BOT 121 : Phanerogams and Palaeobotany

Full Marks: 60 *Terminal Exam: 50 Marks* *Internal Assessment: 10 Marks*

UNIT I

Distribution, general characteristics of *Cycus*, *Pinus*, *Gnetum*, and their comparative study of morphology, anatomy, gametogenesis and embryology.

Concept of palaeobotany, Process of fossilization and study of following fossil types: *Rhynia*, *Psilophyton*, *Lyginopteris*, *Williamsonia*, *Pentoxylon*

UNIT II

Comparative study of following processes in gymnosperms and angiosperms: Micro and megasporogenesis; male and female gametophyte development; formation of pollen tubes; fertilization, endosperm development and embryogenesis.

UNIT III

Organization of root and shoot systems; general forms and modification of stem, leaf and root; adaptability of modified forms.

General concept of angiospermic flower and floral anatomy, Pollination, Self- incompatibility, Apomixis.

UNIT IV

Tissues - their structure, distribution and functions. Principles governing distribution of mechanical tissues.

Primary structures of root and stem; vascular cambium and its role in secondary growth; Anomalous primary structures; Anomalous role of vascular cambium.

UNIT V

Origin and phylogeny of Angiosperms; Concept of plant Systematics and taxonomic hierarchy; binomial nomenclature, systems of classification.

Suggested Readings

Bhojwani, S.S & S.P. Bhatnagar : The Embryology of Angiosperms. Vikas Publishing House, New Delhi.

Chambertain, C.J.: Gymnosperms, Structure and Evotution, CBS Publishers & Distribution. New Delhi . .

Dublish, P.K. & Agarwal, D.K. : An Introduction to Gymnosperms, Kedarnath Ramnath, Meerut.

Dutta, A. C. : Botany for Degree Students, Oxford University Press India.

Esau.K. 1997: Anatomy of Seed Plants. John Wiley and Sons. New York.

Johri, B.M. : Embryology of Angiosperms, Springer-Verlag, Berlin.

Maheshwari, P. : An Introduction to the Embryology of Angiosperms. McGraw-Hill edition.

Pandey, B.P. : Embryology of Angiosperms. S. Chand Limited.

Pandey, B.P. : Plant Anatomy. S. Chand Limited.

Shukla.A.C. & S.P. Mistra : Essentials of Palaeobotany. Vikas Publishing House Pvt. Ltd., New Delhi.

Sporne, K.R. 1977: The Morphology of Angisperms, B.I. Publication, Bombay.

Vasishta, P.C : Gymnosperm. S. Chand & Company Ltd, New Delhi.

SEMESTER - II

Paper 122 (Practical)

Full marks: 40 *Pass marks: 40%* *Terminal Examination: 30 marks* *Time: 3 hrs*

Internal Assessment: 10 Marks

1. Phanerogams : 10 marks

(i) Vegetative, reproductive and anatomical studies of following genera: *Cycas, Pinus, Ginkgo* and *Gnetum.*

(ii) Study of modified angiospermic plant parts.

(iii) Study of essential parts and symmetry of some angiospermic flowers and some special types of inflorescence.

(iv) Pollen viability test by hanging-drop technique in an angiosperm.

(v) Study of some fossil types.

2. Anatomy : 10 marks

(i) Anatomy of primary structure in stems and roots using double staining technique.

(ii) Study of primary and secondary anomalous structures.

(iii) Study of photosynthetic and mechanical tissues.

3. Spotting : 4 marks

Viva Voce : 3 marks

Practical record : 3 marks

SEMESTER - III

BOT 231 : Microbiology & Plant Pathology

Full Marks: 60 *Terminal Exam: 50 Marks* *Internal Assessment: 10 Marks*

UNIT I

Characteristic features of different groups of microorganisms - archaebacteria and eubacteria. Actinomycetes, Mycoplasmas. Structure of a bacterial cell: capsule, flagella, cell wall and endospore.

UNIT II

A brief account of genetic recombination in bacteria. Microbial nutrition, growth and metabolism, microbiology of soil and water. Classification of viruses, Structure of bacteriophages belonging to 'T' series, lytic and lysogenic cycles. Viroids and Prions.

UNIT III

Industrial applications of microbes: alcohol, organic acids (lactic, citric and acetic acid), antibiotics, single cell proteins. Microbes in food and agriculture: Cheese, biofertilizer.

UNIT IV

Concept of disease cycle, mechanism of disease development, Plant pathogen interaction. dissemination and transmission of plant pathogens. Plant disease management- chemical control, biological control, plant quarantine.

UNIT V

symptoms, causal organism, disease cycle, epidemiology and control measures of following diseases - Late blight of potato, Downy mildew of cucurbits, Powdery mildew of pea, Smut of wheat, Blast of Rice; Citrus Canker, Tomato mosaic disease.

Suggested Readings

Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K.

Bilgrami & Dube : A Text Book of Modern Plant Pathology. Vikash Pub.

Dubey, R.C & D.K. Maheswari : A Text Book of Microbiology. Sangam Books

-Hill Co. New Delhi.

Kumar, H.D. & S. Kumar : Modern Concept of Microbiology. Vikas Pub., New Delhi.

Mehrotra, R.S. : Plant Pathology. McGraw-Hill.

Patel, A. H. Industrial Microbiology. Macmillan India Limited

Pelczar, M.J. (2001) Microbiology, 5th edition, Tata Mc Graw -Hill Co, New Delhi.

Presscott, L. Harley, J. and Klein, D. (2005) Microbiology, 6th edition, Tata Mc Graw

Purohit, S.S. : Microbiology. Agrobios India.

Purohit, S.S. : Viruses, Bacteria and Mycoplasma, Oxford University Press.

Rangaswami, G. and Mahadevan, A : Diseases of crop plants of India. Prentice-Hall, India.

Singh, R.S. : Introduction to Principles of Plant Pathology, Oxford University Press

Singh, R.S. : Plant Diseases, Oxford & IBH.

SEMESTER - III

Paper 232 (Practical)

Full marks: 40 *Pass marks: 40%* *Terminal Examination: 30 marks* *Time: 3 hrs*

Internal Assessment: 10 Marks

1. Microbiology : 10 marks

(i) Calibration of Microscope: Determination of dimensions of micro-organisms included in the theory or any available materials.

(ii) Cultivation media for autotrophic and heterotrophic micro-organisms (cleaning of glassware, mineral media, complex media, solid media, sterilization).

(iii) Isolation of micro-organisms: streaking on agar plates / pour plate method, isolation of clones, preservation.

(iv) Determination of microbial population size (yeast, use of haemocytometer, serial dilution technique, relationship between dilution and cell count).

(v) Observation on virus infected plants (symptoms).

(vi) Microscopic study of Yeast and Cyanobacteria.

2. Plant Pathology : 10 marks

(i) Study of plant diseases included in the syllabus.

3. Spotting : 4 marks

Viva Voce : 3 marks

Practical record : 3 marks

SEMESTER - IV

BOT 241 : Plant Physiology

Full Marks: 60 *Terminal Exam: 50 Marks* *Internal Assessment: 10 Marks*

UNIT I

Water relations: diffusion, osmosis, osmotic potential, water potential and imbibition. Mechanism of water absorption, theories of cell permeability. Transpiration.

UNIT II

Mineral nutrition: Macro and micronutrients, deficiency symptoms. Mineral salt absorption: passive and active absorption, translocation in plants. Ascent of sap.

UNIT III

Photosynthesis: Plastidial and non-plastidial pigments, mechanism of light and dark reactions, CO_2 fixation in C_3, C_4 and CAM plants; law of limiting factors; photorespiration.

UNIT IV

Respiration and fermentation: mechanism of aerobic and anaerobic respiration and fermentation, pentose phosphate pathway, electron transport system and oxidative phosphorylation, RQ and factors affecting respiration.

UNIT V

Growth regulators: Plant growth regulators - natural and synthetic; role of growth hormones, photoperiodism and vernalization. Phytochrome: Structure and function. Seed dormancy. Senescence. Plant movements: autonomic and induced.

Suggested Readings

Ahmed, M. : Plant Physiology, Aavishkar Publishers Distributors.

Malik, C.P. : Plant Physiology, Kalyani publishers.

Moore, T.C. : Biochemistry and Physiology of Plant Hormones (2nd edition), Springer-Verlag, New York, USA.

Pandey, S.N. and Sinha, B.K. : Plant Physiology, Vikash Publishing House, New Delhi.

Pandy, S.N. : Plant Physiology, Vikas Publication House Pvt Ltd

Salisbury, F.B. and Ross, C.W. : Plant Physiology. Wadsworth Publishing Co., California. USA.

Taiz, L. & Eduardo Z. Plant Physiology 5th edn, Sinauer Associates Inc.

SEMESTER - IV

Paper 242 (Practical)

Full marks: 40 *Pass marks: 40%* *Terminal Examination: 30 marks* *Time: 3 hrs*

Internal Assessment: 10 Marks

1. **Plant Physiology : 8 + 8 + 4 + 4 = 24 Marks**
   - (i) Determination of DPD by weighing method.
   - (ii) Chlorophyll extraction and separation of four pigments.
   - (iii) Unequal rate of transpiration.
   - (iv) Transpiration and absorption.
   - (v) Ash analysis- Ca, Mg, P, S, K, Fe.
   - (vi) Determination of OP by plasmolytic method.
   - (vii) Evolution of oxygen in Photosynthesis – light intensity, quality of light and CO_2 concentration.
   - (viii) Ionic effect on imbibitions.
   - (ix) Osmotic effect on imbibitions.
   - (x) Temperature effect on cytoplasmic membrane permeablility.
   - (xi) Demonstration of electrical and mechanical absorption.
   - (xii) Demonstration of aerobic respiration in plant material.
   - (xiii) Demonstration of anaerobic respiration in plant material.
   - (xiv) To demonstrate that light, Co_2, chlorophyll pigments are essential for photosynthesis.
   - (xv) Demonstration of phototrophism, geotrophism, hydrotrophism
   - (xvi) Measurement of RGR and NAR.

Viva Voce : 3 marks

Practical record : 3 marks

SEMESTER - V

BOT 351 : Comparative study of cryptogams

Full Marks: 100 *Terminal Exam: 80 Marks* *Internal Assessment: 20 Marks*

UNIT I

Classification and general characteristics of major classes of algae, Pigmentation and storage products, Thallus organization and evolutionary tendencies, Mode of reproduction and life cycle pattern in Chlorophyceae, Phaeophyceae, and Rhodophyceae. Economic importance.

UNIT II

Classification of fungi, Structure, reproduction and life cycle of major classes of fungi.

Types of fungal reproductive structures and spores, Parasexulatilty. Evolutionary trends in fungi.

Lichens: General account, classification, structure and reproduction. Lichens as pollution indicator.

Economic importance of fungi and Lichens.

UNIT III

General features, classification, life cycle patterns, evolutionary significance and economic importance of bryophytes.

UNIT IV

General features and system of classification of Pteridophyta. Stellar types, Heterospory and evolutionary significance. Economic importance of Pteridophytes.

UNIT V

Classification of Gymnosperms and general account of morphology and reproduction of Cycadales, Ginkgoales, Coniferales and Gnetales. Phylogeny and affinity, distribution of Gymnosperms in India. Economic importance of Gymnosperms.

Suggested Readings

Alexopoulos, C.J., Mims, C.W. and Blackwell, M. 1996 Introductory Mycology, 4th edition, John Wiley and Sons.

Bhatnagar, S. P. and Moitra A. Gymnosperms. New Age Publishers, New Delhi.

Biswas, C. & B. M. Johri. 1997. Gymnosoperms. Narosa Publishing House. New Delhi.

Bold, H. C. and Wynne, M. J. Introduction to the algae: structure and reproduction. 3rd Edition. Prentice Hall of India Private Limited.

Dube., H.C. : A Text Book of Fungi. Vikas Publishing House (P) Ltd.

Kumar, H.D. 1999. Introductory Phycology. Aff. East -West Press Pvt Ltd., Delhi.

Lee, R. E. Phycology 4th edn, Cambridge University Press.

Misra, A. & R.P. Agarwal : Lichens – A Preliminary Text, IBH Publishing Co. N. Delhi.

Parihar , N.S: Bryophytes. Central Book Depot, Allahabad.

Parihar, N.S.: The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad

Round, F.E.: The Ecology of Algae. Cambridge University Press.

Van Den Hoek, C. Algae: An introduction to Phycology, Cambridge University Press.

Webster, J. Introduction to Fungi. Cambridge University Press.

SEMESTER - V

BOT 352 : Plant Systematics & Economic Botany

Full Marks: 100 *Terminal Exam: 80 Marks* *Internal Assessment: 20 Marks*

UNIT I

Aims and components of Systematics; introduction to identification, nomenclature, phylogeny and classification, taxonomic keys for identification. Herbarium specimens and their preparation.

UNIT II

ICBN: rules and recommendations; rules of priority and its limitations, type concepts and its applications; concept of biocode; Concept of species, genus and family. Detail study of Bentham and Hooker and Takhtajan system of classifications.

UNIT III

Modern Trend in Plant Taxonomy and classification; Role of anatomy, embryology, palynology in plant classification, Numerical Taxonomy, Chemotaxonomy, Cytotaxonomy, and Serotaxonomy.

UNIT IV

Affinities, phylogeny and comparative studies of the following representative families: Magnoliaceae, Fabaceae, Malvaceae, Apiaceae, Solanaceae, Lamiaceae, Rubiaceae, Asteraceae., Zingiberaceae, Poaceae, Orchidaceae.

UNIT V

Concept of ethnobotany**.** A brief account of ten important plant drugs and their chief constituents used in indigenous and allopathic systems of medicine. A concise account of natural rubber, gums & resins, insecticides and dyes.

Suggested Readings

Davis, P.H. and Heywood, V.H. : Principles of Angiosperm Taxonomy, Oliver and Boyd, London.

Heywood. V.H. and Moore. D.M .: Current Concepts in Plant Taxonomy. Academic Press, London.

Jain, S.K. : Glimpses of Indian Ethnobotany, Oxford & IBH.

Jones. S.B . Jr. and Luchsinger. A.E .: Plant Systematics. McGraw-Hili Book Co . New York.

Naik. V.N .: Taxonomy of Angiosperms, Tata McGraw Hill. New Delhi.

Pandey, B.P : Taxonomy of Angiosperms, Ane Books Pvt Ltd.

Pandey, B.P. : Economic Botany, S. Chand Limited

Sarma. O.P . 1996: Hill's Economic Botany. Tata McGraw Hill Publishmg Company Ltd .

Singh. G . 1999: Plant Systematics: Theory and Practice. Oxford & ISH Pvt . Ltd . New Delhi.

Trivedi, P.C.: Ethnobotany, Aavishkar Publishers.

SEMESTER - V

BOT 353 : Cell Biology, Genetics and Evolution

Full Marks: 100 *Terminal Exam: 80 Marks* *Internal Assessment: 20 Marks*

UNIT I

Structure of prokaryotic and eukaryotic cell, Cell membrane- Fluid mosaic model; Ultra structure of nucleus, mitochondria, and chloroplast; Cytoskeleton- components and functions.

UNIT II

Chromatin organization and packaging of genome. Structure and types of chromosome, Lampbrush, Polytene chromosomes, B-chromosome; Types of chromatin; Karyotype and its importance.

UNIT III

Cell cycle: Interphase and M phase, Stages of Mitosis, Mitotic spindle and chromosome movement, Process and stages of Meiosis.

UNIT IV

Mendel's Laws, Monohybrid and Dihybrid Crosses. Sex-linked Inheritance, Polygenic Inheritance, Extrachromosomal inheritance.

Structural and Numerical changes in chromosome; Polyploidy and crop improvement.

UNIT V

Origin of Life; Modern evolutionary principles, Evidences and Mechanisms of Evolution, Genetic drift, Speciation. Concept of gene pool and Hardy-Weinberg law.

Suggested Readings

Berry, A.K. : A Text Book of Cell Biology , Emkay Publications.

Devasena, T. : Cell Biology (Indian Edition), Oxford University Press.

Gupta, P.K. : Genetics, Rastogi Publications.

Hartl & Jones: Essential Genetics: A Genomic Perspective Jones & Bartlet

Rastogi, S.C. : Cell biology, New Age International.

Rastogi: Organic Evolution. Kedarnath & Ramnath.

Russel, P.J. : Genetics, The Benjamin/Cummings Publishing Co. Inc., USA.

Singh, B. D. Genetics. New Age International.

Snustad & Simmons: Principles of Genetics, John Wiley

Strickberger, MW.: Evolution. CBS, Publ. & Dist., New Delhi.

Striekberger, MW.: Genetics, Prentice Hall, New Delhi.

Sundara Rajan, S. : Introduction Cell Biology, Vikas Publishing House.

SEMESTER - V

Paper 354 (Practical)

Full marks: 100 Pass marks: 40% Terminal Examination: 80 marks Time:5 hrs

Internal Assessment: 20 Marks

Section- A : 15 marks

1. Algae, Fungi & Lichens
   (i) Study of algal specimens given in the theory.
   (ii) Study of fungal specimen thought in the theory.
   (iii) Study of various types of lichens.
2. Bryophytes & Pteridophytes
   (i) Study of morphology and anatomy of thallus and reproductive structures of *Marchantia, Anthoceros and Polytrichum or* any locally available specimens.
   (ii) Study of morphology & anatomy of roots, stems and reproductive structures genera included in the theory.
3. Gymnosperms
   (i) Study of morphology of representative genera included in the theory.
   (ii) Study of anatomy and reproductive structures of representative genera included in the theory.

Section- B : 15 marks

1. Taxonomic study of following representative genera:
   (i) Brassicaceae: *Brassica, Cardamine.*
   (ii) Malvaceae: *Hibiscus, Sida.*
   (iii) Rutaceae: *Murraya, Citrus.*
   (iv) Fabaceae: *Lathyrus, Cajanus, Melilotus, . Trigonella.*
   (v) Apiaceae: *Coriandrum, Foeniculum, Anethum.*
   (vi) Solanaceae: *Solanum, Withania, Datura.*
   (vii) Asterceae: *Ageratum, Euphatoriu.*
   (viii) Lamiaceae: *Ocimum, Salvia.*
   (ix) Poaceae: *Avena, Triticum, Hordeum, Poa, Sorghum.*
2. Study of economically important plants.

Section- C : 15 marks

(i) Squash technique for the study of stages of mitosis and meiosis.
(ii) Preparation of Polytene chromosomes from salivary glands of *Drosophila* or *Chironomus* larvae.
(iii) Karyotype analysis and preparation of Idiogram from given photograph of a chromosome set.
(iv) Identification of primary and secondary constrictions and Satellite chromosome.
(v) Verification of Mendelian ratios and Chi square analysis.

Section- D

(i) Collection of herbarium/specimens 10 marks
(ii) Spotting 9 marks

Viva Voce 8 marks

Practical records 8 marks

SEMESTER - VI

BOT 361 : Environmental Biology & Biostatistics

Full Marks: 100 *Terminal Exam: 80 Marks* *Internal Assessment: 20 Marks*

UNIT I

Ecosystem - Concept, abiotic and biotic components; food chain, food web, ecological pyramids; Energy flow, Biochemical cycles (N and P), primary productivity and its measurement.

UNIT II

Population ecology - Population characteristics; ecotypes and ecads, population growth, mechanisms of population differentiation.

Comm **UNIT**y ecology - Comm **UNIT**y characteristics; frequency, density, IVI; life forms and biological spectrum, species diversity, niche concept, plant interrelationships.

UNIT III

Ecological succession: mechanism and types; nature of climax.

Major biomes of the world; Factors regulating distribution of plants, endemism, isolation and speciation; Phytogeographical regions of India; Vegetation types of North-East India.

UNIT IV

Environmental pollution - Sources and kinds of air, water and soil pollution.

Impact of water pollution on aquatic ecosystems, eutrophication.

Impact of air pollution on plants; acid rain - causes and effects.

Impact of soil Pollution on plants and ecosystems. Ecorestoration.

UNIT V

Utility of biostatistics. Sources of data, Presentation of data by frequency tables, diagrams and graphs. Measures of central tendency: mean, median and mode. Measures of dispersion: range, standard deviation and standard error of mean; t-test and Chi-square test.

Suggested Readings

Ambasht, R.S .: A Text Book of Plant Ecology, 15th Ed, Students Friends Publishers, Varanasi.

Ambasht, R.S and Ambasht, P. K. Environment and Pollution. CBS Pub.

Banerjee, P.K. Introduction to Biostatistics: A Textbook of Biometry. S Chand & Company.

Balaji, K., Raghavaiah, A.V.S. & Jayaveera, K.N. Biostatistics. I.K. International Pub. House

Koromondy, E.J.: Concepts of Ecology, Prentice Hall of India Pvt. Ltd., New Delhi.

Odum, E.P.: Fundamental of Ecology, Natraj Publishers, Dehra Dun.

Sharma, P. D. : Ecology and Environment, Rastogi Pub.

Singh, J. S., Singh, S. P. and Gupta, S. R. Ecology, environment and resource conservation. Anamaya Publishers, New Delhi.

Rajagopalan, R.: Basics of Environmental Studies, 1st Ed., (Indian Edition), Oxford University Press.

Grafen, A. & Hails, R. Modern Statistics for the Life Sciences, 1st Ed., (Indian Edition), Oxford University Press.

SEMESTER - VI

BOT 362 : Biochemistry and Biological Techniques

Full Marks: 100 *Terminal Exam: 80 Marks* *Internal Assessment: 20 Marks*

UNIT I

Chemical bonds and energy, Properties of water as biological solvent.

Amino acids: Structure and classification, Protein structure and conformation.

Carbohydrates: Classification and nomenclature, Monosaccharides, disaccharides and polysaccharides. Reducing and non-reducing sugars.

Structure and Conformation of DNA and RNA, Physical and Chemical properties of Nucleic acids.

UNIT II

Enzymes: General properties, classification and nomenclature, prosthetic group, cofactors and co-enzymes, mechanism of enzyme action, factors affecting enzyme action.

UNIT III

Lipid metabolism: saturated and unsaturated fatty acid. Oxidation of fatty acid (B-oxidation).

Nitrogen metabolism: biological nitrogen fixation and its significance, Nitrate metabolism: Uptake and reduction into ammonia, ammonia assimilation

UNIT IV

Methods of sterilization: Physical and chemical methods. Fixation, staining and Microtomy. Working principle and application: pH meter, Centrifuge and Spectrophotometer.

Types of microscopes - Bright field , Phase contrast, Fluorescence, Transmission and Scanning electron microscopes. Concept of magnification and resolution.

UNIT V

Principle and application of various chromatographic techniques (paper, thin layer, column chromatography)

Gel electrophoresis (Agarose and SDS-PAGE). Autoradiography. DNA sequencing -dideoxy method. Polymerase chain reaction. DNA fingerprinting.

Suggested Readings

Boyer : Modern Experimental Biochemistry, Benjamin-Cummings.

Cooper T. G. 2011. The Tools of Biochemistry. Wiley Inter-Science.

Elliott, W. H. & Elliott D. C. Biochemistry and Molecular Biology, 4th Ed., (Indian Edition), Oxford University Press.

Jain, J.L. : Fundamentals of Biochemistry. S. Chand & Co Ltd, India

Johansen, D.A. : Plant Microtechnique. McGraw-Hill.

Kaul, R. P. Plant Metabolism. Swastik Publishers and Distributors.

Lehninger, Nelson & Cox: Principles of Biochemistry, Sixth Edition, W H Freeman.

Pearse: Histochemistry - Theoretical and applied, Volume I-III, Churchill.

Prasad and Prasad : Outlines of Botanical Micro technique. Emkay publishers.

Rana, S.V.S. : Biotechniques – Theory and Practice. Rastogi Publication.

Wilson & Walker: Experimental Biochemistry, Cambridge University Press.

SEMESTER - VI

BOT 363 : Molecular Biology, Plant Biotechnology and Bioinformatics

Full Marks: 100 *Terminal Exam: 80 Marks* *Internal Assessment: 20 Marks*

UNIT I

DNA replicalion: Formation of Replication fork, Synthesis of DNA, Okazaki fragments. Types and functions of DNA polymerases in *E. coli,* General information about Helicase, Primase, Gyrase and Ligase.

UNIT II

Structure and organization of gene; Gene Expression: Transcriptional **UNIT**, basic concept of transcription (Prokaryotes). *Lac* operon. Pre mRNA processing in Eukaryotes. Nature and Characteristics of the Genetic Code, Protein synthesis in *E.* coli.

UNIT III

Mutations: Spontaneous and Induced mutations, physical and chemical Mutagens, Molecular basis of mutations, DNA repair.

UNIT IV

Tissue Culture: Concept of Totipotency and cellular differentiation; important media and sterilization techniques; micropopagation; somatic embryogenesis; somaclonal variation; protoplast fusion. Synthetic seed.

UNIT V

Recombinant DNA, Vectors and gene cloning, genomic and cDNA libraries, Gene transfer technologies (*Agrobacterium* mediated, particle gun method), Transgenic Plants and their significance.

Bioinformatics: Introduction to Bioinformatics, branches of Bioinformatics, biological databases and information retrieval system, Application of Bioinformatics.

Suggested Readings

Dubey R.C : A text book of Biotechnology. S. Chand, Limited

Ghosh, Z. & B. Mallick : Bioinformatics: Principles and Applications. Oxford University Press.

Gupta, P.K. : Cell and Molecular Biology. Rastogi Publications.

Kalyan Kumar, D. : An Introduction to plant tissue culture. NCBA, Kolkata.

Kar, D.K. & S. Halder : Cell Biology, Genetics, Molecular Biology. NCBA, Kolkata.

Karp: Cell and Molecular Biology, John Wiley.

Kumar, H.D. : Molecular biology. Sangam Books Ltd.

Lesk, Arthur. Introduction to Bioinformatics 3rd Ed. (Indian Edition), Oxford University Press

Rastogi, S. & Pathak, N. Genetic Engineering, 1st Ed., (Indian Edition), Oxford University Press.

Narayanaswamy, S. : Plant Cell & Tissue Culture. McGraw Hill, India.

Pal, J. K. & Ghaskadbi, S. S. Fundamentals of Molecular Biology, 1st Ed., (Indian Edition), Oxford University Press.

Purohit, S.S. and Mathur, S.K. : Biotechnology: Fundamental and Applications, Agro Botanica, India.

Razdan, M. K. (2004). Introduction to Plant Tissue Culture. 2nd ed. Oxford & IBH, New Delhi.

Singh, B.D. : Biotechnology: Expanding horizons. Kalyani Publishers.

Sundararajan, S. & R. Balaji : Introduction to Bioinformatics. Himalaya Publishing House.

SEMESTER - VI

Paper 364 (Practical)

Full marks: 100 Pass marks: 40% Terminal Examination: 80 marks Time:5 hrs
Internal Assessment: 20 Marks

Section- A : 24 marks

(i) To compare the chemical characteristics of given soil samples by the use of rapid tests: Moisture content, carbonate content, nitrate content, base deficiency and pH.

(ii) To determine the working and use of instruments for the measurement of temperature (soil, air, water), moisture (rainfall, relative humidity, soil moisture), wind (velocity and direction) and light intensity.

(iii) To study selected soil properties by spot test: Texture. pH. carbonate. nitrate. base deficiency and reductivity.

(iv) To study ecological adaptations (morphological and anatomical) in plants (hydrophytes, Xerophytes, epiphytes).

(v) To determine minimum area of sampling **UNIT** (quadrat) for the study of grassland comm **UNIT**y.

(vi) Determination of species area curve by minimal quadrate size.

(vii) Analysis of the herbaceous vegetation for frequency, density and abundance.

(viii) To study leaf form spectrum of a woodland.

(ix) Analysis of different water samples for pH, oxygen, carbon-dioxide (titrimetric estimation), turbidity and temperature.

Section- B : 24 marks

(i) Preparation of suspension, emulsion, reversible gel, lyophilic and lyophobic Sols, Brownian movement.

(ii) Tests for glucose, starch, cellulose, hemicellulose amino acids, proteins, fats and oils.

(iii) Activity of catalase in plant tissue.

(iv) Activity of amylase in plant tissue.

(v) pH effect on enzyme activity.

(vi) Demonstration of the technique of micro-propagation by using different explants, e.g. axillary buds, shoot meristems.

Section- C : 16 Marks

(i) Demonstration of the components of the compound and light microscope. Use of condenser, mirror, iris for better image quality and contrast. Use of 10x, 40x and 100x oil immersion objective lenses.

(ii) Micrometry: calibration of ocular micrometer and determination of object size under 10x. 40x and 100x objective lenses.

(iii) Chromatographic separation of amino acid, plant pigments.

(iv) Agarose Gel electrophoresis.

(v) Elementary knowledge about NCBI website.

Viva Voce : 8 Marks

Practical records : 8 Marks
