PSG College of Arts & Science

An Epitome of Quality Learning

Since 1947

M.Sc. BOTANY

2017 - 2019

MSc Botany
Scheme of Examinations
(For students admitted from June 2014 - 15 & onwards)
(Regulations as applicable to students admitted in PG programmes offered in the College)

Code No.	Subject	Duration (Hrs)	Max. Marks			Credit Points
			CA	CA	TOTAL	
FIRST SEMESTER						
14BOP01	Plant Diversity – I	3	25	75	100	5
14BOP02	Plant Diversity – II	3	25	75	100	5
14BOP03	Applied Microbiology	3	25	75	100	5
14BOP04	Cytology and Tissue Biology	3	25	75	100	5
	Botany Practicals – I	-	-	-	-	*
SECOND SEMESTER						
14BOP05	Anatomy and Embryology	3	25	75	100	5
14BOP06	Advanced Molecular Biology	3	25	75	100	5
14BOP07	Genetics and Plant Breeding	3	25	75	100	5
14BOP08A 14BOP08B	**Core Elective – I** Concepts of Bioinformatics OR Horticulture and Plantation Crops	-	100	-	100	5
14BOP09	Botany Practicals – I	4	40	60	100	2
14BOP10	Botany Practicals – II	4	40	60	100	2
14BOP11	Mini Project/ Industrial Training/ Field Visit	-	40	60	100	2
14SBP01	**Skill Based Subject :** Cyber Security	---	100	---	100	2
THIRD SEMESTER						
14BOP12	Taxonomy and Economic Botany	3	25	75	100	5
14BOP13	Medicinal Plant Resources	-	100	-	100	5
14BOP14	Biotechnology & Genetic Engineering	3	25	75	100	5
14BOP15A 14BOP15B	**Core Elective – II** Plant Tissue Culture OR Plant Pathology	3	25	75	100	5

Cont …

Code No.	Subject	Duration (Hrs)	Max. Marks			Credit Points
			CA	CA	TOTAL	
14BOP16A 14BOP16B 14BOP16C	**CLUSTER IDC** Silkworm Rearing (IDC – ZO) OR Nutrition for Life Style Disorders (IDC - CN) OR Foods, Genes and Diseases (IDC - BT)	3	25	75	100	4
	Botany Practicals – III	-	-	-	-	*
FOURTH SEMESTER						
14BOP17	Environmental Botany	3	25	75	100	5
14BOP18	Plant Physiology and Biochemistry	3	25	75	100	5
14BOP19	Botany Practicals – III	4	40	60	100	2
14BOP20	Botany Practicals – IV	4	40	60	100	2
14BOP21	Project &Viva-voce	-	80	120	200	4
			Total Credits			**90**

Code No.	Cluster IDC offered by Botany Department	Hours of Instruction	Exam hour Duration	Maximum Marks			Credit Points
				CA	CE	Total	
14ZOP17A/14CNP19A/ 14BTP18A	Food and Medicinal Resources (For MSc Zoology, Clinical Nutrition & Biotechnology)	4	3	25	75	100	4

FIRST SEMESTER

14BOP01 **PLANT DIVERSITY - I**

PHYCOLOGY, MYCOLOGY, LICHENOLOGY AND BRYOLOGY

65 hours

Aim: To learn the diversity, complexity and the economic value of Cryptogamic plants

Unit I

Algae

History of Phycology, Classification of Algae (Fritsch F.E., 1945). General Characteristics, Thallus Variations, Reproduction, Distribution and reserve food of major classes of algae (Chlorophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae) Economic Importance of Algae. **15 hours**

Unit II

Algae

Range of thallus structure, Origin and Evolution of Sex in algae. Lifecycle Patterns in algae and alternation of generations. Ecology of Algae. Mass Cultivation of fresh water algae. **11 hours**

Unit III

Fungi

Historical and Indian contributions in Mycology, Classification of Fungi (Alexopoulous,1962), General Characters, Occurrence, Distribution, Mode of nutrition, and Reproduction of major classes (Oomycetes, Deuteromycetes, Ascomycetes, Basidiomycetes), Economic Importance of Fungi. **13 hours**

Unit IV

Fungi

Homothallism and Heterothallism in fungi. Reproduction, Types of life cycle, parasexual cycles, Reduction in sexuality in fungi. Spore Dispersal Mechanisms and Fungal Genetics.

Lichen

General Features, Distribution, Classification (Miller 1984), Structure, Reproduction and Physiological Characteristics of Lichen thallus, Uses of lichens. **13 hours**

Unit V

Bryophyta

General Characteristics and Classification of Bryophytes (Watson 1955). Salient features, Vegetative and Sexual Reproduction, Spore Dispersal Mechanisms in major groups (Marchantiales, Jungermaniales and Funariales), Evolution of Gametophytes and Sporophytes. Ecological and Economic Aspects of Bryophytes. **13 hours**

REFERENCES / TEXT BOOKS

1. Bold, H. C. and Wyne, M. J. (1978). Introduction of Algae - Structure and Reproduction. Prentice Hall, New Jersey.
2. Vashishta, B.R. (1979). Botany for Degree students - Bryophyta. S. Chand & Company LTD., New Delhi.
3. Smith, G. M. (1979). Cryptogamic Botany. Vol. II. Tata McGraw Hill, New Delhi.

4. Hale, M. E. Jr. (1983). Biology of Lichens. Edward Arnold, Maryland.
5. Srivastava.H.N.(2004).Bryophyta. Pradeep publications.
6. Vashishta .B.R., A.K.Sinha and V.P.Singh (2005). Botany for Degree students – Algae. S. Chand & Company LTD., New Delhi.
7. Sambamurthy. A.V.S.S (2006). A Textbook of Algae. I.K.International Pvt.Ltd. New Delhi.
8. Pandey.S.N.and P.S.Trivedi (2006). A Textbook of Botany Volume – I.Vikas Publishing house Pvt. Ltd.
9. Vashishta, B. R. and Sinha, A. K. (2007). Botany for Degree Students - Fungi. S. Chand and Co. Ltd., New Delhi.
10. Pandey.B.P (2009).College Botany-Volume-I. S. Chand & Company LTD., New Delhi.

FIRST SEMESTER

14BOP02 PLANT DIVERSITY- II

PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

65 hours

Aim : To understand the Classification and Identification of various forms of Pteridophytes, Gymnosperms and Fossils

Unit I

Pteridophytes

General Characters and Origin of Pteridophytes. Classification of Pteridophytes (Reimers,1954). Morphology, Anatomy and Reproduction of the following orders: Psilotales, Lycopodiales and Equisetales. **13 hours**

Unit II

Pteridophytes

Morphology, Anatomy and Reproduction of the following orders: Marsileales, Filicales and Salviniales. Stelar Evolution in Pteridophytes, Heterospory and Origin of Seed Habit. Economic Importance of Pteridophytes. **13 hours**

Unit III

Gymnosperms

General Characteristic Features of Gymnosperms. Origin of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). General Account of Pteridospermales, Bennetittales and Pentoxylales. **13 hours**

Unit IV

Gymnosperms

Distribution, Morphology, Anatomy and Reproduction of Cycadales, Coniferales and Gnetales. Economic importance of Gymnosperms. **13 hours**

Unit V

Paleobotany

Concepts of Paleobotany, Geological Time Scale. Techniques for paleobotanical study. Fossil types. Fossil Algae, Fungi and Bryophytes. Age determination and methods of study of fossils. **13 hours**

REFERENCES / TEXT BOOKS

1. Gilbert M. Smith (1955). Crytogamic Botany, Bryophytes and Pteridophytes Vol. II. Mc Graw Hill Book Company, INC. New York. Toronto, London, Kogakusha Company LTD, Tokyo.
2. Parihar, N. S. (1977). The Biology and Morphology of the Pteridophytes. Central Book Depot, Allahabad.
3. Shukia, A and Mishra S.P (1982). Essentials of Paleobotany. Vikas Publishing House Pvt. Ltd. Delhi.
4. Pandey, B.P. (1993). The Text Book of Botany - Gymnosperms. S. Chand and Co. Ltd., New Delhi.
5. Pandey, S.P. *et al* (2003). A Text Book of Botany- Vol. II. Vikas Publishing House Pvt. LTD, New Delhi.
6. Pandey, S.N., S.P. Mishra, P.S. Trivedi (2003). A text Book of Botany - Bryophyta, Pteridophyta, Gymnosperm and Palaeobotany Vol. II. Vikas Publishing house Pvt. LTD. New Delhi.

7. Sri Vastava, H.N. (2004). Gymnosperms for undergraduate students. Pradeep Publications, Jalandhar (India).
8. Vashista, P.C., A.K. Sinha and Anilkumar (2006) Botany for Degree students Gymnosperms. S. Chand & Company LTD, New Delhi.
9. Sambamurthy, A.V.S.S. (2009). Taxonomy of Angiosperm, Published by I.K. Intrenational Pvt. Ltd. Delhi.
10. Singh, V., Pande, P.C. and Jain, D.K. (2010). A text Book of Botany, Rastogi Publications, Meerut, India.
11. Pandey, B.P. (2012). College Botany Vol. II. S. Chand and Co. Ltd., New Delhi.

FIRST SEMESTER

14BOP03 APPLIED MICROBIOLOGY 65 hours

Aim:

1. To learn different types of microorganisms and their activities.
2. To study various structural diversity, nutritional variations and exploit their potentialities in industry

UNIT I

General Microbiology / Fundamentals of Microbiology

History and scope of Microbiology. Principles and applications of SEM & TEM, Staining Techniques, Sterilization, Media Preparation for Bacteria and Fungi, Culture Techniques – Pour, Spread, Streak methods. **11 hours**

UNIT II

Microbial Distribution, Decomposition & Virology

Microbial Communities in Soil, Water, Air and Extreme Environments. Microbial Decomposition – Cellulose, Hemicellulose, Lignin, Pectin and Chitin – Factors influencing degradation. Viruses – General Features, Classification, Characteristics and Ultrastructure of Virus. Isolation and Purification of Virus, Transmission of Virus, Structure and Multiplication of TMV and T_4 Phage. Transduction.

15 hours

UNIT III

Bacteriology

Bergey's system of Bacterial Classification. Ultrastructure of Bacterial cell. Bacterial Nutrition. Bacterial Growth, Reproduction and Economic Importance.

Clinical Microbiology

Causal Organism, Disease Cycle and Control measures of

Viral Diseases - Influenza, Measles.

Bacterial Diseases – Pneumonia, Tuberculosis.

Fungal Diseases - Aspergillosis, Candidiasis. **15 hours**

UNIT IV

Industrial Microbiology

Production Strain, Production Media, Industrial Sterilization, Fermentation – Submerged and Solid State, Fermentors Configuration, Production of lactic acid, acetic acid and SCP. Fermented foods (Yogurt and Cheese). **11 hours**

UNIT V

Food Microbiology

General Characteristics of Common Food Spoiling Organisms, Factors affecting the microbial growth, Food Spoilage, Food Preservation and Food Borne Diseases (Food Borne Infections and Food Poisoning), Food Safety and Quality Control. **13 hours**

REFERENCES / TEXT BOOKS

1. Desikachary, T.V. (1959). Cyanophyta ICAR N.Delhi.
2. Frazier, W.C. and D.C. Westhoff (1978). Food Microbiology**.** Univ. of Wisconsin, Madison, Wisconsin. USA.
3. A. H. Patel (1985). Industrial Microbiology, McMillan (India) Ltd., Bombay
4. Prescott. L.m.J.P.Harley and C.A.Klein (1995). Microbiology 2nd edition, C.Brown Publishers.

5. Sharma, P.D. (2005). Environmental Microbiology Alpha Science International.
6. Sharma, O.P (2005). A Text Book of Fungi, Tata McGraw-Hill Publishing Co., New Delhi-
7. Kanika Sharma. (2005). Manual of Microbiology Tools and Techniques. Ane Books, New Delhi.
8. Dubey, R.C. and D.K. Maheswari (2005). The Text Book of Microbiology -. S. Chand and Co. New Delhi.
9. Vashishta, B. R., A. K. Sinha and V. P. Singh. (2008). Botany for Degree Students: Algae. S. Chand & Company Ltd, New Delhi.

FIRST SEMESTER

14BOP04 CYTOLOGY AND TISSUE BIOLOGY 65hours

Aim: To understand the Structural and Functional Elements of Plant cells and tissues constituting the plant body.

Unit I

Plasma Membrane - Biochemical Composition, Various Structural Models and Functions.

Cytoplasm - Physical Nature and Chemical Organization of matrix, Properties of Cytoplasmic matrix. Origin, Structure, Growth, Functions, Chemical Composition of Extra Cellular Matrix (Cellwall),Endoplasmic reticulum, Dictyosomes and Vacuoles.

13 hours

Unit II

Classification of Plastids - Origin, Structure, Biochemical Composition, Genome Organization and Functions of Chloroplasts and Mitochondria. **Ribosomes** – Occurrence & Distribution, Method of Isolation, Types, Structure, Composition, Functions and Biogenesis. **13 hours**

Unit III

Biochemical Composition, Structure and Functions of Nucleus, Microtubules, Centrioles, Cilia and Flagella. Numerical and Structural Variations in Chromosomes, Chromosome banding and Ultra structure. Structure, behavior and Significance of special types of chromosomes. **13 hours**

Unit IV

Chromosomal aberrations – Causes, Autonomous and Induced - Deficiencies, Duplications, Inversions (Para Centric and Peri Centric) and Translocations.

Cell Division – Process of Mitosis & Meiosis. Physico – Chemical Characteristics of Mitotic Apparatus, Mitotic Poisons, Spindle Dynamics and Anaphasic movements. Cell growth and Aging. **13 hours**

Unit V

Apical Organization - Structure and Types of Meristem, Occurrence, Structure and Functions of Parenchyma, Collenchyma, Sclerids, fibres, Primary and Secondary Xylem, Phloem and Laticifers. **13 hours**

REFERENCES / TEXT BOOKS

1. Powar, C.P. (1977). Cell Biology. Himalaya Publishing House, Nagpur.
2. Katherine Esau, (1977). Anatomy of Seed Plants, 2nd edition. John Wiley & Sons, inc. NY.
3. Archana Sharma (1985). Chromosomes. Oxford and IBH Publications, New Delhi.
4. Vashista, P.C. (1986). Plant Anatomy. Pradeep Publications, Jalandhar.
5. Pandey, B.P. (1993). Plant Anatomy. S. Chand & Co. New Delhi.
6. Berry, A. K. (1998). A Text Book of Cell Biology. Emkay Publications, New Delhi.
7. Verma, P.S. and V. K. Agarwal (Reprint 2008). Cytology. S.Chand & Co. New Delhi.

SECOND SEMESTER

14BOP05 ANATOMY AND EMBRYOLOGY 65 hours

Aim: Understanding the internal structural details of various plant parts, Process of growth and reproduction of Angiosperms.

Unit I

Primary and Secondary Structures of Stem and Root of Monocot and Dicot Plants. Process of Secondary Growth in Dicot Stem and Root. Anomalous Secondary Growth (various positions and activities of cambium). Structure and Ontogeny of Monocot and Dicot Leaves. Nodal Anatomy. **15 hours**

Unit II

Anatomical Adaptations of Epiphytes and Parasites. Floral Anatomy (Vasculature of floral parts). Anatomy of Cotyledons, Hypocotyle, Seedling Root and Coleoptiles. Anatomical features of fruit wall (dry & fleshy) and Seed coat. **13 hours**

Unit III

Structure and Development of Anther and Male Gametophyte. Abnormal Pollen germination. Palynology- Pollen Morphology, Viability, *invitro* Pollen Germination. Stigma Pollen Compatibility. **13 hours**

Unit IV

Structure and Types of Ovules, Fertilization and Post fertilization changes. Structure and Development of Embryosac, Endosperm and Embryo (Monocot & Dicot).

13 hours

Unit V

Polyembryony – Types, Induction and Significance.
Apomixis-Types, Classification, Significance, Causes and Apospory.
Parthenocarpy, Dispersal of Fruits and Seeds. **11 hours**

REFERENCES / TEXT BOOKS

1. Maheswari, P. (1950). Introduction to Embryology of Angiosperms. Mc Graw Hill Publications, New York.
2. Maheswari, P. (1963). Recent Advances in Embryology of Angiosperms, Intl Soc. Plant Morphol, New Delhi.
3. Eames, A.J. and Mc Daniels, (1976). An Introduction of Plant Anatomy.
4. Katherine Esau, (1977). Anatomy of Seed Plants, 2nd edition. John Wiley & Sons, inc. NY.
5. Gangulee, Das and Datta (1986). College Botany Vol. I. & II New Central Book Agengy, Calcutta.
6. Vashista, P. C. (1986) Plant Anatomy. Pradeep Publications, Jalandhur.
7. Muneeswaran, A. (1990). Embryology of Angiosperms. Rastogi & Co., Meerut, India.
8. Bhojwani, S.S. and Bhatnagar, S.P. 1993. The Embryology of Angiosperms. Vikas Publishing Home (P) Ltd. New Delhi.
9. Pandey, B.P. (1993). Plant Anatomy. S. Chand & Co. New Delhi.

SECOND SEMESTER

14BOP06 ADVANCED MOLECULAR BIOLOGY 65 hours

Aim: To understand the chemistry, three-dimensional structures of protein and regulation of gene expression.

Unit I

Classification of Proteins based on composition and solubility. Physical and chemical properties of proteins. Chemical Configuration, Structure and Biological Importance of Proteins, Protein Sorting – Targeting of Proteins into Organelles. **11 hours**

Unit II

Chemistry of the gene: Nucleic acids as genetic material; Structure of DNA (different forms) and RNA (different types); Replication of DNA and RNA, Models of DNA replication with experimental evidences. Organization of genetic material – nucleosome concept, techniques involved in nucleosome discovery. **15 hours**

Unit III

Chromosomal DNA content, C-Value Paradox; repetitive DNA, Satellite DNA; Selfish DNA, Mechanism of DNA replication (Linear and Circular DNA), Repair mechanisms, Enhancer element, DNA Dependent RNA. Initiation of transcription, Post transcriptional changes in RNA. Functions of RNA. **13 hours**

Unit IV

Genetic code (Triplet nature, degeneracy, universality, non overlapping nature of Codes, Wobble hypothesis and colinearity of gene and polypeptide). Protein synthesis- Translation - binding of mRNA to ribosomes, aminoacid activation. Initiation of polypeptide, chain elongation, chain termination and fate of Mrna

13 hours

Unit V

Regulation of Gene Expression in Prokaryotes - Repression, Induction (*Lac* operon and *trp* operon). Regulation of Gene Expression in Eukaryotes - Britten Davidson's Model, DNA Methylation, Regulation of Gene Expression by Intracellular and Intercellular Signals and Phages. Expression of lysis and lysogeny in Lambda phage.

13 hours

REFERENCE / TEXT BOOK

1. Powar, CB. (1981) Cell Biology, Himalaya Publications. Nagpur.
2. Jain, J.L. (1992). Fundamentals of Biochemistry. S.Chand and Co. New Delhi.
3. Sandhyamitra (1996) Genetics a Blue Print of Life Tata Mc graw Hill Publishing Company LTD. New Delhi.
4. Meyyan, R.P. (1999). Genetics. Saras Publication. Nagercoil.
5. Arumugam, N. (2001). Cell Biology. Saras Publication. Nagercoil.
6. Jeyanthi, G.P. (2009). Molecular Biology. MJP Publishers, Chennai.
7. Gupta, P.K. (2012). Genetics. Rastogi Publicatioins, Meerut.

SECOND SEMESTER

14BOP07 GENETICS AND PLANT BREEDING 60 hours

Aim: To understand the basic principles of heredity and the role of genetics in breeding crops.

UNIT I

Genetics - Principles of Mendelian Inheritance. Deviation from Mendelian ratio. Incomplete Dominance (Mono and Dihybrid), Lethal Factor. Interaction of Genes, Multiple Alleles - Skin Colour in Rodents and Blood Groups in Man. **10 hours**

UNIT II

Linkage, Crossing over, Recombination, Mapping of genes on the chromosomes, Computer Assisted Chromosome Analysis, Chromosome – Microdissection and Microcloning, Sex Linkage - Drosophila (Eye Colour) and Humans (Colour Blindness), Cytoplasmic Inheritance, Sex Determination in Drosophila, Humans and Plants, Quantitative Inheritance, Multiple Factor Hypothesis (Kernel Colour in Wheat and Skin Colour in Human Beings). **14 hours**

UNIT III

Gene Mutation, Detection of Mutation by CIB Method and Muller - 5 method, Biochemical Mutants in Bacteria and Neurospora. Detection of Mutation in Bacterio-phages and higher plants. Molecular Basis of Mutation, Physical and Chemical Mutagens. Extrachromosomal Inheritance – Inheritance of Kappa Particles in *Paramecium*, Inheritance of Plastids and Male Sterility in Plants. **12 hours**

UNIT IV

Objectives of Plant Breeding, Plant Introduction- Purpose, Procedure and Types of Introduction and Acclimatization. Selection Methods : Mass, Pure- line and Clonal. Hybridization types, Techniques and Methods, Mutation Breeding, Breeding for disease resistance, Hybrid vigor and its Importance. **12 hours**

UNIT V

Genetical Improvement of Cultivated crops - Paddy, Wheat, Cotton, Sugarcane and Redgram. **12 hours**

REFERENCE / TEXT BOOKS

1. Dnyansagar, V.R. (1986).Cytology and Genetics, Tata McGraw Hill, New Delhi.
2. Gupta, P.K. (1987). Genetics. Rastogi Publicatioins, Meerut.
3. Veer Bala (1991). A Text Book of Genetics. Rastogi, Kedar Nath Ram Nath, Meerut.
4. Sandhyamitra (1996). Genetics a Blue Print of Life Tata Mc graw Hill Publishing company LTD. New Delhi.
5. Vijendra Das L.D. (1998). Plant Breeding. Age international (p) Limited Publishers, New Delhi.
6. Meyyan, R.P. (1999). Genetics. Saras Publication. Nagercoil.
7. Darbeshwar Roy (2000). Plant Breeding Analysis and Exploitation of Variation. Narosa Publishing House, New Delhi.
8. Shukla, RS and P.S. Chandel (2004). Cytogenetics, Evolution and Plant Breeding. S. Chand & Company, New Delhi.
9. Verma, P.S. and V.K. Aggarwal (2006). Genetics. S. Chand & Company, New Delhi.
10. Gupta, P.K. (2012). Genetics. Rastogi Publicatioins, Meerut.

CORE ELECTIVE - I

14BOP08A CONCEPTS OF BIOINFORMATICS 60 hours

Aim: To Understand the Basics of Computer, Biological Database, Sequence Analysis and Drug Designing.

Unit I

Basics of Computer and Internet

Computer - Introduction, History, Hardware - Types of Computer, Components of a Computer Input / Output Devices. Software, Introduction to Programming Languages, Operating Systems - DOS, Windows and Linux. Windows - MS Word, MS Excel, MS Power Point, File Formats - Extensions, Image files, Internet - Internet Protocols, Websites, Web Pages, Email, Search Engines & E - Journals. **12 hours**

Unit II

Bioinformatics

Introduction to Bioinformatics, History, Applications and Scope of Bioinformatics, Bioinformatics in India. Databases – Biological Databases – Primary, Secondary and Composite Database, Protein Sequence Database & Structural Database. Genbank, Small Molecular Database, Metabolic Pathway Database, Model Organism Database - *Arabidopsis thaliana* and *Cyanobacteria*. **12 hours**

Unit III

Genomics and Proteomics

Genome, Genome Sequencing Techniques, Structural Genomics, Functional Genomics, Comparative Genomics and Genome Assembly. Proteomics, Classification of Proteomics, Protein Microarray, Datamining and Significance of Proteomics. Proteomic analysis, Secondary Structure Prediction and Homology Modeling. **12 hours**

Unit IV

Sequence Analysis and Phylogenetic Analysis.

Sequence Alignment, Global Vs Local Alignment, Comparison of Sequences, methods of sequence alignment and Multiple sequence alignment. Phylogenetic analysis, types, Molecular Clock Theory, Methods of Phylogenies, Phylogenetic trees and its applications. **12 hours**

Unit V

Drug Discovery

Role of Bioinformatics in Drug Discovery, Target Analysis, Lead Designing, Drug Discovery in India, Pass Prediction, QSAR - Principles of QSAR, Physico - Chemical Properties, QSAR methods. Docking - Different Methods of Docking and Uses **12 hours**

PRACTICALS

1. Creating a document and formatting
2. Creating mark sheet for students using MS Word.
3. Creating Power Point Presentations
4. Internet basics, E mail and HTML basics.
5. NCBI database, EMBL database, Protein database and Genbank database
6. Scanning images and file conversion
7. Retrieving 3D protein structure files
8. Molecular visualization tools
9. Molecular dissection Exporting images
10. Swis prot, Pubmed, Pubchem and Chemsketch
11. PASS prediction
12. Docking
13. QSAR Prediction

REFERENCES / TEXT BOOKS

1 K.Mani and Vijayaraj. (2002). Bioinformatics for Beginners
2 Arthur M.Lesk. (2002). Introduction to Bioinformatics.
3 S.SundaraRajan and R.Balaji. (2002). Introduction to Bioinformatics.
4 David W. Mount. (2001). Bioinformatics: Sequence and genome analysis.
5 Vinay Sharma, Ashok Munjal and Asheesh Shanker. A Text Book of Bioinformatics.

SECOND SEMESTER
CORE ELECTIVE - I

14BOP08B HORTICULTURE AND PLANTATION CROPS 60 hours

Aim: To Impart Basic Knowledge about Forest and Forest Regeneration. Understanding Horticultural Techniques and a few Plantation Crops.

Unit I

Horticulture - Origin, Definitions, Scope and Impact of Horticulture. Types of Horticulture.

Methods of Propagation - Seeds and Vegetative (Cutting, Layering and Grafting). Propagation by specialized stem and roots - Bulbs, Corms, Tubers, Rhizomes and Pseudo bulbs). **12 hours**

Unit II

Floriculture - Definition and Importance of Floriculture. Soil and Climate, Propagation, Nursery practices.

Planting Methods - Cultivation, Harvesting and Storage of flowers (Rose and Anthurium). Common diseases affecting the Horticultural Crops, Flower Arrangement and Bonsai. **12 hours**

Unit III

Gardening and Pomology - Types of Gardens - Indoor Garden, Kitchen Garden and Public Garden.

Pomology - Definition and Importance - Cultivation, Harvesting and Storage of fruits (Banana & Mango). Uses of Growth regulators in Horticulture. **13 hours**

Unit IV

Plantation Crops - Coffee, Tea, Rubber, Coconut and Cocoa. Soil and Climatic requirement, Varieties, Propagation, Planting systems, Shade Regulation, Training and pruning, Pest and Disease Control, Harvesting, Processing and Yield. **13 hours**

Unit V

Plantation Crops - Origin, Distribution, Area of Production , Composition, uses, Importance, Present status and Future Scope in India. **10 hours**

REFERENCE / TEXT BOOKS

1 Kumar**.** N (1977): Introduction to Horticulture, Rajalakshmi Publications, Nagercoil, India.
2 Chadha, K.L. 2001, Handbook of Horticulture, ICAR, New Delhi.
3 Chattopadhyaya, P.K.2001. A text book on Pomology (Fundamentals of fruit growing) Kalyani Publication, New Delhi
4 Christopher, E.P. 2001. Introductory Horticulture, Biotech Books, New Delhi
5 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
6 George Acquaah, 2002, Horticulture-principles and practices. Prentice-Half of India pvt. Ltd., New Delhi.
7 Parthasarathy, V.A., P.K. Chattopadhyay and T.K. Bose**.** (2006) Plantation Crops, Kolkata, Naya Udyog.

14BOP09 **BOTANY PRACTICALS I**

PLANT DIVERSITY - I

Algae

Microscopic Observation of Vegetative and Reproductive Structure of *Chara, Nitella,Turbenaria, Padina* and *Pediastrum.*

Fungi

Observations of Mycelium and Fruiting Body of *Saprolegnia, Alternaria, Puccinia* and *Peziza.*

Lichen

Morphology and Reproductive Structure of *Usnea*

Bryophytes

Observations of Vegetative and Reproductive Structures of *Targionia, Lununaria, Anthoceros, Pogonatum* and *Polytrichum.*

Two days tour and Submission of field trip report.

PLANT DIVERSITY - II

Pteridophytes -

Study of the Morphology, Anatomy and Reproduction of the following Genera: *Psilotum Isoetes, Lycopodium, Equisetum, Angiopteris, Nephrolepis, Salvinia* and *Azolla.*

Gymnosperms

Study of the Morphology, Anatomy and Reproductive parts of the following genera: *Cupressus, Podocarpus, Araucaria, Pinus* and *Ephedra*.

Observation of different fossil types.

Visit to fossil sites

Study of the fossilized materials - structure of *Lepidodendron* (Fossil Slide) and *Lyginopteris* (Fossil Slide), *Spharophyllum, Calamites* and *Williamsonia*.

Microbiology

1. Isolation and Enumeration of Microorganisms from Soil, Food, Fruits and Vegetables by Serial Dilution and Plating Methods.
2. Culture Media Preparation – Liquid and Solid Medium (Fungi and Bacteria).
3. Gram's Staining of Bacteria.
4. Measurement of Bacterial Growth.
5. Preparations of Buffers and Molar Solutions.
6. Production of Cheese, Yoghurt and Vinegar.
7. Visit to the Hospital and Industries and Submission of report.
8. Isolation and identification of food Spoilage Microbes - Bread and vegetables.

Cytology and Tissue Biology

1. Smear of Onion root tip- to study the stages of Mitosis.
2. Squash of *Tradescantia* bud to study the stages of meiosis.
3. Interpretation of Micrographs of different cell organelles.
4. Chromosome banding techniques.
5. Observations of slides / models of different stages of cell division.
6. Study of simple permanent tissues by sectioning and peelings.
7. Study of complex permanent tissue by free hand / Microtomic section.
8. Studying the laticifers by section of leaves and stems.
9. Maceration of wood to observe the vascular elements.

14BOP10 **BOTANY PRACTICALS II**

Anatomy and Embryology

1. Structure of Monocot & Dicot stems.
2. Structure of Monocot & Dicot roots.
3. Anomalous structure in *Achyranthes* & *Nyctanthus.*
4. Anomalous secondary growth in *Bougainvillea, Boerhaavia* and *Mirabilis*.
5. Structure of Moncot & Dicot leaves.
6. Studying vasculature of different floral parts.
7. *In vitro* pollen germination studies using different nutrient solutions.
8. T.S. of anther of *Datura, Cucurbita* and *Cassia.*
9. Observing different types of ovules.
10. Observing different types of endosperms.
11. Embryo dissections- observing different stages.
12. Micrometry- microscopic calibration of cells.
13. Submission of 5 permanent slides of double stained plant materials.

Advanced Molecular Biology

1. Chromatographic separation of amino acids.
2. Separation and quantification of leaf pigments.
3. Immuno electrophoresis
4. Protein fractionation and quantification of different solubility fractions.
5. Determination of Amylose
6. Estimation of cellulose
7. Estimation of fatty acids
8. Estimation of proline

Genetics and Plant Breeding

Problem solving in Genetics

1. Monohybrid cross and Test cross.
2. Dihybrid cross and incomplete dominance.
3. Interaction of genes: 9:7 and 9:3:4.
4. Interaction of genes: 12:3:1 and 15:1.
5. Multiple alleles and blood group inheritance
6. Sex linked inheritance
7. Quantitative inheritance
8. Training in hybridization techniques – Emasculation, Crossing and Bagging
9. Visit to Plant Breeding Research Stations.

THIRD SEMESTER

14BOP12 TAXONOMY AND ECONOMIC BOTANY 60 hours

Aim: To learn the Principles of Systematics, Diversity of Angiospermic Flora and Preparation of Herbarium.

Unit I

Principle of Taxonomy

History & Aims of Classification, Salient Features of International Code of Botanical Nomenclature, System of Classification - Natural System of Classification (Bentham and Hooker). Phylogenetic System (Engler and Prantl) and Modern System (Taktajan). Recent evidences in solving taxonomical problems, Numerical Taxonomy, Herbarium Technique, Keys – Intended & Bracketed, Computerized Systematics.

12 hours

Unit II

Polypetalous Families

Ranunculaceae, Magnoliaceae, Menispermaceae, Capparidaceae, Combretaceae, Fabaceae, Cucurbitaceae and Myrtaceae. **12 hours**

Unit III

Gamopetalous Families

Rubiaceae, Sapotaceae, Bignoniaceae, Boraginaceae, Convolvulaceae, Solanaceae, Scorpulariaceae and Lamiaceae. **12 hours**

Unit IV

Monochlamydous Families

Piperaceae, Moraceae and Chenopodiaceae.

Monocotyledonous Families

Amaryllidaceae, Zingiberaceae, Araceae, Arecaceae and Poaceae. **12 hours**

Unit V

Economic Botany

Binomials, Common names, Parts of the plant used, Cultivation, Harvest, Processing and Economic Importance of Vegetables, Fruits, Fibres, Wood & Cork and Spices.

12 hours

REFERENCE / TEXT BOOKS

1. Gamble J.S. and C.E.C. Fischer (1915-38) Flora of Presidency of Madras. Vol. 1-3. BSI, Calcutta.
2. Anonymous, (1972). The Wealth of India: Raw Materials. IX. Publications and Information Directorate, C.S.I.R., New Delhi.
3. Singh V. and D.K Jain (1981). Taxonomy of Angiosperms. Rastogi Publication, Meerut.
4. Matthew, K. M. (1983). The Flora of the Tamil Nadu Carnatic. Published in Rapinat Herbarium, St. Joseph's College (Tiruchirapalli, India).
5. Sharma, D.P. (1986). Text book of Taxonomy - Tata McGraw Hills, New Delhi
6. Pandey.B.P.(1995). Economic Botany. S.Chand and company Ltd. NewDelhi.
7. Sundararajan, S.(1999).Morphology and Economic Botany of Angiosperms. Vedams eBooks (P) Ltd. Pitampura, New Delhi.
8. Rao.K.N. and K.V.Krishnamurthy (2000). Angiosperms (Morphylogy, Taxonomy,Anatomy & Embrology). S.Viswanathan (Printers & Publishers),Pvt.Ltd., Chennai.

9. Vashista.P.C. (2006) Taxonomy of Angiosperms. S.Chand and company Ltd. NewDelhi.
10. Pandey.B.P.(2009). Taxonomy of Angiosperms.S.Chand and company Ltd. NewDelhi.
11. Sambamurthy A.V.S.S. (2009).Taxonomy of Angiosperms. I.K.International Pvt.Ltd. New Delhi.

THIRD SEMESTER

14BOP13 MEDICINAL PLANT RESOURCES 60 hours

Aim: To gain the Knowledge of Morphology, Distribution, Active Principles, Cultivation Practices, Marketing Potential and Therapeutic uses of indigenous medicinal plants.

Unit I

History and Scope of Pharmacognosy, Classification of natural drugs, Collection and Evaluation of crude drugs. Foreign exchange fetching herbs and their export potential. Medicinal uses of non flowering plants. Conservation of Medicinal Herbs.

12 hours

Unit II

Herbal Gardens - Designing and Maintenance, major elements grown in herbal gardens of hills, Plains and Kitchen gardens. Cultivation practices and marketing of *Gloriosa superba*, *Coleus forskholii*, *Rauvolfia serpentina*, *Cassia anguistifolia* and *Aloe vera.*

Value Added Products- *Aloe vera*, *Curcuma longa*, and *Crocus sativus.*

12 hours

Unit III

Identifying features, Distribution, Flowering and Fruiting season, Active Principles and Therapeutic uses of

Entire Plants - *Bacopa monnieri, Evolvulus alsionoides* and *Mollugo cerviana.*

Roots - *Glycirrhiza glabra, Plumbago zeylanica* and *Vetiveria zizanoides.*

Rhizomes – *Alpinia galanga* and *Urginea indica.*

Leaves - *Ruta graveolens, Digitalis purpurea* and *Hydrocotyle asiatica.*

12 hours

Unit IV

Identifying features, Distribution, Flowering and Fruiting season, Active Principles and Therapeutic uses of

Barks- *Cinchona officinalis, Cinnamomum verum* and *Holarrhena antidysenterica.*

Flowers - *Leucas aspera, Michelia champaca* and *Eugenia caryophyllata*

Fruits – *Phyllanthus emblica, Terminalia chebula* and *Terminalia bellerica.*

Seeds - *Butea monosperma, Mucuna pruriens* and *Myristica fragrans.*

12 hours

Unit V

Pharmacological grouping of medicinal plants (Biological Source, Distribution, Morphology, Active Components and Therapeutic uses)

Cardio tonics - *Digitalis purpurea* and *Terminalia arjuna.*

Gastro Intestinal regulators – *Carum copticum*, *Piper nigrum* and *Zingiber officinale.*

Antihypertensive - *Rauvolfia serpentina.*

Expectorants and Anti asthmatics – *Adhatoda vasica, Ocimum sanctum* and *Coleus amboinicus.*

Antitumor – *Podophyllum* sp, *Colchicum autumnale* and *Taxus buccata.*

Diuretics - *Tribulus terrestris* and *Boerhaavia diffusa*.

Oxytocics – *Claviceps purpurea*. **12 hours**

REFERENCES /TEXT BOOKS

1. Trease and Evans (1978). Pharmacognosy. Cassell & Collier Macmillan Publications New Delhi.

2. Atal, C. K. and B. M. Kapur (1982). Cultivation and Utilization of Medicinal Plants, RRL - (SIR) Jummu Tawi.
3. Vedavathy, S., Mirudhula and A. Sudhakar (1997). Tribal medicines of Chittoor District, A.P. Herbal folklore Research Centre, Tirupathi.
4. Somasundaram, S. (1997). Maruthuvath Thavaraviyal Ilangovan Pathipugm, Palayam Kotti.
5. Gokhale, S .B., C. K, Kokate and A. P. Purohit (2000). The Pharmacognosy Nirali Prakashan, Pune.
6. Kumar, N.C. An Introduction to Medicinal Botany and Pharmcognosy, Emkay publications New Delhi.

14BOP14 **THIRD SEMESTER**

BIOTECHNOLOGY AND GENETIC ENGINEERING **60 hours**

Aim: To understand the Organisms, Methodology and Downstream Processing of Secondary Metabolites, Knowing the techniques of Genetic transformations and its applications.

Unit I

Scope and Importance of Biotechnology, Biotechnology in India, Energy and fuel using Microbes, Biogas Production, Enzymes (Amylases and Proteases) – Industrial, Medicinal utility, Isolation, Purification, Entrapping (Micro capsulation) and Immobilization. **10 hours**

Unit II

General Designs of an Antibiotic Producing Unit - Isolation, Culturing of microbes Penicillin and Streptomycin. Biotechnology in Paper Industry, Biohydro - Metallurgy, Biomineralization, Biofertilizers and Bioinsecticides. **13 hours**

Unit III

Tools of Genetic Engineering - Enzymes (Restiction endonucleases, Polymerases and ligases). Restriction mapping, Vectors (Plasmids & Phages). DNA separation by AGE, Blotting techniques, DNA sequencing (Maxam and Gilbert's method, Sanger's dideoxy method). **13 hours**

Unit IV

Genetic Transformation (Vector and Non- vector dependent systems). Isolation of genes. Artificial synthesis of genes. Amplifications of DNA by PCR. Genomic and c DNA libraries. Selection and Screening of Recombinants. **12 hours**

Unit V

Applications of Biotechnology in Medicine, Agriculture and industry. Biotechnology in Pollution Control and Biodegradation. Biotechnology and IPR (Intellectual Property Right), IPP (Intellectual Property Protection), Patenting of Biological materials. **12 hours**

REFERENCES / TEXT BOOKS

1. Casida, C. (1964). Industrial Microbiology. Wiley Eastern Ltd. New Delhi.
2. Gupta, P. K. (1978). Elements of Biotechnology, Rastogi & Co, Meerut. New Nelhi.
3. Prescott & Dunn, (1983). Industrial Microbiology. Mc Graw Hill Book-6. New York Toranto.
4. Patel, A. H. (1985). Industrial Microbiology. Mc Millan (Inolia) Ltd. Bombay.
5. Ramawat, K. G. (2004). Plant Biotechnology S. Chand & Co. New Delhi.
6. Rama, S.V.S. (2005). Biotechniques, Theory and Practice. Rastogi Publications, Meerut.
7. John Jothi Prakash,E. (2006). Outlines of Biotechnology, Emkay Publications. NewDelhi

THIRD SEMESTER

CORE ELECTIVE - II

14BOP15A **PLANT TISSUE CULTURE** **60 hours**

Aim: Basic Knowledge about Plant Tissue Culture Techniques and Application in Improvement of Crops.

Unit I

Plant Tissue Culture - History, Scope and Concepts of Basic Techniques in Plant Tissue Culture. Sterilization, Media – types, Constituents and Preparation of media – Selection of suitable medium. Totipotency – Differentiation, Dedifferentiation & Redifferentiation.

Growth Regulators – Auxin, Gibberellins, Cytokinins & Abscissic Acids.

12 hours

Unit II

Organogenesis, Somatic Embryogenesis – Process, Structure, Stages of embryo development and factors affecting embryogenesis, Artificial Seeds and its applications. Types of *Invitro* cultures - Cell Suspension Cultures, Protoplast Culture - Isolation, maintenance and Culture. Somatic Hybridization and their Importance.

12 hours

Unit III

Haploid Production and Application, Clonal Propagation , Somoclonal Variation and its Importance, *in-vitro* Pollination – Ovule and Ovary culture and their applications. Callus culture, Organ culture – Embryo culture, Leaf culture, Shoot culture, Root apex, Flower culture and Endosperm culture and their applications. Hardening and acclimatization of Tissue Culture Plants. **12 hours**

Unit IV

Industrial Tissue culture - Meristem Culture for virus free plants, Gene transfer methods in plants – direct and indirect gene transfer and its applications. *Invitro* Production of Secondary Metabolities – Classification of Secondary Metabolities, Biosynthetic Pathways and Factors Controlling the Production, Cell Immbolization, Cryopreservation and its importance. **12 hours**

Unit V

Techniques for Crop Improvement - Banana, Papaya, Citrus and Grapes. Quality Control in Commercial Plant Tissue Culture. Applications of Tissue Culture in Agriculture, Horticulture, Forestry & Industry. **12 hours**

REFERENCE / TEXT BOOKS

1. Ramawat.K.G.(2000). Plant Biotechnology, S.Chand &Co., New Delhi.
2. Razdan.M.K.(2004). Introduction to Plant Tissue Culture, 2nd Ed.Oxford & IBH Publishing Co Private Limited, New Delhi.
3. Misra.S.P. Plant Tissue Culture. Ane Books Pvt.Ltd.
4. Kumar.U (2011). Methods in Plant Tissue Culture. Agrobios India,Jodhpur.
5. Verma, V. (2007). Textbook of Plant Physiology. New Delhi, Ane Books India,
6. Narayanaswamy (2008). Plant Cell & Tissue Culture, Tata Mcgraw Hill Publishing Company Limited, New Delhi.
7. B. D. Singh. (2003). Biotechnology, Kalyani Publishers, Ansari Road, Daryaganj, New Delhi.

FOURTH SEMESTER
CORE ELECTIVE - II

14BOP15B PLANT PATHOLOGY 60 hours

Aim: To study about the causal organisms and control measures of plant diseases affecting economically viable plants.

Unit I

Nature and Concept of Plant Diseases, Classification of diseases according to major Causal Oragnisms (Walker). History of Plant Pathology, Host Penetration and entry of pathogens, Defense mechanism of plants. **12 hours**

Unit II

Enzymes and Toxins in Plant Diseases, Effects of infection on the physiology of host. Dissemination of Pathogens. Symptoms of Plant Diseases. General Control Methods of Plant Diseases. **12 hours**

Unit III

Fungal Diseases – Causal Organisms, Diseases Cycle and Control Measures of Late Blight of Potato, White rust of Crucifers, Rust of Wheat, Wilt of Cotton, Red Rot of Sugarcane, Tikka Disease of Groundnut and Downy Mildew of Grapes. **12 hours**

Unit IV

Bacterial and Viral Diseases - Causal Organisms, Diseases Cycle and Control Measures of Bacterial Blight of Paddy, Citrus Canker, Crown Gall of Stone Fruits, TMV Disease, Yellow Vein Disease of Bhendi and Bean Mosaic Virus. **12 hours**

Unit V

Mycoplasmal Diseases – Sandal Spike, Citrus Greening, Rice Yellow Dwarf and Little Leaf of Brinjal. A general account of Nematode Diseases. **12 hours**

Practicals

1. Isolations of Plant Pathogens and Identification.
2. Preparation of PDA medium, Nutrient Agar Medium for Pure Culturing of Pathogens.
3. Observing the Morphology of Diseases Plants (Rust, Wilt of cotton, Red Rot of Sugar cane and Tikka Disease).
4. Studying the Pathogens by sectioning the diseased materials.
5. Observing permanent slides of the sectioned diseased materials.

REFERENCES / TEXT BOOKS

1. Butler, E. J. and Jones, S. G. (1949). Plant Pathology. Macmillan & Co., London
2. Rangaswamy, G. (1972). Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd.
3. Rangaswamy, G. and Soumini Rajagopalan. (1973). Bacterial Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
4. Bilgrami, K. S. and Dube, H. C. (1990). A Textbook of Modern Plant Pathology. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Mehrothra.R.S. (2003) Plant Pathology, Tata Mc Graw Hill publishing company Limited NewDelhi.
6. Dubey R.C and.Maheswari. D.K (2005) A Text Book of Microbiology. S.Chand and Co. Limited NewDelhi.

7. Pandey, B. P. (2005). A Textbook of Plant Pathology, Pathogen and Plant Diseases. S. Chand and Co. Ltd., New Delhi.
8. Vashita P.C (2008) Botany for Degree students 'Fungi' S.Chand and Co, New Delhi.

14BOP16A CLUSTER IDC – SILKWORM REARING (45 Hours)

(for MSc Botany, MSc Clinical Nutrition & MSc Biotechnology)

THIRD SEMESTER

OBJECTIVES: To acquire knowledge about the biology of silkworm and the various rearing techniques. To know above the various techniques of propagating mulberry plants and to know about the various disease of mulberry and silkworms.

UNIT – I **(9 hours)**

Scope and importance of sericulture – species of silkworm – Description of mulberry plant-Propagation of mulberry plant-A brief account of mulberry varieties and planting methods, Irrigation methods.

UNIT – II **(9 hours)**

Macro, micro and bionutrients of mulberry- Deficiency diseases with particular reference to N, P, K, Fe and Bo.

Mulberry disease and Pests: Causative agents, symptoms and management of Root-rot, Powdery mildew, Tukra and Leaf miner.

UNIT – III **(9 hours)**

Morphology of mulberry silkworm: Egg, larva, pupa and adult.

Structure of silk gland and silk proteins.

Life –cycle of silkworm.

UNIT – IV **(9 hours)**

Silkworm seed production and incubation.

Rearing: Model rearing house, rearing appliances and mountage.

Rearing young age silkworm. Rearing Late-age silkworms.

UNIT – V **(9 hours)**

Disinfection of rearing house and equipments.

Silkworm diseases: Pebrine, Flacherie and Grasserie.

Silkworm: A brief account of life-cycle and management.

Cocoon types. Shell-ratio, Renditta and price fixation.

Cocoon marketing. A brief account on reeling process

By-products of sericulture.

REFERENCES:

1. Krishnasamy, S. New Technology of silkworm rearing. Central Sericulture Research and Training Institute, Mysore.
2. Krishnamsamy, S. Mulberry Cultivation in South India. Central Sericulture Research and Training Institute, Mysore.
3. Madan Mohan Rao, 1978. A Text Book of Sericulture. B.S. Publishers. Hyderabad.
4. Yoshemaro Tanaka, Sericology, Central Sericulture Research and Training Institute, Mumbai.

14BOP16B **Cluster IDC** **(4 hrs / week)**

Nutrition for Life Style Disorders

(For MSc., Zoology, Botany and Biotechnology)

Objectives

To enable the students to

1. Study the importance of lifestyle disorders
2. Know the causative factors of lifestyle disorders and
3. Learn the importance of nutrition for prevention and management of lifestyle disorders

UNIT 1

NUTRITION AND LIFESTYLE DISORDERS **(12 hours)**

Definition of Nutrition, balanced diet, Nutritional status, assessment of body composition, biology of adiposity, nature of foods, nutrients, RDA, energy balance, foods that lead to life style disorders.

UNIT 11

NUTRITION AND WEIGHT MANAGEMENT **(12 hours)**

Malnutrition- Under weight and Obesity- Nutrients for Underweight conditions, Nutrition for management of obesity, Anorexia Nervosa and Bulimia nervosa, Hazards of Obesity, Obesity in Children, Strategies to overcome Obesity.

UNIT 111

NUTRITION AND CARDIOVASCULAR DISEASES **(12 hours)**

Cardiovascular diseases- Atherosclerosis, Coronary Heart Diseases and Congestive Heart Failure, Hypertension, Hyperlipidemia and Dyslipidemia- Role of antioxidants, nutraceuticals and functional foods in cardiovascular diseases. Dietary management of cardiovascular diseases.

UNIT 1V

NUTRITION AND DIABETES MELLITUS **(12 hours)**

Definition of Diabetes Mellitus- Types- Etiological factors, Diagnosis and Complication of Diabetes Mellitus. Role of Nutraceuticals and functional foods in of Diabetes Mellitus. Dietary management of Diabetes Mellitus.

UNIT V

NUTRITION IN CANCER **(12 hours)**

Definition of Cancer- Types- Causative factors, Nutrients and Cancer- Detection and Treatment of Cancer- Role of antioxidants, Nutraceuticals and Functional foods in Cancer. Dietary treatment in cancer

References

1. **L. Kathleen Mahan, Sylvid Escott- Stump**: Karause's Food, Nutrition and Diet therapy, 2000, 10th edition, W.B.Saunders Company.
2. **Laura E. Matarese, Michele M. Gottschlich,** Contemporary nutrition support practice: a clinical guide, 2003,I edition, Saunders Elsviers Science, Missouri
3. **Scott A. Shikora, George L. Blackburn**, Nutrition Support: Theory and Therapeutics, 1996, I edition, International Thomas Publishing (ITP) online publishing –thomson.com
4. **NIN**, RDA for Indians, 2001

5. **NIN**, Nutritive value of Indian foods, 2001
6. **Shills E. M., Olseon J.A and Skike M.,** Modern nutrition in health and disease, vol. I & II, 1994 and Febiger.
7. Antia F.P, Clinical nutrition and dietetics, 1997, Oxford University press.
8. Michele M. Gottschlich, The Science And Practice Of Nutrition Support: A Case-Based Core Curriculum, 2007, I edition, American Society of Parenteral and enteral Nutrition (ASPEN)
9. Annalynn Skipper, Dietitian's Handbook of Enteral and Parenteral Nutrition, 1996, I edition, An ASPEN Publication

14BOP16C **III Semester**

FOODS, GENES AND DISEASES 4 hrs/week

(For MSc Botany, Zoology and Clinical Nutrition)

Objectives:

- to study the relationship between food and health
- to understand the role of common dietary compounds on gene expression
- to understand dietary intervention based on knowledge of nutritional requirement, nutritional status, and genotype

Unit I **(9hours)**

Foods and genes: Genetics and epigenetic of bioactive foods, conventional and Indian traditional foods and food components, vitamins and minerals- antioxidant potentials; their role in preventing diseases, incidence of diet related diseases, influence of genes on dietary preference and tolerance, mucosal tolerance, Role of Selenium in oxidant and inflammatory process

Unit II **(9hours)**

Health Biomarkers: Identification and validation of compounds in tissues, blood and fluids; genetic screening for predisposition and occurrence in inflammatory diseases; genetic markers associated with increased risk for chronic disease, metabolic dysfunction.
Case Study: IGF rs680 polymorphisms in height variation in preadolescent children

Unit III **(9hours)**

Gene approaches for diseases: Nutrigenetics of myocardial infarction, Nutrient regulation of insulin gene, genetics in Crohn's disease, genetics and nutritional control of lipid metabolism, nutrigenetic approach to study obesity

Unit IV **(9hours)**

Diagnostics for diseases: Nutrigenomics for cancer detection, nutrigenomics in ageing, DNA polymorphisms, Microarrays to study gene expression , gene-nutrient interaction, Dietary signatures

Unit V **(9hours)**

Personalized medicine: Dietary indications for population health and wellness, vitamin and supplement products, genetic counseling, clinical trials to test food effects to demonstrate efficacy of food-health claims

Reference:

1. Nutritional Genomics: Discovering the path to personalized nutrition , Edited by Jim Kaput, 2013, Wiley
2. Nutrigenomics and Nutrigenetics in functional foods and personalized nutrition, Edited by Lynnette R Ferguson,2013, CRC Press
3. Genomics and proteomics in nutrition Edited by Carolyn D Berdeiner and Namia Moustaid Moussa, 2004, CRC Press
4. Dietary modulation of Cell Signaling pathways by Zigang Dong and Young Joon Surh, 2008, CRC Press

FOURTH SEMESTER

14BOP17 ENVIRONMENTAL BOTANY 60 hours

Aim: To understand the Interaction between the Environment and Plants.

UNIT I

Environment - Physical Environment, Biotic Environment, Biotic and Abiotic Interactions, Climate and Soil Pattern of World.

Habitat Ecology - Concept of Habitat and Niche, Niche width and overlap, Fundamental and Realized Niche, Resource Partitioning, Character Displacement and Major Habitat types of the subcontinent. **12 hours**

UNIT II

Population Ecology - Characteristics of a Population, Population Growth Curves, Population Regulation, Life History Strategies (r and k selection), Age Structured Populations.

Species Interactions - Types of Interactions, Interspecific Competition, Herbivory, Carnivory, Pollination, Symbiosis, Mechanisms of litter fall decomposition and climatic factors associated with decomposition. **12 hours**

UNIT III

Community Ecology - Nature of Communities, Community Structure and Attributes; Analysis of Communities (Analytical and Synthetic Characters), Levels of species diversity and its measurement, Edges and Ecotones.

Ecological succession - Types, Mechanisms, Changes involved in succession, Concept of climax, Models of succession.

Ecological Adaptations - Hydrophytes, Xerophytes and Halophytes. **12 hours**

UNIT IV

Ecosystem Ecology - Structure and Function, Energy Flow and Biogeochemical Cycles, Primary Production and Methods of Measurement, Global Pattern and Controlling Factors, Ecosystem Restoration.

Biomes - Distribution, Climatic and Edaphic, Floral and Faunal Characteristics of major Terrestrial Ecosystems. **12 hours**

UNIT V

Environmental Education - Principles, Environmental Education Programmes. Environmental Education in India. Environmental Organization and Agencies, MAB-National Organization. Human Health and Environmental Change, The search for fuels, Natural Resources and their Management, Applications of GIS and RS technology in environmental studies, The future of Planet Earth. **12 hours**

REFERENCE / TEXT BOOKS

1. Begon, M. Harper, J.L. and Townsend, C.R. 1996. Ecology. Blackwell Science, Cambridge, USA.
2. Campman, J.L. and Reiss, M.J. 1998. Ecology. Principles and Applications, Cambridge University Press, U.K.
3. Ludwing, J. and Reynolds, J.F. 1998. Statistical Ecology. John Wiley & Sons.

4. Ambasht, R.S. and Ambasht, N.K. 1999. A text book of Ecology. CBS Publ. & Distr. New Delhi.
5. Sharma, P.D. 2001. Ecology and Environment, Rastogi Publications, Meerut.
6. Odum, E.P. and Barrett, G.W. 2005. Fundamentals of Ecology (5th Ed.) Brooks/Cengage Learning India Pvt. Ltd., New Delhi.
7. Kormondy, E.J. 2008. Concepts of Ecology. Prentice Hall of India., New Delhi.
8. Subrahmanyam, N.S. and Sambamurty, A.V.S.S. 2008. Ecology (2nd Ed.) Narosa Publishing House, New Delhi
9. Singh, J.S., Singh, S.P. and Gupta, S.R. 2008. Ecology, Environment and Resource Conservation, Anamaya Publishers, New Delhi.
10. Stiling, P. 2009. Ecology: Theory and Applications (4th Ed.). PHI Learning Pvt. Ltd. New Delhi.

FOURTH SEMESTER

14BOP18 PLANT PHYSIOLOGY AND BIOCHEMISTRY 60 hours

Aim: To understand Basic Functioning, Biochemical and Molecular Machinery of Plants.

Unit I

Water Relations in plants (Diffusion, Osmosis, Plasmolysis and Water Potential). Absorption of Water, Ascent of Sap and Transpiration. Absorption of Minerals Translocation of organic food materials(Phloem Transport). Photoperiodism, Phytochrome and Flowering, Vernalization, Circadian Rhythm and Biological Clock. Stomatal Movements, Tropic and Nastic Movements. Mineral Nutrients and their deficiency symptoms. **13 hours**

Unit II

Enzymes - Nomenclature, Classification, Structure, Properties and Mechanisms of actions. Enzyme inhibition - Competitive, Non Competitive & Allosteric Inhibition. Factors affecting enzyme action. Isolation and Purification of Enzymes. **10 hours**

Unit III

Respiratory Substrates, Respiratory quotients. Generation of pyruvate- fate of pyruvate in anaerobic (fermentation) and aerobes (TCA Cycle). Electron Transport Chain and oxidative phosphorylation, Chemiosmotic theory and ATP generation. Account of ATP. Pentose Phosphate Pathway (Hexose monophosphate Shunt). Factors affecting respiration. **13 hours**

Unit IV

Source of energy and energy conversion mechanisms. Components of Pigment System I and II. Hill reaction. Light Dependent Reactions - Cyclic and Non - Cyclic photophosphorylations. Path of carbon fixation- Calvin's cycle (C_3), Hatch and Slack pathway (C_4). Photorespiration (C_2 Cycle (or) Glycolate Pathway). Factors affecting photosynthesis. **12 hours**

Unit V

Nitrogen and Fat Metabolism - Sources of Nitrogen, Nitrogen Fixation, Synthesis of aminoacids (Reductive amination and transamination) , Incorporation in Proteins, α and β oxidation of fat.

Fruit and Seed Physiology - Seed dormancy, Methods to break dormancy, Development of fruit and seed. Physiology of Seed Germination and Mobilization of Reserve Foods. Physiology of fruit ripening, Stress Physiology (Heat, Water, Salinity and Metal). **12 hours**

REFERENCES / TEXT BOOKS

1. Sarbhai, R.P.S. and Semwal (1989). A Text Book of Plant Physiology. Ratan Prakash Mandir – Agra.
2. Pandey, S.N. and B. K. Sinha (1993). Plant Physiology, Vikas Publications PVD, LTD, New Delhi.
3. Verma, S.K. (1999) A Textbook of Plant Physiology.S.Chand & Co.New Delhi.
4. Gupta, N. K. and S. Gupta (2000). Plant Physiology Oxford & IBH Publishing Co. PVD - LTD, New Delhi.

5. Salisbury and Ross (2004). Plant Physiology, Thomson Wards Work, Singapore
6. Leninger (2005) Principles of Biochemistry (fourth edition). W.H.Freeman & Company, New York.
7. Stryer's Biochemistry published by W. H. Freeman and Company. New Delhi.
8. Verma, P. (2006). Plant Physiology, Emkay Publications, New Delhi.
9. Verma, V. (2007) Textbook of Plant Physiology. New Delhi, Ane Books India.

14BOP19 **BOTANY PRACTICALS III**

Taxonomy and Economic Botany

1. Identification of Plants using Gamble Flora
2. Study of the Characters and Technical Description of families mentioned in the syllabus (any available Material).
3. Study of the Binomials, Family and Morphology of economically useful parts of plants.
4. Preparation of Artificial Key.
5. Field visit of 3-5 days, Vegetation studies, Submission of 50 herbarium sheets with field note Book and Tour Report.

Medicinal Plant Science

1. Identification and medicinal uses of available medicinal plants enlisted in the syllabus.
2. Phytochemical Screening for active principles (Qualitative Identification of Proteins, Carbohydrates, Fat, Alkaloids, Saponins, Phenols, Flavonoids, Glycosides,Terpenoids and Steroids)
3. Herbal Medicinal Preparations - Medicated Oils, Powders, Jellies and Syrups.
4. Pot -Culturing of available Medicinal Plants.
5. Visit to a Herbal Garden.
6. Submission of 25 Medicinal Plants Herbarium Materials and 5 bottled dry specimens.

Biotechnology and Genetic Engineering

1. Extraction and Estimation of Plant DNA
2. Extration and Estimation of RNA (Bial's Test)
3. Polyacrylamide gel electrophoetic separation of proteins
4. Agarose gel electrophoretic separation of DNA
5. Southern Blotting
6. Microbial hydrolysis of starch
7. Hydrolysis of casein
8. Antibiotic sensitivity test
9. Fermentation of Different Sugars.

Plant Tissue Culture

1. Visit to Plant Tissue Culture Industry.
2. Media Preparation.
3. Callus Induction and Regeneration
4. Hardening and Acclimatization.
5. Bioassay using Plant Growth Regulators – Auxin (Root), Gibberellins, Cytokinins (Shoot).

FOURTH SEMESTER

14BOP20 BOTANY PRACTICALS IV

Environmental Botany

1. To Study the Physical Characteristics (Temperature, Colour and Texture) of soil.
2. To determine pH and Conductivity of Soils collected from different locations.
3. Chemical testing of Soil for Phosphorus, Potassium and Nitrate.
4. To determine the pH and conductivity of Water Samples Collected from different locations.
5. To Estimate the dissolved oxygen content in water samples.
6. To Record the abiotic components i.e. pH, temperature, turbidity and light intensity of water in a pond ecosystem.
7. To determine the minimum size of the quadrat by species- area curve.
8. To Study the community by Belt transect method by determining frequency, density and abundance of different species present in the community.
9. Determination of species diversity index and importance value index of local vegetation.
10. To study the species composition of an area for analyzing biological spectrum and comparison with Raunkiaer's normal biological spectrum.
11. To survey and study the ecological adaptations of locally available hydrophytes and xerophytes.
12. Field visit of any protected area and to discuss causes and impacts of biodiversity loss. (Report to be submitted).

Plant Physiology and Biochemistry

1. Microkjeldahl method of N_2 / Crude protein estimation in plants.
2. Protein Fractionation and Estimation of total proteins from pulse seeds.
3. Amino acid extraction and estimation of germinating seeds.
4. Extraction and estimation of free sugars from some fruit crops.
5. Absorption Spectrum of Chlorophyll.
6. Separation of Plant Pigments by Thin Layer Chromatography.
7. Effect of substrate concentration and temperature on enzyme activity (Peroxidase)
8. Mechanical scarification of seeds.
9. Chemical scarification of seeds.
10. Mobilization of proteins in germinating pulses.
11. Mobilization of starch in germinating cereals.
12. Proximate Composition of any two seed materials (Moisture, Ash, Crude fibre, Crude Protein, Crude Lipid, NFE and Total Calories).
13. Roll Towel Method of Seed Germination.
14. Demonstration of Hill's Reaction by isolated Chloroplasts.

14ZOP17A/14CNP19A/14BTP18A

FOOD AND MEDICINAL RESOURCES
CLUSTER IDC

(for MSc., Zoology, Clinical Nutrition and Biotechnology) **45 hours**

Aim: To gain the knowledge of morphology, distribution, active principles, and therapeutic uses of indigenous medicinal plants.

Unit-I

Conservation of Food Crops and Medicinal Plants, Assessment of Best Germplasms. Germplasm Multiplication. Botanical Status, Distribution, Mode of Consumption, Proximate Composition, Nutritional and Antinutritional factors of less known Pulses - *Bauhinia vahli* and *Mucuna pruriens.* **9 hours**

Unit-II

Botanical Status, Distribution, Mode of Consumption, Proximate Composition, Nutritional and Antinutritional Components of less known -

Millets – *Elucine indica.*

Vegetables - *Canavalia gladiata.* **9 hours**

Unit – III

Traditional Systems of Medicines, Classification of Medicinal Plants, Collection and Preparation of Natural Drugs for Marketing. Adulterants and Substitutions in Medicinal Plants. **9 hours**

Unit – IV

A General Account of Bioactive Substances - Basic Structural and Functional Aspects of Digestive and Cardiovascular Systems of Man. Botanical Identity, Distribution, Active Principle and Therapeutic uses of

Carminative and Gastro Intestinal Tract Regulators – *Coriandrum sativum* and *Piper nigrum.*

Cardiotonics and Antihypertensives – *Digitalis purpurea* and *Terminalia arjuna* **9 hours**

Unit – V

Basic Structural and Functional Features of Respiratory System and Urino Genital System of Human Beings. Botanical Identity, Distribution and Therapeutic uses of

Antitussives and Expectorants – *Justicia adhatoda* and *Ocimum sanctum,*

Diuretics – *Tribulus terrestris* and *Boerhaavia diffusa.*

Antidiabetics – *Gymnema sylvestre* and *Cassia auriculata.* **9 hours**

REFERENCE / TEXT BOOKS

1. Trease and Evans (1978) Pharmacognosy, Cassell & Collier Macmillan publications, New Delhi.
2. Kumar, N.C An introduction to Medicinal Botany and Pharmacognosy. Emkay publications, New Delhi.
3. Gokhalae, S.B, Kokate, C.K and Purohit, A (2000). Pharmacognosy, Nirali prakhasam, Pune.
4. Atal C.K and B.M Kapur (1982). Cultivation and Utilization of Medicinal plants, RRL (SIR), Jammu Tawi.
5. Jain. J.L (1992) Fundamentals of Biochemistry. S. Chand & Co, New Delhi.
6. Stryer – Biochemistry- W.H. Freeman Company.