Government of Puducherry

DEPARTMENT OF BOTANY

KANCHI MAMUNIVAR CENTRE FOR POSTGRADUATE STUDIES

(An autonomous college with potential for excellence and accredited by NAAC 'A' Grade)

LAWSPET, PUDUCHERRY – 605 008

TEL: 0413-2251687

CBCS-SYLLABUS

BOTANY

M.Sc. (PLANT BIOLOGY AND BIOTECHNOLOGY)

(Effective from 2018 onwards)

2018-2019

SCHEME FOR M. Sc. Plant Biology & Biotechnology course offered under CBCS

Semester	Code	Title of Paper	Hours/ Week (30)	Credits	Total Credits
S-1	PBHT101	MICROBIOLOGY AND PLANT PATHOLOGY	4	3	18
	PBHT102	PHYCOLOGY, MYCOLOGY AND BRYOLOGY	4	3	
	PBHT103	PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY	4	3	
	PBHT104	MICROBIAL BIOTECHNOLOGY	4	3	
	PBHP105	PRACTICAL-I	10	3	
	PBSC106	SOFT CORE: Internal FOREST ECOLOGY	4	3	
S-2	PBHT207	COMPUTER APPLICATIONS IN BIOLOGY AND BIOSTATISTICS	4	3	18
	PBHT208	PLANT ANATOMY AND EMBRYOLOGY	4	3	
	PBHT209	PLANT ECOLOGY	4	3	
	PBHT210 A	BIOINSTUMENTATION	4	3	
	PBHP211	PRACTICAL-II	10	3	
	PBSC212	**SOFT CORE: External MEDICAL BOTANY**	**4**	**3**	
S-3	PBHT313	ANGIOSPERM SYSTEMATICS AND RESOURCE UTILIZATION	4	3	18
	PBHT314	GENETICS, PLANT BREEDING AND EVOLUTION	4	3	
	PBHT315	CELL AND MOLECULAR BIOLOGY	4	3	
	PBHT316	GENE TECHNOLOGY	4	3	
	PBHP317	PRACTICAL-III	10	3	
	PBSC318 A	SOFT CORE: Internal MEDICAL BOTANY	4	3	
S-4	PBHT419	PLANT PHYSIOLOGY	4	3	18
	PBHT420	APPLIED PLANT BIOTECHNOLOGY	4	3	
	PBHP421	PRACTICAL-IV	8	3	
	PBPW422	PROJECT WORK	10	4	
	PBPV423	PROJECT VIVA	-	2	
	PBSC424	**SOFT CORE: External MUSHROOM TECHNOLOGY**	**4**	**3**	

Hard Core 17 x 3 = 51
Soft core 07 x 3 = 21

Total Credits = 72

Soft core subjects offered to other Departments:

1) Medical Botany, 2) Mushroom Technology

Government of Puducherry

DEPARTMENT OF BOTANY

KANCHI MAMUNIVAR CENTRE FOR POSTGRADUATE STUDIES

(An autonomous college with potential for excellence and accredited by NAAC 'A' Grade)

LAWSPET, PUDUCHERRY – 605 008

TEL: 0413-2251687

CBCS-SYLLABUS

BOTANY

M.Sc. (PLANT BIOLOGY AND BIOTECHNOLOGY)

SEMESTER I

2018-2019

SEMESTER -I

HARD CORE COURSE I

PBHT 101- Microbiology and Plant Pathology

Unit – I

History and Scope of Microbial Diversity; General accounts of Bacteria, Cyanobacteria, Viruses, Mycoplasma, Protozoa and Fungi; Methods of sterilization; Culture and staining techniques; Preservation of microbes. Identification and classification of Bacteria and Fungi. Classification of Bacteria- Bergey's Manual.

Unit – II

Microbial Nutrition: nutritional types - autotrophy, heterotrophy- Growth of Bacteria-Growth cycle - Archaea and types, Cultural characteristics of bacteria and fungi. Bacteriological and Fungal Media. Microbial fermentation, Generation time production of Antibiotics, organic acids and vitamins; General design and applications of a Biofermenter. Nitrogen fixation – Symbiotic, non symbiotic.

Unit – III

Microbial Genetics: Mechanism of gene transfer -Vertical and horizontal gene transfer, homologous recombination. Conjugation - Types; transformation; Transduction – Types, Lysogeny and lytic cycle in bacteriophages.

Unit – IV

Plant diseases: Distribution, disease cycle, symptoms and control measures of Bacterial diseases Citrus canker, BLB of Paddy), Viral diseases (TMV, YMV), Fungal diseases (Red rot of sugarcane, Tikka disease) and Mycoplasma disease (Little leaf of Brinjal).

Unit –V

Host parasite interaction in Plants: Recognition and entry processes of different pathogens, defence mechanism- molecular and morphological changes. Integrated Pest management. Antagonism, Biological control, Bioformulations and application Biopesticides.

Practicals:

1. Preparation of culture media – sterilization techniques- Plating technique.
2. Isolation of bacteria and fungi from air, water and soil.
3. Staining techniques (Gram staining, Negative Staining and Capsule Staining).
4. Wet mounts (hanging drop) method.
5. Estimation of acidity in milk.
6. MPN analysis of different water bodies.

7. Isolation of genomic and Plasmid DNA from fungi and bacteria.
8. Isolation and culture of *Trichoderma* and *Bacillus sp.*
10. Industrial visit to waste water treatment plant, dairy, food industry.
11. Study on Tikka disease/Red rot
12. Study on Citrus canker/BLB
13. Little leaf of brinjal.

TEXT BOOKS:

1. Pelczar M. J., Reid, R. D., and Chan, E. C. S. 1983. Microbiology, Tata Mc Graw Hill Publishing Co. New Delhi.
2. Sullia, S. B. and shantharam, S. 1998. General Microbiology, Oxford & IBH Publishing Co. Pvt Ltd., New Delhi.
3. Dubey R. C. and Maheswari D. K. 1999. A Text Book of Microbiology, S. Chand & Company ltd., New delhi
4. Rangasamy, C. Diseases of Crop Plants of India, Prentice-Hall, 1972.
5. Mehrothra, R.S. and Ashok Agarwal. 2010. Plant Pathology. Tata McGraw Publishing Co. New Delhi.
6. Bilgrami.K.S. and Dube, H.C. 1976. A Text Book of Modern Pathology. Vikas Publications, New Delhi.

REFERENCE BOOKS:

1. Prescott, L.M., J.P. Harley, and D.A .Klein. 2002. Microbiology, McGraw -Hill Publishing Company, New Delhi.
2. Tortora, G. J., Funke, B. R. and Case, C.L 1995, Microbiology- An Introduction (5 th Ed.), The Benjamin/ Cummings Publishing Company Inc., Redwood city, California, U. S. A., pp.801.
3. Reed, G. 1986. General Microbiology (6^{th} Ed), Cambridge University Press, Cambridge.
4. Stainer, R. Y., Ingraham, J. I., Wheelis M. L. and Painter, P.R. 1986. General Microbiology (5^{th} Ed.), Macmillan Press Ltd., London, pp.689.
5. Steindraus, K. H. (Ed) 1983.Hand Book of Indigenous Fermented Food, Parcel Dekker Inc., New York.
6. Agrios, G. N.1978. Plant Pathology, 2^{nd} Ed. Academic Press, New York.
7. Aneja K R. 1993. Experiments in Microbiology, Plant pathology and Tissue culture. Wishwa Prakashan, Wiley Eastern Ltd., New Delhi.
8. Brock biology of microorganisms. Details to be added

SEMESTER-I

HARD CORE COURSE II

PBHT 102 -Phycology, Mycology and Bryology

Unit-I

General characters of Algae. Classification of Algae- Fritsch (1935) classification, Criteria for algal classification. Cell structure, EM studies of algal cell, cell wall, flagella, chloroplast, pyrenoid, eye spot, pigments- their importance in classification. General account of thallus structure, reproduction, relationship and life cycle of important groups- Cyanophyceae, Chlorophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae, Rhodophyceae.

Unit-II

Economic importance of algae: Algal Biofertilizers and its role in soil fertility, algae in industry, biological importance of phytoplanktons and water blooms.

Unit-III

General characters of fungi. Classification of fungi. Alexopolous, Mims and Blackwell (1996), ultra structure of cell, unicellular, multicellular organization, hyphal growth, cell wall composition, nutrition (saprophyte, biotrophic, symbiotic, predaceous), reproduction, heterothallism, parasexuality. General account of Myxomycota, Mastigomycota, Zygomycota, Ascomycota, Basidiomycota and Mitosporic fungi. Kinds of spores and their dispersal.

Unit-IV

Economic importance of fungi. Decomposition of organic matter, coprophilous fungi, lignin degrading fungi, degradation of pesticides. Role of fungi as symbionts- Lichens, Mycorrhiza- ectotrophic, orchidaceous and Ericoid mycorrhiza- their distribution and significance, Fungal Endophytes. Edible fungi.

Unit-V

Classification of Bryophytes- by Proskauer (1957. General account of major groups of bryophytes (Hepaticopsida, Anthoceoratopsida and Bryopsida). Origin of Bryophytes. Range of thallus structure, evolution of gametophytes and sporophytes. Reproduction and life cycle. Ecological and economic importance of bryophytes

Practicals:

1. Collection and study of algae:

   Spirulina, Anabaena, Hydrodictyon, Chlorella,
   Enteromorpha, Closterium, Zygnema, Nitella/Chara
   Pinnularia, Padina, Gracilaria. Gelidium, Sargassum
   Culture of some important algae

2. Study of the morphological characteristics and reproductive structure:

   Albugo, Peronospora, Rhizopus, Penicillium,
   Alternaria Lycoperdon, Ganoderma, Peziza,
   Curvularia, Aspergillus Puccinia, Colletotrichum
   Mucor

3. Study of the morphological characteristics and reproductive structure:
   Riccia, Marchantia, Lunularia, Anthoceros, Funaira, Sphagnum

4. Field visit to study the diversity of Algae, Fungi and Bryophytes (Preparation & submission of tour report).

TEXT BOOKS

1. B R Vasishtha, Sinha A K and Singh V P (2007), Botany for degree students-Algae (5th Ed), S. Chand & Co. Ltd., New Delhi
2. O P Sharma (2002), Text book of Fungi (9th Ed), Tata McGraw-Hill Publishing Co Ltd., Delhi.
3. H.C. Dubey (2005), An Introduction to Fungi, (3rd Ed), Vikas Publishing House P.Ltd., New Delhi.
4. Singh V, Pande P C and Jain D K (2008-09) A Text Book of Botany, Rastogi Publication, Meerut.
5. Vashishta B R and Sinha A K (2007) Botany for Degree student-Bryophyta S Chand & Company Ltd., New Delhi

REFERENCE BOOKS:

Phycology:

1. Bold HC and Wynne MJ (1985) Introduction to Algae- Structure and reproduction. Prentice Hall, New Jersey.
2. Chapman VJ and Chapman (1973) The Algae. ELBS and Macmillan, London.
3. Fritch EF (1935). The Structure and Reproduction of Algae. Tata McGraw Hill. New Delhi.
4. Ian Morris (1967) -An introduction to the Algae, Hutchinson Press, London.
5. Kumar, H.D (1989). Introductory Phycology- East-West press, New Delhi.
6. Prescott GW (1969) The Algae: A Review. Nelson.
7. Sharma, O.P. (1986). Text book of Algae- TATA McGraw-Hill New Delhi.

Mycology

1. Alexopolous CJ and Mims CW (1979) Introductory Mycology. Wiley Eastern Ltd, New Delhi.
2. Bessey EA (1971) Morphology and Taxonomy of Fungi. Vikas Publishing House Pvt Ltd, New Delhi.
3. Bold H.C. & others (1980) – Morphology of Plants & Fungi – Harper & Row Public, New York.
4. Burnet JH (1971) Fundamentals of Mycology. ELBS Publications, London

Bryology

1. Kashyap SR 1933. The Liverworts of Western Himalayas and Punjab plains I&II Punjab University publications.
2. Parihar N S (1996) Bryophytes. Central book Dept. Allahabad
3. Prem Puri 1973. Bryophytes- A Broad Perspective, Atma Ram & Sons, New Delhi.
4. Smith GM 1971. Cryptogamic Botany Vol. I & II Tata McGraw Hill, New Delhi.
5. Watson EV 1971. The structure and life of Bryophytes. Hutchinsons publications, London

SEMESTER-I

HARD CORE COURSE III

PBHT 103- Pteridophytes, Gymnosperms and Palaeobotany

Unit 1

Origin of land flora, colonization in terrestrial environment, Evolutionary trends in stelar organization and soral organization – Vegetative propagation – apogamy; apospory; embryogeny; homospory and heterospory – seed habit and seed evolution – Life cycle pattern.

Unit II

General characteristic features of Pteridophytes and Classification up to order level (Smith 1955) – Study of vegetative and reproductive characters : Psilophytales, Psilotales, Lycopodiales, Selaginellales, Isoetales and Filicales.

Unit III

General characteristic features of Gymnosperms and Classification up to order level (Sporne 1965) – Study of vegetative and reproductive characters of plants belonging to following orders: Cycadales, Coniferales, Taxales, Ginkgoales and Gnetales.

Unit IV

Fossilization and types of fossils – changes in organic and vegetation profile through the ages (geological time scale), Palaeopalynology and Carbon dating. Contributions of Indian Paleontologist - Birbal Sahani.

Unit V

A detailed study of the following fossils: Psilophyton, Lepidodendron, Heterangium, Lagenostoma, Lyginopteris and Cordaites.

Practicals

1. Study of morphology and anatomy of vegetative and reproductive characters using whole mount preparations, dissections and sections of the following plants:
   Lycopodium, Selaginella, Equisetum,
   Adiantum Marsilea Cycas,
   Ephedra, Gnetum, Ginkgo,
   Lepidodendron, Cordaites. Lagenostoma, Heterangium
   Types of fossils (Impression, Compression, Petrification)
2. A field trip to places of botanical interest to familiarize the students with different types of vegetation and fossils.

TEXT BOOKS

1. P C Vasistha, A K Sinha and Anil Kumar 2099. Botany for Degree students-Pteridophyta. S Chand & Company Ltd., New Delhi
2. An Introduction to Pteridophytes, Vikash Publishing House Pvt. Ltd. New Delhi.
3. Gangulee H C and Kar A K (1993, New Print). College Botany Vol II. New Central Book Agency, Kollatta.
4. P C Vasistha, A K Sinha and Anil Kumar 2099. Botany for Degree students-Gymnosperm. S Chand & Company Ltd., New Delhi.
5. W S Stewart, Gra W Rothwell Paleobotany and evolution of plants, Foundation Books Pvt. Ltd. Cambridge House, New Delhi.

REFERENCE BOOKS:

1. Andrews, H.N. (1961). Studies in Palaeobotany. John Wiley & Sons, New York.
2. Arnold, C.A. (1947). An introduction to Palaeobotany. McGraw-Hill, New York, London.
3. Bierhost, D.W. (1947). Morphology of Vascular Plants. The MacMillion, New York, London.
4. Bower, F.O. (1908). The Origin of Land flora. The MacMillion, New York, London.
5. Chamberlain, C.J. (1934). Gymnosperms – Structure and Evolution, Chocago.
6. Coulter, J.M. and Chamberlain, C.J. (1917). Morphology of Gymnosperms, Chicago.
7. Devevoryas, T. (1962). Morphology and evolution of fossil plants. Holt, Rinchart & Winston, New York.
8. Eames, A.J. (1936). Morphology of Vascular Plants – Lower groups. McGrow Hill, New York, London.
9. Smith, G.M. (1955). Cryptogamic Botany Vol.II McGraw-Hill, New York, London.
10. Sporne, K.R. (1962). The Morphology of Pteridophytes Hutchinson University Library, London.
11. Sporne, K.R. (1965). The Morphology of Gymnosperms. Hutchinson Univ. Library, London.
12. Watson, J (1953). An Introduction to the study of fossil plants, Londo

SEMESTER - I

HARD CORE COURSE IV

PBHT 104 - Microbial Biotechnology

Unit - I

Fermentation process: Fermentation media; inoculum preparations; scale up of fermentation, submerged and solid state fermentation; multiple fermentations; continuous fermentations, fermentor design.

Unit- II

Microbial Products: Antibiotics viz,. production of penicillin fermentation; anaerobic fermentation; alcohol production, Baker's yeast & probiotics.

Unit -III

Biomolecules: vitamins viz., Vitamin B_{12}, Riboflavin, vitamin A; Plant hormone (Gibberellin) production.

Unit -IV

Biopesticides & biofertilizers- production and applications, use of algal & fungal inoculants to improve crop growth. Sewage treatment and Biogas production.

Unit -V

Enzymes and acid products: Production of amylases, proteolytic enzymes, pectinase; production of acetic acid, citric acid and alpha-ketoglutaric acid fermentation.

Practicals:

1. Preparation of fermentation media – sterilization techniques.
2. Screening and Identification of Antibiotic producing microbes.
3. Demonstration of different types of bio-fermentor.
4. Staining techniques for fungi and bacteria.
5. Production of alcohol from yeast and grape.
6. Production of organic acid viz., acetic acid.
7. Production of metallic nanoparticles from fungi.
8. Visit to wine, pharmaceutical and food industries.

TEXT BOOKS:

1. Casida Jr L. E. 1996. Industrial Microbiology, New Age International (P) Ltd., New Delhi.
2. Verrall, M. S. and Hudson M. J. 1990. Separation for Biotechnology, Ellis Horwood Ltd.
3. Patel, A. H. 2005. Industrial Microbiology. Macmillan India Limited, New Delhi.
4. Anandan A. 1989. An Introduction to Industrial Microbiology.

REFERENCE BOOKS:

1. Prescott, L. M., J. D. Hardley and D. A. Klein, 1990. Microbiology, WEB Mc Graw hill
2. Peppler, H. J. and Pertman, D.1979. Microbial Technology. Vols. 1 and 2, Academic Press, New York.
3. Thoma G. T. 1977. Industrial Microbiology. Dowden Hutchinson & Ross Inc., Pennsylvania.

SEMESTER –I

SOFT CORE ELECTIVE I

PBSC 106- Forest Ecology

Unit-I

Silviculture: General Silvicultural Principles: ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests, Silviculture – systems**:** Clear felling, uniform shelter wood selection, coppice and conversion systems - establishment and rehabilitation of degraded mangrove formations

Uint-II

Agroforestry: Agroforestry - scope and necessity; role in the life of people and domestic animals and in integrated land use, planning especially related to (i) soil and water conservation; (ii) water recharge; (iii) enhancing bio-diversity, medicinal and other flora and fauna.

Uint-III

Social/Urban Forestry: Objectives, scope and necessity; peoples participation. **JFM (Joint Forest Management)** – principles, objectives, methodology, scope, benefits and role of NGOs (Non Govt Organization).

Unit-IV

Soil, Environment and Biodiversity Conservation: Forests Soils, Soil conservation - definition, types - wind and water erosion; conservation and management of eroded soils/areas, wind breaks, shelter belts; sand dunes; Role of forests in conserving soils

Unit-V

Forest Ecology and Legislation: Environment components and importance, Principles of conservation Impact of deforestation; forest fires. Forest types in India. Role of afforestation and forest regeneration in absorption of CO_2. Indian Forest Policy of 1990; Forest Conservation Act, 1980; Wildlife Protection Act 1972.

TEXT BOOKS

1. Adrian Newton, **Forest Ecology and Conservation** (1st Ed) Oxford University Press.
2. Agarwal S K. **Fundamentals of Ecology**, APH Publishing.
3. Burton V. Barnes, Donald R. Zak, Shirley R. Denton, Stephen H., Spurr. **Forest Ecology (**4th Ed**)** Wiley 1998.
4. Champion and Seth. **A revised survey of the forest types of India**, Manager of Publications, 1935.
5. Champion and Seth, **General silviculture for India**, Govt. of India Publication Branch, Dept, of Print. And Stationery, 1968.
6. James P. Kimmins, **Forest Ecology** (3rd Ed) Benjamin-Cummings Publishing company 1998.
7. Kimmins J.P., **Forest Ecology: A Fountation for Sustainable Management,** 1997, Prentice Hall, 2nd Ed.

REFERENCE BOOKS:

1. Lal, A B. **Silvicultural systems and forest management** 1961 Kishore Publishers
2. Lal A B, **Indian Silviculture**, publisher Kishore, 1976
3. Puri G S, **Forest Ecology**, Oxford & IBH Publishing,2000, ISBN: 8120403649
4. Sharad Singh Negi, , **Forest types of India, Nepal, and Bhutan,** Periodical Expert Book Agency, 1989
5. Singh G.B., **Forest Ecology in India** (1st) South Asia Books,
6. Stephen Spurr, **Forest Ecology** JR Rudol Barnes ,Denton John Wiley & Sons (Feb. 28th, 1998)
7. Troup R S, **The Silviculture of Indian Trees,** The Clarendon press, 1921

Government of Puducherry

DEPARTMENT OF BOTANY

KANCHI MAMUNIVAR CENTRE FOR POSTGRADUATE STUDIES

(An autonomous college with potential for excellence and accredited by NAAC 'A' Grade)

LAWSPET, PUDUCHERRY – 605 008

TEL: 0413-2251687

CBCS-SYLLABUS

BOTANY

M.Sc. (PLANT BIOLOGY AND BIOTECHNOLOGY)

SEMESTER II

2018-2019

SEMESTER-II

HARD CORE COURSE I

PBHT 207- Computer applications in Biology and Biostatistics

Unit I

Fundamental knowledge of computers – Basic components of computers – CPU, Input – Output devices, keyboard, mouse and scanner, printers, data storage and retrieval, hard disc, floppy disk, CD ROM, Types of computers, Hardware and Software

Unit II

Operating systems: Introduction to operating systems – Windows/Linux; concept of data, types of data and data structures. **Computer Networking**: Fundamentals of networking: OSI reference model, TCP/IP, topologies and protocols. Network security.

Unit III

Introduction to Bioinformatics; Overview of Bioinformatics resources on the web – NCBI/EBI/EXPASY. Biological databases: Nucleic acid sequence databases, Genbank/EMBL/DDBJ; Protein sequence databases – UniProtKB. Multiple sequence alignment – CLUSTALW and Phylogenetics. Database on bibliography. Application of software with special reference to Taxonomy.

Unit IV

Biostatistics: Measures of Central Tendency- Mean, Median, Mode- Measures of Dispersion- Quartile deviation, Mean deviation, Standard deviation- Coefficient of Variation. Probability distributions: Binomial distribution, Poisson distribution , Normal distribution.

Unit V

Correlation and Regression: Definition, types and significance. Chi-square test: Characteristics and applications. Tests of significance: Null hypothesis and alternate hypothesis, Student's t- test, F-test, X^2- test; ANOVA – one way and two way analysis of variance. Basics of SPSS, applications of SPSS.

Practicals:

1. Windows utilities
2. Computer presentation with graphics, working with formulae and functions, graphs, (SPSS).
3. Browsers and various search engines
4. E-mail, designing and creation of web pages.

5. Genbank databases using ENTREZ search engine.
6. Preparation of powerpoint presentation.
7. NCBI-BLAST Sequence analysis.

TEXT BOOKS:

1. Current Protocols in Bioinformatics, Edited by A.D. Baxevanis et al, Wiley Publishers 2005
2. Bioinformatics by David W. Mount, Cold Spring Harbor Laboratory Press, 2001,
3. Computational Molecular Biology by P. A. Pevzner, Prentice Hall of India Ltd, 2004.
4. Fundamental concepts of Bioinformatics by D.E. Krane and M.L Raymer, Pearson Education 2003 ISBN 81-297-0044-1
5. Cynthia gibas, Per Jambeck 2001, Developing bioinformatics computer skills O'REILLY publication.16

REFERENCE BOOKS:

1. Kutti, C and Unix programming: a conceptual perspective, Tata McGraw Hill, 1995.
2. Gibas Cynthia, Jambeck P. Developing bioinformatics in computer skills. Oreilly & Associates Inc. Shroff Publishers, 2001.
3. Mount David W. Bioinformatics: Sequence and Genome analysis: Cold Spring Harbor
4. Alexis Leon, Mathews Leon. Fundamentals of Information Technology. Leon Press, Chennai & Vikas Publishing House Pvt Ltd. Delhi.
5. Rajaraman. Fundamentals of Computer. 4th Edition. Prentice Hall India.
6.Tanenbaum Andrew S. Computer Networks 4th edition; Prentice Hall. 2003.
7. Rajaraman V. Fundamentals of Computers. Publisher: Phi Learning, 2001.

SEMESTER- II

HARD CORE COURSE II

PBHT 208-Plant Anatomy and Embryology

Unit I

Basic Concepts of Anatomy- Theories of Organization of meristems in stem and root, Differentiation of Xylem and Phloem Tissues; Structure and Function of Vascular Cambium and Cork-cambium; Cambial activity and wound healing; Secondary and Anomalous Secondary growth in stem and root of plants; Wood types and structures.

Unit II

Morphogenesis in Stem and Root: Organization of Shoot and Root Apical meristems; Nodal anatomy; Shoot and Root developments in plants; Lateral roots and Root Hairs.

Unit III

Morphogenesis in Leaf and Flower- Leaf development, Phyllotaxy, Epidermis Development- Trichomes and Stomata Development; Flower Development- Organization of Floral meristems and Flower development in Plants (*Arabidopsis*).

Unit IV

Basic Plant Embryology- Microsporogenesis and Development of Male gametophyte; Megasporogenesis and Development of Female gametophyte, Pollination and Double fertilization in plants; Development of Embryo and Endosperm in plants.

Unit V

Advanced or Applied Embryology- Polyembryony, Apomixis, Sexual incompatibility in plants; Cellular Totipotency and Regeneration; Production of Somatic embryo and haploid embryos; Synthetic Seed production; Genetics of Zygotic and Somatic embryogenesis.

Practicals

1. Isolation and microscopic examination of pollen grains and pollinium.
2. Isolation and dissection of embryo.
3. Micro-preparation of SAM in Dicot and Monocot.
4. Micro-preparation of RAM in Dicot and Monocot.
5. Pollen Germination and Test- *Datura* sp., *Catharanthus* sp.
6. Anomalous structure of stem of *Boerhaavia, Nyctanthes, Achyranthes*
7. TS / LS showing initiation of lateral roots.
8. Observation of permanent slides/micropreparations/photographs/charts/specimens etc of the following Anthers, Ovules, Embryo-sacs, different stages of embryo, Endosperms, SAM, RAM, Seeds

TEXT BOOKS

1. H P Sharma 2009, Plant Embryology (Classical and Experimental) Narosa Publishing House Pvt. Ltd. India
2. S S Bhojwani and S P Bhatnagar, 1999. The Embryology of Angiosperms, (4th revised and enlarged Ed) Vikash Publishing House Pvt, Ltd. New Delhi
3. P Maheswari 1997. An Introduction to the Embryology of Angiosperms, Tata McGraw Hill Publishing company Ltd., New Delhi.
4. S N Pandey and A Chadha, 2007. Plant Anatomy and Embryology, Vikash Publishing House Pvt. Ltd. New Delhi.

REFERENCE BOOKS:

1. Molecular genetics of Plant Development" Stephen H. Howell; Cambridge University Press.
2. Patterns formation and plant tissue" Sachs T. (1991) Cambridge University Press.
3. Plant Development/; the cellular basis" Lyndon R. F.(1990) Unnin Hyman, London,
4. Plant Developmental Biology - Biotechnological Perspectives: Volume 1", Eng Chong Pua, Michael R. Davey, Publisher: Springer (2009)
5. Plant Developmental Biology:Methods and Protocols", Hennig, Lars; Köhler, Claudia (Eds.), 1st Edition., 2010, Humana Press

SEMESTER- II

HARD CORE COURSE III

PBHT 209-Plant Ecology

Unit I

The Environment: Physical environment; biotic environment; biotic and abiotic interactions. Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Habitat and Niche: Concept of habitat and Niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Unit II

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.

Unit III

Ecosystem Ecology: Ecosystem structure; ecosystem function. Energy flow and mineral cycling (C.N.P.); primary production and decomposition; structure and functions of ecosystems; terrestrial (forest, grassland) and aquatic (fresh water, marine and eustarine).

Unit IV

Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies; concept of metapopulation- demes and dispersal, interdemic extinctions, age structured populations.

Unit V

Conservation Biology: Principles of conservation, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves). Applied Ecology: Environmental pollution; global environmental change; biodiversity: status, monitoring and documentation, major drives of biodiversity change;

Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

Practicals

1. Qualitative and quantitative analysis of vegetation.
2. Anatomical adaptation.

3. Analysis of soil samples (pH, EC, organic Carbon).
4. Analysis of water samples (pH, dissolved Oxygen).
5. Visit to places of ecological importance.

TEXT BOOKS

1. N S Subrahmaniam & AVSS Sambamurthy, 2006. Ecology. II Ed, Narosa Publishing House Pvt. Ltd. New Delhi, India
2. R N Trivedi, 2001. A textbook of Environmental Sciences, Anmol Publications Pvt. Ltd. New Delhi.
3. Jonathan turk and Amos Turk 1984, Environmental Science IIIrd Ed, CBS College Publishing, USA.
4. Prithipal Singh 2010. An Introduction of Biodiversity. Ane Books Pvt. Ltd., New Delhi.
5. Madhab Chandra Dash and satya Prakash Dash, 2009. Fundamental of Ecology IIIrd Ed, McGraw hill Publishing Company Ltd, New Delhi.

REFERENCE BOOKS:

1. Chapman and Reeis (1988). Ecology, Principles and Applications, Cambridge University Press, UK.
2. Miller TG. Environmental Science, Wadsworth Publishing Co.
3. Trivedi and Goel. Introduction to air pollution. Techno-Science Publication.
4. Jadhav and Bhosale (1995). Environmental Protection and Laws. Himalaya Pub. House, New Delhi.
5. Wanger. Environmental Management. W.B. Saunders Co. Philadelphia.
6. Odum, EP (1971) Fundamentals of Ecology, Saunders, Philadelphia.
7. Agarwal Kd (2001) Environmental Biology. Nidhi Publications. Bikaner.

SEMESTER – II

HARD CORE COURSE IV

PBHT 210 A- Bioinstrumentation

Unit I

Microscopy: Principles of Light Microscopy, Magnification, Resolving power. Phase Contrast Microscopy, Fluorescence Microscopy. Electron Microscopy: TEM and SEM. Foldscope. Camera Lucida, Ocular and Stage micrometer. Photomicrography. Microtechniques: Microtomes – Rotary and Sledge, Fixatives (FAA) and Staining (single, double). Types of mounting media.

Unit II

Centrifuge – Basic principles of sedimentation, RCF, Sedimentation coefficient. Types of Centrifuges – Analytical and Ultracentrifuges. pH meter – principle, electrodes, working of a pH meter.

Unit III

Chromatography – paper, TLC, column, GLC, HPLC. Electrophoresis – Gel electrophoresis, Agarose/SDS PAGE. Immunoelectrophoresis – applications.

Unit IV

Spectrophotometer – Absorbance and Transmittance, Beer-Lambert's Law, Visible and UV spectrophotometers. Atomic Absorbance Spectrometer, Flame photometer.

Unit V

Radio isotopic techniques – radioisotopes, Half-life, Applications of tracer techniques in Biology, Measurement of radioactivity – GM and Scintillation counters. Autoradiography.

Practicals:

1. Separation of proteins by gel electrophoresis.
2. Estimation of proteins by Lowry's et al method.
3. Preparation of a standard curve for protein (BSA).
4. Preparation of buffers using a pH meter.
5. pH of various soil and water samples.
6. Training the students to use UV-VIS Spectrophotometer.

7. Demonstration of Column Chromatography.
8. TLC – separation of pigments and amino acids.
9. Calibration of a microscope using ocular and stage micrometers.

TEXT BOOKS

1. S C Rastogi, 2003. Biochemistry, Tata McGraw Hill Pvt. Ltd. New Delhi.
2. V Satyanarayan and Chakrapani 2006. Biochemistry. Books and Allied (p) Ltd. Kolkata.
3. J L Jain. 2005. Fundamentals of Biochemistry, 6th Ed. S Chand & Co Ltd. New Delhi.
4. L Veerakumari 2009. Bioinstrumentation. MJP Publishers, New Delhi.
5. N Gurumani, 2011. Research methodology: For Biological Sciences, MJP Publishers, New Delhi.

REFERENCES:

1. Philip Sheeler and Bianchi – Cell and Molecular Biology.
2. Jeyaraman, J. 1972. Techniques in Biology, Higginbothams Pvt. Ltd, Madras.
3. Prasad and Prasad ,Outlines of Microtechnique, Emkay Publications, Delhi.
4. Veerakumari, L. 2009. Bioinstrumentation, www.mjpublishers.com
5. Voet and Voet. 1992. Biochemistry, John wiley and Sons, New York, USA.
6. Moore, T. C. 1989. Biochemistry and Physiology of Plant Hormones, Springer Verlag, New York, USA.
7. Dennis, D.T., Turpin, D.H.., Lefebvre, D.B. and Layzell, D.B. 1997. Plant Metabolism (2nd Edn.) Longman, Essex, England.

SEMESTER – II

HARD CORE COURSE IV

PBHT 210 B - Environmental Biotechnology

Unit I

Introduction: The environment- soil, water and air. Pollution and climate change, it's causes. non-conventional energy resources- biogas production, methane and hydrogen production. Recycling of waste products- composting/Vermicomposting.

Unit II

Source and treatment of polluted water and effluents: Biological treatment of sewage-characteristics of sewage and objective in sewage treatment- Activated sludge process-Trickling filters- Anaerobic digestion. Treatment of industrial effluents.

Unit III

Soil and air pollution and their treatment: soil pollution by xenobiotics. Degradation of xenobiotics- pathways of phenol, pentachlorophenol and polychlorinated biphenyl degradation. Purification of polluted air.

Unit IV

Bioremediation: Introduction. Types (Bioaugmentation, Biostimulation). *Ex situ* and *in situ* bioremediation. Phytoremediation.

Unit V

Pollution of water bodies by heavy metals and pesticides-their removal by biosorption. Removal of oil spills by using microbes, Superbug. Biomineralizaiton- bioleaching-metal transformation-biofilms and biocorrosion. Pollution by radionuclides.

Practicals

1. Composting techniques (Vermi-composting).
2. Demonstration of Biogas production.
3. Demonstration of bioreactor.
4. Visit to nearby sewage treatment plant.
5. Visit to industries to show air purification units and mechanism.
6. Estimation of BOD and COD-Demonstration.
7. Water quality parameters and standards-Demonstration.

TEXT BOOKS

1. J L Sharma and P L Buldini. 1994. A Dictionary of Pollution, CBS Publishers & Distributers (P) Ltd. New delhi.
2. Robert Leo Smith, 1986. Elements of Ecology IInd Ed, Haper & Row Publishiers, New York.
3. A G Murugesan and C R Rajakumari, 2005. Environmental Science and Biotechnology Theory and Techniques, NJP Publishers, Chennai, India.
4. P K Gupta. 2004. A HandBook of Soil, Fertilizer and Namure. Agrobios, India.
5. R K trivedy, 1989. Pollution management in Industries Environmental Publications, India.

REFERENCE BOOKS:

1. Alan Scragg (1999). Environmental Biotechnology. Pearson Education Limited.
2. Dubey (2004). A text book of Biotechnology. S. Chand & Company Ltd. New Delhi.
3. Joseph C Daniel (1996). Environmental aspects of microbiology. Britixh Sun Publication.
4. Sharma (2005). Environmental Microbiology. Narosa Publishing House Pvt. Ltd. New Delhi.
5. Raina Maier, Pepper, Gerba (2000). Environmental Microbiology. Academic Press, UK.

SEMESTER - II

SOFT CORE COURSE I

PBSC 212- Medical Botany

Unit 1

Pharmacognosy - Definition and scope — History – Scheme for pharmacognostic studies of a natural drug – Indian Systems of medicine: Ayurveda, Siddha, Yoga, Unani, Homeopathy, Traditional botanical knowledge, Ethnobotany and Folklore medicines - AYUSH

Unit II

Medicinal plants – Methods of cultivation, factors affecting cultivation, use of Biofertilizer, pest control. Collection, Harvesting, Drying, Packaging and storage of crude drugs. Cultivation and utilization of medicinal and aromatic plants in India. Methods of cultivation of *Aloe vera* and *Ocimum* (Tulsi)

Unit III

Tissue culture of endangered medicinal plants- Role of tissue culture in the improvement of medicinal plants – Different types of drug adulteration and substitution – Microscopic analysis and phytochemical evaluation of crude drugs

Unit IV

Biological source, geographical distribution, morphology of useful part, active principles and therapeutive value of the following drugs: Fox glove (*Digitalis purpurea*), Myrobalan (Terminalia *Chebula),* Neem (*Azadirachta indica*), Turmeric (*Curcuma sp.),* Asafoetida (*Ferulla asafetida*), Ginger (*Zingiber officinale),* Lemon grass (*Cymbopogon citrates*), Clove (*Eugenia Caryophyllata*), Vinca (*Catharanthus roseus*)

Unit V

Bioactive compound isolation: Isolation and Characterization by HPLC, Flash chromatography.

Practicals:

1. Identification and morphological study of drugs included in the syllabus.
2. Determination of Epidermal cell number, Epidermal cell size.
3. Determination of stomatal number, stomatal size, stomatal index, vein islet number, vein termination number and study of trichomes.
4. Determination of Vein islet Number and Vein termination number.
5. Microscopic study of Trichomes.

TEXT BOOK

1. Shah C S and Qadry J S (2005), A Text Book of Pharmacognosy, B S Shah Prakasha, Amdavad.
2. Mohammed ali (2008), Text Book Of Pharmacognosy (2nd Ed), CBS Publishers & Distributors, New Delhi.
3. Ansari S H (2006), Essentials of Pharmacognosy, Birla Publications Pvt. Ltd. Delhi.
4. Kolate C K, Purohit a P and Gokhale S B (2008), Pharmacognosy (42nd Ed), NiraliPrakashan, Pune.
5. Khandelwal K R (2008), Practical Pharmacognosy-Tehcniques & Experiments (19th Ed), NiraliPrakashan, Pune.

REFERENCE BOOKS:

1. Chopra R.N. (1958). Indigenous Plants of India.
2. Chopra, R.N., Nayar S.L. and Chopara I.C. (1956) Glossary of Indian Medicinal plants. CSIR, New Delhi, India.
3. Iyengar, M.A. (1975) A hand book of Pharmacognosy, Manipal.
4. Iyengar, M.A. (1978) Powered drugs of India, Manipal.
5. Kokate, C.K. (1988) Practical Pharmacognosy.
6. Kokate, C.K., A.P. Purohit and S.B. Gokhale (1995) Pharmacognosy. Furia, Narali Prakashan, Jageshwari Mandir Lane, Pune.
7. Nadkarni, K.M.(1976) Indian Materia Medica, Vol I & II. Popular Prakashan Pvt. Ltd., Bombay.
8. Wallis, T.E.(1985), Test book of Pharmacognosy. CBS Publications and distributers, Bholonath Nagar, Shhadara, Delhi.
9. William Charles Evans, (1989) Trease and Evans Pharmnacognosy. 14th Edition.

Government of Puducherry

DEPARTMENT OF BOTANY

KANCHI MAMUNIVAR CENTRE FOR POSTGRADUATE STUDIES

(An autonomous college with potential for excellence and accredited by NAAC 'A' Grade)

LAWSPET, PUDUCHERRY – 605 008

TEL: 0413-2251687

CBCS-SYLLABUS

BOTANY

M.Sc. (PLANT BIOLOGY AND BIOTECHNOLOGY)

SEMESTER III

2018-2019

SEMESTER - III

HARD CORE COURSE- I

PBHT 313 - Angiosperm Systematics & Resource Utilization

Unit I

Comprehensive view of various approaches of plant classification: artificial (Linnaeus), natural (Bentham & Hooker), phylogenetic (Cronquist). Introdcution to APG. Taxonomic hierarchy. Homology and analogy. Keys: single access or sequential keys, multi-access keys, indented keys; ICN: rules of nomenclature, typification; Effective and valid publication.

Unit II

Modern plant systematic- molecular approaches in plant systematic, -RFLP (Restricted Fragment Length Polymorphism), PCR based molecular markers, RAPD (Random amplifies polymorphic DNA).

Unit III

Tools of Taxanomy- herbarium, flora, monograph. Techniques in Taxonomy- Numerical, Cytotaxanomy, Chemotaxanomy, Serological, finger printing, bar coding, Cladistics in Taxonomy & Taxonomical softwares (Delta etc.).

Unit IV

Detailed study of the following families: Menispermaceae, Nymphaeaceae, Malvaceae, Meliaceae, Sapindaceae, Fabaceae, Lythraceae, Rubiaceae, Asteraceae, Sapotaceae, Apocynaceae, Convolvulaceae, Bignoniaceae, Acanthaceae, Lamiaceae, Amaranthaceae, Euphorbiaceae, Casuarinaceae, Orchidaceae, Araceae, Commelinaceae, Cyperaceae, Poaceae

Unit V

World centres of orgin and diversity of domesticed plants- cultivation and uses of i) Food crops: Cerales and Pseudoceral ii) Pulses iii) Nuts :protein and fat content iv) Vegetables: underground , Leaf and fruit v) Fruits:Tropical and Temperate fruit vi) Spices and condiments obtained from : Stem, leaves, flowers seeds, lichen vii) Fatty oils: Drying , semidrying, non-drying oils and vegetable fats viii) Commericial crops Texitle fibre, Brush fibre Filing fibre and natural fibre ix) Timbers: Porous and non porous wood, Early wood and late wood, Sap wood and heart wood, Texture, Grain and figure x) Fire wood xi) Essential oils xii) Drug yielding plants: obtained from roots, stem, bark,stem and wood, leaves, fruits, seeds and all parts of the plants. xiii) Forage/ fodder crops.

Practicals

1. Binomial identification of local plants by using flora.
2. Study of Families mentioned in the syllabus – at least two local taxa from each family may be dissected and sketched in record sheets.
3. Construction of artificial key for any six plants.
4. Field visits (local / interstate) for 5 to 7 days and submission of 30 herbarium sheets of wild plants along with the field book.
5. Food plants: Morphology, Anatomy, histochemical tests for wheat, rice & Bengal gram.
6. Study of any locally available fodder / forage plant.
7. Microscopic examination and identification of fibers.
8. Macro and microscopic studies of any three medicinal plants included in the syllabus.
9. Identification of wood shavings based on the micro, and macroscopic features.
10. Visit to any Regional Research Laboratory of India (like TBGRI, Trivandrum).

Text books

1. Subramanium, N.S. 1996 Laboratory manual of Plant Taxonomy, Vikas publishers, New Delhi
2. Subramanium, N.S. 1996 Modern Plant Taxonomy, Vikas publishers, New Delhi
3. Chopra, G.L. 1982 Angiosperms (Systematics & Life Cycle) Pradeep publishers, Jullander, Punjab.
4. Pandey, B.P. 2004 Angiosperms, S.Chand publishers, New Delhi.
5. Bharat Bhattacharia, 2005 systematic Botany, Narosa publishers, New Delhi.
6. Gurucharan Singh, 2005 Plant Systematics (Theory & Practice), Oxford & IBH publishers, New Delhi.
7. Sivarajan, V.V.1991, Introduction to the principles of Plant Taxonomy, Oxford and IBH publishers, New Delhi.
8. CSIR – 1948-1976. The Wealth of India: A dictionary of Indian raw material & Industrial production, New Delhi, Raw materials XII Revision Vol. I-II (1985 – 1992). Supplement (2000)

9. Kocchar, S. L, 1998. Economic Botany of the Tropics II edition, Macmillan India Ltd, New Delhi.

References

1. Lawrence, H.M.1971 Taxonomy of Vascular Plants, Oxford and IBH publishers, New Delhi.
2. Davis, P.H and Heywood, V. H. 1973 Principles of Angiosperm Taxonomy. Oliver and Boyd Ltd. UK.
3. Heywood, V. H. 1984 Modern methods in Plant Taxonomy, Academic Publishers, USA.
4. Takhtajan, A. 1995 Flowering Plants – Origin & Dispersal, Oliver and Boyd. UK.
5. Jones, S.B, Jr. and Luchsinger , A.E 1986 Plant Systematics, 2nd Edn. Mc Graw Hill, New York.
6. Stace, C. A. 1989, Plant Taxonomy and Biosystematics (2nd Edn.) Edward Arnold Ltd, London.
7. Franker, O. H., Brown, A. H and Burdon, J.J 1995. The conservation of plant diversity. Cambridge University Press, Cambridge, UK.

SEMESTER III

HARD CORE COURSE II

PBHT 314 - Genetics, Plant Breeding and Evolution

Unit I

Mendelian Genetics, Incomplete dominance, interaction of Genes Multiple factor inheritance, Multiple allelism, Linkage and Crossing over; Chromosome mapping. Plastidal inheritance in *Mirabilis,* Mitochondrial inheritance in Yeast.

Unit II

Microbial genetics, Sex linked inheritance, DNA as a genetic material. Sex determination in plants; Mutation: Causes of mutation, mutagens, detection of mutation ; Chromosomal aberration; Chromosomal variation; Population genetics.

Unit III

Gene linkage in bacteria; Circular chromosome map of *E. coli*, circular genetic map of phage T_4; transposable elements; Insertion sequences, Complex transposons, transposons of *E. coli*, bacteriophage Mu, Yeast Ty elements.

Unit-IV

Plant Breeding: History, introduction, principles, modern techniques involved in crop improvement – Mutation breeding, Polyploid breeding and Transgenic technology. Hybridization: Intergeneric hybridization, Interspecific hybridization, Intervarietal hybridization, heterosis and hybrid vigour.

Unit V

Origin of basic biological molecules; a biotic synthesis of organic monomers and polymers, Concepts of Oparin and Haldane; experiment of Miller (1953); Evolutionary time scale, major events in the evolutionary time scale, origin of major group of plants; Concepts of neutral evolution; molecular divergence, molecular clocks, molecular tools in phylogeny. Theory of endosymbiosis- hologenome theory of evolution

Practicals:

1. Interaction of Genes, Evolutionary and Phylogenetic Tree (demo).
2. Sex linked inheritance.
3. Construction of chromosome maps.

4. Linkage maps of Drosophila ad Maize.
5. Photographs / diagram / models of; Structural changes in chromosome (deletion, duplication,inversion and translocation);Numerical changes in the chromosome (euploidy and aneuploidy).
6. Incomplete dominance.
7. Polygenic inheritance or multiple alleles.
8. Trihybrid Test cross.

Text books:

1. Ajoy Paul, 2007. *Text Book of Cell and Molecular Biology*. Books and Allied (P) Ltd. Kolkatta.
2. P.K. Gupta 1996 *Genetics*, Rastogi Publications. Meerut.
3. P.S. Verma, V.K. Agarwal. 2004. *Cell Biology Genetics, Molecular Biology, Evolution and Ecology*. S. Chand & Co. New Delhi.
4. Sarin C. 1990 *Genetics*. Tata Mc Graw Hill Publication Co. Ltd. New Delhi.
5. Veera Bala Rastogi 2008. *Fundamentals of Molecular Biology*, Rastogi Publications Meerut.

References:

1. Atherly, A.G. Girton, J.R and McDonald, J.F. 1999. The Science of Genetics. Saunders College Publishing, Fort Worth, USA.
2. Gardner J. Simmons J. Snustad P. 1991. Principles of Genetics. VIII edn. John Wiley & Sons INO New York.
3. Gardner, E.J. and Snutud D. Peter. 1978. Principles of Genetics. John Wiley & Sons, New York.
4. Herskowitz, Little Grown & Co : Genetics
5. Levine, P.P. 1976. Genetics. Holt Rinehart & Wilson Inc., USA
6. Lewin B. 2000 Gene VII Oxford University Press. New York.
7. Philip Sheeler and Donald E. Bianchi 2004. Ed. Cell and Molecular Biology III Ed. Replica Press Pvt. Ltd., India.
8. Russel, P.J. 1998. Genetics. Benjamin Publishing Company Inc., USA

9. Serra; Acdemic Press : Modern Genetics
10. Sinnot, Dann and Dobzhansky: Principles of genetics
11. Srib et al., W.H. Sreeman Co: General genetics.
12. Stabbin Prentice Hall: Process of organic evolution.
13. Strickburger 1990. Genetics. III Ed. Maxwell MacMillon International Edn. New Delhi.
14. William Hexter and Henry, T.Y. 1974. The Science of Genetic. Prentice – Hall Pvt. Ltd., New Delhi.
15. Winchester, A.M. 1984. Genetic. Oxford & IBH publishing & Co. Ltd; New Delhi.

SEMESTER - III

HARD CORE COURSE III

PBHT 315 - Cell and Molecular Biology

Unit I

Cell: Ultra structure, of Plant Cell and function of Cell organelles-Cell wall, Plasma membrane, Cytoplasm. Structure and functions of cell organelles. Endosymbiont hypothesis on the evolution of mitochondria and chloroplast,

Unit II

Cell cycle: Phases of Cell cycle and checkpoints, types of cell division, Molecular events during cell cycle

Unit III

Structure of chromatin- histones and nonhistone proteins, nucleosomal organization of chromatin. Heterochromatin and Euchromatin, Chromosomal packing and structure of metaphase chromosome. Molecular structure of the Centromere and Telomere.

Unit IV

Watson and Crick model of DNA structure, Different types of DNA. DNA replication in prokaryotes and eukaryotes: enzymes and proteins involved in replication. Replication in the telomere – telomerase. DNA damage and repair mechanisms: Types- Direct, excision. Mismatch and Recombination repair types

Unit V

Gene expression: Concept of gene; Important features of the genetic code. mRNA transcription and processing, mRNA transport and stability. Mechanism of translation; Protein sorting. Post-translational modification of proteins. Protein folding – self assembly, role of chaperones in protein assembly. Regulation of gene expression in prokaryotes and Eukaryotes. Organisation of rRNA and tRNA genes and Significance of introns, organellar genome organisation.

Practicals

1. Aceto carmine root tip squash technique – Observation of chromosomes during mitotic stages.
2. Anther smear techniques for meiosis – Observation of chromosomes during meiotic stages.
3. Identification of chromosomes by Banding techniques – Giemsa, Quinacrine, Reverse, Centrometric.
4. Isolation of plant DNA and its quantification by a spectrophotometric method.
5. Isolation of plant RNA and its quantification by a spectrophotometric method.

Text Books

1. Archana Sharma. Chromosomes, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Arumugam N. Cell biology, genetics and molecular Biology, Saras Publications, Nagercoil
3. Ajoy Paul, 2007. Text Book of Cell and Molecular Biology.Books and Allied (P) Ltd., Kolkata.
4. Sumita Sen, DipakKumar Kar. Cytology and Genetics, Narosa, New Delhi
5. Gupta P K. Cell and Molecular Biology, Rastogi Publications, Meerut.
6. Rastogi V.B 2008. Fundamentals of Molecular Biology, Rastogi Publications, Meerut.

References

1. Gerald Karp (2008). Cell and Molecular biology: Concepts and experiments (V Edn). John Wiley & Sons.
2. Harvey Lodish, Arnold Berk, Lawrence Zipursky, Paul Matsudaira, David Baltimore, James Darnell (2000). Molecular cell biology (IV Edn). W H Freeman & Company.

3. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2002). Molecular biology of the cell (IV Edn). Garland Science, Taylor and Francis group.
4. Bob B Buchanan, Wilhelm Gruissem, Russel L Jones (2000). Biochemistry and Molecular biology of plants. I K International Pvt. Ltd.
5. Daniel L Hartl, Elizabeth W Jones (2012). Genetics: Analysis of genes and genomes (VII Edn). Jones and Bartlett publishers.
6. James D Watson, Tania A Baker, Stephen P Bell, Alexander Gann, Michael Levine, Richard Losick (2009). Molecular biology of the gene (V Edn). Pearson.
7. Robert F Weaver (2002). Molecular biology (II Edn). McGraw Hill.
8. Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2010). Essential Cell Biology. Garland Science.
9. Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Matthew P. Scott, Anthony Bretscher, Hidde Ploegh, Paul Matsudaira (2007). Molecular cell biology (VI Edn). W H Freeman & Company.
10. William H Elliott, Daphne C Elliott (2001). Biochemistry and molecular biology (II Edn). Oxford.
11. David P Clark (2010). Molecular biology. Elsevier.

SEMESTER - III

HARD CORE COURSE IV

PBHT 316 - Gene Technology

UNIT-I

Recombinant DNA technology: Types of vectors – plasmids, phagemids, cosmids, CaMV, M13, and Expression vectors. Characteristic features of vectors. rDNA technology, Gene cloning techniques, identification of clones by screening procedures, Construction of genomic / cDNA libraries, PCR and its applications, Blotting techniques, DNA fingerprinting.

UNIT – II

Genetic transformation: *Agrobacterium* as a natural genetic engineer, Ti and Ri plasmids, Opines and their significance, T-DNA. CRISPR Cas genome editing; whole genome transfer, Zinc finger; Gene transfer methods – Electroporation, Microprojectile bombardment. Transgene stability and gene silencing. Strategies to avoid gene silencing and improve gene expression in transgenic plants.

UNIT – III

Application of Genetic Engineering: Gene manipulation of microbes in the production of alcohol, beer, wine and vinegar. Genetically modified crops and their significance. Molecular farming. Pharmaceuticals and neutraceuticals.

UNIT – IV

Nano-technology: Basic concepts of Nano science and nanotechnology, its applications, characterization of bionano materials- Spectrophotometer, FTIR.

UNIT- V

Biotic stress tolerance; Herbicide resistance, bruise resistance, pest resistance, Disease resistance. Abiotic stress tolerance: Drought, temperature and salt. Application of gene technology for the production of quality oil and Industrial enzymes. Metabolic engineering for plant secondary metabolites.

Practicals:

1. Problems related to DNA fingerprinting and other genetic engineering techniques.
2. Demonstration of blotting techniques.

3. *Agrobacterium* mediated transformations.
4. Nucleic acid separation by electrophoresis.
5. Protein separation by Electrophoresis.
6. Isolation of genomic DNA from Bacteria.
7. Isolation of plasmid DNA from Bacteria.
8. Study of microbes in the production of alcoholic beverages.

Text books

1. Rastogi, S. C. Biotechnology: Principles & Applications.
2. Joshi, P. Genetic Engineering & its applications.
3. Kumar, H. D. 1998. Modern concepts of Biotechnology, Vikas publishing House, Noida (UP), India.
4. Das, H.K. 2007. Textbook of Biotechnology, III Edn. Willey India (P) Ltd.
5. Satyanarayana, U. 2005. Biotechnology. Books & Allied (P) Ltd, India.
6. Tejovathi, G, Vimala, Y and Rekha Bhadauric. 1996. A Practical manual for Plant Biotechnology, CBS Publishers & Distributors, New Delhi.
7. Chawla, H. S. 2002. Introduction to Plant Biotechnology, II Edition, Oxford & IBH Publishing Co., New Delhi.

References:

1. Snustad & Simmons, 2006. Principles of Genetics, IV Edn. Willey Asia Student Edition.
2. Rev. Fr. Dr. Ignacimuthu, S. 1996. Applied Plant Biotechnology, Tata McGraw-Hill Publishing Co., New Delhi

SEMESTER III

SOFT CORE COURSE I

PBSC 318 A- Medical Botany

Unit 1

Pharmacognosy - Definition and scope — History – Scheme for pharmacognostic studies of a natural drug – Indian Systems of medicine: Ayurveda, Siddha, Yoga, Unani, Homeopathy, Traditional botanical knowledge, Ethnobotany and Folklore medicines - AYUSH

Unit II

Medicinal plants – Methods of cultivation, factors affecting cultivation, use of Biofertilizer, pest control. Collection, Harvesting, Drying, Packaging and storage of crude drugs. Cultivation and utilization of medicinal and aromatic plants in India. Methods of cultivation of *Aloe vera* and *Ocimum* (Tulsi)

Unit III

Tissue culture of endangered medicinal plants- Role of tissue culture in the improvement of medicinal plants – Different types of drug adulteration and substitution – Microscopic analysis and phytochemical evaluation of crude drugs

Unit IV

Biological source, geographical distribution, morphology of useful part, active principles and therapeutive value of the following drugs: Fox glove (*Digitalis purpurea*), Myrobalan (Terminalia *Chebula),* Neem (*Azadirachta indica*), Turmeric (*Curcuma sp.),* Asafoetida (*Ferulla asafetida*), Ginger (*Zingiber officinale),* Lemon grass (*Cymbopogon citrates*), Clove (*Eugenia Caryophyllata*), Vinca (*Catharanthus roseus*)

Unit V

Bioactive compound isolation: Isolation and Characterization by HPLC, Flash chromatography.

Practicals:

1. Identification and morphological study of drugs included in the syllabus.

2. Determination of Epidermal cell number, Epidermal cell size.

3. Determination of stomatal number, stomatal size, stomatal index, vein islet number, vein termination number and study of trichomes.

4. Determination of Vein islet Number and Vein termination number.

5. Microscopic study of Trichomes

TEXT BOOKS

1. Shah C S and Qadry J S (2005), A Text Book of Pharmacognosy, B S Shah Prakasha, Amdavad.

2. Mohammed ali (2008), Text Book Of Pharmacognosy (2nd Ed), CBS Publishers & Distributors, New Delhi.

3. Ansari S H (2006), Essentials of Pharmacognosy, Birla Publications Pvt. Ltd. Delhi.

4. Kolate C K, Purohit a P and Gokhale S B (2008), Pharmacognosy (42nd Ed), NiraliPrakashan, Pune.

5. Khandelwal K R (2008), Practical Pharmacognosy-Tehcniques & Experiments (19th Ed), NiraliPrakashan, Pune.

REFERENCE BOOKS:

1. Chopra R.N. (1958). Indigenous Plants of India.

2. Chopra, R.N., Nayar S.L. and Chopara I.C. (1956) Glossary of Indian Medicinal plants. CSIR, New Delhi, India.

3. Iyengar, M.A. (1975) A hand book of Pharmacognosy, Manipal.

4. Iyengar, M.A. (1978) Powered drugs of India, Manipal.

5. Kokate, C.K. (1988) Practical Pharmacognosy.

6. Kokate, C.K., A.P. Purohit and S.B. Gokhale (1995) Pharmacognosy. Furia, Narali Prakashan, Jageshwari Mandir Lane, Pune.

7. Nadkarni, K.M.(1976) Indian Materia Medica, Vol I & II. Popular Prakashan Pvt. Ltd., Bombay.

8. Wallis, T.E.(1985), Test book of Pharmacognosy. CBS Publications and distributers, Bholonath Nagar, Shhadara, Delhi.

9.William Charles Evans, (1989) Trease and Evans Pharmnacognosy. 14th Edition.

SEMESTER-III

SOFT CORE COURSE II

PBSC 318 B - Bioinformatics

UNIT-I

Introduction to computers and Bioinformatics. Types of hardware and software operating systems. Fundamentals of networking, operation of networks, telnet, ftp, www. Internet.

UNIT-II

Biological Research on the web: - Using search engines, finding scientific articles, public biological databases, searching biological databases. Use of nucleic acid and protein data banks - NCBI, EMBL, DDBJ, SWISSPORT multiple sequence alignment.

UNIT-III

Sequence analysis, pair wise alignment and Database search. Phylogenetic analysis, MEGA, Alogrithms- Cladogram and Phylogram. Protein structures-visualizing, predicting and function from a sequence. Phylogenetic tree building- Neighbour joining, UPGMA maximum likelihood parsimony.

UNIT IV

Chemical composition - Bio-molecules. DNA, RNA. Structure of DNA, development of DNA sequence methods. Gene finder and feature detection in DNA.

UNIT V

Drug designing- Introduction, principles and use of bioinformatics in drug designing.

Practicals:

1. Accessing information from database using computer (Eg: Retrieving Nucleic acid sequence, Protein sequence etc.).

Text books:

1. Gibas and Jamback, Developing Bioinformatics computer skills, 0'
Reilly Asssociates;
2. Misenes S and Cravete S.A., Methods in molecular biology Vol 132;
Bioinformatics methods and protocols.
3. Harshitha D., 2006, Techniques of Teaching Computer Science,
international.}. Book Distributor, Dehradun.

References:

1. Bioinformatics, A Practical Guide to the Analysis of Genes and Proteins by A.D. Baxevanis and B.F. Ouellettee (free online for NYU students: http://www3.interscience.wiley.com/cgi-bin/booktoc/104086862).
2. Bioinformatics for Dummies by Jean-Michel Claveri.

Government of Puducherry

DEPARTMENT OF BOTANY

KANCHI MAMUNIVAR CENTRE FOR POSTGRADUATE STUDIES

(An autonomous college with potential for excellence and accredited by NAAC 'A' Grade)

LAWSPET, PUDUCHERRY – 605 008

TEL: 0413-2251687

CBCS-SYLLABUS

BOTANY

M.Sc. (PLANT BIOLOGY AND BIOTECHNOLOGY)

SEMESTER IV

2018-2019

SEMESTER IV

HARD CORE COURSE I

PBHT 419 - Plant Physiology

UNIT I

Water relations: water potential, chemical potential, water absorption – apoplast and symplast concept, SPAC. Translocation of water. Translocation of solutes – phloem loading and unloading, source-sink relationship. Membrane transport proteins. Signal transduction - G-proteins & role of cyclic nucleotides

UNIT II

Photosynthesis – Photosynthetic pigments, Organization of PS I and II, Absorption spectrum, Action spectrum, Fluorescence and Phosphorescence, Red drop and Emerson's effect. Mechanism of Light reaction - cyclic, non-cyclic and pseudocyclic photophosphorylations. Photosynthetic carbon reduction cycles – C_3 and C_4 cycles. Crassulacean Acid Metabolism (CAM). Photorespiration and its significance.

UNIT III

Respiration: Dark respiration Aerobic and anaerobic. Glycolysis (Sucrolysis), fate of pyruvate, Krebs cycle, Terminal oxidation of reduced coenzymes and phosphorylation. Alternate oxidase, Cyanide resistant respiration. Oxidative pentose phosphate pathway. Mechanism of phosphorylation

UNIT IV

Nitrogen metabolism - Importance of N_2 to plants, sources of N_2, reduction of nitrate to NH_3, nitrate reductase enzyme. Biological N_2 fixation – asymbiotic and symbiotic fixation. Ammonium assimilation (reductive amination, transamination and GS-GOGAT).

UNIT V

Plant Growth Regulators - Physiological effects of Auxins, Gibberellins, Cytokinins, Ethylene, ABA. Physiology of flowering – Photoperiodism, photoperiodic induction, florigen, Mechanism of flowering, Bunning's hypothesis and Chailakyan's hypothesis. Importance of photoperiodism. Vernalization mechanism, Biological clock / rhythm.

Sensory photobiology – Photo morphogenesis, Mechanism of Phytochrome action and function, Crypto-chrome.

Practicals

1. Measurement of stomatal index and frequency.
2. Determination of water potential (Shardakov's method).
3. Determination of solute potential.
4. Estimation of total acidity in CAM plants.
5. Estimation of photosynthetic pigments – a, b, total chlorophyll and carotenoids by standard procedures.
6. Separation of photosynthetic pigments by paper chromatography.
7. Estimation of total nitrogen by Nesslerization method (or) Microkjeldhal method.
8. Extraction of amylase and determination of its activity.

Text books

1. Devlin and Witham, 1986. Plan Physiology, CBS Publishers and Distributors, New Delhi.
2. Voet and Voet, 1992. Biochemistry, John Wiley and Sons., New York, USA.
3. Salisbury F.B and Ross C.W 1992. Plant physiology (Fourth Edition) Wordsworth Publishing Company, California, USA.
4. Ghosh and Mukerjee. Photosynthesis.
5. Sinha, R. K. 2004. Modern Plant Physiology, Narosa Publishing House, New Delhi.

References

1. Hopkins, W.G. 1995. Introduction to Plant Physiology, John Wiley and Sons., New York, USA.
2. Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones, Springer Verlag, New York, USA.
3. Taiz, L. and Zeiger, E. 2003. Plant Physiology (Indian Edn.), Panima Publishing Corporation, New Delhi.
4. Dennis, D.T., Turpin, D.H., Lefebvre, D.B. and Layzell, D.B. 1997. Plant Metabolism (2^{nd} Edn.) Longman, Essex, England.
5. Bray, C.M. (1983) Nitrogen metabolism in plants. Longman, England.
6. Casey, E. J. (1962) Biophysics: Concepts and mechanisms. East West Press, New Delhi.

7. Kramer, P. J. (1969) Plant and soil water relationships. McGraw Hill Book Company, New York.

8. Noggle, G.R. and Fritz, G.J. (1976) Introductory Plant Physiology. Prentice Hall, India, New Delhi.

9. Steward, F.C. (1956) Plant Physiology (Vol. I-VID). Addition Clowes & Sons, Limited, London.

SEMESTER-IV

HARD CORE COURSE II

PBHT 420 - Applied Plant Biotechnology

UNIT-I

Introduction to Plant Biotechnology. Concept of cellular differentiation and totipotency. Tissue culture media (composition, preparation). Types of cultures. Sterilization of explants. Initiation and maintenance of callus and cell suspension culture, organogenesis.

UNIT-II

Micropropagation, callus regeneration, axillary shoot induction. Somatic embryogenesis and artificial seeds. Production of haploids, Somaclonal variations, Protoplast isolation culture and fusion. Cybrids. Germplasm storage, Cryopreservation.

UNIT-III

Technology of plant cell culture for production of bioactive compounds. Bioreactors systems and models for mass cultivation of plant cells. The production of secondary metabolites from plant cell culture.

UNIT-IV

Cell culture as biofactories. *Agrobacterium* mediated gene transfer; *Agrobacterium* based vectors, viral vectors and their application.

UNIT-V

Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment. Biotransformation using plant cell cultures.

Practicals

1. Plant tissue culture techniques (media preparation, culture of explants).
2. Callus culture.
3. Cell suspension culture.
4. Plant transformation system (demostration).
5. Study of the design and components of bioreactor and its working principle.
6. Co-culture of *Agrobacterium* with leaf disc method.

Text books:

1. Ignacimuthu, S. (1997) Applied Plant Biotechnology. Tata McGraw Hill.
2. Roberta Smith (2000) Plant Tissue Culture: Techniques and Experiments. 2nd ed., AcademicPress.
3. Bhojwani, S.S. and Rajdan (2004) Plant Tissue Culture: Theory and Practice.
4. Vasil IK (1988) Cell culture and somatic cell genetics of plants, Vol. 1-6.
5. John Hammond, Peter McGarvey, Vidadi Yusibov (1999) Plant Biotechnology: New Products. And Applications, Springer Verlag.
6. Peter M. Gresshoff (1994) Plant Genome Analysis: Current Topics in Plant Molecular Biology. CRC Press.
7. Shekhawat MS (2011) Plant Biotechnology. M.J.P. Publishers, India.

References:

1. Roberta Smith (2000) Plant Tissue Culture: Techniques and Experiments, Academic Press; 2nd ed.
2. Crispeels, M.J. and Sadava, D.E. (2003) Plants, Genes and Crop Biotechnology, Jones and Bartlett Publishers (2nd Edition).
3. Bhowjwani, S.S. (1990) Plant Tissue Culture: Application and Limitations. Amsterdam, Elsevier.
4. Charles Cunningham and Andrew J.R. Porter (1997) Recombinant Proteins from Plants: Production and Isolation of Clinically Useful Compounds (Methods in Biotechnology), Humana Press,
5. Bernard R. Glick and John E. Thompson (1993) Methods in Plant Molecular Biology and Biotechnology, CRC Press.
6. Potrykus I. and Spangenberg (1997) Gene Transfer to Plants (Springer Lab Manual), Springer Verlag.

SEMESTER IV

HARD CORE COURSE III (OPTIONAL)

PBHT 421 - Biodiversity and Conservation

UNIT - I

Biological Diversity: Definition- evolution of the concept- types and measures of biodiversity- Species Concept - Species, Community and ecosystem diversity, Genetic diversity, values and importance - Species Inventory and Systematics in Diversity Environment and Genetic Variations – Biological Classification – Biological and Phylogenetic Concepts.

UNIT II

Species Diversity – Global Distribution of Species – Latitudinal and Altitudinal Distribution -Tropical species diversity – Diversity in terrestrial, marine and freshwater – Micro-organisms-lower and higher plants - Species extinctions - Endangered species; Monitoring indicator species and habitats; Threats to biodiversity: Extinction – Past and present rates of Extinction, Human Caused Extinctions, Endemic species, Extinction rates, Man and animal conflicts.

UNIT III

Habitats and Ecosystem – Classification, Ecosystem mapping, tropical forests, grasslands, wetlands, coral reefs, mangroves; Habitat loss: Habitat destruction – Fragmentation and degradation, desertification,

UNIT IV

Economics of Ecosystem, Green Revolution, Food Plants, medicinal and ornamental plants, animal uses – livestock and fisheries.

UNIT – V

Conservation and Management – National Legislations, Protection of Wild flora and Fauna - IUCN categories– Red data book and Red list. Protection of National Habitats - National and International Protected Areas Biodiversity. Current Practices in Conservation - in *situ* Conservation and *ex situ* Conservation, hot spots, National and International organizations and Legal Instruments for Biodiversity conservation including Biodiversity Act of 2002 – Patent Act, Agenda 21, Multilateral Treaties, Convention on Biodiversity. Recent Scientific advances and biotechnology in Biodiversity conservation.

Practicals:

1. Taxonomic identification of plants.
2. Vegetation studies by line, quadrates and belt transect methods and their analysis.
3. Species inventory, Diversity and distribution patterns and calculation of indices; establishment of plots and species area curves.

Text Books:

1. Krishnamurthy, K.V (2003). An Advanced Textbook on Biodiversity – Principles and Practice,. Oxford and IBH Publishing, New Delhi.
2. Melchios,G,(2001) Biodiversity and conservation, Oxford and IBH Publishing, New Delhi.
3. Nayar,M.P.,(1992) Hotspots of Endemic Plants of India, Nepal and Bhutan. Tropical Botanical garden and Research Institute, Thiruvananthapuram.
4. Puspangadan,P,Ravi,K and Santhosh, V. (1997).Conservation and Echnomic Evalution of Biodiversity. Oxford and IBH Publishing, New Delhi.

References:

1. Groombridge,B (1992), Global Biodiversity – Status of the Earths Living Resources, Chapman & Hall, London.
2. Ramade, F. (1991), Ecology of Natural Resources, , John Wiley.
3. IUCN (1992),Global Biodiversity and Strategy.
4. Francesco, C (1996), Biodiversity, Science and Development, Backhuys Publishers, The Netherlands.
5. Kato, M (1999), The Biology of Biodiversity, Springer Verlag, Tokyo. M.Sc. Environmental Sciences (UD) 2011-12
6. Kotwal, P.C. and S. Banerjee (2002). Biodiversity Conservation – In Managed forest and Protected areas, Agrobios, India.
7. Sinha, R. K(1997),Global Biodiversity, INA Shree Publishers, Jaipur
8. Chaudhuri, A. B. and D. D. Sarkar (2003), Mega diversity Conservation, flora, Fauna and
9. Medicinal Plants of India's hot spots, Daya Publishing House, Delhi.

10. Singh, M.P., B.S. Singh and Soma S. Dey (2004), Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.
11. Dadhich L. K. and A.P. Sharma (2002), Biodiversity –Strategies for Conservation,APH Publishing Corporation, New Delhi.
12. Khan, T. I and Dhari N Al Ajmi (1999), Global Biodiversity – Conservation Measure, Pointer Publishers, Jaipur.

SEMESTER IV

HARD CORE COURSE IV (OPTIONAL)

PBHT 422 – Research Methodology

Unit I

Choosing the problem for research – Review of Literature – Primary, Secondary and Tertiary sources, Bibliographs – Indexing and abstracting, Reporting the results of research in conference, Oral and Poster presentation.

Unit II

Planning, preparation and organization of thesis, Research journals, National and International monographs – Reprints – Proof correction, Thesis writing, Full paper – Short Communication – Review Paper.

Unit III

Organization to computer – CPU – Input and output devices – Memory – Internal and external storage memory – Knowledge about windows and its scientific applications (MS Office, Power Point, Excel) – Retrieval of information from internet. Plagiarism – ethics – copyrights – biosafety.

Unit IV

Scientific data collection, source and methods – Web browsing and searching. Tabulation – Graphical and diagrammatic representation, Literature and refer ence collection,Thesis format – Journal format, Citation, proof correction and editing.

Unit V

Databases and networks- citation index- H index- Pub Med, Scopus, Researchgate, Linkedin, open access policy-IPR.

Practicals:

1. Preparation of abstract.
2. Graphical representation of data.
3. Training to the student to prepare bibliography.

Text books:

1. Edekar, V. H., 1982. How to write assignments, Research papers, dissertations, Kanak publ., New Delhi.

2. Balagurusamy, E. (1985) Programming in BASIC. 2nd ed. Tata McGraw Hill Publishing Co. Ltd., New Delhi.
3. Connor and Peter Woodford (1979) Writing Scientific Paper in English Pitman. Medical Publishing Co. Ltd., England.

References:

1. Jayaraman, J. (1972) Techniques in Biology. Higginbothams Pvt. Ltd., Madras.
2. Kothari, C. R. (1991) Research Methodology: Methods and Techniques. Wiley Eastern Ltd., New Delhi.
3. Sree Ramulu, V. S. (1988) Thesis Writing. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

SEMESTER IV

SOFT CORE COURSE I

PBSC 424 – Mushroom Technology

Unit I:

Introduction, History and importance of mushrooms, Vegetative characters - Formation and development of Basidiocarp, structure of basidiocarp - Agaricus. Mushroom research centres in India.

Unit II:

Isolation and culture of spores, culture media preparation. Production of mother spawn, multiplication of spawn - Inoculation Technique - Cultivation technology - Substrates, composting technology, bed, polythene bag preparation, spawning - casing – Cropping.

Unit III:

Mushroom production - Harvest - Storage methods and marketing. Nutritional value of mushrooms. Economics of mushroom cultivation.

Unit IV:

Edible, Poisonous and medicinal Mushrooms. Management of fungal, bacterial, nematode and viral diseases of mushroom, Health hazards associated with mushroom cultivation

Unit-V:

Cultivation of button mushroom (Agaricus bisporus), milky mushroom (Calocybe indica), oyster mushroom (Pleurotus sajorcaju) and paddy straw mushroom (Volvariella volvcea).

Reference Books:

Alice, D., Muthusamy and Yesuraja, M. (1999). Mushroom Culture. Agricultural College, Research Institute Publications, Madurai.

Marimuthu, T. et al. (1991). Oyster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.

Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.

Pathak, V. N. and Yadav, N. (1998).Mushroom Production and Processing Technology. Agrobios, Jodhpur.

Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.

Tripathi, D. P. (2005). Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Government of Puducherry

DEPARTMENT OF BOTANY

KANCHI MAMUNIVAR CENTRE FOR POSTGRADUATE STUDIES

(An autonomous college with potential for excellence and accredited by NAAC 'A' Grade)

LAWSPET, PUDUCHERRY – 605 008

TEL: 0413-2251687

CBCS-SYLLABUS

M. Phil. BOTANY

(For semesters I and II)

2018-2019

KANCHI MAMUNIVAR CENTRE FOR POST-GRADUATE STUDIES

(AUTONOMOUS), PONDICHERRY – 605 008

M. Phil. Scheme of Examination - Credits

Total No. of credits: 36 **Total Marks: 500**

Semester	Paper	Paper code	Title of the paper	No. of hrs/week (15)	No. of credits	Total no. of credits	Marks for the paper
I	Paper-I	MHT-11	Research Methodology	5	6	18	100
	Paper-II	MHT-12	Adv. Topics in Botany	5	6		100
	Paper-III	MHT-13	Area Paper	5	6		100
II	Paper-V	MHD-21	Dissertation	15	15	18	150
	Paper-VI	MHV-22	Viva Voce	--	3		50

Total Credits = 36

M. Phil. in Botany

SEMESTER-I

Paper –I- MHT 11 – Research Methodology

Unit I - Microscopy and Centrifugation

Microscopy - Differential interference contrast (DIC), polarization, fluorescent Microscopy, dark field and phase contrast microscopy. Electron microscope - SEM and TEM. Atomic Force Microscopy. Centrifugation: Principle and Types of centrifuges. Ultracentrifugation, density gradient centrifugation and continuous centrifugation.

Unit II - Spectrometry, Electrophoresis and Separation techniques

Spectrophotometer - Principle – Beer Lambert's Law. UV, IR, FTIR, Atomic Absorption Spectroscopy and NMR. Electrophoresis: Principle of Gel electrophoresis, Polyacrylamide gel electrophoresis (PAGE & SDS PAGE) and Agarose gel electrophoresis, comet assay and capillary electrophoresis. Two dimensional electrophoresis and isoelectrofocussing.

Chromatography: Principle, Procedures and Application of TLC, PC, Gel Filtration and Ion exchange, Affinity Chromatography, GC, GLC, HPLC(High-performance liquid chromatography), FPLC (Fast protein liquid chromatography) and HPTLC (High performance thin layer chromatography).

Unit III - Molecular biological techniques

Molecular biological techniques: Isolation and amplification of nucleic acid- Genome DNA (*E.coli*), Plasmid DNA, total RNA, Polymerase chain reaction – Types and its application. Gene cloning techniques: Phosphatase treatment of cloning vectors, use of adapters and linkers in cloning-screening of recombinants-labeling of nucleic acids by radioactive methods plaque and colony hybridization-southern blotting and western blot-Northern blot-DNA finger printing and Microarray.

Unit IV - Biostatistics, Data collection, Analysis and Research publications

Biostatistics: Collection and Presentation of Experimental data. Biological significance of correlation and regression – Tests of significance: Basis of statistical inference – Student's 't' test for mean, difference of means and test for correlation and regression coefficients – Chi-square test – Analysis of variance and DMRT (Duncan's multiple

range test). Data collection and analysis-Web browsing and searching - Electronic biological data bases – NCBI, Pub Med, Sequence and Structure data bases. Research publications, reparation of manuscripts-full paper, short communications and LCD preparations. Review of articles, Thesis writing, Bibliography and Proof reading, Journal citation index, H index, Plagiarism and Ethics.

.**Text Books**

1. Kothari, C. R. (1991) Research Methodology: Methods and Techniques. Wiley Eastern Ltd., New Delhi.
2. Rastogi, V. B. (2006) Fundamentals of Biostatistics. Ane Book India, New Delhi.
3. Sree Ramulu, V. S. (1988) Thesis Writing. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

References

1. Becker, J.M., Caldwell, G.A. and Zachgo, E.A. (1996). Biotechnology: A Laboratory Course, 2nd Edn. Academic Press, Inc., San Diego, California.
2. Chirikjian, J.G.1995. Biotechnology: Theory and Techniques Vol. I.Plant
3. Biotechnology, AnimalCell Culture, Immunobiotechnology. Jones and Bartlett Publishers, London, England.
4. Cynthia Gibas and Per Jambek. (2001). Developing Bioinformatics computer skills, Shroff Pub., Mumbai.
5. Gupta, S.C. and Kapoor, V.K. (2002) Fundamentals of Mathematical Statistics, (11th Edn) Sultan Chand and Sons, New Delhi.
6. Harborne, J.B. (1998). Phytochemical Methods. Chapman & Hall, London.
7. Jordan, D.W. and Smith, P. 2002. Mathematical Techniques. Oxford University Press, New Delhi.
8. Primrose, *et al*. (2005). Principles of gene manipulation. Black Well Science, London.
9. Sambrok and Russel. (2001). Molecular cloning-A laboratory manual. Cold Spring Laboratory Press, New York.
10. Wilson K, Walker, J. (1994). Principle and techniques of practical biochemistry, 4th Ed) Cambridge university press, Cambridge.

M. Phil. in Botany

SEMESTER-I

Paper –II- MHT 12 – Advanced Topics in Botany

Unit 1

Diversity of Life forms: Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy of plants – Important criteria used for the classification of each taxon - Major habitat types, seasonality and phenology of the sub-continent, geographic orgins and migrations of species.

Unit II

Strategies for conservation : Protected areas in India – Sanctuaries, national parks, biosphere reserves, wetlands, mangroves and coral reefs for conservation of wild biodiversity – gene banks, seed banks, cryobanks, General account of the activities of Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and industrial Research (CSIR), and the Department of Biotechnology (DBT)

Unit III

Bio-safety and Intellectual Property Rights (IPR) : Bio-safety-methods and implication of Genetically modified organisms - Intellectual Property Protection (IPP), Intellectual Property Rights (Patents, Trademarks, trade secrets and copy rights), GATT, TRIPS, and WHO - Patenting of biological materials, obligation with patent application, Patenting of transegenics, Plant breeders right and farmers right- Biohazards of GMO.

Unit IV

Bio-informatics and molecular biology: Bioinformatics - introduction, Databases, Protein sequencing, macromolecule structures and nucleic acid sequencing; Nano DNA technology: Concept and application - PCR variations and application; DNA modifying enzymes - nucleases, polymerases, restriction endonucleases, Nucleic acid blotting techniques.

Text books:

1. Adams V.D. Fields C, Venter J.C. – Automated DNA sequencing and analysis.
2. Anonymous, 1997. Plant Wealth of India 1997. Special Issue of Proceedings Indian National Science Academy.
3. Bishop V.J. Rawling C.J. – Nucleic acid and protein sequences analysis. A practical approach.
5. Bryan Bergeron. Bioinformatics computing, Pearson Education.
6. Conway, G and Barbier, E.1994. Plant Genes and Agriculture. Jones and Barlett. Publishers Bostori.
7. Cristi, B.R.(ed) 1999, CRC Handbook of Plant Sciences and Agriculture. Vol I in-situ Conservation. CRC Press Boca Roton, Florida. USA.

References:

1. De.K.K. 1987 Plant Tissue Culture. New Central Book Agency, Calcutta.
2. Dubey, R.C 2001 Text Book of Biotechnology, S. Chand & Co., New Delhi.
3. Falk, D.A., Olwell, M and MillanC. 1996. Restoring Diversity. Island Press. Columbia, USA
4. Frankel, OH., Brown, AHD & Burdon. J.J.1995. The Conservation of plant Diversity. Cambridge University Press Cambridge, UK
5. Gupta, P.K. Elements of Biotechnology – Rastogi publications.
6. Kumar, H.D 1993. Molecular Biology and Biotechnology, Vikas publishers, New Delhi.
7. Martell and Smith. 1983. Plant Biotechnology, Cambridge U.K. University Press.
8. Old, R.W. and Primerose, S.B.1996. Principles of Gene manipulation, Black well – Scientific publications, London.
9. Paroda, R.S. and Arora, R.K. 1998. Plant Genetic Resources: Conservation and management. IPGRI (Publication) Wouth Asia Office c/o NBPGR, Pusa Campus, New Delhi.
10. Westhead D.R. Parish, JH and Twyman RM 2003. Bioinformatics, Viva publishers.

KANCHI MAMUNIVAR CENTRE FOR POST-GRADUATE STUDIES

(AUTONOMOUS) PONDICHERRY – 605 008

M. Phil. in Botany

SEMESTER – I

Paper I: MHT 11 – Research Methodology	**Marks 100**
Paper II: MHT 12 – Advanced Topics in Botany	**Marks 100**
Paper III: MHT 13 – Area Paper (Guide paper)	**Marks 100**

KANCHI MAMUNIVAR CENTRE FOR POST-GRADUATE STUDIES

(AUTONOMOUS) PONDICHERRY – 605 008

M. Phil. in Botany

Semester-II

Paper IV: MHD 21 – Dissertation (Marks 150)

Paper V: MHV 22 – Viva Voce (Marks - 50)