

## M.Sc. BOTANY

SEM	COURSE CODE	COURSE	COURSE TITLE	HRS / WEEK	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
<b>I</b>	14PBO1C1	CORE I	Phycology, Mycology and Bryophytes	6	5	40	60	100
	14PBO1C2	CORE II	Pteridophytes and Gymnosperms	6	5	40	60	100
	14PBO1C3	CORE III	Genetics and Evolution	6	5	40	60	100
	14PBO1C4	CORE IV	Phycology, Mycology, Bryophytes, Pteridophytes, Gymnosperms, Genetics & Evolution - Practical	6	5	40	60	100
	14PBO1CE	CORE BASED ELECTIVE I #		6	5	40	60	100
<b>TOTAL</b>				<b>30</b>	<b>25</b>	<b>200</b>	<b>300</b>	<b>500</b>
<b>II</b>	14PBO2C5	CORE V	Anatomy and Embryology of Angiosperms	6	5	40	60	100
	14PBO2C6	CORE VI	Plant Physiology	6	5	40	60	100
	14PBO2C7	CORE VII	Biochemistry and Biophysics	6	5	40	60	100
	14PBO2C8	CORE VIII	Anatomy, Embryology, Plant Physiology, Biochemistry & Biophysics - Practical	6	5	40	60	100
	14PBO2CE	CORE BASED ELECTIVE II #		6	5	40	60	100
<b>TOTAL</b>				<b>30</b>	<b>25</b>	<b>200</b>	<b>300</b>	<b>500</b>
<b>III</b>	14PBO3C9	CORE IX	Plant Molecular Biology	6	5	40	60	100
	14PBO3C10	CORE X	Biotechnology	6	5	40	60	100
	14PBO3C11	CORE XI	Taxonomy of Angiosperms	6	5	40	60	100
	14PBO3C12	CORE XII	Plant Molecular Biology, Biotechnology and Taxonomy - Practical	6	5	40	60	100
	14PBO3CE	CORE BASED ELECTIVE III #		6	5	40	60	100
14PBO3EC	EXTRA CREDIT-I	Horticulture	-	5*	-	100*	100*	
<b>TOTAL</b>				<b>30</b>	<b>25</b>	<b>200</b>	<b>300</b>	<b>500</b>
<b>IV</b>	14PBO4C13	CORE XIII	Microbiology and Immunology	6	5	40	60	100
	14PBO4C14	CORE XIV	Microbiology and Immunology - Practical	6	5	40	60	100
	14PBO4EC	EXTRA CREDIT-II	Botanical Pharmacy	-	5*	-	100*	100*
	14PBO4PW	PROJECT WORK		18	5	40	60	100
<b>TOTAL</b>				<b>30</b>	<b>15</b>	<b>120</b>	<b>180</b>	<b>300</b>
<b>GRAND TOTAL</b>				<b>120</b>	<b>90</b>	<b>720</b>	<b>1080</b>	<b>1800</b>

# Core Based Electives

SEMESTER	CORE BASED ELECTIVES
I	Bioinformatics and Biostatistics
	Remote Sensing and Vegetation Analysis
II	Bioinstrumentation and Research Methodology
	Organic Farming
III	Natural Products
	Landscape Designing

\* Not considered for Grand Total and CGPA

**SEMESTER I: CORE I  
PHYCOLOGY, MYCOLOGY AND BRYOPHYTES**

**Course Code : 14PBO1C1**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of distribution, protection and conservation of plants

**UNIT I**

**18 hours**

**Phycology:**#Algae in diversified habitats (terrestrial, freshwater, marine)#–Thallus organization – cell ultrastructure – reproduction – criteria for classification of algae (Fritsch) - Salient features of Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta, Rhodophyta – Algal blooms, algal biofertilizers.

**UNIT II**

**18 hours**

Detailed study of the following types: Gloeocapsa, Spirulina, Hydrodictyon, Bulbochaet, Closterium (Desmids), Acetabularia, Chara, Nitella, Euglena, Botrydium, Cyclotella and Navicula (Diatoms), Padina, Sargassum, Batrachospermum, Gracilaria, Amphivora,# Dictyota, Ulva.#.

**UNIT III**

**18 hours**

**Mycology:** General characters of fungi – substrate relationships in fungi – cell ultrastructure – unicellular and multicellular organization – cell wall composition, nutrition (saprobic, biotrophic, symbiotic) – reproduction – heterothallism – heterokaryosis – parasexuality# – recent trends in classification (Alexopolus and Mins)#. Type study: Taphrina, Lycoperdon, Cercospora, Colletotrichum, Rhizopus, Aspergillus, Penicillium and Fusarium.

**UNIT IV**

**18 hours**

General account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina – Fungi in industry, medicine and as food –# fungal diseases in plants and humans# - Mycorrhizae - Structure and reproduction of Lichens (Usnea)

**UNIT V**

**18 hours**

**Bryophytes:**#General characters and economic importance#-morphology, structure, reproduction and life history – classification (Watson), distribution – general account of Marchantiales, Jungermaniales, Anthocerotales, Sphagnales, Funariales and Polytrichales–#Evolution of Gametophytes,# Sporophytes and fossil bryophytes. Type study: Targionia, Reboulia, Anthoceros and Pogonatum.

#.....# **Self study portion.**

**Text Books:****Phycology:**

Chapman, V.J and Chapman. The Algae - ELBS and Mc Millan, London (1973).

**Unit - I** : Chapter – 1, 2, 3, 4, 5, 6, 7.

**Unit – II** : Chapter – 8, 9, 10, 11, 12.

**Mycology:**

Alexopoulos, C.J and Mims, C.W. -Introductory mycology-Wiley Eastern Ltd., New Delhi (1979).

**Unit – III** : Chapter – 6, 7, 9, 10.

The Fungi. P.D.Sharma, Second Edition, Rastogi Publications, Shivaiji Road, Meerut, India, (2003).

**Unit – IV** : Chapter - 4, 5, 6, 7, 8, 10.

**Bryophytes:**

Prempuri, Bryophytes - A Broad perspective. Atma Ram & Sons, New Delhi (1973).

**Unit – V:** Chapter – 1, 2, 3, 4, 5, 6, 7, 8, 10.

**Books for Reference:**

1. Fritsch, F.E -The structure and reproduction of the Algae (2Vols)-Cambridge University Press, England (1935).
2. Mukta Bharagava. The Latest portfolio of Theory and practice in fungi dominant publishers and Distributors – New Delhi (2003).
3. Round, F.E. The Biology of Algae. Cambridge University Press, Cambridge(1986).

**SEMESTER I: CORE II**  
**PTERIDOPHYTES AND GYMNOSPERMS**

**Course Code : 14PBO1C2**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the diversity of non flowering vascular plants.

**UNIT I**

**18 hours**

**Pteridophytes:** General characters -# Classification (Sporne)# - Introduction to Psilopsida, Lycopside, Sphenopsida and Pteropsida.

**UNIT II**

**18 hours**

Evolution of stele -# Heterospory -# Origin of seed habit - general account of fossil Pteridophyta (Rhynia, Lepidodendron and Calamites).

**UNIT III**

**18 hours**

A detailed study of structure, reproduction and life cycle of the following genera: Ophioglossum, Angiopteris, Osmunda, # Gleichenia, # Salvinia and Azolla.

**UNIT IV**

**18 hours**

**Gymnosperms:** General characters - Concept of Progymnosperms -# Origin of Gymnosperms - # Classification (Sporne's system and Bhatnager's system) - Detailed study of the following fossil forms: Lyginopteris, Lagenostoma, Medullosa, Glossopteris, Caytonia, Bennettites, Williamsoniella, Nilsonia, Pentaxylon.

**UNIT V**

**18 hours**

Brief account of Cycadales, Ginkgoales, Coniferales, Gnetales, Ephederales and Welwitschiales. General account on the male and female gametophyte development in gymnosperms (Cycas) -# Economic significances of gymnosperms.#

#.....# **Self study portion.**

**Text Books:**

**Pteridophytes**

P.C.Vastishta, A. K. Sinha, Anikumar, Pteridophyta., S. Chand and Company, Pvt. Ltd., Ram Nagar, New Delhi, Revised edition (2006).

**Unit - I** : Chapter - 1.

**Unit - II** : Chapter - 2, 4, 7.

**Unit - III** : Chapter - 9, 11, 13, 19.

**Gymnosperms**

P.C.Vastishta, A. K. Sinha, Anikumar, Gymnosperms. S. Chand and Company, Pvt. Ltd., Ram Nagar, New Delhi, Revised edition (2006).

**Unit -IV** : Chapter- 1, 2, 6, 7,9.

**Unit -V** : Chapter- 8, 11, 12, 15, 17.

**Books for Reference:**

1. Sporne, K.R. The morphology of Pteridophytes (The structure of Ferns and Allied Plants). Hutchinson University, London (1970).

**SEMESTER I: CORE III  
GENETICS AND EVOLUTION**

**Course Code : 14PBO1C3**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of Heredity and variation in plants.

**UNIT I**

**18 hours**

Genetics – History – Scope and significance – Mendel’s experiments – Lethality – Interactions of genes – multiple alleles and isoalleles - Blood groups in human.# Concept of allelomorphism.#

**UNIT II**

**18 hours**

Linkage and crossing over – coupling and repulsion hypothesis - mapping of genes on the chromosomes – Phenotypic expression of gene – Regulation of gene action –# chemical nature of genetic material.#

**UNIT III**

**18 hours**

Determination of sex – theories of sex determination –# Genetic balance theory of sex determination –# Environmental control of sex – Sex linked inheritance – sex reversal – Sex linked traits (eye color in Drosophila, Hemophilia and color blindness in human), Sex determination in plants and man.

**UNIT IV**

**18 hours**

Mutation – Introduction – Occurrence of mutation - Range and types of mutations - Mutation rate and its frequency – induced mutation – practical application of mutation,# Biochemical and molecular mutation.#

**UNIT V**

**18 hours**

Evolution-Evolutionary concepts – Evidences of organic evolution – Geographic distribution – #specialization and isolating mechanism –# Theories of organic evolution - Inheritance of acquired characters – Theories of natural selection – mutation theory, synthetic theory.

#.....# **Self study portion.**

**Text Books-**

1.C. Emmanuel, S. Ignacimuthu and Vincent, Applied Genetics- -MJP-Publishers(2006).

**Unit-I** : Chapter-2  
**Unit-II** : Chapter-5  
**Unit-III** : Chapter-6  
**Unit-IV** : Chapter-14

2.P.S.Verma and V.K. Agarwal- S. Genetics- Chand & Co., Pvt. Ltd., New Delhi (2009).

**Unit-I** : Chapter-1 Part-Two - Chapter-18  
**Unit-II** : Chapter-2 Part-Two - Chapter-19  
**Unit-III** : Chapter-3 Part- Two - Chapter-25  
**Unit-IV** : Chapter-4 Part- Two - Chapter -11

3. Gardner, Simmons and Snustad. Principles of Genetics-John Wiley and Son (Asia) Pvt, Ltd. (2006).

**Unit-II** : Chapter-1 - Chapter-7

**Unit-IV** : Chapter-2 - Chapter-4

**Unit- V** : Chapter-3 - Chapter-11

4. Vijiwala-Deshmach. Cytogenetics and evolution-, Dominant Publishers distributors, first student Edition (2005).

**Unit-V** : Chapter-1, 2, 3, 4, 5, 6 (Section-III)

5. Shukla and Chand. Cytogenetics, Evolution and Biostatistics- (S. Chand Publications) Edition (2007, 2009).

**Unit-V** : Chapter-27

### **Books for Reference;**

#### **Genetics:**

1. Gardner, E.J. and Shusted, D.P. Principles of Genetics 7th Edn. John Wiley & Sons, N.Y., Chichester, Brisbane, Toronto, Singapore (1984).
2. Gupta, P.K, Genetics, Rastogi Publishers, Meerut, India (2000).

**Evolution: 1.** Shukla, R.S. and P.S. Chandel, Cytogenetics, Evolution & Plant Breeding, S. Chand & Co. New Delhi (1999).

**SEMESTER I: CORE IV**  
**PHYCOLOGY, MYCOLOGY, BRYOPHYTES, PTERIDOPHYTES,**  
**GYMNOSPERMS, GENETICS & EVOLUTION - PRACTICAL**

**Course Code : 14PBO1C4P**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Algae:**

Cyanobacteria : Gloeocapsa, Spirulina,  
Chlorophyta : Hydrodictyon, Bulbochaet,  
Closterium (Desmids), Acetabularia,  
Charophyta : Nitella.  
Eulenophyta : Euglena  
Xanthophyta : Botrydium  
Bacillariophyta : Cyclotella and Navicula (Diatoms)  
Phaeophyta : Padina, Sargassum  
Rhodophyta : Batrachospermum, Gracilaria,  
Introduction to laboratory cultivation of algae

**Fungi:**

Ascomycotina : Taphrina, Basidiomycotina : Lycoperdon, Dueteromycotina : Cercospora,  
Colletotrichum, Examination of Mycorrhizal Association  
Identification of fungal culture: Rhizopus, Aspergillus, Penicillium and Fusarium.  
Lichens: Usnea Cross section of Pongamia leaves infected by Phyllochora

**Bryophytes** : Morphological and anatomical features of the following: Targionia, Reboulia,  
Anthoceros and Pogonatum.

**Pteridophytes:** Morphology and anatomy of the vegetative and reproductive parts of the  
following: Ophioglossum, Angiopteris, Osmunda, Gleichenia, Salvinia and Azolla.

**Gymnosperms:** Morphology and anatomy of the vegetative and reproductive  
parts of the following- Cupressus, Podocarpus and Ephedra.

**BOTANICAL TOUR:**

Compulsory botanical tour for minimum of three days  
Submission of 5 specimens and tour report for (10 + 5) 15 marks.

**Genetics and Evolution:**

Problem solving related to genetics theory.

**SEMESTER I: CORE BASED ELECTIVE I  
BIOINFORMATICS AND BIOSTATISTICS**

**Course Code : 14PBO1CE1**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of principles and working knowledge of information and statistics

**UNIT I**

**18 hours**

Biostatistics: #Brief history,# definition, importance; Sampling techniques - Data – types, collection, classification, tabulation, presentation-diagrammatic and graphical; Measures of central tendencies - mean, median and mode; Measures of dispersion - range, mean deviation, variance, standard deviation and standard error; Skewness and Kurtosis.

**UNIT II**

**18 hours**

Probability and Probability distribution - Binomial, Poisson and normal distribution; #Correlation – types and methods of studying;# Regression (Simple and Linear) - Types, analysis and significance; Tests of significance – t-test, G-test, Chi-square test, F-test and ANOVA (one way and two way).

**UNIT III**

**18 hours**

Bioinformatics - #an overview -# definition and history; Internet in bioinformatics; Biological databases: Nucleotide sequence databases-Primary nucleotide sequence databases - EMBL, GeneBank, DDBJ; Secondary nucleotide sequence databases - Unigene, SGD; Protein sequence databases-SwissProt/TrEMBL, PIR; Sequence motif databases- Pfam, PROSITE; Protein structure databases- PDB, SCOP, CATH; Other relevant databases-KEGG, PQS, DockGround;# Literature database,# file formats of genbank, Swissprot, PDB, NCBI. Data retrieval using Entrez. Biodiversity database (brief account).

**UNIT IV**

**18 hours**

Proteins and amino acids:# Amino acids- structure,# classification; Peptide bonds - Levels of protein structure - helix, sheet and turns - Ramachandran plot - Super secondary structures - Domains -Quaternary structure. DNA and RNA structure -# Watson and Crick model -# A, B and Z forms of DNA - RNA secondary structure.

**UNIT V**

**18 hours**

Biological Sequence analysis: Pair wise sequence comparison - Scoring matrix, Dynamics programming, Heuristic methods – FASTA, BLAST. Multiple sequence alignments -Phylogenetic alignment. Protein structure# visualization tools - RasMol, Swiss PDB Viewer #– Structure Classification, alignment and analysis - SCOP, CATH, FSSP

**#.....#Self study portion.**

## Text Books

- T.B- 1. Arora, P.N, Biostatistics, Variety Book Depot, 2006.  
T.B- 2. Bailey, N.T.J, Statistical methods in Biology. Third edition, Cambridge University press, 1995.  
T.B- 3. Grumani, N, Introduction to Biostatistics, Mjp Publishers, 2004.  
T.B- 4. Khan, I.A. and Khanum, A Fundamentals of Biostatistics, Vikas Publications, Hyderabad, 1994.  
T.B- 5. Rastogi, V.B, Fundamentals of Biostatistics. Ane Books India, New Delhi, 2006.  
T.B-7. Attwood, T.K. and Parry-Smith, D.J, Introduction to Bioinformatics, Pearson Education Ltd., New Delhi, 2004.  
T.B-8. Lesk, A.M, An introduction to Bioinformatics, Second edition, Oxford University Press. New Delhi, 2006.  
T.B-9. Mani, K and Viyaraj, N, Bioinformatics for beginners, Kalaikathir Achchagam, Coimbatore, India, 2002.

Unit I	T.B.1 Chapter – 2–5
Unit I	T.B.2 Chapter – 3-4
Unit II	T.B.3 Chapter – 5.; T.B-4 Chapter 4-6
Unit II	T.B. 5 Chapter – 8
Unit III	T.B. 7 Chapter – 3.
Unit IV	T.B. 8 Chapter – 3-5
Unit V	T.B.9 Chapter – 5

**SEMESTER I: CORE BASED ELECTIVE I  
REMOTE SENSING AND VEGETATION ANALYSIS**

**Course Code : 14PBO1CE1**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

- To impart knowledge of Remote sensing and vegetation analysis.
- To learn the simple and basic methods of vegetation analysis
- To learn the quantification methods to study plant diversity.

**UNIT I**

**18 hours**

Introduction to Remote Sensing – Satellites – Polar orbitary and Geostationary satellites – Pass time – Spectral signature – Data recovery -# Introduction to Geographical information system.#

**UNIT II**

**18 hours**

Arc view, Arc info, Map maker software's – Application packages (Google Earth) – Introduction to Global Positioning System –# Tracking, Navigation, Measurements.#

**UNIT III**

**18 hours**

Vegetation – Landscape – Landscape elements – Standard methods of vegetation sampling – Line transect, Belt transect, Plot method, Quadrat method –# Database structure using simple software's –# Application of Microsoft Excel.

**UNIT IV**

**18 hours**

Determination of minimum sample size – Species area curve – Diversity indices – Shannon Weiner's index, Simpson's Index – Similarity indices –# Sorensen's Qualitative index and Sorensen's Quantitative index –# Alpha, Beta and Gamma levels of diversity.

**UNIT V**

**18 hours**

Vegetation mapping – Basic map reading skills – Top sheets – Calculation of geo-coordinates – decimal scale conversion – Digitization of maps – Supervised and Unsupervised classification of remote sensing data – Resolution and quality of maps –# Construction, Printing and publishing of vegetation maps.#

#.....# **Self Study portion**

**Text Books:**

- T.B-1.** Verbyla, L.D, Satellite Remote Sensing of natural resources. Lewis Publishers, 1995.  
**T.B-2.** Kumarasamy, Remote Sensing, 2005.  
**T.B-3.** Magurran, A.E., Ecological Diversity and Its Measurement. Blackwell Publishing Inc. 1988.

Unit I	TB1: Chapter – 1 & 2
Unit II	TB2: Chapter – 3 & 4
Unit III	TB3: Chapter – 3 & 4
Unit IV	TB3: Chapter – 3 & 4
Unit V	TB3: Chapter – 1, 4 & 6

**SEMESTER II: CORE V**  
**ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS**

**Course Code : 14PBO2C5**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of plant international structure and reproductive mechanism

**UNIT I**

**18 hours**

General account and theories of organization of apical meristems of shoot apex and root apex, quiescent centre.# Structural diversity and phylogenetic trends of specialization of xylem and phloem.# Cambium - origin - cellular structure, cell division, stories and nonstoriedtypes. Cambium in budding and grafting - wound healing role. Trichomes, periderm and lenticels.

**UNIT II**

**18 hours**

#Anatomical characteristics and vascular differentiation in primary and secondary structure of root and stem in Dicot and Monocot.# Origin of lateral roots - Root stem transition - Anatomy of Dicot and Monocot leaves. Leaf abscission, stomatal types, petiole anatomy.

**UNIT III**

**18 hours**

Secondary growth- in dicot stem-in dicot root-healing of wounds-#Anomalous secondary growth in dicot stem and root# -Anomalous secondary growth in monocot stem- nodal anatomy – Anatomy and vascularisation of flower –fruit wall and seed coat anatomy-ecological anatomy:hydrophytes-xerophytes-wood anatomy –vessel features-wood parenchyma.

**UNIT IV**

**18 hours**

Embryology: Microsporangium - Microsporogenesis, Microspores - arrangement - morphology -ultrastructure - Microgametogenesis - Pollen - Stigma - Incompatibility - Methods to overcome incompatibility - Megasporangium - Megagametogenesis - Femalegametophyte - Monosporic - Bisporic and Tetrasporic -# Nutrition of embryo sac and fertilization.#

**UNIT V**

**18 hours**

Endosperm - Types - Endosperm haustoria -# Cytology and physiology of endosperms,# functions of endosperms - Embryo development in Dicot and Monocot, Nutrition of embryo - polyembryony - Causes, Apomixis - Causes, Apospory - Their role in plant improvement programmes and seed development.

#..... # **Self study portion.**

**Text Books:**

S.N.Pandey and Ajantha Chandha. Plant anatomy and Embryology. Vikas Publishing house PVT. LTD (2007).

**Unit-I :** Chapter-4, 5, 6.

**Unit-II :** Chapter- 7,8,9.

**Unit-III:** Chapter-10, 11, 12.

**Unit-IV :** Part- Two Chapter -2, 3.

**Unit- V :** Part- Two Chapter -9,10,11,12,13.

B.P. Pandey. Plant anatomy S.Chand and Company LTD (2009).

**Unit-I :** Chapter- 6,7,8.

**Unit-II :** Chapter- 11.

**Unit-III:** Chapter- 9.

**Unit-IV and V:** Chapter -21.

**Books for Reference:**

1. Vasishta, P.C. A Text Book of Plant Anatomy S. Nagin & Co., Jullunder & New Delhi-460pp (1977).
2. Cutter, E.G. Plant Anatomy Part: I: Cells & Tissues (2nd Edn.) Plant Anatomy Part II: Experiments & Interpretations Edward Arnold, London-1 (1978).
3. Eames, A.J., & Mc Daniels, L.H. An Introduction to Plant anatomy Tata-McGraw-Hill Publishing Co., (P)Ltd., Bombay, New Delhi (1979).
4. Esau. K. Plant Anatomy, (2nd Edition) Wiley Eastern Ltd., New Delhi, Bangalore, Bombay Calcutta, Madras, Hyderabad (1980).
5. Fahn, A. Plant Anatomy Pergamum Press, Oxford (1997).
6. Maheswari, P An Introduction to the embryology of Angiosperms. Mc Graw Hill Book .Co India, New Delhi (1950).

**SEMESTER II: CORE VI  
PLANT PHYSIOLOGY**

**Course Code : 14PBO2C6**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept and mechanism of plant functions

**UNIT I**

**18 hours**

Plant water relations: Structure and properties of water - Water transport processes - diffusion, osmosis, chemical potential, water potential, absorption of water, mechanism of water transport – Apoplast and symplast concept – Accent of sap – SPAC concept, Theories explaining accent of sap. Transpiration and its significance, mechanism of stomatal movement. Membrane permeability - Nutrient uptake and transport mechanism - ion pumps and carriers, active and passive transport, transcellular transport, -# phloem translocation - phloem loading and unloading, mechanism of phloem translocation.#

**UNIT II**

**18 hours**

Photosynthesis and respiration: Photosynthetic pigments and light harvesting complex, photooxidation of water, mechanism of electron and proton transport – Z scheme of e-transport chain and photophorylation. Carbon assimilation – the Calvin cycle, photorespiration and its significance, the C4 cycle, the CAM pathway,# CO2 concentration mechanism.# Respiration – glycolysis, Krebs cycle, electron transport and ATP synthesis, pentose phosphate pathway, cyanide - resistant respiration.

**UNIT III**

**18 hours**

Nitrogen fixation: Biological nitrogen fixation - nodule formation and nod factor, mechanism of nitrogen fixation,# genes involved in nitrogen fixation - nitrate and ammonium assimilation pathways.# Growth and development: Physiological effects and mechanism of action auxins, gibberellins, cytokinins, ethylene and abscisic acid. Photomorphogenesis–concept–types of photoreceptors, phytochromes, photoresponses types – cytochrome role, flowering – photoperiodism – short day, long day and day neutral, vernalization.

**UNIT IV**

**18 hours**

Stress physiology: Plant responses to abiotic and biotic stress, mechanism of abiotic and biotic stress tolerance, water stress, heat stress and adaptation, salt stress and osmotic adjustment, metal toxicity, chilling and freezing stress,# oxygen deficiency and acclimation,# free radicals and oxidative stress, antioxidative defense mechanism, stress proteins.

**UNIT V**

**18 hours**

Fruit ripening – introduction,# changes during ripening, controlled atmosphere storage,# design of ripening rooms, ethylene on ripening, sources of ethylene, alternative gases to ethylene, mechanism of ripening – climacteric, shelf life of tropical fruits, Biological clocks in plants – circadian rhythms.

#.....# **Self study portion.**

**Text Books:**

Subansh Chandra Datta. Plant Physiology. Wilky Eastern Limited (1994).

**Unit-I** : Chapter- 5, 6,7,8,9.

**Unit-II** : Chapter- 12.

Jain, V. K. Fundamentals of plant physiology, 5<sup>th</sup> Edition.S. Chand & Company LTD., New Delhi (2010).

**Unit-I** : Chapter-4, 5, 7.

**Unit-II** : Chapter- 11.

**Unit-III** : Chapter-9, 17.

**Unit-IV** : Chapter -23.

**Unit-V** : Chapter -11.

**Books for Reference:**

1. Leopold, A.C. Plant growth and development, Tata McGraw-Hill Co (1973).
2. Nobel, PS Introduction to Biophysical Plant Physiology. W. H. Freeman and Company, San Francisco (1970).
3. Salisbury, F B and Ross, CW Plant Physiology. Third edition, CBS Publishers and Distributors, New Delhi (1986).
4. Taiz, L and Zeiger, E Plant physiology. The Benjamin/Cummings publishing company, Inc., California, New York (1991).

**SEMESTER II: CORE VII  
BIOCHEMISTRY AND BIOPHYSICS**

**Course Code : 14PBO2C7**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of metabolic process

**UNIT I**

**18 hours**

Biochemistry – Structure and properties of atoms and molecules – types of bonds – Electrolyte – pH and buffers – Bronsted Acids –# Ionization of weak acids and bases – determining pKa value#

**UNIT II**

**18 hours**

Carbohydrate: Classification, Stereo isomerism – optical isomerism - structure of mono, di, and polysaccharides and# glycoprotein's -# Lipids – Classification – structure – classification – simple lipids – compound lipids.

**UNIT III**

**18 hours**

Protein – classification – importance - Primary structure of protein – protein configuration – protein degradation –# protein biosynthesis –# Amino acids – structure – classification – function – non protein amino acids – chemistry of amino acids –# determination of amino acids – #biosynthesis of amino acids -

**UNIT IV**

**18 hours**

Enzymes and nucleic acids – General characters – nomenclature – classification – isolation and purification – enzyme action – Michaelis Mentons evidences – coenzymes and isoenzymes – Nucleic acids –# physical and chemical properties of nucleic acids and synthesis.# Vitamins – general characters – classification – structure and properties – fat soluble and water soluble vitamins.

**UNIT V**

**18 hours**

Biophysics – metabolism – concepts – Bioenergetics – coupling and concept of energy – standard free energy – thermodynamic principles and laws – transfer potential of ATP – energy currency – #energy transduction in biological system.#

**#.....# Self study portion.**

**Text Books:**

- T.B.1. Freifelder, D, Essentials of modern biochemistry-Jones & Barlett (1985).  
T.B.2. Lehninger, A.L, Biochemistry - Worth Publishers (1985).  
T.B.3. Veerakumari. L., Biochemistry – M.J.P, Publishers, Chennai (2004).  
T.B.4. Casey, E. J, Biophysics - Concepts and mechanisms - Van Nostrand Reinhold Co., & East- west Press, New Delhi(1962).  
T.B.5. Subramanian, M.A. Biophysics Principles and techniques, M.J.P Publishers, Chennai (2005).

Unit I	T.B.1. Chapter – 1-3.
Unit II	T.B.2. Chapter – 3
Unit II	T.B.3. Chapter – 4
Unit III	T.B.3. Chapter – 5
Unit IV	T.B.2. Chapter – 7-8
Unit V	T.B.5. Chapter – 2-4

**SEMESTER II: CORE VIII**  
**ANATOMY, EMBRYOLOGY, PLANT PHYSIOLOGY,**  
**BIOCHEMISTRY AND BIOPHYSICS - PRACTICAL**

**Course Code : 14PBO2C8P**

**Hours/Week : 6**

**Credits : 5**

**Max Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Anatomy:**

1. Preparation of Transverse Sections of the following plant parts to observe and record the internal structure.
2. Monocot and Dicot stem
3. Monocot and Dicot leaf
4. Normal secondary thickening in Dicot stem
5. Anomalous secondary thickening in Dracaena, Nyctanthes and Boerhaavia stems.
6. Nodal anatomy-uni-& trilacunar.

**Embryology:**

1. T.S. of anther (young and mature)
2. Pollen types
3. L.S. of ovule
4. Types of ovules-orthotropous and anatropous.
5. Dicot Embryo Dissection.

**Plant physiology**

1. Measurement of water potential by gravimetric method.
2. Effect of various physical and chemical treatments on membrane permeability.
3. Estimation of chlorophyll, carotenoids and their absorption spectra in C3 and C4 plants.
4. Paper chromatography.
5. Hill reaction.
6. Survey of C4 plants and CAM plants.
7. Assay of succinic dehydrogenase
8. Assay of nitrate reductase activity.
9. Determination of amylase activity in germinating seeds and its induction by GA.
10. Protein profile (SDS-PAGE).in plants under stress.
11. Assay of free radical scavenging enzyme - catalase.
12. Measurement of RWC
13. Determination of fruit ripening

**Biochemistry and Biophysics**

1. Estimation of total sugars.
2. Estimation of total protein by Lowry's method.
3. Estimation of fatty acid value of oils.
4. Estimation of lipids.
5. Spotters (centrifuge, pH meter, Colori meter, spectrophotometer)

**SEMESTER II: CORE BASED ELECTIVE II  
BIOINSTRUMENTATION AND RESEARCH METHODOLOGY**

**Course Code : 14PBO2CE2**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of principles and working knowledge of instrumentation

**UNIT I**

**18 hours**

Microscopy – Light, Dark and phase contrast microscopes – Brief account on SEM, TEM and STM. Fixation and staining: Theory of fixation – Fixation agents –# Fixation fluids – Vacuum fixation.#

**UNIT II**

**18 hours**

pH and pH meter : Sorensen's pH scale – Electrolytic dissociation of water – Acid and Bases – Buffers – Properties – Phosphate and Tris Buffers. pH meter – Principle – Calorel electrode, Glass electrode and combined electrode – Factors affecting pH measurement – Applications. #Centrifuges – Principle – Types of Centrifuges – Types of centrifugation.#

**UNIT III**

**18 hours**

#Chromatography-Basic principles–#Thin layer chromatography–Gas Chromatography– High performance liquid chromatography

**UNIT IV**

**18 hours**

#Spectroscopy – X-ray spectroscopy –# Colorimeter – UV-Vis spectroscopy – Flame photometry. Spectrophotometer – Atomic absorption- spectrophotometer – NMR and ESR.

**UNIT V**

**18 hours**

Electrophoresis – Polyacrylamide Gel Electrophoresis – Agarose Gel Electrophoresis – Immuno electrophoresis- Gel documentation system.# Enzyme assay Blotting technique.#

#.....# **Self study portion.**

**Text Book:**

N. Gurumani. Research methodology for biological Science, MJP, Publishers, Triplicane, Chennai (2011).

**Unit-I** : Chapter-9.  
**Unit-II** : Chapter- 10, 11.  
**Unit-III** : Chapter- 12.  
**Unit-IV** : Chapter -14.  
**Unit-V** : Chapter -13.

**Books for Reference:**

1. Gupta, S.P, Metrology of Study and Scientific work Research, Narosa Publishing House.Life Science Book House, Madurai(1990).
2. Jayaraman, J., Statistical Methods-Sultan Chand & Sons(1985).
3. Plummer, D.T., An Introduction to Practical Biochemistry, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (1978).
4. Clark, J.N, Hand book of Basic Microtechnique, McGraw Hill Book Co., London, (1964).

**SEMESTER II: CORE BASED ELECTIVE II  
ORGANIC FARMING**

**Course Code : 14PBO2CE2**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of recycling the biological waste into the useful products

**UNIT I**

**18 hours**

History of organic farming – Adverse effects of modern agricultural practices – Alternative agriculture – Components of organic farming system –# Methods in organic farming#

**UNIT II**

**18 hours**

Agricultural pollution – #Soil pollution –# Fertilizer pollution – Elementary toxicity – Pesticidal pollution.

**UNIT III**

**18 hours**

Traditional additives for organic farming – Bulky organic manures –# Green manuring – #Agronomic importance of organic manures – Non-traditional additives for organic farming – Types of biofertilizers – Soil conditioners – aquatic weeds.

**UNIT IV**

**18 hours**

Biogas technologies for organic farming waste –# Waste water treatment –# Recycled use of water in organic farming – Domestic and industrial wastes for organic farming – organic certification.

**UNIT V**

**18 hours**

Nutritional quality of organic agriculture –# Future trends in organic farming –# General rules and regulation for commercialization of organic products

**#.....# Self study portion.**

**Text Book:**

Dahama, A.K. Organic Farming for sustainable Agriculture, Second Enlarged Edition, Jodhpur (1997).

<b>Unit-I</b>	:	Chapter- 1.
<b>Unit-II</b>	:	Chapter- 2, 4.
<b>Unit-III</b>	:	Chapter- 5, 6.
<b>Unit-IV</b>	:	Chapter – 8, 9. 10.
<b>Unit-V</b>	:	Chapter -11.

**Book for Reference:**

Veeresh, G.K, Organic Farming, Foundation books Pvt. Ltd, New Delhi (2006).

**SEMESTER III: CORE IX  
PLANT MOLECULAR BIOLOGY**

**Course Code : 14PBO3C9**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the role of nucleic acid in plant system

**UNIT I**

**18 hours**

Nucleic acids – types, structure and properties – composition of nucleic acids – Replication of nucleic acid (DNA) – Semi conservative model – Structure, # property and importance of telomeres.#

**UNIT II**

**18 hours**

Organization of genome in bacteria and plants – genome size – C-value paradox - Genes and chromosomes Historical perspective: Bacterial system of gene regulation –# Lac operon model – gene expression#.

**UNIT III**

**18 hours**

Role of chromatin in gene expression – Histone modifications – Epigenetic mechanism of gene regulation – epigenetic changes –# transgene induced silencing of endogenous genes.#

**UNIT IV**

**18 hours**

DNA Transcription – characters and functions of RNA – cellular RNA – Transcriptome – Types (ribosomal, tRNA, mRNA) –# cDNA synthesis – c DNA libraries.#

**UNIT V**

**18 hours**

DNA Repair – damage – pyrimidine dimers – excision repair – mismatch repair – homologous recombination – and its applications#. PCR – types and applications.#

**#.....# Self study portion.**

**Text Books:**

P.S.Verma, V.K.Agarwal. Molecular Biology. S.Chand and Company LTD. Ram Nagar New Delhi, First Edition (2009).

**Unit-I** : Chapter-2.  
**Unit-II** : Chapter- 3,14.  
**Unit-III** : Chapter- 11.  
**Unit-IV** : Chapter -7, 9.  
**Unit-V** : Chapter -7,9.

**Books for Reference:**

1. Buchanan, B.B., Grissem, W. and Jones, R.L. I.K. International Publishers, New Delhi, (2000).
2. Malay, S.R., Cronan Jr, J.E., Freifelder, D, Narosa Publishers, New Delhi (1994).

## SEMESTER III: CORE X BIOTECHNOLOGY

**Course Code : 14PBO3C10**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

### **Objective:**

To cultivate the integration of biology with technology, to work the modern techniques of Biotechnology.

### **UNIT I**

**18 hours**

Concepts and importance of genetic engineering - Enzyme in rDNA technology – Polymerases, #DNA ligases,# Nucleases, Restriction enzymes - Cloning vectors, Binary vectors and Cointegration vectors - Use of restriction enzyme linkers and homopolymers.

### **UNIT II**

**18 hours**

Gene transfer methods into plant cells - Direct method - Agrobacterium mediated transformation - Gene transfer using Ti plasmids,# gene transfer using Ri plasmids.#

### **UNIT III**

**18 hours**

Indirect method –# Electroporation - #Particle bombardment - Microinjection - In planta method - Reporter and marker gene - Genomic DNA library, cDNA library, chromosome walking, chromosome jumping - Screening and selection of recombinants.

### **UNIT IV**

**18 hours**

Transgenic plants - Development of pathogen, herbicide, insect and viral resistant plants - Golden rice - Molecular farming -# Edible vaccines,# edible antibodies and edible interferon's -Biotechnology in microbial production of therapeutic agents.

### **UNIT V**

**18 hours**

Bioremediation, bioaugmentation and bioleaching -# Biosafety#- Intellectual property rights and protection - Patenting of biotechnology products- Nanotechnology - Dry delivery system, prostheses and implants, diagnosis and screening – Microarrays.

**#.....# Self study portion.**

### **Text Book:**

Kumaresan, V. Biotechnology. Saras Publication, Nagercoil, India (2013).

- Unit-I** : Chapter-4, 5, 6.
- Unit-II** : Chapter- 10.
- Unit-III** : Chapter-14, 15.
- Unit-IV** : Chapter -19, 18.
- Unit-V** : Chapter -58, 59, 60, 31.

### **Books for Reference:**

1. Adrian Slater, Nigel Scott and Mark Fowler. Plant biotechnology. Oxford University Press, 1st Pub (2003).
2. Bernard R. Glick, Jack J. Pasternak Molecular biotechnology. American society for Microbiology. In India CBS Publishers, New Delhi (2004).

**SEMESTER III: CORE XI  
TAXONOMY OF ANGIOSPERMS**

**Course Code : 14PBO3C11**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To promote a knowledge of plants by rendering of easy to discover and to provide an understanding about the components of biodiversity to conserve and sustainable uses

**UNIT I**

**18 hours**

History and principles of classification: Detailed account of the system of classifications proposed by Bentham & Hooker, Engler & Prantl, Bessey and Cronquist (including merits and demerits).# Phylogeny of Angiosperms: Origin, evolution and interrelationship.#

**UNIT II**

**18 hours**

Modern trends in Classification: Numerical taxonomy, Chemotaxonomy and Serotaxonomy. Biosystematics:# Botanical Survey of India (B.S.I) -# Organization, function and contribution. National and International Herbaria. Taxonomic literature – taxonomic index, monographs and revisions. Bibliographies, catalogues and review serials, periodicals and floras.

**UNIT III**

**18 hours**

Plant identification; Methods of Identification,# Keys: types of keys; rules for construction of Keys; advantages and disadvantages.# Nomenclature: International code of Botanical Nomenclature (ICBN). Typification, Priority, Publication, Author citation and retention, choice and rejection of names, current changes. Taxonomy in relation to anatomy, floral anatomy, Palynology, Embryology and Cytology.

**UNIT IV**

**18 hours**

A detailed account of the following families, their economic importance and# systematic and phylogeny:# Ranunculaceae, Magnoliaceae, Minicipermaceae, Caryophyllaceae, Portulacaceae, Rhamnaceae, Vitaceae, Sapindaceae, Combretaceae, Sapotaceae and Aizoaceae.

**UNIT V**

**18 hours**

Boraginaceae, Convolvulaceae, Scrophulariaceae, Bignoniaceae, Chenopodiaceae. Polygonaceae, Loranthaceae, Casuarinaceae, Orchidaceae, Amaryllidaceae, Commelinaceae, Typhaceae, Alismataceae, Cyperaceae and# Poaceae.#

**#.....# Self study portion.**

**Text Books**

Sharma, O.P, Plant Taxonomy, Published by Tata McGraw-Hill publishing Company Limited, New Delhi (1996).

- Unit-I** : Chapter-2, 3, 7 – 16, 18 – 34.
- Unit-II** : Chapter- 8, 89-93.
- Unit-IV** : Chapter -18.
- Unit-V** : Chapter – 177- 435.

C.Jeffrey. An Introduction to plant Taxonomy, Second Edition, Cambridge University Press, Cambridge (1982).

- Unit I** : Chapter 7, 118-125.
- Unit-III** : Chapter- 4, 37-61.5, 64-116

**Books for Reference:**

1. Gamble, J.S. and Fisher, L.E. F. The Flora of the presidency of Madras (Vol. I - III), Botanical Survey of India, Calcutta (1967).
2. Lawrence, G.H.M. The Taxonomy of vascular plants (Vol.I-IV). Central Book Depot, Allahabad(1955).
3. Mathew,K.M. The Flora of Tamil Nadu Carnatic. The Rapinat Herbarium, Trichy(1983).
4. Singh, V and Jain,V.K. Taxonomy of Angiosperms. Rastogi Publication, Meerut(1989).
5. Sivarajan, V.V, Introduction to principles of plant Taxonomy. Oxford and IBH, New Delhi. (1989).
6. Subramaniam, N.S. Modern Plant Taxonomy. Vikas Publishing House, New Delhi (1995).

**SEMESTER III: CORE XII  
PLANT MOLECULAR BIOLOGY, BIOTECHNOLOGY  
AND TAXONOMY - PRACTICAL**

**Course Code : 14PBO3C12P**

**Hours/Week : 6**

**Credits : 5**

**Max Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Taxonomy and systematics:**

1. Detailed study of the plants representing each family mentioned in the theory syllabus.
2. Preparation of keys for various morphotypes (either by using dichotomous keys punch cards)
3. Working of nomenclature problems.

**Plant molecular biology and Biotechnology**

1. Isolation of plasmid DNA from E. coli
2. Isolation of total genomic DNA from cheek cells and plant tissue.
3. Agarose gel electrophoresis
4. Construction of plasmid restriction maps.
5. Spotters related to PCR.

**\*COMPULSORY BOTANICAL TOUR FOR MINIMUM OF FIVE DAYS**

**\*SUBMISSION OF 30 HERBARIUM SHEETS AND TOUR REPORT (10 + 5) 15 MARKS**

**SEMESTER III: CORE BASED ELECTIVE III  
NATURAL PRODUCTS**

**Course Code : 14PBO3CE3**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of product of plant used for human health

**UNIT I**

**18 hours**

Natural products from algae – nutraceuticals: single cell proteins, agar-agar and pharmaceuticals Natural Products from Fungi – Industrial and non industrial fungal metabolites from fungi like mycotoxins, pigments, organic acids, alcohols, enzymes, antibiotics etc. Medicinal mushrooms, lichens as a Source of Bioactive Compounds, agricultural metabolites like mycoproteins, zearalone, gibberellins, aroma and flavoring compounds.# Other groups like Bryophytes, Pteridophytes and Gymnosperms used for pharmaceuticals.#

**UNIT II**

**18 hours**

Plant Based industry: Scope, study of infrastructure, staff requirements, project profiles, equipments, processing, research and development & Regulatory requirements. Role of natural products in herbal medicines. General status and importance of herbal medicines. Safety of herbals/herbalpharmacovigilance. # W.H.O Policy on herbal medicines#.

**UNIT III**

**18 hours**

Definition of herb, herbal medicines, herbal medicinal product and herbal drug preparations. Source, selection, identification and authentication of herbal materials. Drying and processing of herbal raw materials. # Packing and labeling of finished products#.

**UNIT IV**

**18 hours**

General biosynthetic pathways in the formation of secondary metabolites Methods of investigation in biogenetic studies. Biosynthesis of phenyl propanoids Isolation, identification, classification, structure determination and important pharmacological activities of flavonoids. Detailed study of rutin including extraction and isolation.# Pesticides of natural origin. Poisonous plants. Plant allergens.#

**UNIT V**

**18 hours**

Introduction- Terpenoids- Synthesis of terpenoids. Alkaloids, biosynthesis of alkaloids, Flavanoids – Synthesis of flavanoids, biosynthesis of lignin, lignans and suberization. #Biotechnological application of alkaloid biosynthesis.#

#.....# **Self study portion.**

**Text Book:**

Buchanan, Gmisse, Jones. Plant Biochemistry and Molecular Biology of plants., I.K. International PVT LTD, Second Indian Reprint (2007).

- Unit-I** : Chapter-24.
- Unit-II** : Chapter- 24.
- Unit-III** : Chapter-24.
- Unit-IV** : Chapter -24.
- Unit-V** : Chapter -24, 1250- 1311.

**Book for Reference:**

Peter B. Kaufmann. Natural Products from plants. CRC Press (1999).

**SEMESTER III: CORE BASED ELECTIVE III  
LANDSCAPE DESIGNING**

**Course Code : 14PBO3CE3**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To understand the concept of strengthening the capacity of the architecture of the plants

**UNIT I**

**18 hours**

Landscape gardening – Components of beauty in the landscape – Garden types – Principles in laying out a garden – Lawn making – Cultivation of roses, jasmines and# Chrysanthemum.#

**UNIT II**

**18 hours**

Kitchen garden – Indoor garden – special group of garden plants – succulents and cacti – Ornamental palms, Orchids, Rockery and water gardens – #Bonsai –# cut flower decoration.

**UNIT III**

**18 hours**

Landscape garden designing: Formal gardening - Informal gardening - Planning - Designing – #Garden features# - Walls, Fencing, Steps, Garden drives and paths, Hedges, Edges, Arches, Pergola, Flower beds, Shrubbery, Topiary, Borders.

**UNIT IV**

**18 hours**

Establishment of garden - Lawn making - Green houses - Simple, Commercial, and Conservatories - Indoor gardening.  
Plant propagation methods – cutting, layering, grafting, budding, stock and scion relationship – #micropropagation –# cultivation practice.

**UNIT V**

**18 hours**

Values of Horticulture - Classification of horticultural crops – Kinds of soil and Climatic factors – Manures and Manuring – #Vermicompost,# Biofertilizers - Methods of application.

**#.....# Self study portion.**

**Text Book:**

V.Kumaresan. Horticulture and Plant Breeding First Edition, Saras publications, Nagercoil (2009).

- Unit-I** : Chapter- 20, 22.
- Unit-II** : Chapter- 18, 21, 23, 24, 25.
- Unit-III** : Chapter- 2, 3.
- Unit-IV** : Chapter – 6, 22.
- Unit-V** : Chapter -1.

**Books for Reference:**

1. Edmond Senn & Arews and Halfacre, Fundamentals of Horticulture, Tata McGraw Hill book Co., Ltd. New Delhi (1987).
2. Kumar.N, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil, India (1977).
3. Pratibha, P. Trivedi, Home gardening, ICAR Publication, New Delhi (1987).

**SEMESTER III: EXTRA CREDIT – I  
HORTICULTURE**

**Course Code : 14PBO3EC1**  
**Hours/Week :**  
**Credits : 5\***

**Max Marks : 100\***  
**Internal Marks : --**  
**External Marks : 100\***

**Objective:**

To understand the concept of plant propagation and cultivation of economic plants

**UNIT I**

**18 hours**

Importance of horticulture - Divisions of horticulture - Kinds of soil and climatic factors - Manures and manuring - Vermicompost, Biofertilizers - Irrigation systems - Surface irrigation, sub irrigation, special irrigation systems-# Plant growth regulators in horticulture -# Methods for controlling pest.

**UNIT II**

**18 hours**

Plant propagation methods - Cutting, layering. Grafting, budding, stock and scion relationship - #Micropropagation - #Cultivation practice of Coconut, Citrus and Grapes.

**UNIT III**

**18 hours**

Landscape garden designing: Formal gardening - Informal gardening - Planning - Designing – Garden features - Walls, Fencing, Steps, Garden drives and paths, Hedges, Edges, Arches, Pergola, Flower beds, Shrubbery, Topiary, Borders- Establishment of garden - Lawn making - #Green houses -# Simple, Commercial, and Conservatories - Indoor gardening.

**UNIT IV**

**18 hours**

Horticulture classification of vegetables - Purpose of vegetable growing - Cultural aspects of vegetable in South Indian condition- Cultivation of Brinjal, Chillies, Bhendi, Tomato, Cucumber, Bitter guard, Snake guard, Cluster bean, Radish- Kitchen garden -# Terrace garden.#

**UNIT V**

**18 hours**

Cut flowers - Packages for export of cut flowers - Handling of important cut flowers: Roses, Chrysanthimum, Orchids, Gladiolus, Anthuriums and Carnations - Flower arrangements - Dry decorations -# Bonsai -#Ikebana - Flower bouquets.

**#.....# Self study portion.**

**Text Books:**

1. Kumar. N. Introduction to Horticulture, Rajalakshmi Publications, Nagarcoil, India, 1977.  
**Unit-I** : Chapter- 1, 6, 13.  
**Unit-II** : Chapter- 15, 16.  
**Unit-III** : Chapter-17, 24, 2, 26.
2. V.Kumaresan. Horticulture and Plant Breeding First Edition, Saras publications, Nagercoil (2009).  
**Unit-IV** : Chapter -17.  
**Unit-V** : Chapter -21.

**Books for Reference:**

1. Pratibha, P. Trivedi. Home gardening, ICAR Publication, New Delhi (1987).
2. Edmond Senn., Arews and Halfacre, Fundamentals of Horticulture, Tata McGrawHill book Co., Ltd. New Delhi (1987).

**SEMESTER IV: CORE XIII  
MICROBIOLOGY AND IMMUNOLOGY**

**Course Code : 14PBO4C13**  
**Hours/Week : 6**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**

**Objective:**

To create awareness about microorganism, to acquire knowledge on Bacteria and Virus, to understand the immune system

**UNIT I**

**18 hours**

Fundamentals of Microbiology: History of Microbiology-Archaeobacteria and Eubacteria. Birth of modern chemotherapy #(Dreams of a Magic Bullet).# Developments and scope of microbiology. Microscopy- Dark field, Phase-contrast, Fluorescence and Electron Microscopy (TEM & SEM). Preparation of specimen for light microscopy – Preparing smears for staining, simple stain, differential stain, special stain -# Out line of Bergey’s systematic classification.#

**UNIT II**

**18 hours**

Functional anatomy of Prokaryotic cells. Cell size, shape and arrangement of bacterial cells. Structures external to the cell wall – Glycocalyx, flagella, axial filaments, fimbriae and pili. Cell wall – composition and characteristics. #Introduction of structure of the cell wall #- Plasma (Cytoplasmic) membrane, movement of materials across, membranes, cytoplasm, nuclear area, ribosomes, inclusions, endospores.

**UNIT III**

**18 hours**

Viruses- General characteristics of plant and animal viruses. Classification of viruses, isolation, cultivation and identification of viruses. Viral multiplications (lytic cycle, lysogenic cycle, specialised transduction) – viroids, prions, classification, morphology and #lifecycle of bacteriophages, cyanophages and mycoviruses.#

**UNIT IV**

**18 hours**

Immunology: Immune system-Historical perspective, Innate immunity; adaptive immunity; Cell and organs of the immune system. Antigen - types, general properties, role played by #Biological system in the immunogenicity,# Adjuvants, Epitopes, Haptens and Super antigens.

## UNIT V

18 hours

Antibodies – Immunoglobulin structure and function, antigenic determinants on immunoglobulin and immunoglobulin classes. Antigen and antibody# interactions – agglutinations reactions, RIA, ELISA and western blotting.#

#.....# **Self study portion.**

### **Text Books:**

#### **Microbiology:**

Joanne, M. Prescott, Microbiology- Eighth Edition (2011).

**Unit-I** : Chapter- 2.

**Unit-II** : Chapter- 3.

**Unit-III** : Chapter- 5.

#### **Immunology:**

Kuby, Immunology, 6<sup>th</sup> Edition, W.H. Freeman and Company (2007).

**Unit-IV** : Chapter – 1, 2.

**Unit-V** : Chapter -4, 6.

### **Books for Reference:**

1. Stainer, R.Y. Adelberg, E.A. and Ingram, J.L, General Microbiology, MacMillan & Co., London (1978).
2. Staley,J.T, Bergey's Manual of systematic Bacteriology Vol. I-IV Williams & Wilkins, London (1984).
3. Salle, A.J, Fundamental principles of Bacteriology, Tata McGraw Hill Publishing co., New Delhi (1974).
4. Pelczar, M. H. Chan, E.C.S. and Krieg, N.R. Microbiology, Tata McGraw Hill Publishing co., Ltd., New Delhi (1993).
5. Power and Daginwara, General Microbiology, Himalayan Publishing House (1994).
6. Schegal, H.E, General Microbiology, Cambridge University, London (1986).

**SEMESTER IV: CORE XIV**  
**MICROBIOLOGY AND IMMUNOLOGY - PRACTICAL**

**Course Code : 14PBO4C14P**

**Hours/Week : 6**

**Credits : 5**

**Max Marks : 100**

**Internal Marks : 40**

**External Marks : 60**

**Microbiology and immunology:**

1. Isolation of microbes from soil-serial dilution and plating.
2. Gram's staining of Bacteria found in Curd, Root-Nodules.
3. Growth Curve of Bacteria.
4. Isolation of Rhizobium from root-nodules of Legumes.
5. Effect of different antibodies on bacterial growth (antibiotic sensitivity)
6. Effect of different pH on bacterial growth.
7. Microbial analysis of Milk by Methylene-Blue Reduction Test.
8. Hemeagglutination – Blood grouping.

**SEMESTER IV: CORE: EXTRA CREDIT – II**  
**BOTANICAL PHARMACY**

**Course Code : 14PBO4EC2**  
**Hours/Week : –**  
**Credits : 5\***

**Max Marks : 100\***  
**Internal Marks : --**  
**External Marks : 100\***

**Objective:**

To understand the concept of mechanical importance of plants

**UNIT I**

**18 hours**

Introduction-Parts of medicinal plants- Cultivation collection and processing of Herbal drugs. #Utilization of medicinal and aromatic plants in India.#

**UNIT II**

**18 hours**

Analytical pharmacognosy – Drug adulteration- morphological -- organoleptic evaluation- Microscopic evaluation- Chemical evaluation – Physical evaluation – Biological Evaluation – #Quality control of Herbal drugs.#

**UNIT III**

**18 hours**

Pharmaceutical plant products: - Carbohydrates derived plant products. Glycosides- .Tannin- , Amla Black catechu. Lipids- Arachis oil, Castor oil, Rice bran oil and corn oil. Terpenoids- Lemon Grass oil, cinnamon, Garlic and tulsi. Alkaloidal drugs- isolation and extraction of alkaloids- # Vinca and Cinchona.#

**UNIT IV**

**18 hours**

Products of commercial interest obtained through tissue culture. Morphine alkaloids, tropane alkaloids, quinoline alkaloids, antitumorous compounds, vanillin and vanilla aromacolors and flavors#-production of natural sweeteners.#

**UNIT V**

**18 hours**

Hairy root culture- biotransformation – immobilization of plant cells- Nutraceuticals and cosmeceuticals. Marine drugs. Natural pesticides and immunomodulators,# adaptogens and Rasayana.#

#.....# **Self study portion.**

**Text Books:**

1. Kokate, C.K., Purohit, A.P., and Gokahale, Pharmacognosy, Nirali Prakasan, 2002.

**Unit-I** : Chapter- 2, 3, 4.

**Unit-II** : Chapter- 7.

**Unit-III** : Chapter- 8,10,11,14.

2. Dubey, R.C. A Text book of Biotechnology (2006).

**Unit-IV** : Chapter – 15.

**Unit-V** : Chapter -5, 10, 17, 18, 19, 21.

**Books for Reference:**

1. Peter B. Kaufman et al., Natural Products from plants. CRC Press (1999).
2. Tyler, V.E., Brady, L.R. and Robbers, J.E, Pharmacognosy. 9th ed. Lea and Fibiger, Philadelphia (1981).

**SEMESTER IV: CORE IV  
PROJECT WORK**

**Course Code : 14PBO4PW**  
**Hours/Week : 18**  
**Credits : 5**

**Max Marks : 100**  
**Internal Marks : 40**  
**External Marks : 60**