

# Botany Syllabus

**B. Sc.**

**(2015- 2016 onwards)**



**DEPARTMENT OF BOTANY**

**Periyar EVR College  
(Autonomous)  
Tiruchirappalli – 620 023**

**PERIYAR E.V.R.COLLEGE (AUTONOMOUS), TIRUCHIRAPPALLI -23**

**MCBCS – GENERAL PATTERN FOR UG – BOTANY ( 2015- 2016 onwards)**

SL. NO.	COURSE TITLE			Hrs.	Credits	Internal	External
<b>I SEMESTER</b>							
1	P-I	TAMIL I		6	3	25	75
2	P-II	ENGLISH I		6	3	25	75
3	P-III	CORE I	Algae, Fungi, Lichens, Plant Pathology and Bryophytes	6	5	25	75
		CORE-P II*	Core Practical – I	2	-	-	-
4		ALLIED I	Paper - I - Zoology	4	4	25	75
		ALLIED –P II*	Zoology Practical – I	2	-	-	-
5	P-IV	VE	Value Education	2	2	25	75
6		SBE I	Cultivation of commercial flowers and fruit crops.	2	4	25	75
<b>Total</b>				<b>30</b>	<b>21</b>	<b>150</b>	<b>450</b>
<b>II SEMESTER</b>							
7	P-I	TAMIL II		6	3	25	75
8	P-II	ENGLISH II		6	3	25	75
9	P-III	CORE III	Pteridophytes, Gymnosperms and Paleobotany	6	4	25	75
10		CORE-P II*	Core Practical – I	4	4	25	75
11		ALLIED –P II*	Zoology Practical – I	2	3	25	75
12		ALLIED III	Paper –III - Zoology	4	4	25	75
13	P-IV	ES	Environmental Studies	2	2	25	75
<b>Total</b>				<b>30</b>	<b>23</b>	<b>175</b>	<b>525</b>
<b>III SEMESTER</b>							
14	P-I	TAMIL III		6	3	25	75
15	P-II	ENGLISH III		6	3	25	75
16	P-III	CORE IV	Anatomy and Embryology	4	4	25	75
		CORE-P V*	Core Practical – II	2	-	-	-
17		ALLIED IV	Paper –IV - Chemistry	4	3	25	75
		ALLIED – P V*	Chemistry Practical -I	2	-	-	-
18	P-IV	ME I	Microbiology	4	5	25	75
19		SBE II	Herbal Botany	2	4	25	75
<b>Total</b>				<b>30</b>	<b>22</b>	<b>150</b>	<b>450</b>

**PERIYAR E.V.R.COLLEGE (AUTONOMOUS),TIRUCHIRAPPALLI -23**

**MCBCS – GENERAL PATTERN FOR UG – BOTANY ( 2015- 2016 onwards)**

SL. NO.	COURSE TITLE			Hrs.	Credits	Internal	External
<b>IV SEMESTER</b>							
20	P-I	TAMIL IV		6	3	25	75
21	P-II	ENGLISH IV		6	3	25	75
22	P-III	CORE VI	Horticulture and Plant Breeding	6	4	25	75
23		CORE-P V*	Core Practical – II	4	4	25	75
24		ALLIED –P V*	Chemistry Practical -I	2	3	25	75
25		ALLIED VI	Paper –VI - Chemistry	4	3	25	75
26	P-IV	NME I	Spoken English	2	2	25	75
<b>Total</b>				<b>30</b>	<b>22</b>	<b>175</b>	<b>525</b>
<b>V SEMESTER</b>							
27	P-III	CORE VII	Morphology and Taxonomy	6	5	25	75
28		CORE VIII	Cytology and Genetics	6	5	25	75
29		CORE IX	Plant Biotechnology	6	4	25	75
30		CORE - P X	Core Practical – III	4	4	25	75
31		ME II	Mushroom Cultivation Technology	5	5	25	75
32	P-IV	NME II	Geography of India	2	2	25	75
33	P-V	EA	Campus Flora Study	1	1	25	75
<b>Total</b>				<b>30</b>	<b>26</b>	<b>175</b>	<b>525</b>
<b>VI SEMESTER</b>							
34	P-III	CORE XI	Plant Physiology	6	5	25	75
35		CORE XII	Biophysics, Biochemistry and Biostatistics	6	4	25	75
36		CORE XIII	Ecology and Conservation Biology	5	4	25	75
37		CORE –P XIV	Core Practical – IV	5	4	25	75
38		ME III	Botany for Competitive Examinations	5	4	25	75
39	P- IV	SBE III	Biofertilizers and Biopesticides	2	4	25	75
40	P -V	GE	Gender Equality	1	1	25	75
<b>Total</b>				<b>30</b>	<b>26</b>	<b>175</b>	<b>525</b>
<b>Grand Total</b>				<b>180</b>	<b>140</b>	<b>1000</b>	<b>3000</b>

\*- Running Practical

## SEMESTER – I

### CORE COURSE – I - ALGAE, FUNGI, LICHENS, PLANT PATHOLOGY AND BRYOPHYTES

**Hours: 6**  
**Credits: 5**  
**Code:**

**Objectives:** Cryptogams include 84% of World's Botanical diversity. Scientific information on these group of plants excepting Pteridophytes will be taught along with a introduction to plant diseases.

#### Unit – I

Classification of Algae (Fritsch). General characters of various divisions of Algae. Structure and reproduction of *Oscillatoria*, *Chlamydomonas* and *Caulerpa*.

#### Unit – II

Structure and reproduction of *Navicula*, *Dictyota* and *Gracilaria*. Economic importance of Algae.

#### Unit – III

Classification of Fungi (Alexopolous). General characters – Structure and reproduction of *Albugo*, *Polyporus* and *Puccinia*. Economic importance of Fungi. Classification of Lichens – Structure and reproduction of *Usnea*. Economic importance of Lichens.

#### Unit – IV

Causal organism, symptoms and control measures of Blast disease of Paddy, Red rot of Sugarcane, Tikka disease of Groundnut, Wart disease of Potato, Citrus canker, Little leaf of Brinjal and Bunchy top of banana.

#### Unit – V

Classification of Bryophytes (Rothmaler). Structure and reproduction of *Porella*, *Anthoceros* and *Polytrichum*.

#### Text Books

1. Singh and Pandey – (1966) College botany Vol-I Books of India Publishers
2. Vashishta, B. R. *et al.* (2008). Botany for Degree Students - Algae. S. Chand and Co. Ltd., New Delhi.
3. Kumar, H. D. (1989). Introductory Phycology. East-West Press, Madras.
4. Sharma, O. P. (1986). Textbook of Algae. Tata McGraw Hill, New Delhi.
5. Kumaresan V. Algae & Bryophytes. Saras publications, Tamil Nadu.
6. Sharma, P. D. (1987). The Fungi. Rastogi and Co., Meerut.

7. Vashishta, B. R. and Sinha, A. K. (2007). Botany for Degree Students - Fungi. S. Chand and Co. Ltd., New Delhi.
8. Hale, M. E. Jr. (1983). Biology of Lichens. Edward Arnold, Maryland.
9. Vashishta, B. R. *et al.* (2008). Botany for Degree Students: Bryophyta. S. Chand and Co. Ltd., New Delhi.
10. Kumaresan V. Fungi & Plant Pathology. Saras publications, Tamil Nadu.

### **Reference Books**

1. Bold, H. C. and Wynne, M. J. (1978). Introduction of Algae - Structure and Reproduction. Prentice Hall, New Jersey.
2. Chapman, C.J. and Chapman, D.J. (1981). The Algae. 2nd ed. Macmillan, London.
3. Alexopoulos, C. J. and Mims, C. W. (1979). Introductory Mycology. Wiley Eastern Ltd., New York.
4. Bessey, E. A. (1979). Morphology and Taxonomy of Fungi. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Parihar, N. .S (1972). An Introduction to Embryophyta-I: Bryophyta. Central Book Depot, Allahabad.
6. Watson, E. V. (1971). The Structure and Life of Bryophytes. B.I. Publications, New Delhi.

**SEMESTER - I**  
**SKILL BASED ELECTIVE PAPER - I**  
**CULTIVATION OF COMMERCIAL FLOWERS AND FRUIT CROPS**

**Hours: 2**  
**Credits: 4**  
**Code:**

**Objectives:** This course gives essential information on ornamental floriculture and pomology which will help the student to have a clear perspective of Horticulture business.

**Unit – I**

Common methods of propagation – Seed propagation – Vegetative propagation – Cutting, Layering, Grafting and Budding.

**Unit – II**

Cultivation of Rose, *Ixora* and Jasmine.

**Unit – III**

Cultivation of *Chrysanthemum*, *Polyanthes* and *Crossandra*.

**Unit – IV**

Cultivation of Mango, Grapes and Banana.

**Unit – V**

Cultivation of Guava, Pomegranate and Sapota.

**Text Books**

1. Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ. Bose TK &
2. Yadav LP. 1989. Commercial Flowers. Naya Prokash. Chadha KL & Choudhury B.1992. Ornamental
3. Horticulture in India. ICAR. Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.
4. Chandrasekar, P. 2015. **தோட்டக்கலையியல்**, TK Publishers, Pudukkottai.
5. Kumar, N. 2015. Introduction to Horticulture, Oxford & IBH Book Publishing Co. Pvt. Ltd., New Delhi.

## **Reference Books**

1. Arora JS. 2006. Introductory Ornamental horticulture. Kalyani.
2. Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.
3. Bose TK & Yadav LP. 1989. Commercial Flowers. Naya Prokash.
4. Bose TK, Maiti RG, Dhua RS & Das P. 1999. Floriculture and Landscaping. Naya Prokash.
5. Chadha KL & Chaudhury B. 1992. Ornamental Horticulture in India. ICAR.
6. Chadha KL. 1995. Advances in Horticulture. Vol. XII. Malhotra Publ. House.

**SEMESTER - I**  
**ALLIED BOTANY I**

**Hours: 4**  
**Credits: 4**  
**Code:**

**Objectives:** To learn about the external and internal structure and economic importance of Thallophytes, Bryophytes, Pteridophytes and Gymnosperms and to learn about external morphology, description and classification of higher plants

**Unit – I**

Classification of Algae – Structure and reproduction of *Oscillatoria*, *Chlamydomonas*, *Ectocarpus* and *Polysiphonia*. Economic importance of algae.

**Unit - II**

Classification of Fungi – Structure and reproduction of *Albugo*, *Penicillium* and *Puccinia*. Economic importance of fungi. Causes, symptoms and control measures of Blast disease of Paddy, Tikka disease of Groundnut and Red rot disease of Sugarcane.

**Unit - III**

Structure and reproduction of *Polytrichum*, *Lycopodium* and *Cycas*.

**Unit - IV**

Bentham and Hooker's system of classification – Study of the families with their economic importance – Annonaceae, Rubiaceae, Rutaceae, Fabaceae and Caesalpinaceae.

**Unit – V**

Study of the families with their economic importance – Cucurbitaceae, Apocynaceae, Solanaceae, Euphorbiaceae and Poaceae.

**Text Books**

1. Ganguly A.K. 1971, General Botany, Vol.I. The New Book Stall, Calcutta.
2. Rao. K.N. Krishnamurthy K.V. and Rao. G., 1979, Outlines of Botany, Viswanathan Private Ltd.
3. Dutta A.C., College Botany, Vol. I & II.



## SEMESTER - II

### CORE COURSE – III - PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

**Hours: 6**  
**Credits: 4**  
**Code:**

**Objectives:** This course deals with the structure and development of primitive vascular plants and stelar evolution. This course aims to develop the basic knowledge on the diversity among the plant life forms.

#### Unit – I

Classification of Pteridophytes (Riemers) – Structure and Reproduction in *Psilotum*, *Lycopodium* and *Selaginella*.

#### Unit – II

Structure and Reproduction in *Equisetum*, *Ophioglossum* and *Adiantum*.

#### Unit – III

Structure and reproduction in *Marsilea*. Stelar evolution in Pteridophytes – Evolution of heterospory and seed habit. Apospory and Apogamy.

#### Unit – IV

Classification of Gymnosperms (Sporne) - Structure and reproduction of *Cycas*, *Pinus* and *Gnetum*. (Developmental studies excluded)

#### Unit – V

Fossil – Types of fossils – Compression, Impression, Petrification and Coal Balls. Carbon dating - Geological time scale – A brief study of *Rhynia*, *Lepidodendron*, *Calamites* and *Williamsonia*.

#### Text Books

1. Sundararajan, S. (2007). Introduction to Pteridophyta. New Age International Publishers, New Delhi.
2. Vashishta, P. C. *et al.* (2008). Botany for Degree Students: Pteridophyta. S. Chand and Co. Ltd., New Delhi.

3. Vashishta B.R. 2001. Botany for degree students – Pteridophytes. S Chand & Co Ltd; 5th edition.
4. Parihar N.S. 1959. An introduction of Peridophytes. Central Book Depot. Publishers.
5. Trivedi P.C. 2002. Advances in Pteridology. Pointer Publishers.
6. Rashid A 1978. An introduction of Peridophytes. Vikas publishers
7. Sporne, K. R. (1974). The Morphology of Gymnosperm. B.I. Publications, New Delhi.
8. Vasishta, P. C. *et al.* (2006). Botany for Degree Students: Gymnosperms. S. Chand and Co. Ltd., New Delhi.

### **Reference Books**

1. Govil C.M. 2011. Gymnosperm. Krishna Prakashan Media.
2. Bhatnagar S.P. and Alok Moitra 1996. Gymnosperms. New Age International.
3. Sambamurthy, A.V.S.S. 2005. A Textbook of Bryophytes, Pteridophytes, Gymnosperms and paleobotany. I.K. International Publishing House. New Delhi.
4. Shukla, A. C. and Mishra, S. P. (1982). Essentials of Paleobotany. 2nd ed. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Arnold C.A. 1972. An introduction to Paleobotany. New York, McGraw-Hill Publishers.

**SEMESTER I & II**  
**CORE – P - II - PRACTICAL – I**

**Hours: 2 + 4**  
**Credits: 4**  
**Code:**

Practical covering

Core Paper I

- Algae
- Fungi
- Lichens
- Plant Pathology
- Bryophytes

Core Paper III

- Pteridophytes
- Gymnosperms
- Paleobotany

**SEMESTER - II**  
**ALLIED BOTANY III**

**Hours: 4**  
**Credits: 4**  
**Code:**

**Objectives:** To learn about internal structure, morphogenesis, internal physiology of plants and Environment factors.

**Unit – I**

Structure and functions of Cell wall, Plasma membrane, Chloroplast, Mitochondria, Golgi bodies, Endoplasmic reticulum and Nucleus. Mendel's Laws – Monohybrid and Dihybrid Cross.

**Unit – II**

Structure, types and functions of Parenchyma, Collenchyma and Sclerenchyma. Structure of Xylem and Phloem components. Primary structure of Monocot stem and Dicot stem; Monocot root and Dicot root; Monocot leaf and Dicot leaf.

**Unit – III**

Structure of anther. Structure and types of Ovules – Structure of *Polygonum* type of embryo sac. Types of endosperm. Double fertilization. Development of Dicot embryo.

**Unit – IV**

Absorption of water. Transpiration and factors influencing the transpiration. Photosynthesis – Light and Dark reactions - C<sub>3</sub> Cycle. Respiration – Glycolysis, Krebs's Cycle. Growth Hormones: Auxins, Gibberellins and Cytokinins

**Unit – V**

Autecology – Synecology – Components of ecosystem – Pond ecosystem – Grassland ecosystem - Food Chain – Food Web – Ecological adaptations of Xerophytes – *Nerium*. Hydrophytes – *Eichhornia*.

**Text Books**

1. Ganguly A.K. 1971, General Botany, Vol.I. The New Book Stall, Calcutta.
2. Rao. K.N. Krishnamurthy K.V. and Rao. G., 1979, Outlines of Botany, Viswanathan Private Ltd.
3. Dutta A.C., College Botany, Vol. I & II.

**SEMESTER I & II  
ALLIED PRACTICAL – II**

**Hours: 2 + 2**  
**Credits: 3**  
**Code:**

Practical covering

Allied Paper I - Allied Botany I

Allied Paper II - Allied Botany III

**SEMESTER - III**  
**CORE COURSE – IV - ANATOMY AND EMBRYOLOGY**

**Hours: 4**  
**Credits: 4**  
**Code:**

**Objectives:** This course will introduce the types of tissues, normal and abnormal anatomical features of plants and will impart the knowledge about the various aspects of embryo formation in angiosperms.

**Unit – I**

Meristems – Origin, Classification and structure - Root apex and Shoot apex - theories - Apical, Histogen and Tunica-carpus theory – Quiescent Centre. Plant Tissues - Simple permanent tissues- Parenchyma, Collenchyma and Sclerenchyma - Complex permanent tissues – Xylem and Phloem.

**Unit – II**

Primary structure of root, stem and leaf in Dicots and Monocots. Detailed account of Normal and abnormal Secondary growth in Dicot stem and root .

**Unit – III**

Features of wood –Annual rings- heart wood - sap wood - Lenticels – Periderm formation. Anomalous Secondary growth in *Aristolochia*, *Nyctanthes*, *Boerhaavia* and *Dracaena*.

**Unit – IV**

Development of Anther - Microsporogenesis – Development of male gametophyte. Development, Structure and Types of Ovules - Megasporogenesis –Development of female gametophyte. Development of monosporic embryo sac (*Polygonum*)

**Unit – V**

Double fertilization and Triple fusion –Development of Dicot embryo (*Capsella*) and Monocot embryo (*Luzula*). Endosperm - Nuclear, Cellular and Helobial. Brief account of Apomixis and Polyembryony.

**Text Books**

1. Pandey, B.P. 2007. Plant Anatomy, S. Chand & Co. De, New Delhi.
2. Tayal, M.S. 2004 . Plant Anatomy ,Rastogi Publications, Meerut.
3. Brown et al., 1981. Text book of Wood Technology, Mc Graw Hill Inc. New York.
4. Bhojwani, S S. & Bhatnagar, S.P. 2008. Embryology of Angiosperms, Vikas Publishing House (P) Ltd., New Delhi.

5.Singh,V., Pande,P.C. & Jain,D.K. 2005.Embryology of Angiosperms, Rastogi Publications, Meerut

**Reference Books**

1. Cuttler, EG. 1969. Plant Anatomy - Part I Cells & Tissue. Edward Arnold Ltd., London.
2. Esau K. 1985. Plant Anatomy (2nd ed.) Wiley Eastern Ltd. New Delhi
- 3.Maheswari, P. 1985. An Introduction to the Embryology of Angiosperms .Tata McGraw Hill Publishing Co.,Ltd., New Delhi.

**SEMESTER - III**  
**MAJOR ELECTIVE PAPER I - MICROBIOLOGY**

**Hours: 4**  
**Credits: 5**  
**Code:**

**Objectives:** This course will introduce the student to the world of microbes, which are there in every possible niche. The beneficial and detrimental aspects will be taught.

**Unit – I**

Historical outline of microbiology. Contributions of Leeuwenhoek, Louis Pasteur, Robert Koch and Ivanowsky-Characterization and Classification of microorganisms -Sterilization methods – Physical and chemical - Composition of nutrient agar medium, nutrient broth and PDA medium.

**Unit – II**

Bacteria – outline of classification (Bergey’s Manual of Systematic Bacteriology, 2<sup>nd</sup> Edition) – morphology, ultra structure, reproduction and economic importance. Virus: General characters, Structure and multiplication.

**Unit – III**

Agricultural and soil microbiology - common soil microflora - Biofertilizer - Role of microbes in nitrogen fixation and phosphate solubilization. Biogeochemical cycles.

**Unit – IV**

Medical and food microbiology – Antibiotics and their mode of action (Penicillin, Streptomycin and Erythromycin). Food microbiology – microbial spoilage of food, food poisoning – food borne infections – Food preservation methods – physical and chemical.

**Unit – V**

Environmental microbiology – microbial remediation of industrial effluents– microbial preservation of raw materials, enzymatic treatment during industrial process, Waste treatment – solid (compost) and liquid (sewage). Fermentation process –alcoholic fermentation and acetic acid fermentation. Microbes and their role in leaching metals (Bioleaching).



### **Text Books**

1. நுண்ணுயிரியல். 2015. P. Chandrasekaran, TK Publishers, Pudukkottai.
2. Microbiology. 2015. RC Dubey and DK Maheswari, S. Chand & Co., New Delhi.
3. Microbiology. 2015. PD Sharma, Rastogi Publications, Meerut

### **Reference Books**

1. Microbiology. 1986. M.J. Pelczar, Jr., E.C.S. Chang and N.R. Krieg, McGraw Hill Company, Newyork.
2. Microbiology - concepts and applications. 1993. M.J. Pelczar, Jr., E.C.S. Chan and N.R. Krieg, McGraw Hill Company.
3. Microbiology. 1993. L.M. Prescott, J.P. Harley D.A. Klein – Wm.c. Brown publishers. Dutique, Jawa, Melbourne.
4. Modern Microbiology. 1962. Wayne w. Umbreit – W.H, Freeman and company, London.
5. Basic and Practical Microbiology. 1986. Ronald M. Atlas, Mac.Milleen Company, Newyork.

## SEMESTER - III

### *SKILL BASED ELECTIVE PAPER II - HERBAL BOTANY*

**Hours: 2**  
**Credits: 4**  
**Code:**

**Objectives:** This course will help the student to know about the medicinal value of Indian medicinal plants and appreciate the Indian System of Medicines.

#### **Unit – I**

Traditional systems of medicine – Siddha, Unani and Ayurveda - Scope and Applications of Herbal Botany.

#### **Unit – II**

Identification ,Collection and storage of medicinal plants - Cultivation of medicinal plants in pots – garden – farms .

#### **Unit – III**

Drugs containing Glycosides – (*Aloe Vera*, *Centella asiatica*, *Andrographis paniculata*)-

Tannins (Amla) – Lipids (Olive Oil).

#### **Unit – IV**

Drugs containing – Terpenoids (Eucalyptus Oil) – Protein Drugs (Lectins) and Alkaloidal drugs (*Vinca*)

#### **Unit – V**

Herbal Cosmetics – Pimple and Acne – Dandruff – Leucoderma – teeth care.

#### **Text Books**

1. Jain S.K. (1989) Methods and approaches in Ethnobotany, Society of Ethnobotanists, Luknow.
2. Pal D.C. and Jain S.K. (1998) Tribal Medicine. Naya Prakash Publishers, Calcutta.
3. Shukla RS (2000) Forestry for Tribal Development. AH Wheeler & Co., Ltd., India.

#### **Reference Books**

1. Sharol Tilgner N.D. (1999). Herbal Medicine – From the heart to the Earth. Printed in the USA, by Malloy Lithographing Inc.
2. Kumar N.C. (1993) Introduction to Medical Botany and Pharmacognosy. Emkay Publications, Delhi.

## SEMESTER - IV

### CORE PAPER –VI - HORTICULTURE AND PLANT BREEDING

**Hours: 6**  
**Credits: 4**  
**Code:**

**Objectives:** This course will help the student to understand the principle of basic techniques in Horticulture and Plant breeding and know about the progresses made.

#### **Unit – I**

Importance and scope of horticulture. Classification of horticultural crops –fruits and vegetables. Garden implements & tools. Garden designs. Types of gardens –Formal, Informal and Kitchen. Establishment and maintenance of Lawn.

#### **Unit – II**

Garden – its components – hedges, edges, rockery, topiary, water garden, indoor gardening, green houses. Bonsai, cut flowers – training and pruning.

#### **Unit – III**

Orchard – establishment, planning, layout, cultivation. Use of plant growth regulators in Horticulture – Induction of rooting, flowering, fruit set and ripening.

#### **Unit – IV**

Breeding – basic principles, introduction & scope, selection (Mass, Pureline and Clonal). Hybridization – Selfing and Crossing Techniques – Heterosis – Hybrid vigour.

#### **Unit – V**

Breeding for disease resistance. Role of polyploidy in plant breeding – Auto and Allopolyploids – Mutation Breeding.

#### **Text Books**

1. Kumar, N. (1987). Introduction to Horticulture., Rajalakshmi Publishers, Nagercoil.
2. Manibushan Rao, K. (1991). Textbook of Horticulture. Macmillan Publishing Co., New York.
3. Rao, K. M. (2000). Text Book of Horticulture. Macmillan India Ltd., New Delhi.
4. V.L. Sheela. (2011). Horticulture. MJP publishers, India.
5. Chopra, V. L. (1989). Plant Breeding. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Sundararaj, D. D. and Thulasidas, G. and Durairaj, M. S. (1997). Introduction to Cytogenetics and Plant Breeding. Popular Book Depot, Chennai.

### **Reference Books**

1. Arora, J. S. (1992). Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
2. Edmond, J. B. *et al.* (1977). Fundamentals of Horticulture. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
3. George Acquah. (2002). Horticulture Principles and Practices. 2nd ed. Pearson Education, Delhi.
4. Sundararajan J.S. *et al.* A guide to Horticulture. Thiruvankadam Printers, Coimbatore.

**SEMESTER III & IV**  
***CORE – P - V - PRACTICAL – II***

**Hours: 2 + 4**  
**Credits: 4**  
**Code:**

Practical covering

Core Paper IV

- Anatomy
- Embryology

Major Elective Paper I

- Microbiology

Core Paper VI

- Horticulture
- Plant Breeding

## SEMESTER IV

### NON-MAJOR ELECTIVE PAPER – I - HORTICULTURE

(For English Literature Regular Stream)

**Hours: 2**  
**Credits: 2**  
**Code:**

**Objectives:** This course will help the student to understand the principle of basic techniques in Horticulture.

#### UNIT I

Importance and scope of Horticulture – classification of horticultural crops – importance of gardens and types: Rock garden, water garden, roof garden and kitchen garden.

#### UNIT II

Growth regulators used in Horticulture. Role of mineral elements in the growth of the plant. Establishment of Lawn.

#### UNIT III

Plant propagation methods – sexual & asexual- importance and advantages of sexual propagation – seed germination – treatment to stimulate germination and knowledge about dormancy. Advantages & disadvantages of vegetative propagation or asexual reproduction.

#### UNIT IV

Indoor gardening and interior scaping – introduction – types of containers used – environmental factors – selection of plants, popular indoor plants, potting media, propagation, watering, tips for watering.

#### UNIT V

Bonsai – introduction, kinds of bonsai, origin, training, pruning, watering, manuring, pests and diseases.

#### Text Book

1. Kumar, N. (1987). Introduction to Horticulture., Rajalakshmi Publishers, Nagercoil.

#### Reference Books

1. Arora, J. S. (1992). Introductory Ornamental Horticulture. Kalyani Publishers, New Delhi.
2. Edmond, J. B. *et al.* (1977). Fundamentals of Horticulture. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
3. George Acquaah. (2002). Horticulture Principles and Practices. 2nd ed. Pearson Education, Delhi.

## SEMESTER - V

### CORE PAPER – VII - MORPHOLOGY AND TAXONOMY

**Hours: 6**  
**Credits: 5**  
**Code:**

**Objectives:** Angiosperms are a group of flowering plants that represent a major community in the plant kingdom. They include about 2,50,000 species distributed all over the world. They are the most highly evolved group of plants and appeared on Earth about 130 million years ago and this paper will introduce ways and means of identifying them

#### **Unit – I**

Morphology – Types of Phyllotaxy - Inflorescence types – (Racemose, Cymose and special types ) Flower and floral parts – (Descriptive technologies of a flower). Types of fruits (Fleshy, dry, Aggregate and Multiple)

#### **Unit – II**

Brief account of systems of classification –Linnaeus, Bentham and Hooker; Current Systems of Classification - Cronquist and Takhtajan. Herbarium techniques and uses.

#### **Unit – III**

Binomial nomenclature and taxonomic hierarchy. Brief account of ICBN and BSI. Modern taxonomy - Brief account on chemotaxonomy, cytotaxonomy and numerical taxonomy.

#### **Unit – IV**

A detailed study of the following families and their economic importance: Annonaceae, Nymphaeaceae, Capparidaceae, Tiliaceae, Rutaceae, Leguminosae and Cucurbitaceae.

#### **Unit – V**

A detailed study of the following families and their economic importance : Rubiaceae, Asclepiadaceae, Solanaceae, Acanthaceae, Verbenaceae, Amaranthaceae, Euphorbiaceae, Orchidaceae and Poaceae.

#### **Text Books**

1. Taxonomy of Angiosperms. BP Pandey
2. Systematic Botany – RK Gupta
3. Taxonomy of Angiosperms – V. Singh & DK Jain

#### **Reference Book**

1. Taxonomy of Angiosperms. AVSS, Sambamurthy.

## SEMESTER V

### CORE PAPER VIII - CYTOLOGY AND GENETICS

**Hours: 6**  
**Credits: 5**  
**Code:**

**Objectives:** In this paper exposure would be given to Cells and their role as structural, biological and functional units of all living organisms. Heredity is a vital aspect of any Botany course and its basics will be dealt.

#### UNIT I:

Cell theory, ultrastructure of prokaryotic and eukaryotic cell. Structure and function of cell organelles – plasma membrane, cell wall, endoplasmic reticulum, lysosomes, spherosomes, mitochondria, plastids and ribosomes.

#### UNIT II:

Ultrastructure of nucleus and its functions. Ultrastructure of nucleolus, structure of chromosomes, polytene chromosomes & lamp brush chromosomes.

#### UNIT III:

Cell division – amitosis, mitosis, meiosis and its significance. Mutations- types, physical and chemical mutagens and chromosomal aberrations.

#### UNIT IV:

Mendelian principles of inheritance- mono and dihybrid cross. Incomplete dominance, multiple alleles and epistasis. Polygenic inheritance.

#### UNIT V:

Linkage & crossing over and its significance - sex linkage- Sex determination in plants and human beings. Cytoplasmic inheritance.

#### Textbooks

1. Meyyan, R.P., (2000) : Genetics & Evolution Saras Publication, Nagercoil, India
2. Gupta, P.K. (2000) : Genetics Rastogi Publishers, Meerut, India
3. Agarwal., V.K. (2000) : Simplified course in Genetics(B.Sc., Zoology) S. Chand & Co.,New Delhi
4. Sharma N.S. 2005, Molecular Cell Biology, International Book distributors, Dehradun
5. Verma P.S. and Agarwal V.K. 1986, Cell Biology and Molecular Biology (Cytology) S. Chand and Company, New Delhi.



## **Reference Books**

1. Winchester, A.M. (1958) : Genetics(3rd Edition) Oxford & IBH Publishing House, New Delhi
2. Singleton, R. (1963) : Elementary Genetics D. Van Nostrand Co., Ltd., Inc., N.Y. & Affiliated East West Press (P) Ltd., New Delhi
3. Chandrasekaran, S.N. & Parathasarathy , S.V. (1965) : Cytogenetics and Plant Breeding P. Varadhachari & Co., Madras
4. Sinha, U.& Sinha, S. (1989) : Cytogenetics, Plant Breeding & Evolution Vikas publishing House, New Delhi-408pp.,
5. Ahluwalia, K.B. (1990) : Genetics Wiley Eastern Ltd.,New Delhi
6. Sandhya Mitra (1994) : Genetics-A Blue Print of Life Tata McGraw Hill Publishing Co., Ltd., New Delhi

## SEMESTER - V

### CORE PAPER - IX - PLANT BIOTECHNOLOGY

**Hours: 6**  
**Credits: 4**  
**Code:**

**Objectives:** Plant Biotechnology includes genetic modification, genetic engineering and mutagenesis. This paper will deal with the basic principles of these.

#### Unit – I

Biotechnology - scope and importance. Areas of application. Gene transfer mechanism in Bacteria, transformation, transduction (General and specialized) and conjugation (F<sup>+</sup> & F<sup>-</sup>, Hfr).

#### Unit – II

Plasmid biology – plasmids as vectors - pBR 322, T<sub>i</sub> plasmids; cosmids; Phagemids; transposons. Genetic engineering - enzymes involved.

#### Unit – III

Isolation of DNA (reverse transcriptase method)- Insertion of DNA into vector – Transfer of rDNA into their host cells (*Agrobacterium* mediated transfer: Electroporation) – Selection of clones (colony hybridization, southern blotting ) – gene cloning (PCR). Role of *Agrobacterium* in genetic engineering. Site directed mutagenesis.

#### Unit – IV

Tissue culture – sterilization methods – culture tools, totipotency, MS medium, direct and indirect *in vitro* regeneration. Micropropagation – somatic embryogenesis, cell suspension culture.

#### Unit – V

Protoplast isolation, fusion of culture. Hybrids and cybrids. Synthetic seed technology. Production of secondary metabolites through cell culture - Cryobiology

#### Text Books

1. R.C. Dubey. 2015. A text book of Biotechnology, S.Chand & Co., New Delhi
2. P. Parihar. 2015. A text book of Biotechnology, Argobios Publications, Jodhpur

## **Reference Books**

1. P.K. Gupta: Elements of Biotechnology, Restogi Publications, Meerut
2. Kalyan Kumar De: Plant Tissue culture, New central Book Agency, Calcutta
3. M.D. Kumar: A text book on Biotechnology, East west press, New Delhi
4. S.S. Purohit: Agricultural Biotechnology, Agrobios Publications, Joshpur
5. S. Ignacimuthu: Plant Biotechnology, Oxford & IBM Publishing Co., New Delhi
6. Trevan, Boffey, Goulding & Stanbury: Biotechnology – The Biological Principles, Tata Mc Graw Hill Publishing Co., New Delhi
7. A.K Chatterji: Introduction to Environmental Biotechnology, Prentice Hall India Pvt., Ltd., New Delhi

## SEMESTER - V

### MAJOR ELECTIVE PAPER - II - MUSHROOM CULTIVATION TECHNOLOGY

**Hours: 5**  
**Credits: 5**  
**Code:**

**Objectives:** This paper is an introduction to mushroom cultivation and will give basic knowledge and techniques required in mushroom cultivation.

#### Unit – I

Introduction – History- Scope of mushroom cultivation – Types of edible mushroom available in India – Food value of mushrooms – Medicinal value of mushrooms.

#### Unit – II

Life cycle of common edible mushroom (*Agaricus*), Identification – edible and poisonous mushrooms – external factors for growth.

#### Unit – III

Salient features of common edible mushrooms – *Agaricus bisporus* - *Volvariella volvacea*, *Pleurotus sajor – caju* .

#### Unit – IV

Cultivation of Paddy straw mushroom – Cultivation of oyster mushroom – Cultivation of White button mushroom.

#### Unit – V

Diseases of mushrooms (Fungal – Dry bubble; Bacterial – Brown blotch; Viral – Dieback disease)– Preservation and storage of mushrooms – Food Preparation (Soups, cutlets, omlet and samosas).

#### Text Books

1. Alice, D., Muthusamy and Yesuraja, M. (1999). Mushroom Culture. Agricultural College, Research Institute Publications, Madurai.
2. Marimuthu, T. et al. (1991). Oster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.

3. Kappor , JN. (1999) Mushroom Cultivation. ICAR. NewDelhi.

**Reference Books**

1. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
3. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
4. Tripathi, D. P. (2005). Mushroom Cultivation. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

**SEMESTER V**  
**CORE – P - X - PRACTICAL – III**

**Hours: 4**  
**Credits: 4**  
**Code:**

Practical covering

Core Paper VII

- Morphology
- Taxonomy

Core Paper VIII

- Cytology
- Genetics

Core Paper IX

- Plant Biotechnology

Major Elective Paper II

- Mushroom Culture.

## SEMESTER – V

### NON MAJOR ELECTIVE PAPER – II - ECONOMIC BOTANY

(For Physics Students)

**Hours: 2**  
**Credits: 2**  
**Code:**

**Objectives:** This paper introduces the commercial potential of plants and will help the student to understand its importance.

#### Unit – I

Vegetables and tropical fruits – underground vegetables – Beetroot, Onion and Carrot. Leafy vegetables – *Amaranthus* and *Cannabis sativus*. Fruits of Cucurbitaceae (Water melon) and Solanaceae (Tomato)

#### Unit – II

Medicinal products from bark, leaves, flowers, fruits and seeds. Antibiotics – Penicillin and Erythromycin (source, production and uses)

#### Unit – III

Cultivation and harvest of Maize, Wheat and Paddy.

#### Unit – IV

Cultivation of pulses and nuts. Red gram, Black gram, Bengal gram and Cashewnut. Cultivation and uses of Spices and Condiments: Ginger and Pepper.

#### Unit – V

Wood and forest products : Timber, Paper and Rubber.

#### Text Books

1. Vardhana, R. 2009. Economic Botany (1st ed.), Sarup Book Publishers Pvt. Ltd., New Delhi.

#### Reference Books

2. Hill, A.F. 1952. Economic Botany; A Textbook of Useful Plants and Plant Products (2nd ed.), McGraw- Hill Book Co., Inc., New York.
3. Thompson, H.C. 1949. Vegetable Crops (4th ed.), McGraw- Hill Book Co., Inc., New York.
4. Wallis, T.E. 1946. Text book of Pharmacognosy. J. & A. Churchill Ltd, London.

**SEMESTER - VI**  
**CORE PAPER – XI - PLANT PHYSIOLOGY**

**Hours: 6**  
**Credits: 5**  
**Code:**

**Objectives:** This paper deals with various physiological processes in plants related to metabolism, growth and reproduction; understand the various abiotic stresses faced by plants and to learn the different types of plant movements.

**Unit – I**

Role of water –biological significance, physical and chemical properties. Properties of solutions, suspensions and colloids. Osmotic and non-osmotic uptake. Ascent of sap – Cohesion and root pressure theories. Transpiration –Guttation.

**Unit – II**

Mineral nutrition – role of major & minor elements, mineral deficiency symptoms, Hydroponics, Foliar nutrition, Absorption of mineral salts, Active & passive absorption, Translocation of organic solutes, mass flow. Stress physiology – water stress, temperature stress, salt stress, role of plant physiology in agriculture.

**Unit – III**

Enzymes – nature and properties. Mechanism of enzyme action, factors affecting enzyme action. Nitrogen metabolism – source of nitrogen, nitrogen assimilation – protein synthesis. Respiration - respiratory substrates, aerobic and anaerobic, Glycolysis, Krebs's cycle, Electron transport, Oxidative phosphorylation and Energetics.

**Unit – IV**

Radiant energy and its role in photosynthesis. Action and absorption spectrum. Role of pigments, Emerson Enhancement effect, PS I and PS II, Photoelectron transport, cyclic and non cyclic photophosphorylation Carbon assimilation –C<sub>3</sub>, C<sub>4</sub> and CAM cycles. Photorespiration.

**Unit – V**

Plant growth regulatory substances – Auxins, Kinetins, Gibberellins and ABA. Phytochrome, Photoperiodism and Vernalization. Senescence. Plant movements – Geotropism, Phototropism, Thigmotropism.



### **Text Books**

1. Jain V.K. (1990) – Plant Physiology – S. Chand & Co. New Delhi.
2. Malik. C.P., and Srinivastra, (1995) – Plant Physiology.
3. Verma. S.K (1999) – Plant Physiology- S.Chand & Co., New Delhi.
4. Verma,S.K., 1999,A Text book of Plant Physiology, S. Chand & Co,New Delhi.

### **Reference Books**

1. Fang. F.K., (1982) – Light Reaction path of photosynthesis, Vol 35. molecular biology, Biochemistry and Biophysics – Springer.
2. Palmer. J.M., (ed) 1984 – the physiology and biochemistry of Plant respiration – Cambridge University Press. U.K.
3. Delvin. R.M. (1969) – Plant Physiology – Holt, Rinehart & Winston & Affiliated east west, Press (p) Ltd., New Delhi.
4. S. Salisbury. F.B. & C.W. Ross – (1999) Plant Physiology – CBS Publishers & Printers, New Delhi.
5. Noggle, G.R. and Frintz, G.J., 1976, Introductory Plant Physiology, Prentice-Hall, India.

## SEMESTER - VI

### CORE PAPER – XII - BIOPHYSICS, BIOCHEMISTRY AND BIOSTATISTICS

**Hours: 6**  
**Credits: 4**  
**Code:**

**Objectives:** This paper deals with the study of various primary & secondary plant products and the principle of various bio-instruments and concepts in biophysics. Basic Biostatistics is also dealt.

#### Unit – I

Biophysics – laws of thermodynamics – enthalpy, entropy and free energy. Bioenergetics (ATP) dual nature of light (wave and particulate) – Energy status of atoms - ground, excited, singlet and triplet. De-excitation, heat and light phosphorescence, fluorescence. Biological effects of ionizing radiations.

#### Unit – II

pH and its determination - Buffers – Chromatography –principle ,uses and types – TLC and HPLC .Basic principles of Colorimetry and centrifugation.

#### Unit – III

Chemical bonds – primary & secondary, Primary plant products – Carbohydrates: classification, structure and properties of glucose, sucrose and cellulose. Lipids - Fatty acids - classification, saturated and unsaturated fatty acids .Secondary plant products: alkaloids, terpenoids and flavonoids.

#### Unit – IV

Nucleic acids –RNA, DNA. Double helical model of DNA. Types of RNA and functions. Amino acids – structure, classification and properties. Proteins –classification and structure (primary, secondary, tertiary).

#### Unit – V

Data collection, sources and methods, presentation, tabulation, graphical and diagrammatic representation, Histograms. Measures of central tendencies – Mean, Median and Mode. Standard deviation. Coefficient of variation – Chi square test.

#### Text Books

1. Trehan, K (1987) : Biochemistry Wiley Eastern Ltd., New Delhi
2. Srivastava, H.S. (1990) : Elements of Biochemistry. Rastogi Publications, Meerut, India

3. Narayanan, P. (2000) : Essentials of Biophysics. New Age International Publishers(P)ltd., New Delhi, Bangalore, Calcutta, Chennai, Guwahati, Hyderabad, Lucknow, Mumbai
4. Annie & Arumugam, N. (2000): Biochemistry & Biophysics. Saras Publications, Nagercoil, Tamilnadu.
5. Arumugam N. Biostatistics. Saras publications. Tamil Nadu.
6. Khan & Khanum. Fundamentals of Biostatistics. 1994. Ukaaz publications, India.
7. Thiravia Raj S. 1999. Biophysics. Saras publications, Tamil Nadu.
8. Jain J.L. 1979. Fundamentals of Biochemistry. S. Chand & Co., Ltd.

### **Reference Books**

1. Lehninger, A.L. (1984) : Biochemistry (2nd Edition). Kalyani Publishers, Ludhiana, New Delhi
2. Jayaraman, J. (1981) : Laboratory Manual of Biochemistry. Wiley Eastern Ltd., New Delhi
3. Stryer, L. (1989) : Biochemistrty. W.H. Freeman & Co., New York, San Francisco
4. Plummer, D. (1989) : Biochemistry –the Chemistry of life. McGraw Hill Book Co., London, N..Y.  
New Delhi, Paris, Singapore, Tokyo.
5. Casey, E.J. (1969) : Biophysics-Concepts and Mechanisms. Van Nostrand Reinhold Co., & Affiliated East West Press (P) Ltd., New Delhi.
6. Daniel M. (1989). Basic Biophysics for Biologists. Agrobotanical publishers. India.
7. Upadhay A. et al. (2000). Biophysical Chemistry – principles & Techniques. Himalaya publishing house, Delhi.

## SEMESTER - VI

### CORE PAPER– XIII - ECOLOGY AND CONSERVATION BIOLOGY

**Hours: 5**  
**Credits: 4**  
**Code:**

**Objectives:** The world is in a period of unprecedented environmental change. Learning how to live sustainably on this planet is going to require that humanity learns how to utilize and manage our natural resources more effectively and this paper will deal this.

#### Unit – I

Ecology – Definition; Plant Ecology and its divisions. Approaches to the study of Ecology – Autecology and Synecology. Applications of Plant Ecology. Factors influencing plant environment – climatic, edaphic and biotic factors.

#### Unit – II

Ecosystem concept – components of ecosystem- biotic and abiotic – producers, consumers and decomposers. Ecological pyramids, Food chain and Food web. Pond ecosystem.

#### Unit – III

Units of vegetation – formation, association, consociation and society. Development of vegetation – migration, ecesis and colonization. Plant succession – Hydrosere and Xerosere.

#### Unit – IV

Pollution types and its control –air pollution, water pollution, soil pollution, noise pollution, thermal pollution and radioactive pollution.

#### Unit – V

Endangered Flora – Conservation of Genetic Resources – Red Data Book – Biosphere Reserves Forest Reserves – National Parks and Sanctuaries - Methods of conservation of biodiversity - *in situ* and *ex situ*.

#### Text Books

1. Shukla, R. S. and Chandel, P. S. 2015. Textbook of Plant Ecology. S. Chand Publications Pvt. Ltd., NewDelhi.

2. Chandrasekar, P. 2015. சுற்றுச்சூழல் பயில்வுகள், TK Publishers, Pudukkottai.
3. Palaniyappan, P. 2015. சூழ்நிலையியல், Mohan Pathipagam, Chennai.

### **Reference Books**

1. Muller-Dombois, D. and Ellenberg, H. (1974). Aims and Methods of Vegetation Ecology, Wiley, New York.
2. Odum, E.P. (1983), Basic Ecology, Sanders, Philadelphia.
3. Robert Ricklefs (2001). The Ecology of Nature. Fifth Edition. W.H. Freeman and Company.
4. Singh K.P. and J.S. Singh (1992). Tropical Ecosystems: Ecology and Management. Wiley Eastern Limited, Lucknow, India.

**SEMESTER - VI**  
**MAJOR ELECTIVE PAPER – III - BOTANY FOR COMPETITIVE**  
**EXAMINATIONS**

**INTERNAL QUESTION PAPER SETTING**

*Question Paper Pattern*

- ❖ Section A (30 X 1) = 30 marks – Answer ALL the questions - MCQs
- ❖ Section B (3 X 15) = 45 marks – Three Qs. to be answered out of Five – Essay type

**Hours: 5**  
**Credits: 4**  
**Code:**

**Objectives:** To educate the technique of answering objective questions in competitive examinations and to impart knowledge in basic botany which is a key to success in various competitive examinations.

**Unit I**

A brief study about the structure and reproduction of the following genera: *Oscillatoria*, *Chlamydomonas*, *Caulerpa*, *Polysiphonia*, *Albugo*, *Puccinia*, *Agaricus* and *Lichens*. Structure of bacteria and viruses. (\*Economic importance of Algae, Fungi and Bacteria)

**Unit II**

A brief study about the structure and reproduction of the following genera: *Porella*, *Anthoceros*, *Polytrichum*, *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*, *Adiantum*, *Marsilea*, *Cycas*, *Pinus* and *Gnetum*. (\*General characters and economic importance of Bryophytes, Pteridophytes and Gymnosperms)

**Unit III**

Meristem theories, Simple and Complex tissues, Primary structure of Dicot and Monocot root, stem and leaf, Structure and function of cellular organelles. (\*Ultra structure of plant cell, Mitosis and meiosis)

**Unit IV**

Cutting, Grafting and Layering techniques. Transpiration, respiration and photosynthesis. Genetic engineering techniques, structure and function of plasmids. (\*Layout of kitchen garden, Cultivation & marketing of commercial flowers and fruits, Sterilization methods in microbiology, Role of Biotechnology in Agriculture)

**Unit V**

Monohybrid, dihybrid cross and test cross, Multiple alleles, Sex linked inheritance, Mutation and Polyploidy. Food chain, Food Web, Hydrophytes, Mesophytes and Xerophytes. (\*Pond and Grassland Ecosystem, Air, Water and Land Pollution, Forest types of Tamilnadu)

\* Portions for descriptive Questions only

**SEMESTER - VI**  
**SKILL BASED ELECTIVE – III - BIOFERTILIZERS AND BIOPESTICIDES**

**Hours: 2**

**Credits: 4**

**Code:**

**Objectives:** To educate the students on the principles, applications and advantages of Biofertilizers and Biopesticides.

**Unit – I**

General account of Biofertilizers and Biopesticides. Scope, Advantages and Importance of Biofertilizers.

**Unit – II**

Biofertilizers - Symbiotic Nitrogen fixers (*Rhizobium*) – Non-Symbiotic nitrogen fixers (*Azospirillum*) – Free Nitrogen Fixers (Cyanobacteria)

**Unit – III**

Phosphate solubilizers — *Bacillus megaterium* – Mycorrhiza as Biofertilizer – mass inoculum production and field application of mycorrhiza.

**Unit – IV**

Mass cultivation of microbial inoculants. Field application of *Rhizobium*, *Azospirillum* and Cyanobacteria

**Unit – V**

Biopesticides – Bacterial Pesticides (*Bacillus thuringiensis*), Viral Pesticides (NPV and CPV), Mycopesticides (*Entomophthora*, *Beauveria*) – Mechanism of Biocontrol.

**Text Book**

1. Subba Rao, N.S. 2000 Soil Microbiology. Oxford and IBH Publishing Co. Ltd.

**Reference Books**

1. Verma A and Hock B. 1995. Mycorrhiza.
2. Yaacovokan, 1994 - Azospirillum, CBC press
3. Wicklow, D.T. and B.E. Soderstrom. 1997, Environmental and microbial relationships. Springer.

**SEMESTER VI**  
**CORE – P - XIV - PRACTICAL – IV**

**Hours: 5**

**Credits: 4**

**Code:**

Practical covering

Core Paper XI

- Plant Physiology

Core Paper XII

- Biophysics
- Biochemistry
- Biostatistics

Core Paper XIII

- Ecology
- Conservation Biology

Major Elective Paper III

- Botany for Competitive Examinations