MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Botany
(Choice Based Credit System)
(with effect from the academic year 2021-2022 onwards)

Semester-VI				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	Core VIII	Genetics, Evolution and Biostatistics	CMBO61	4
III	Core IX	Plant Physiology	CMBO62	4
III	Core X	Microbiology	CMBO63	4
III	Elective I	Horticulture and Plant Breeding - I(A)	CEBO61	4
III	Elective II	Environmental Biotechnology - II(B)	CEBO64	4
III	Major Practical VII	Genetics, Evolution, Biostatistics and Elective – I Practical	CMBOP7	2
III	Major Practical VIII	Plant Physiology - Practical	CMBOP8	2
III	Practical IX	Microbiology and Elective II - Practical	CMBOP9	2

Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. **Scheme for internal Assessment**:
Maximum marks for written test: **20 marks**
3 internal tests, each of **I hour** duration shall be conducted every semester.
To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:
Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination
3 hrs. examination at the end of the semester
A – Part : 1 mark question two - from each unit
B – Part : 5 marks question one - from each unit
C – Part : 8 marks question one - from each unit

- **Conversion of Marks into Grade Points and Letter Grades**

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

- **Cumulative Grade Point Average (CGPA)**

$$\mathbf{CGPA} = \frac{\mathbf{\Sigma\,(GP \times C)}}{\mathbf{\Sigma C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

- **Classification**
  a) First Class with Distinction : CGPA $\geq$ 7.5*****
  b) First Class : CGPA $\geq$ 6.0
  c) Second Class : CGPA $\geq$ 5.0 and $<$ 6.0
  d) Third Class : CGPA$<$ 5.0

GENETICS, EVOLUTION AND BIOSTATISTICS

Objectives:

- To learn the pattern of inheritance.
- To understand the mechanism of gene action.
- To learn the concept of Biostatistics.
- To become aware of the importance of statistical tools in life sciences.

UNIT – I

Mendel's laws of heredity with reference to Monohybrid and Dihybrid crosses. Test cross - Monohybrid and Dihybrid. Incomplete dominance - Monohybrid and Dihybrid. Lethal gene action in Maize and Mice.

UNIT – II

Interaction of genes; Supplementary genes, Complementary genes and Duplicate factors. Polygenic inheritance with reference to ear length in corn. Linkage, crossing over and recombination

UNIT – III

Molecular structure of DNA, Replication of DNA - Semi conservative method, Proof for DNA as genetic material, Genetic code, Sex determination in plants.

UNIT – V

Evolutionary theories - Lamarckism, Darwinism, Mutation theory of Devries. Chemosynthetic theories – evidence any five; modern synthetic theory of evolution, speciation.

UNIT – V

Collection and interpretation of data, Mean, Median, Mode, Standard deviation & Chi-square test.

PRACTICAL:

1. To work out simple genetic problem in Monohybrid, Dihybrid, Incomplete dominance, Lethal genes and Interaction of genes.
2. Using available data to find out the Mean and Standard deviation and to draw frequency curve / histogram.
3. To work out simple Chi-square problems.
4. To record variation: Intra / Inter specific.
5. **Spotters: Models and Charts:** DNA structure, Replication of DNA, use and disuse theory of Lamarck, Natural selection theory - Struggle for existence.

To maintain a record notebook for external evaluation.

REFERENCES:

1. Gupta. P.K., 1991, Genetics, Rastogi Publications, Meerut.
2. Gupta. P.K., 2004, Cell and Molecular Biology, Rastogi Publications, Meerut.
3. John Jothi Prakash. E. and David Paulraj M., 2007, Genetics and Biostatistics, JPR Publications, Neyyor.
4. Verma. P.S. and Agarwal. V.L., 1991, Genetics, S.Chand and Co., NewDelhi.

https://www.youtube.com/watch?v=xTOMgXeGizU
https://www.youtube.com/watch?v=YJHGfbW55l0
https://www.youtube.com/watch?v=6NiCeKP0wwU
https://www.youtube.com/watch?v=o_-6JXLYS-k
https://www.youtube.com/watch?v=TNKWgcFPHqw

PLANT PHYSIOLOGY

Objectives:

- Understand the various functions of the plants.
- Know the mechanisms of the various activities.
- Relates the role of phytohormones on growth and development of plants.

UNIT – I

Water Relations: Imbibition, Diffusion, Osmosis and Plasmolysis; Water Potential- Definition, Components, Absorption of Water –Mechanism and Factors affecting Water Absorption; Transpiration- Definition, Types, Significance and Mechanism of Stomatal Transpiration- steps and theories, Guttation

UNIT – II

Ascent of Sap –Definition, Path of Ascent of Sap, Mechanism- Transpiration Pull and Cohesion Theory; Mineral nutrition: Macro and Micro-nutrients - Absorption of Mineral Salts – Mechanism; Translocation of Organic Solutes: Mechanism - Munch's Mass flow hypothesis.

UNIT – III

Photosynthesis: Light and Dark Reactions - Photosynthetic Electron Transport Chain and Photophosphorylation (Cylic and Non cyclic); Carbon Assimilation - C3, and C4 Pathways and its Significance; Respiration: Types, Glycolysis, Kreb's cycle and Oxidative Phosphorylation.

UNIT – IV

Growth Curve and phases of growth; Phytohormones: Physiological Effects and Practical applications - Auxin, Gibberellic acid, Cytokinin, Ethylene and Abscisic acid.

UNIT – V

Seed dormancy: Causes and Methods of breaking seed dormancy; Photoperiodism and Vernalization.

PRACTICAL:

1. Water Potential by Falling Drop Method.
2. Osmotic Potential by Plasmolytic Method.
3. Rate of Photosynthesis in Different Concentrations of Bi-Carbonate – Bubble Method.
4. Determination of Respiratory Quotient (R.Q) using Ganong's Respirometer.
5. Effect of Temperature on Permeability of Plasma Membrane.
6. Separation of Chlorophyll Pigments by Ascending Paper Chromatography.

DEMONSTRATION:

1. Tissue Tension; 2. Suction due to Transpiration; 3. Fermentation; 4. Arc Auxanometer; 5. Clinostat; 6. Phototropism

Spotters

1. Absorption Spectrum of Chlorophylls
2. Growth curve.
3. Growth hormone

To maintain a record notebook for external evaluation.

REFERENCES:

1. Devlin, R.M. (1969). Plant Physiology. Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi.
2. Dulsy Fatima, R.P. et al., (1994). Elements of Biochemistry. Saras Publications, Nagercoil, Tamil Nadu.
3. Jain, V.K. (1990). Fundamentals of Plant Physiology. S. Chand & Co., New Delhi. Noggle, R. and Fritz (1989). Introductory Plant Physiology. Prentice Hall of India. Pandey, S.N. (1991). Plant Physiology. Vikas Publishing House (P) Ltd., New Delhi.
4. Periyasamy, K. (1978). Cell Iyakka Viyal (Cell Physiology). Tamil Nadu text Book Society, Chennai.
5. Salisbury, F.B. and Ross, C.W. (1999). Plant Physiology. CBS Publishers and

Printers, New Delhi.

https://www.youtube.com/watch?v=4to_4guDx50
https://www.youtube.com/watch?v=5jJLfwTkGe8
https://www.youtube.com/watch?v=S8XhuNlqbHQ
https://www.youtube.com/watch?v=zWO-bTi6u8M
https://www.youtube.com/watch?v=QRE9HAxgN4g

MICROBIOLOGY

Objectives:

- The paper aims to impart knowledge of Bacteriology and Virology including classification, structure, multiplication, transmission, food borne pathogens, water borne pathogens and microbial control.
- The paper aims to give the students broad theoretical knowledge in industrial microbiology and agricultural microbiology.

UNIT – I

Brief History and Development of Microbiology, classification of Microorganisms (Whittaker's five kingdom concept), Bacteria- outline of Bacterial classification (Bergey's manual); Ultra-structure, nutritional types and reproduction of Bacteria, Media preparation and Pure culture Techniques of Bacteria; staining Technique- Gram staining.

UNIT – II

Viruses: General characteristics, structure and reproduction of TMV, T4 bacteriophages, Viroids, Virions, Prions; Transmission and control measures of plant viruses, Isolation and purification of Viruses.

UNIT – III

Microbes in Food production, spoilage, poisoning and preservation – Bacterial Flora in Milk, Pasteurization of Milk and milk products; Bacterial pathogens and water pollution; Drinking water as a vehicle of Diseases; purification of water.

UNIT – IV

Methods of Direct Gene Transfer – Ultra sonication, Electroporation, Liposome Mediated Gene transfer. Microscopy – Principles and Applications of Phase Contrast, Fluorescence, Polarization; Camera Lucida.

UNIT – V

Identification of Recombinants – Insertional inactivation, Immunochemical Method and colony Hybridization Technique, Selection of Recombinant using selective

medium and reporter genes. Blotting Techniques – Southern, Northern and Western Blotting.

PRACTICAL

1. Preparation of Culture Media for Bacteria.
2. Demonstration of preparation of serial dilution and isolation of pure culture from soil.
3. Procedure for gram staining and identify the type of bacteria
4. Demonstration of analysis of milk – Methylene Blue Dye Reduction Test.
5. Spotters:
    i. Ultra structure of bacterial cell wall \
    ii. T 4 Phage
    iii. HIV Virus
    iv. Autoclave
    v. Laminar Air Flow Chamber
    vi. Hot Air Oven
    vii. Inoculation needle
    viii. Agar medium
    ix. Streak Plate Method
    x. Spoiled food
    xi. Liposome mediated gene transfer in plants
    xii. Colony hybridization technique
    xiii. Blotting technique – Southern, Northern and Western Blotting

To maintain a record notebook for external evaluation.

REFERENCES:

1. Ananthanarayan R and Jayaram Paniker CK (2020). Textbook of Microbiology, Eleventh Edition. Universities Press (India) Pvt. Ltd.
2. Aneja K.R (2017). Fundamental Agricultural Microbiology. New Age International Private Limited.
3. Dubey RC and Maheshwari DK. (2010). A Textbook of Microbiology S Chand Publications.
4. Casida LEJR. (2019). Industrial Microbiology Paperback. New Age International Private Limited.
5. Pelczar MJ. Chan Noel ECS and Krieg R. (1986). Microbiology Hardcover, 5th edition. McGraw-Hill Inc., US.
6. Rangaswami G and Bagyaraj DJ. Agricultural Microbiology. 2nd Edition. Phi Learning.
7. BabuNarendra G, Girisham S, Reddy SM and Reddy B. Vijaypal. (2017). Applied Microbiology. Scientific Publishers.

8. William C. Frazier, Dennis C. Westhoff, Vanitha, N.M. (2017). Food Microbiology, 5th Edition. McGraw Hill Education.

https://www.youtube.com/watch?v=7AgJpLvAv6Q
https://www.youtube.com/watch?v=SAbYEYs-_ak
https://www.youtube.com/watch?v=fJwOhhaws_Y
https://www.youtube.com/watch?v=D5aEKiez_nw
https://www.youtube.com/watch?v=-RHBURAVnIU

HORTICULTURE & PLANT BREEDING

Objectives:

- Develop skills in horticultural practices and techniques.
- Learn to construct kitchen garden and ornamental gardens.
- Gain a knowledge of the techniques of producing desirable plants through hybridization

UNIT – I

Scope, importance and divisions of horticulture; Gardening: Definition and objectives – different types of gardening – Formal, informal and kitchen garden.

UNIT – II

Propagation methods: Cutting – root, stem and leaf; Layering – ground and air layering, grafting – tongue and approach grafting; Budding – T budding and Patch budding; Vegetative propagules - bulb, sucker, corm. Seed Propagation: Preparation of Nursery beds, Transplantation – steps and Methods.

UNIT – III

Garden components: Lawn, Hedges, Edges, Rockery, Topiary, water garden, Bonsai and Hanging basket. Garden implements - spade, water can, pruning scissors, digging fork

UNIT – IV

Nature, Scope and Objectives of Plant Breeding; Plant introduction- selection methods (pure line and mass), Hybridization techniques, Heterosis breeding, Interspecific and intergeneric hybridization.

UNIT – V

Mutation Breeding: Procedure and practices, Mutagens, Polyploidy breeding and its applications. Breeding for disease resistance.

PRACTICALS:

1. Vegetative methods of propagation.
    a. Cutting-Stem and Leaf cutting
    b. Layering-Simple and air layering.
    c. Grafting - Tongue grafting.
    d. Budding - T-budding.
2. Garden components -Rockery, hanging baskets, and topiary
3. Garden implements - spade, water can, pruning scissors, digging fork
4. Designing Kitchen Garden.
5. Plant Breeding: Emasculation and Bagging methods.

To maintain a record notebook for external evaluation.

REFERENCES:

1. Allard, R.W. (1960). Principles of Plant Breeding. John Wiley & Sons, NewYork.
2. Bose, T.K., Maiti, R.G., Dhua, R.S. and Das, P. (1999). Floriculture and Landscaping. Naya Prakash, Calcutta.
3. Chopra, V.L. (1989). Plant Breeding. Oxford IBH, New Delhi.
4. Kumar,N.(1997).Introduction to Horticulture. Rajalakshmi Publication, India. Manibhushan Rao, K. (1991). Text Book of Horticulture. MacMillan Publications, New Delhi.
5. Mukherjee, D. (1972). Gardening in India. Oxford & IBH Publishing Co., Kolkatta, Mumbai, New Delhi.
6. Roy Choudhry, N. and Mishra, H.P. (2001). Text book on Floriculture and Landscaping. Raja Info Tech Enterprise, India.
7. Sharma, J.R.(1994). Principles and Practice of Plant Breeding. Tata McGraw Hill, NewDelhi.

https://www.youtube.com/watch?v=2DED2nRPZUQ
https://www.youtube.com/watch?v=mQHzKIa-XDs
https://www.youtube.com/watch?v=USNHQpwCrXw
https://www.youtube.com/watch?v=0cZ-nsBo5D0
https://www.youtube.com/watch?v=ACaeM8djkCQ

ENVIRONMENTAL BIOTECHNOLOGY

Objectives:

- To enable the students to understand and how to tackling environmental problems.
- To enable the students to understand the morphological, anatomical and physiological adaptations of hydrophytes, xerophytes and halophytes.
- To develop skills in identification of different forest types of Tamil Nadu.

UNIT – I

Aims and scope of environmental biotechnology. Environmental spheres - Hydrosphere, Geosphere, Biosphere and Anthrosphere. Pollution measurement - Biotechnological methods for measurement of pollution. Role of Biosensors in pollution monitoring.

UNIT – II

Biofuels: Biogas - production of biogas, uses of biogas, Hydrogen production - microbial production of hydrogen, uses of hydrogen. Petroleum plants: Calotropis procera, Euphorbia tirucalli, Jatropha curcas.

UNIT – III

Sewage treatment - Primary, secondary and tertiary treatment, water recycling, soil conservation and restoration. Sustainable agricultural management.

UNIT – IV

Solid waste treatment and disposal, Biodegradation of hydrocarbons, pesticides and herbicides. Bioremediation: Types of Bioremediation, Genetically Engineered microorganisms in Bioremediation. Phytoremediation, Biosensors.

UNIT – V

Greenhouse effect, Global warming, Ozone depletion and Acid rain - Causes, effects and control measures. Remote sensing and its applications in ecology.

PRACTICAL:

Photographs / model: Biogas plant, Biosensor, Sewage treatment, Acid rain, and Greenhouse effect.

Spotters: Petro plants, Calotropis procera, Euphorbia tirucalli and Jatropha curcas

To maintain a record notebook for external evaluation.

REFERENCES

1. Mishra. D.D.2008. Fundamental concepts in Environmental Studies. S. Chand and Company Ltd., New Delhi.
2. Saha. T.K. 2008. Ecology and Environmental Biology. Books and Allied (P) Ltd., Kolkatta.
3. Shukla. R.S., and Chandel. P.S. 2007. A text book of plant Ecology, S. Chand and Company Ltd., New Delhi.
4. Singh. H.R. Environmental Biology. S. Chand and Company Ltd, New Delhi.
5. Vijaya Ramesh. K. 2004. Environmental Microbiology, MJP Publishers, Chennai.

https://www.youtube.com/watch?v=GxwmuXqhJqE
https://www.youtube.com/watch?v=NZRJtS6xopc
https://www.youtube.com/watch?v=8J7yL9Tfijo
https://www.youtube.com/watch?v=foXhalIITPQ
https://www.youtube.com/watch?v=XHi7kV-ZMT0
https://www.youtube.com/watch?v=d7Ci_EooW-k
https://www.youtube.com/watch?v=Nf8cuvl62Vc