PG Sem 1

Semester: PG 1	
Course : Major	
Paper Title: Introductory Physiology For Microbes And Plants	
Paper code: M2C4MB260142TP	**Credits: 6**
Hours/week : 7	
Category: Core/MDC/SEC/VAC : Core	
Theory / Practical / Composite : Composite	
No of Modules : No modules	

Course Overview: The course is focussed on the various aspects of advanced physiological aspects of prokaryotic and eukaryotic cells under different physical, chemical and biological stress present in the environment. It helps us to analyse the biochemical regulations brought in through the genetic regulation under through different environmental stress.

It also focusses on the advanced features of plant tissue culture, forming an integral part of plant biotechnology.

Course Outcome:

1. Remember: To remember the role of microbial and plant cell components in relation to their physiological function.

2. Understand: the stress response in bacteria and plants. and analyze, study the formation of bacterial biofilms and their significance.

3. Apply: To Apply the concept of microbial and plant physiology in managing stress adaptation of microbes and plants.

4. Analyze: To analyse the role of signalling systems in bacteria and plants in adaptating to environmental stress responses. To analyse the role of culture medium in propagating plants under tissue culture conditions.

5. Evaluate: To evaluate the techniques of plant tissue culture techniques and apply them in the field of plant biotechnology. To evaluate the role of signaling system and its effect on the genetic control of microbes and plants.

6. Create: To apply the role of signalling system in creating novel extremophilic bacterial cells, overcoming plant stress and production of transgenic plants.

Prerequisites: ***Basic knowledge about any prior course***

SYLLABUS

UNIT/Module	CONTENT	HOURS or NUMBER OF CLASSES	CO Mapping	COGNITIVE LEVEL
I.	Microbial Physiology Cell structure and its physiological significance in microbes. Physiological Adaptations of Microorganisms: Stress responses in microbes, Sporulation in bacteria, Biofilm formation, Microbial survival strategies in extreme environments.	**12**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5**

II.	Plant Physiology Water relations, mineral nutrition, nitrogen utilization & metabolism, phosphorus and sulphur metabolism, stomatal physiology, source and sink relationship, physiology and biochemistry of seed dormancy and germination, hormonal regulation of growth and development, physiology of flowering, senescence. Stress physiology- causes and the effects of various plant stresses on plants including stress hormones. Brief mechanism of stress signalling in plant: Abiotic (Heat, cold, pH, etc.) & Biotic (Fungi & Bacteria); Control of plant diseases.	**12**	**CO2, CO3, CO4, CO5, CO6**	**K2, K3, K4, K5, K6**
III.	Plant tissue culture Totipotency: Plant growth regulators. Regeneration and micropropagation of plants. Cell suspension culture and its practical application. Plant transformation methods: Agrobacterium-mediated transformation and other methods, Agroinfiltration.	**12**	**CO1, CO2, CO3, CO4, CO5**	**K1, K2, K3, K4, K5**
IV.	Practical 1. Fundamentals of Ecology-Odum. 2. Environmental Studies-Mitra and Chakraborty 3. Fundamentals of Ecological Modelling-Jorgensen 4. Plant Physiology by Ross and Salisbury. 5. Plant metabolism by Prof. S. N. Gupta 6. Plant tissue culture: Theory and Practice by S.S. Bhojwani and M.K. Razdan 7. Brock Biology of Microorganisms – Madigan et alUV survival curve of E.coli. 2. Effects of UV, pH, disinfectants, chemicals and heavy metals on spore germination of Bacillus spp. 3. Determination of thermal death time (TDT) of a microbial culture. 4. Assay for biofilm formation. 5. Demonstration of hill activity, separation of plant pigments by paper chromatography, determination of stomatal frequency and estimation of transpiration rate. Comparative photosynthetic efficiency of different plants. 6. Media preparation (White's and MS), sterilization of explants and inoculation, shoot tip culture,	**48**	**CO2, CO3, CO4, CO5, CO6**	**K2, K3, K4, K5, K6**

	suspension culture, Agrobacterium-mediated transformation, production of secondary metabolites in tissue culture.			

Text Books

1. Fundamentals of Ecology-Odum.
2. Environmental Studies-Mitra and Chakraborty
3. Fundamentals of Ecological Modelling-Jorgensen
4. Plant Physiology by Ross and Salisbury.
5. Plant metabolism by Prof. S. N. Gupta
6. Plant tissue culture: Theory and Practice by S.S. Bhojwani and M.K. Razdan
7. Brock Biology of Microorganisms – Madigan et al

Suggested readings

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Web Resources

Microbial Physiology – Albert G. Moat, John W. Foster & Michael P. Spector

9. Prescott's Microbiology – Willey, Sherwood & Woolverton

10. Principles of Microbiology – Atlas & Bartha

Evaluation Theory CA: CIA: 15 (10+3+2) Marks (Theory) End semester Exam: 45

Practical CIA: 40 marks (38+2)

Paper Structure for Theory Semester Exam Module : End semester Exam: 45 marks

Full Marks: 45 Short questions: 5 (each 1 mark) from 7 (5x1=5)

Long questions: 4 (each 10 marks) from 6 (4x10=40)

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels

CO1	**Remember**: To remember the role of microbial and plant cell components in relation to their physiological function.	K1
CO2	**Understand:** the stress response in bacteria and plants. and analyze, study the formation of bacterial biofilms and their significance.	K2
CO3	**Apply:** To Apply the concept of microbial and plant physiology in managing stress adaptation of microbes and plants.	K3
CO4	**Analyze:** To analyse the role of signalling systems in bacteria and plants in adaptating to environmental stress responses. To analyse the role of culture medium in propagating plants under tissue culture conditions.	K4
CO5	**Evaluate**: To evaluate the techniques of plant tissue culture techniques and apply them in the field of plant biotechnology. To evaluate the role of signaling system and its effect on the genetic control of microbes and plants.	K5
CO6	**Create:** To apply the role of signalling system in creating novel extremophilic bacterial cells, overcoming plant stress and production of transgenic plants.	K6