Holy Cross College (Autonomous), Nagercoil

Kanyakumari District, Tamil Nadu.

Accredited with A^{+} by NAAC - IV cycle – CGPA 3.35

Affiliated to

Manonmaniam Sundaranar University, Tirunelveli

DEPARTMENT OF BOTANY

SYLLABUS FOR POSTGRADUATE PROGRAMME

TEACHING PLAN

ODD SEMESTER 2024- 2025

Vision

To impart knowledge with professional zeal and devotion for plant science.

Mission

Providing student – centered and profession- oriented higher education that bestows academic environment to create intellectuals with scientific temperament, in the context of global issues and environmental challenges.

Programme Educational Objectives (PEOs)

PEOs	Upon completion of M. Sc. Botany Programme, the graduates will be able to:	Mapping with Mission
PEO1	apply scientific and computational technology to solve social and ecological issues and pursue research.	M1, M2
PEO2	continue to learn and advance their career in industry both in private and public sectors.	M4 & M5
PEO3	develop leadership, teamwork, and professional abilities to become a more cultured and civilized person and to tackle the challenges in serving the country.	M2, M5 & M6

Programme Outcomes (POs)

POs	Upon completion of M.Sc. Botany Programme, the graduates will be able to:	Mapping with PEOs
PO1	apply their knowledge, analyze complex problems, think independently, formulate and perform quality research.	PEO1 & PEO2
PO2	carry out internship programmes and research projects to develop scientific and innovative ideas through effective communication.	PEO1, PEO2 & PEO3
PO3	develop a multidisciplinary perspective and contribute to the knowledge capital of the globe.	PEO2
PO4	develop innovative initiatives to sustain ecofriendly environment	PEO1, PEO2
PO5	through active career, team work and using managerial skills guide people to the right destination in a smooth and efficient way.	PEO2
PO6	employ appropriate analysis tools and ICT in a range of learning scenarios, demonstrating the capacity to find, assess, and apply relevant information sources.	PEO1, PEO2 & PEO3
PO7	learn independently for lifelong executing professional, social and ethical responsibilities leading to sustainable development.	PEO3

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes (PSO)

On successful completion of the M.Sc. Botany programme, the students are expected to	
PSO1	familiarize with the fundamental, advanced and emerging concepts in Botany.
PSO2	understand the role of plants and their interactions with other organisms in variousecosystems.
PSO3	identify the potency of plant resources in contemporary research and visualize futurethrust areas in Botany.
PSO4	design scientific experiments independently and to generate useful information toaddress various issues in Botany.
PSO5	acquire basic knowledge on principles and applications of laboratory instruments andadequate skills to handle them.
PSO6	choose and apply appropriate tools, techniques, resources, etc. to perform variousexperiments in Botany.
PSO7	carryout scientific experiments independently or in collaboration with inter-disciplinary or multidisciplinary approaches.
PSO8	disseminate knowledge on conservation of biodiversity and protection of environment.
PSO9	awareness on the sustainable utilization of plant/microbial resources following thebioethical norms.
PSO10	demonstrate proficiency in communicating with various stakeholders like students,teachers, scientists and society.

M.Sc. BOTANY

Teaching Plan
Department : Botany
Class : I M.Sc. Botany
Title of the Course : Core I: PLANT DIVERSITY – I: ALGAE, FUNGI, LICHENS AND BRYOPHYTES
Semester : I
Course Code : BP231CC1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
BP231CC1	5	2	-	5	7	105	25	75	100

Objectives

- To learn about the classification, distinguishing traits, geographic distribution, and reproductive cycle of algae, fungi, lichens, and bryophytes.
- To gain knowledge about the ecological and economic importance of algae, fungi, lichens and bryophytes.

Course outcomes

Course outcomes:	On completion of this course, the students will be able to: CO	PSO addressed	Cognitive level
CO 1	Relate to the structural organizations of algae, fungi, lichens and Bryophytes.	PSO -1	K1(R)
CO2	Demonstrate both the theoretical and practical knowledge in understanding the diversity of basic life forms and their importance.	PSO -1	K2(U)
CO3	Explain life cycle patterns in algae, fungi, lichens and Bryophytes.	PSO -2	K3(Ap)
CO4	Compare and contrast the mode of reproduction in diverse groups of basic plant forms.	PSO -2	K4(An)
CO5	Discuss and develop skills for effective conservation and utilization of lower plant forms.	PSO-4	K5 & K6(Ev&Cr)

Teaching plan

Total Contact hours: 105 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1	General account of algology, Contributions of Indian Phycologist (T.V.Desikachary, V.Krishnamurthy and V.S. Sundaralingam), Classification of algae by F.E. Fritsch (1935-45) & Silva (1982).	5	K2(U)	Lecture using Chalk and talk ,Introductory session, Mind mapping,	Short essays, MCQ, Quiz
	2	Salient features of major classes: Cyanophyceae, Chlorophyceae, Xanthophyceae, Chrysophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenophyceae, Charophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae..	4	K2(U)	PPT, Lecture	Short summary
	3	Range of thallus organization, algae of diverse habitats, reproduction (vegetative, asexual and sexual) and life cycles	4	K1(R)	Review, Lecture	MCQ, Quiz,Short Essay, True or false
	4	Phylogeny and inter-relationships of algae, origin and evolution of sex in algae.	4	K3(Ap)	Demonstration, PPT, Review	Discussion, Debating or Presentations
	5	Structure, reproduction and life histories of the following genera: *Oscillatoria*, *Scytonema, Ulva, Codium, Diatoms, Dictyota*and*Gelidium.*	4	K4(An)	Group discussion	Essay
II	**1**	**FUNGI:** General Characteristics, occurrence and distribution. Mode of nutrition in fungi. Contributions of Indian	4	K1(U)	Lecture using videos, Group discussion	Definitions, MCQ, Assignment

		Mycologists (C.V.Subramanian),				
	2	Classification of Fungi by Alexopoulos and Mims (1979) & Recent trends in the classification of fungi - Phylogeny and inter-relationships of major groups of fungi.	4	K2(R)	Lecture using videos,	Essay, Discriminating the concepts
	3	General characters of major classes: Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina.	4	K3(An)	Lecture using Chalk and talk	Explain,
	4	Heterothallism in fungi, sexuality in fungi, Para sexuality, sex hormones in fungi.	4	K3(Ap)	Group discussion	Concept with examples, short essay, Seminar
	5	Structure, reproduction and life histories of the following genera: *Plasmodiophora, Phytophthora, Rhizopus, Taphrina, Polyporus* and *Colletotrichum*	5	K4(An)	Group discussion	Seminar,
III	**1**	**LICHENS** Introduction and Classification (Hale, 1969).	5	K1 (U)	Lecture using Chalk and talk ,Introductory session,	MCQ, Concepts, short essay
	2.	Occurrence and inter-relationship of phycobionts and mycobionts	4	K2(R)	Lecture using Chalk and talk Method	MCQ, Quiz
	3.	Structure and reproduction in Ascolichens, Basiodiolichens and Deuterolichens.	4	K4(An)	Group discussion	Diagrammatic representation, Essays
	4.	Structure and reproduction in Basiodiolichens	4	K4(An)	Lecture using Chalk and talk method	Differentiating the characters, short essays
	5.	Structure and reproduction in Deuterolichens.	4	K4(An)	Group discussion	Summarize, Essays,
IV	**1**	**BRYOPHYTES:** General characters and Classification of Bryophytes by Watson (1971).	4	K1(U)	Lecture using Chalk and talk ,Introductory session,	MCQ, Quiz,Group discussion,

	2.	Distribution, Structural variations and evolution of gametophytes and sporophytes in Bryopsida, Anthoceropsida and Mosses.	4	K4(An)	Lecture using Chalk and talk ,Introductory session,	MCQ, Quiz,Group discussion,
	3.	General characters of major groups - Marchantiales, Jungermaniales, Anthocerotales, Sphagnales, Funariales and Polytrichales.	5	K2(R)	Group discussion	Differentiating the characters, short essays
	4.	Reproduction - Vegetative and sexual, spore dispersal mechanisms in bryophytes, spore germination patterns in bryophytes.	4	K3(Ap)	Review	Summarize, Essays, diagrammatic representations
	5.	Structure, reproduction and life histories of the following genera: *Targionia, Porella*and*Polytrichum.*	4	K4(An)	Lecture using PPT Videos	Essays,
V	**1**	**ECONOMIC IMPORTANCE** Algae - Economic importance in Food and feed - Single cell protein,	5	K3(Ap)	Group Discussion,	Short essays, MCQ, Quiz, True or false, Assignments
	2.	Industrial products (Agar-Agar, Carrageenan, Alginic acid, Iodine, biofertilizers, Vitamins and biofuel), Medicinal value and Diatomaceous earth.	4	K4(Ap)	Group Discussion	Short essays, MCQ, quiz
	3.	Fungi – Economic importance in food, industries and medicine. Culturing and cultivation of mushrooms *Pleurotus.*	4	K4(Ap)	Group Discussion	Short essays, MCQ, quiz
	4.	Lichen –economic importance and as indicator pollution.	4	K5(Ev)	Group Discussion,	Summarize, Slip test
	5.	Bryophytes – Ecological and economic importance – industry, horticulture and medicine.	4	K5(Ev)	Group Discussion,	Summarize, Slip test

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Skill Development**
Activities (Em/ En/SD): **Algae visit**
Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): **Environment Sustainability**
Activities related to Cross Cutting Issues : **-**
Assignment : **Mode of nutrition in fungi./ online**
Seminar Topic: **Heterothallism in fungi.**

Sample questions

Part A

1. Who is the father of Algology?
2. Which of the following fungi division includes 'Club fungi'?
   a. Zygomycotina b. Deuteromycotina
   b. Basidiomycotina d, Ascomycotina
3. What is dolipore septum?
4. What is the algal component of Lichen?
5. Cite the lichen used as food.

Part B

1. Write short note on the thallus organisation of Algae.
2. List out the general characters of Fungi .
3. Categorize lichen based on habitat.
4. Explain the morphological and anatomical structures of *Marchantia*.
5. Criticize the economic importance of Bryophytes

Part C

1. Classify Algae based on Fritsch.
2. Summarize Parasexuality in Fungi with neat labelled sketches.
3. Discuss the structure and reproduction in Lichen.
4. Explain the evolution of sporophytes in Bryophytes
5. Critique on the economic importance of Algae.

Head of the Department **Course Instructor**

Dr. J. Celin Pappa Rani

Teaching Plan

Department : Botany

Class : I M.Sc. Botany

Title of the Course : PLANT DIVERSITY – II: PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY

Semester : I

Course Code : BP231CC2

Course Code	L	T	P	Credits	Inst.Hours	Total Hours	Marks		
							CIA	External	Total
BP231CC2	5	2	-	5	7	105	25	75	100

Objectives

1. To investigate the classification, distinctive traits,distributionandreproductionandlifehistoryofthevariousclassesand major types of Pteridophytes and Gymnosperms.
2. To identify and characterize diversity of lower vascular plants in order to comprehend the dynamics of diversity to realize the importance of diversity.

Course Outcomes

CO	Uponcompletionofthiscourse, the students will be able to:	PSOAddressed	Cognitive level
CO- 1	Recallonclassification,recenttrendsin phylogeneticrelationship, Generalcharacters ofPteridophytesand Gymnosperms.	PSO-1	K1 &K3
CO- 2	Learnthemorphological/anatomicalor ganization,lifehistory ofmajortypes ofPteridophytesand Gymnosperms.	PSO-2	K3 & K4
CO- 3	Comprehendtheeconomicimportance ofPteridophytes, Gymnosperms, and fossils.	PSO-3	K3 & K5
CO- 4	Understandingtheevolutionaryrelation shipofPteridophytesand Gymnosperms.	PSO-3	K2
CO- 5	Awarenessonfossiltypes,fossilizationa ndfossilrecordsof Pteridophytesand Gymnosperms.	PSO-3	K1 & K3

Teaching plan

Total Contact Hours:105 (Including Lectures, Assignments and Tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	General characteristics and classification (Reimer, 1954).Stellar evolution.	4	K2(U)	Lecture using Chalkandtalk Demonstration	Evaluation through short test, MCQ, True/False, Short essays, Concept explanations, Shortsummary or overview
	2.	Range of structure, reproduction and evolution of the gametophytes	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps,Concept definitions
	3.	Gametophyte types – sex organs. Apogamy and Apospory. Life cycles.	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Heterospory and seed habit, Telome theory.	4	K4(An)	Lecture using videos	Finish a procedure in many steps, Differentiate betweenvarious ideas,Map knowledge
	5.	Morphogenesis, Economic importance of Pteridophytes.	5	K5(E)	PPT	Longer essay/ Evaluation essay

II						
	1.	Structure, anatomy, reproduction and life histories of *Isoetes*	4	K2(U)	Lecture using Chalkandtalk Demonstration	Evaluation through short test, MCQ Shortsummary
	2.	Structure, anatomy, reproduction and life histories of *Equisetum*	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Concept definitions
	3.	Structure, anatomy, reproduction and life histories of *Angiopteris*	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Structure, anatomy, reproduction and life histories of*Osmunda*	4	K4(An)	Lecture using videos	Finish a procedure in many steps, Differentiate betweenvarious ideas,Map knowledge
	5.	Structure, anatomy, reproduction and life histories of *Pteris* and*Azolla*.	5	K5(E)	PPT	Longer essay/ Evaluation essay
III						
	1.	General characters - A general account of distribution of Gymnosperms.	4	K2(U)	Lecture using Chalkandtalk Demonstration	Evaluation through short test
	2.	Morphology, anatomy of Gymnosperms.	4	K1(R)	Introductory session, Group Discussion,	Simple definitions,Co ncept definitions
	3.	Reproduction, phylogeny of Gymnosperms.	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Classification of Gymnosperms. (K.R.Sporne, 1965).	5	K4(An)	Lecture using videos	Differentiate betweenvarious ideas,Map knowledge
	5.	Economic importance of Gymnosperms.	4	K5(E)	PPT	Longer essay/ Evaluation essay
IV						
	1.	Structure (Exomorphic and endomorphic),	4	K2(U)	Lecture using Chalkandtalk Demonstration	Evaluation through short test, MCQ,

		anatomy, reproduction and life histories of *Thuja*				True/False, Short essays, Concept explanations, Shortsummary or overview
	2.	Structure (Exomorphic and endomorphic), anatomy, reproduction and life histories of *Cupressus*	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps,Concept definitions
	3.	Structure (Exomorphic and endomorphic), anatomy, reproduction and life histories of *Araucaria*	3	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Structure (Exomorphic and endomorphic), anatomy, reproduction and life histories of *Podocarpus*	3	K4(An)	Lecture using videos	Finish a procedure in many steps, Differentiate betweenvarious ideas,Map knowledge
	5.	Structure (Exomorphic and endomorphic), anatomy, reproduction and life histories of *Gnetum*	3	K5(E)	PPT	Longer essay/ Evaluation essay
	6.	Structure (Exomorphic and endomorphic), anatomy, reproduction and life histories of the following genera: *Ephedra*.	4	K5(E)	PPT	Evaluation essay
V						
	1.	**PALEOBOTANY:** Geological Scale; Radiocarbon dating;. Fossilization and fossil types.	4	K2(U)	Lecture using Chalkandtalk Demonstration	Evaluation through short test, MCQ, True/False, Short essays, Concept explanations, Shortsummary or overview
	2.	Contribution of BirbalSahni to Paleobotany, Gondwana flora of India.	3	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps,Concept definitions

	3.	Study of fossils in understanding evolution, Economic importance of fossils. fossil fuels and industrial raw materials and uses	5	K3(Ap)	Lecture and Chalk method	Suggest idea/concept with examples
	4.	Study of organ genera: *Rhynia, Lepidocarpon*	3	K4(An)	Lecture using videos	Differentiate betweenvarious ideas,Map knowledge
	5.	Study of organ genera: *Calamites,Cordaites*	3	K5(E)	Lecture and PPT	Longer essay/ Evaluation essay
	6.	Study of organ genera:*Lyginopteris.*	3	K5(E)	Lecture and PPT	Longer essay/ Evaluation essay

CourseFocussingonEmployability/Entrepreneurship/SkillDevelopment: Activities (Em/ En/SD): **Skill Development**

CourseFocussingonCrossCuttingIssues(ProfessionalEthics/HumanValues/Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: **Field Visit**

Assignment: **Economic importance of Pteridophytes**

Seminar Topic: **Study of fossils in understanding evolution, Economic importance of fossils.**

Part-A

1. Spores of Pteridophytesare
   a. Haploid b. Diploid c. Triploid d.Tetraploid
2. In Pteridophytes, the dominant generation is
   a. Gametophytic (b) haploid (c) diploid (d) triploid
3. Reduction division in pteridophytes occurs in
   (a) Prothallus is formed (b) Gametes are formed
   (c) spores are formed (d) sex organs are formed
4. In pteridophytes, the gametophyte is dominant, while sporophyte is a dependent generation-State True or False.
5. The phloem of pteridophytes does not possess _____ cells.

Part-B

1. Describe the structure and reproduction in Coniferales
2. Write an essay on evolution of Gymnosperms
3. Discuss the variation in the structure of female gametophyte in Gymnosperms
4. Write short notes on Cordaitales
5. Comment on Lyginopteris

Part-C

1.Write a classification of Bryophytes in detail.
2. Explain the life history of Ricca in detail.
3.Write a detail account on "Telome theory".
4.Explain the lifecycle of Isoetes.
5.Give a detail account on lifecycle of Marsilea.

Head of the Department **Course Instructor**

Dr. W. Vincy

Teaching Plan

Department : Botany

Class : I M.Sc Botany

Title of the Course : Elective I MICROBIOLOGY, IMMUNOLOGY AND PLANT PATHOLOGY

Semester : I

Course Code : BP231EC1

Course Code	L	T	P	Credits	Inst.Hours	Total Hours	Marks		
							CIA	External	Total
BP23ED11	4	1	-	3	5	75	25	75	100

Objectives

1. To provide comprehensive knowledge about microbes and its effect on man and environment.
2. To provide comparative analysis of major groups of microbes.
3. To study the principles of immune system, immunizing agents like antibodies and vaccines and gene therapy methods.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	Recognize the general characteristics of microbes, plant defense and immune cells.	PSO-1	K1 (K)
CO- 2	Explain about the stages in disease development and various defense mechanisms in plants and humans.	PSO-2	K2 (U)
CO- 3	Elucidate concepts of microbial interactions with plant and humans	PSO-3	K3 (AP)
CO- 4	Analyze the importance of harmful and beneficial microbes and immune system	PSO-3	K4 (AN)
CO- 5	Determine and interpret the detection of pathogens and appreciate their adaptive strategies.	PSO-3	K5 & K6(C & E)

Teaching plan

Total Contact Hours: 75 (Including Lectures, Assignments and Tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	Types of microorganisms. General characteristic of bacteria – Outline classification of Bergey's manual of 9th edition.	2	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,
	2.	Classification of bacteria based on Morphological, cultural, physiological and molecular characteristics.	2	K 3(Ap)	PPT	Simple definitions, Concept definitions
	3.	Bacterial growth – batch culture and continuous culture. Growth Curve. Factors affecting growth	2	K1(K)	Introductory session, Group Discussion	Suggest idea/concept with examples,
	4.	Determination of bacterial growth – Direct method: Haemocytometer, Viable plate count; Indirect method: Turbidity. Nutritional types.	3	K4(An)	Group Discussion, Mind mapping	Differentiate between various ideas, Map knowledge
	5.	Reproduction - Fission and sporulation. Genetic recombination- Transformation, Transduction and Conjugation	3	K5(E)	Demonstration, PPT	Longer essay/ Evaluation essay
	6.	Isolation and cultivation of bacteria. Maintenance of bacterial culture.	3	K2(U)	Lecture using Chalk and talk	MCQ, True/False

II	

	1.	General characters, Classification, Structure, Multiplication of virus	3	K2(U)	Lecture using Chalk and talk ,Introductory session,	Concept explanations, Short summary or overview
	2.	Overview of Phycoviruses and Mycoviruses. Viruses of Eukaryotes – Animal & Plant viruses.	3	K 3(Ap)	Mind mapping, Peer tutoring, PPT, Review	Evaluation through short test, MCQ, True/False,
	3.	Cultivation of viruses – in embryonated egg and in plants. Control of viral infections.	3	K1(K)	Lecture using videos,Demonstration,	Suggest idea/concept with examples,
	4.	Bacteriophages- classification, replication of DNA and RNA phages -Lytic and Lysogenic cycle.	3	K4(An)	Mind mapping, Peer tutoring,	Differentiate between various ideas,
	5.	Viroids and prions. Mycoplasma: Structure and classification.	3	K5(E)	Lecture using Chalk and talk PPT,	Map knowledge
III	**Food Microbiology**					
	1.	Beneficial role of microbes – yoghurt, Olives, Cheese, Bread, Wine, Tempeh, Miso & Fermented green tea.	3	K 3(Ap)	Peer tutoring, Lecture using videos, Demonstration,	Evaluation through short test, MCQ, True/False,
	2.	Spoilage of fruits, vegetables, meats, poultry, eggs, bakery products, dairy products and canned foods.	3	K1(K)	Lecture using Chalk and talk ,Introductory session,	Simple definitions, Concept definitions
	3.	Microbial toxins - Exotoxin, Endotoxin & Mycotoxin. Action of Enterotoxin, Cytotoxin& Neurotoxin. Food Preservation – temperature, drying, radiation and chemicals.	3	K4(An)	Demonstration, PPT, Review	Suggest idea/concept with examples,
	4.	Soil Microbiology: Importance of Microbial flora of soil and factors affecting the microbial community in soil. Interaction among soil microbes (positive and negative interactions) & with higher plants	2	K5(E)	Lecture using Chalk and talk ,Introductory session,	Differentiate between various ideas, Map knowledge

		(rhizosphere &phyllosphere).				
	5.	Environmental Microbiology: Microbiology of water and air. Water borne diseases - diphtheria, chicken pox.	2	K2(U)	Peer tutoring, Lecture using videos, Demonstration,	Longer essay/ Evaluation essay
	6.	Air borne diseases - Swine flu and **Measles.** Microbial degradation of chemical pesticides and hydrocarbon.	2	K 3(Ap)	Demonstration, PPT, Review	Simple definitions, Concept definitions
IV	**Immunology**					
	1.	Introduction; Immune System; Types of Immunity - Innate and Acquired.Immune Cells - Hematopoiesis, B and T lymphocytes - Maturation, NK cells	3	K4(An)	Lecture using Chalk and talk ,Demonstration,	Concept explanations, Short summary or overview
	2.	Introduction to inflammation, Adaptive immune system, Innate Immune system. Antigen: Definition, Properties and types. Antibody – Structure, types and function.	3	K5(E)	Demonstration, PPT, Review	Evaluation through short test, MCQ, True/False,
	3.	Generation of antibody diversity.Antigen - Antibody interactions: definition, types- Precipitation, Agglutination, Complement fixation.	3	K2(U)	PPT, Review	Suggest idea/concept with examples,
	4.	Immune Response – Humoral and Cell Mediated. Vaccines – history, types and recombinant vaccines	2	K 3(Ap)	Lecture using Chalk and talk ,Introductory session,	Differentiate between various ideas,
	5.	Immunodiagnosis – Blood Grouping, Widal test, Enzyme-Linked Immunosorbent Assay (ELISA).	2	K1(K)	Mind mapping, Peer tutoring,	Map knowledge

	6.	Immunoelectrophoresis and Immunodiffusion.	2	K4(An)	Mind mapping, Peer tutoring, Lecture using videos.	Concept explanations, Short summary or overview
V	Plant Pathology					
	1.	History and significance of plant pathology. Classification of plant diseases, Symptomology (important symptoms of **plant pathogens).**	2	K2(U)	Mind mapping, Peer tutoring, PPT, Review	Evaluation through short test, MCQ, True/False,
	2.	Causal agents of plant diseases - biotic causes (fungi, bacteria virus, mycoplasma, nematodes, parasitic algae	2	K 3(Ap)	Lecture using videos,Demonstration,	Evaluation through short test, MCQ, True/False,
	3.	Angiospermic parasites - Abiotic causes (Physiological, deficiency of nutrients & minerals and pollution).Mechanism of penetration- Disease development of pathogen (colonization) and dissemination of pathogens.	3	K1(K)	Mind mapping, Peer tutoring,	Suggest idea/concept with examples,
	4.	Role of enzymes and toxins in disease development. Important diseases of crop plants in India - Sheath blight of rice, Late blight of potato, Little leaf of Brinjal and Red rust of tea	3	K4(An)	PPT, Review	Differentiate between various ideas,
	5.	Principles of disease management – Cultural practices, physical, chemical and biological methods, disease controlled by immunization	3	K4(An)	PPT, Review	Map knowledge
	6.	Biocontrol - merits and demerits; Diagnostic technique to detect pest/pathogen infection -	2	K5(E)	Lecture using videos,Demonstration,	Evaluation through short test, MCQ, True/False,

		Immunofluorescence (IF).				

Course Focussing on Employability/Entrepreneurship/Skill Development: Activities (Em/ En/SD): **Employability**

Course Focussing on Cross Cutting Issues (Professional Ethics/Human Values/Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: Industrial Visit – **Milk Plant, Microbiology Lab**

Assignment: **Classification, Structure, Multiplication of virus - Online**

Genetic recombination- **Transformation, Transduction and Conjugation**

Seminar Topic: **Spoilage of fruits, vegetables, meats, poultry, eggs, bakery products, dairy products and canned foods.**

Sample questions

Part A

1.Which of the following immunity is obtained during a lifetime?

a. Acquired immunity b. Active immunity c. Passive immunity d. None of the above.

2.Which of these bacterial components is least likely to contain useful antigens?

a. Cell wall b. Flagella c. Ribosomes d. Capsule

3. Which of the following contains structures composed of N-acetylmuramic acid and N-acetylglucosamine?

a. Mycoplasmas b. Amoeba c. E.coli d. Spheroplast

4. The association of endotoxin in gram-negative bacteria is due to the presence of

a. Steroids b. Peptidoglycan c. Lipopolysaccharides d. Polypeptide

5. Which of the following is a gram-positive eubacterium?

a. *Actinomyces* b. *Clostridium*

c. *Rhizobium* d. *Clostridium*, *Actinomycetes*

PartB

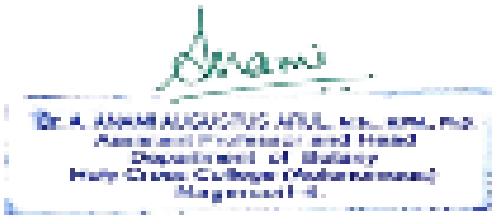
1. Determine the bacterial count methods
2. Discuss viriods.
3. Define the spoilage of microbes in fruits.
4. Differentiate Acquired Immunity & Innate Immunity.
5. Recall Citrus Canker.

PartC

1. Explain the Bacterial growth culture and its methods.
2. Formulate the nomenclature and classification of virus.
3. Criticize the beneficial role of microbes with a relevant example.
4. Analyze, how cytokines act as a signalling molecules to mediate and regulate immunity?
5. Recall Late Blight of Potato with respect to its casual organism, disease cycle, symptoms and control measures.

Head of the Department **Course Instructor**

Dr. S. Kala Vetha Kumari



Teaching Plan

Department : Botany

Class : I M.Sc Botany

Title of the Course : Elective I ETHNOBOTANY, NATUROPATHY AND TRADITIONAL HEALTH CARE

Semester : I

Course Code : BP231EC4

Course Code	L	T	P	Credits	Inst.Hours	Total Hours	Marks		
							CIA	External	Total
BP23ED21	4	1	-	3	5	75	25	75	100

Objectives

1.Understand the concept of ethnobotany and the life style and traditional practices of plants by Indian tribals.

2. Emphasize the importance of non-timber forest products for Indian tribal people livelihoods.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	Recall or remember concept of ethnobotany.	PSO-1	K1
CO- 2	Understand the life style and traditional practices of plants by Indian tribals.	PSO-2	K2 & K6
CO- 3	Highlight the role of Non-Timber Forest products for livelihood of tribal people of India	PSO-3	K3
CO- 4	Assess the methods to transform ethnobotanical knowledge into value added products.	PSO-3	K4
CO- 5	Build idea to make digitization of ethnobotanical knowledge.	PSO-3	K5

Teaching plan

Total Contact Hours : 75 (Including Lectures, Assignments and Tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	Concept, important landmarks in the development, scope, sub disciplines of ethno botany.:	4	K2(U)	Lecture using Chalk and talk	Evaluation through short test, MCQ,
	2.	Interdisciplinary approaches. Knowledge of following sociological and anthropological terms	4	K1(R)	Lecture using videos	Simple definitions, MCQ,
	3.	culture, values and norms, institutions, culture diffusion and ethnocentrism.	4	K3(Ap)	Demonstration, PPT, Review	short test
	4.	History of ethnobotany: A brief history of ethno botanical studies in the world and in India.	3	K4(An)	Demonstration, PPT, Review	Differentiate betweenvarious ideas, Map knowledge

II						
	1.	Distribution of tribes in India.	3	K2(U)	Mind mapping, Peer tutoring	Simple definitions,
	2.	. Basic knowledge of following tribes of Tamil Nadu: Irulas, Kanis,	4	K 3(Ap)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False
	3.	PaliyarsBadagas, Kurumbres,	4	K1(K)	PPT	Simple definitions,
	4.	Thodas and Malayalis. Plants used by tribals of Tamil Nadu.	4	K4(An)	Introductory session, Group Discussion	Evaluation through short test, MCQ, True/False,
III						
	1.	Primary - archeological sources and inventories, Secondary - travelogues, folklore and literary sources.	3	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,
	2.	Herbaria, medicinal texts and official records. Methods in ethnobotanical research	3	K 3(Ap)	PPT	Simple definitions, Concept definitions
	3.	Prior Informed Consent, PRA techniques, interviews and questionnaire methods, choice of resource persons	3	K1(K)	Introductory session, Group Discussion	Suggest idea/concept with examples,
	4.	Folk taxonomy – plants associated with culture and socio- religious activities	3	K4(An)	Group Discussion, Mind mapping	Differentiate between various ideas, Map knowledge
	5.	Non – timber forest products (NTFP) and livelihood – Sustainable harvest and value addition.	3	K5(E)	Demonstration, PPT	Longer essay/ Evaluation essay
IV						
	1.	Role of plants in naturopathy- Importance and relevance of medicinal drugs in India.	3	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,

	2.	Indian Systems of Medicine (Ayurveda, Siddha, Allopathy, Homeopathy, Unani, Tibetan, Yoga and Naturopathy)	3	K 3(Ap)	PPT	Simple definitions, Concept definitions
	3.	Disease diagnosis, treatment, and cure using natural therapies including dietetics, botanical medicine, homeopathy, fasting, exercise, lifestyle counseling, detoxification, and chelation	3	K1(K)	Introductory session, Group Discussion	Suggest idea/concept with examples,
	4.	clinical nutrition, hydrotherapy, naturopathic manipulation, spiritual healing, environmental assessment,	2	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,
	5.	Health practices, approaches, knowledge and beliefs incorporating plant, animal and mineral based medicines, spiritual therapies.	2	K 3(Ap)	PPT	Simple definitions, Concept definitions
	6.	manual techniques and exercises, applied singularly or in combination to treat, diagnose and prevent illnesses or maintain	2	K1(K)	Introductory session, Group Discussion	Suggest idea/concept with examples,
V						
	1.	Bioprospecting of drug molecules derived from Indian traditional plants.	3	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,
	2.	Methods for bioprospecting of natural resources	4	K 3(Ap)	PPT	Simple definitions, Concept definitions
	3.	From folk Taxonomy to species confirmation - evidences based on phylogenetic and metabolomic analyses	4	K1(K)	Introductory session, Group Discussion	Suggest idea/concept with examples,

	4.	Ethno botanical databases and Traditional knowledge Digital Library (TKDL).	4	K4(An)	Group Discussion, Mind mapping	Differentiate between various ideas, Map knowledge

Course Focussing on Employability/Entrepreneurship/Skill Development:(Mention) Activities (Em/ En/SD): **Entrepreneurship**

Course Focussing on Cross Cutting Issues(ProfessionalEthics/HumanValues/Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: **Collection of Medicinal herbs from Tribal Areas**

Assignment: **Herbaria, medicinal texts and official records. Methods in ethnobotanical research**

Seminar Topic: **Bioprospecting of drug molecules derived from Indian traditional plants**

Sample questions

Part A

1. The word ”ethno” in ethnobotany refers to ?
a. region- locality- people b. culture c. civilization d. all of above
2. The concept and idea of greeks that walnut could be used to heal ailments of the human brain is known as?
a. doctrine of signatures b. doctrine of homeopathy c. doctrine of Allelopathy d. None of these
3. The cereals belong to the family ?
a. Fabaceae b. Poaceae c. Solanaceae d. Rosaceae
4. The search for previously unknown compounds in organisms that have been never used in traditional medicines is
a. Molecular farming b. Bioremediation c. Biopiracy d. Bioprospecting
5. The Siddha science is a traditional treatment system generated from _____culture.
a. Indian b. Tamil c. Kerala d. Maharastra

Part B

1.Write the botanical name, family, important plant part and traditional uses of ‘Ashwagandha’.
2. Differentiate between Ethnobotany and Economic botany.
3. Explain the ethnomedicinal uses of *Janakiaarayalpatra.*
4. Differentiate Ayurvedic pharmacopoeia from pharmacology.
5. Explain the importance of phyto-pharmacological screening in herbal drug development.

Part C

1. Analyze the history of ethnobotany.
2. Discuss about the tribes of Tamilnadu**.**
3. Evaluate the importance of folk taxonomy.
4. List out the traditional healthcare practices**.**
5. Summarize hydrotherapy.

Head of the Department

Course Instructor

Dr. S. Kala Vetha Kumari

Teaching Plan

Department : Botany
Class : I M.Sc. Botany
Title of the Course : CORE COURSE VI : CELL AND MOLECULAR BIOLOGY
Semester : III
Course Code : BP233CC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
BP233CC1	4	2	-	-	5	6	90	25	75	100

Objectives:

1.To understand the cell division and its molecular mechanism so as to appreciate and manipulate normal and abnormal cell and tissue growth.

2. A thorough examination of DNA structure, replication process, transcription process and translation processes.

Course outcomes

CO	On completion of this course, the students will be able to:	PSO addressed	Cognitive level
CO -1	understand the scope and importance of population ecology, plant communities and ecosystem ecology.	PSO- 1	K1& K2
CO -2	understand the applied aspect of environmental botany.	PSO-2	K1&K4
CO -3	students will spot the sources and pollution and seek remedies to mitigate and rectify them.	PSO-3	K2& K6
CO -3	identify different plant communities, categorize plant biomes and identify threatened, endangered plant species and create awareness program in protection of biodiversity.	PSO-4	K3& K6
CO -4	analyze insight into the vegetation types, species interaction and their importance and the factors influencing the environmental conditions.	PSO-5	K5

Teaching plan Total Contact hours :90 (including lectures, assignments and test)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	1	Concept of prokaryote and Eukaryote. Structural organization of plant cell, specialized plant cell types chemical foundation.	5	K1(R)	Introductory session	Edpuzzle, Short Essay, oral test, online assignment, student presentations, Summarize, debate, observation note, class test
	2	Cell wall- Structure and functions	3	K1(R)	Brainstorming sessions,	Oral test
	3	Plasma membrane; structure, models and functions, site for ATPase, ion carriers channels and pumps, receptors.	5	K1(R)	Lecture using slido	Suggest idea/concept with examples, Suggest formulae, Solve problems, Explain
	4	Plasmodesmata and its role in movement of molecule.	4	K2(U)	Lecture using PPT	Class test
II	1	Chloroplast-structure and function,	2	K1(U)	Lecture using gamma PPT, online videos	Oral test, questioning in classroom class test, Mentimeter Slip test, Seminar presentation, open book test
	2	genome organization, gene expression,	4	K2(R)	Interactive PPT	Oral test
	3	Mitochondria; structure, genome organization, biogenesis.	4	K3(An)	Lecture using slido	Problem-solving questions,
	4	Plant Vacuole - Tonoplast membrane, ATPases transporters as a storage organelle.	5	K3(Ap)	Lecture	Longer essay/ Evaluation essay,
	5	Structure and function of other cell organelles- Golgi apparatus, lysosomes, endoplasmic reticulum and microbodies.	5	K4(An)	Flipped classroom,	Differentiate between various ideas

III	1	Nucleus: Structure and function, nuclear pore, Nucleosome organization, euchromatin and heterochromatin.	5	K1 (U)	Lecture using slido	Quiziz, album preparation, open book test, online assignment, oral test, observation note
	2	Ribosome- Structure and functional significance. RNA and DNA Structure. A, B and Z Forms.	5	K4 (An)	Group discussion	Evaluation through short test, Seminar
	3	DNA damage and repair (Thymine dimer, photoreactivation, excision repair).	4	K4 (An)	Interactive PPT	Definitions, MCQ, Recall steps, Concept definitions
	4	Cell cycle and Apoptosis; Control mechanisms.	4	K4(An)	Nearpod, Group discussion	Essay questions, Concept definitions
	5	Cytokinesis and cell plate formation, mechanisms of programmed cell death.	4	K3(Ap)	Lecture using Youtube videos	
IV	1	DNA replication (prokaryotes and eukaryotes), enzymes involved in replication, DNA repair. DNA sequencing.	5	K1(U)	Introductory session, Lecture using nearpod	Mentimeter, surprise test, oral test,
	2	Transcription, enzymes involved in transcription,	4	K2(R)	Flipped classroom	.Class test, essay questions
	3	post transcription changes, reverse transcription,	5	K3(Ap)		Student presentations.
	4	Translation. overlapping genes.	3	K4(An)	Lecture using PPT Videos	Chart presentations
V	1	DNA/gene manipulating enzymes: endonuclease, ligase, polymerase, phosphatase, transcriptase, transferase, topoisomerase.	5	K3(Ap)	Nearpod class, blended learning	Google forms, oral test, Assignments, student presentations, surprise test, class test
	2	Gene cloning: cloning vectors, molecular cloning and DNA libraries, transposons.	5	K4(Ap)	Flipped classroom	Album preparation

	3	Recombinant DNA. Direct and indirect gene transfer.	5	K5(Ev)	Integrative learning	online assignment
	4	Detection of recombinant molecule, production of gene products from cloned genes.	5	K4(Ap)	Flipped classroom	Critique or justify with pros and cons
	5	Genome library, cDNA library.	4	K5(Ev)	Integrative learning	Flipped classroom

Course Focussing on Employability/ Entrepreneurship/ Skill Development : Skill Development Activities (Em/ En/SD): Visit to Cell biology Laboratory
Course Focussing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Environment Sustainability
Activities related to Cross Cutting Issues :-
Assignment : Genome library, cDNA library./ online
Seminar Topic: DNA replication.

Sample questions (minimum one question from each unit)

Part A

1. What is a cell?
   a) smallest and advanced unit of life b) smallest and basic unit of life
   c) largest and basic unit of life d) largest and advanced unit of life
2. Which of the following is a functional unit of a body?
   a) Mitochondria b) Cytoplasm c) Spleen d) Cell
3. Which of the following is known as the powerhouse of a cell?
   a) Mitochondria b) Cytoplasm c) Lysosome d) Nuclei
4. DNA is stored in which of the following cell organelle?
   a) Cell wall b) Cell Membrane c) Nucleus d) Cytoplasm
5. Protein synthesis takes place in which of the following cell organelle?
   a) Cell wall b) Ribosome c) Nucleus d) Cytoplasm

Part B

1. Write short note on Plasmodesmata and its role in movement of molecule.
2. Enlist the characters of ATPases transporters.
3. Differentiate euchromatin and heterochromatin.
4. Criticize on DNA sequencing.
5. Enlist the cloning vectors used in recombinant DNA Technology.

Part C

1. Evaluate the structure, models and functions Plasma membrane.
2. Illustrate the Chloroplast-structure and function.
3. Discuss the structure and function of Ribosome.
4. Illustrate the process of DNA replication.
5. Explain direct and indirect gene transfer methods in prokaryotic cell.

Head of the Department

Course Instructor

Dr. J.Celin Pappa Rani

Teaching Plan

Department : Botany

Class : II M.Sc. Botany

Title of the Course : GENETICS, PLANT BREEDING AND BIOSTATISTICS

Semester : III

Course Code : BP233CC2

CourseCode	L	T	P	Credits	Inst.Hours	Total Hours	Marks		
							CIA	External	Total
BP233CC2	4	2	-	5	6	75	25	75	100

Objectives

1. The students will be able to have conceptual understanding of laws of inheritance, genetic basis of loci and alleles and their linkage.
2. Develop critical understanding of chemical basis of genes and their interactions at population and evolutionary levels.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	Understand the Mendal's Law of inheritance and gene interactions	PSO-1	K1 (K)
CO- 2	Analyse the various factors determining the heredity from one generation to another.	PSO-2	K2 (U)
CO- 3	Explain Gene mapping methods**:** Linkage maps.	PSO-3	K3 (AP)
CO- 4	Compare and contrast the genetic basis of breeding self and cross – pollinated crops.	PSO-3	K4 (AN)
CO- 5	Discuss and develop skills for statistical analysis of biological problems	PSO-3	K5 & K6(C & E)

Teaching plan

Total Contact Hours: 90 (Including Lectures, Assignments, seminars and Tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	Mendal's Law of inheritance. Gene interactions and modified dihybrid ratios.	3	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,
	2.	Quantitative inheritance. Sex determination in plants and theories of sex determination.	3	K 3(Ap)	Interactive PPT	Simple definitions, Online quiz, slip test
	3.	Sex linked characters. Structure of Gene ,Operon , inducible operon , Operator site, Promoter, Polycistronic m RNA, Regulator, regulator constitutive.	3	K1(K)	Introductory session, Group Discussion, Lecture using videos	Short essays, MCQ, True/False
	4.	Gene function and regulation in prokaryotes with reference to Lac operon and trp operon.	3	K4(An)	Group Discussion, Mind mapping Peer teaching	Differentiate between various ideas, Map knowledge
	5.	Producer gene , structural gene and integrator gene. Gene Regulation eukaryotes –Britten and Davidson model.	3	K5(E)	Demonstration, PPT, Group Discussion	Longer essay/ Evaluation essay
	6.	Arabidopsis- gene regulation in flowering.	3	K2(U)	Lecture using Chalk and talk	MCQ, True/False, slip test

II						
	1.	Recombination: Homologous and non-homologous recombination, site-specific recombination.	4	K2(U)	Lecture using Chalk and talk ,Introductory session,	Concept explanations, Short summary or overview, class test
	2.	Holiday model of recombination. Transposable genetic elements: transposase, transposon, simple transposon, composite transposon.	4	K 3(Ap)	Mind mapping, Peer tutoring, PPT, Review	Evaluation through short test, MCQ, True/False, online quiz(mentimeter)
	3.	Transposons in *Zea mays*. Transposable elements in prokaryotes.	4	K1(K)	Lecture using videos,Demonstration,	Suggest idea/concept with examples,
	4.	UV induced mutation and its repair mechanism. Mismatch DNA repair mechanism.	3	K4(An)	Mind mapping, Peer tutoring,	Differentiate between various ideas, Open book test
	5.	Mutation types- frame shift mutation, addition, deletion, substitution, transition and transversion.	3	K5(E)	Lecture using Chalk and talk PPT,	Map knowledge
III						
	1.	ABO blood group in humans.	6	K 3(Ap)	Peer tutoring, Lecture using videos, Demonstration,	Evaluation through short test, MCQ, True/False,
	2.	QTL mapping, Gene mapping methods**:** Linkage maps, tetrad analysis, mapping with molecular markers ,mapping by using somatic cell hybrids.	6	K1(K)	Lecture using Chalk and talk Brainstormihg	Simple definitions, Observation note, Dictation
	3.	Extra chromosomal inheritance, maternal inheritance.	6	K4(An)	Demonstration, PPT, Interactive e-book	Creative writing, Quiz, slip test
IV						
	1.	Objectives of plant breeding, characteristics improved by plant breeding.	4	K4(An)	Lecture using Chalk and talk ,Demonstration,	Short summary or overview, panel discussion, Peer review

	2.	Genetic basis of breeding self and cross – pollinated crops.	4	K5(E)	Demonstration, PPT, Review	Evaluation through short test, MCQ, True/False,
	3.	Pure line theory, pure line selection and mass selection,	4	K2(U)	PPT, Review, you tube videos	Suggest idea/concept with examples,
	4.	clonal selection methods. , Hybridization.	3	K 3(Ap)	Lecture using Chalk and talk ,Introductoryses sion,	Oral presentatio n, observatio n notes
	5.	Genetics and physiological basis of heterosis.	3	K1(K)	Mind mapping, Peer tutoring,	Surprise test, Quiziz, oral test
V						
	1.	Measures of central tendency (Mean , Median , Mode)	4	K2(U)	Mind mapping, Peer tutoring, PPT, Review	Evaluation through short test, MCQ, problem solving
	2.	Dispersal (Mean deviation , standard deviation) , standard errors ANOVA (One way).	4	K 3(Ap)	Lecture using videos,Demonst ration,	Oral presentation, observation notes, Home work
	3.	Sampling distribution; levels of significance;	4	K1(K)	Mind mapping, Peer tutoring, Problem solving	Assignments, slip test, home work
	4.	Regression and correlation;	3	K4(An)	PPT, solving problems, Research projects	Observatio n notes, class test, Mind map
	5.	t-test; analysis of variance; X2 test.	3	K4(An)	PPT, Brainstorming	Slip test, online quiz, home work

Course Focussing on Employability/Entrepreneurship/Skill Development: Activities (Em/ En/SD): **Employability**

Course Focussing on Cross Cutting Issues (Professional Ethics/Human Values/Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: Poster Presentation, Album making,

Assignment: Producer gene , structural gene and integrator gene. Gene Regulation eukaryotes –Britten and Davidson model.

Seminar Topic: Measures of central tendency (Mean , Median , Mode)

Sample questions

Part : A

1. What is the structural unit of a gene?
   Exon b. Intron c. both a&b d. None of these
2. In a dihybrid cross, the phenotypic ratio of 9:3:3:1 represents _____ inheritance.
3. According to the Britten and Davidson model, what are gene batteries? a. Genes regulating metabolism b. Genes regulating development c. Sets of coordinately regulated gene d. Genes involved in energy production
4. QTL mapping is used to identify _____ associated with quantitative traits.
5. Maternal inheritance is often associated with which type of genetic material? a. Nuclear DNA b. Chloroplast DNA c. Mitochondrial DNA d. Both B and C
6. Transposable elements in Zea mays are also known as _____ genes.
7. Heterosis is also known as ----------
8. The mean is a measure of central _____, while standard deviation is a measure of _____.

Part: B

1. Describe Mendel's Law of Segregation with an example
2. Interpret the basic structure of a gene and its components
3. Predicting the role of transposase in the mobility of transposable elements.?
4. Describe the principle of QTL mapping and its applications in plant breeding?
5. Highlight the ABO blood group system in human health and medical practice.
6. Role of pure line selection in breeding – justify
7. Illustrate the genetic basis of breeding in self-pollinated crops.
8. Categorize the measures of central tendency and their significance in statistical analysis
9. Analyze the types of correlation & its advantages

Part: C

2. Summarize sex determination in plants and discuss various theories of sex determination.
3. Compare and contrast homologous recombination and non-homologous recombination .
4. Classify the methods of gene mapping with molecular markers. Include examples of markers used.
5. Determine the genetic and physiological basis of heterosis, including its application in plant breeding.?
6. Calculate and interpret the mean, median, mode, standard deviation, and mean deviation for the following data set: [5, 8, 12, 15, 18, 22, 26)
7. Illustrate the use of one-way ANOVA in comparing means with a detailed example and interpretation of results.

Head of the Department **Course Instructor**

Dr. S. Kala Vetha Kumari

Teaching Plan

Department : Botany

Class : II M.Sc. Botany

Title of the Course : ENTREPRENEURIAL OPPORTUNITIES IN BOTANY

Semester : III

Course Code : BP233EC1

Course Code	L	T	P	Credits	Inst.Hours	Total Hours	Marks		
							CIA	External	Total
BP233EC1	4	-	-	3	4	60	25	75	100

Objectives

1. Understand the different classifications of horticultural crops, nursery management, and use of technology in horticulture.

2. Evaluate the importance of floriculture and contribution spices and condiments on economy.

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	Students can acquire knowledge about organic farming and their advantages	PSO-1	K1
CO- 2	Understand both the theoretical and practical knowledge in understanding various horticultural techniques.	PSO-2	K2 & K6
CO- 3	To develop kitchen garden or terrace garden in their living area.	PSO-3	K3
CO- 4	Evaluate the horticultural techniques to students can develop self-employment and economical improvement.	PSO-3	K4
CO- 5	Create and develop skills for mushroom cultivation.	PSO-3	K5

Teaching plan

Total Contact Hours: 60 (Including Lectures, Assignments, seminar and Tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	Organic manures and fertilizers. Composition of fertilizer, NPK content of various fertilizers.	3	K2(U)	Lecture using Chalk and talk	Creative writing, Quiz, slip test
	2.	Common organic manures bone meal, cow dung, poultry waste, oil cakes, organic mixtures and compost.	3	K1(R)	Lecture using videos	Oral presentation, observation notes
	3.	Preparation of compost, aerobic and anaerobic – advantages.	3	K3(Ap)	Demonstration, PPT, Review	Surprise test, Quiziz, oral test
	4.	Vermicompost preparation, Panchakaviyam.	3	K4(An)	Demonstration, PPT, Review	

II						
	1.	Common garden tools.	3	K2(U)	Mind mapping, Peer tutoring	Oral presentation, observation notes
	2.	Methods of plant propagation by seeds.	3	K 3(Ap)	Lecture using Chalk and talk Mind mapping,	Surprise test, Quiziz, oral test
	3.	Vegetative propagation, cutting, grafting, budding and layering.	3	K1(K)	Interactive PPT, You tube videos	Simple definitions, class test
	4.	Use of growth regulators for rooting.	3	K4(An)	Introductory session, Group Discussion	Evaluation through short test, MCQ, True/False,
III						
	1.	Gardening – types of gardens, ornamental, indoor garden, kitchen garden, terrace garden, vegetable garden for marketing.	3	K2(U)	Lecture using Chalk and talk Mind mapping,	Panel discussion, oral presentation, online quiz
	2.	Rockery and artificial ponds.	3	K 3(Ap)	PPT, Lecture with videos, Peer teaching	Debate, seminar presentation, slip test
	3.	Ornamental garden designing.	3	K1(K)	Introductory session, Group Discussion	Suggest idea/concept with examples,
	4.	Garden components flower beds, borders, hedges, edges, drives, paths, garden adornments.	3	K4(An)	Group Discussion, Mind mapping	Creative writing, Quiz, slip test
IV						
	1.	Packaging of fruits, vegetables.	4	K2(U)	Lecture using Chalk and talk Mind mapping, Demonstration	Evaluation through short test, MCQ, True/False,
	2.	Preservation techniques drying, heat treatment, low temperature storage and by chemicals.	4	K 3(Ap)	PPT, Interactive e books, you tube videos	Panel discussion, oral presentation, online quiz
	3.	Preparation of wine, vinegar and dairy products.	4	K1(K)	Introductory session, Group Discussion	Debate, seminar presentation, slip test

V						
	1.	Significance of mushrooms. Cultivation.	3	K2(U)	Lecture using Chalk and talk Mind mapping,	Quiziz, online assignments, oral presentation
	2.	Types of mushrooms (button mushroom, oyster mushroom).	3	K 3(Ap)	PPT, Demonstration, Brainstorming	Debate, seminar presentation, slip test
	3.	Spawn isolation and preparation.	3	K1(K)	Introductory session, Group Discussion	Preparation of questions, Open book test
	4.	Value added products from mushroom – pickles, candies and dried mushrooms.	3	K4(An)	Group Discussion, Mind mapping, caes study method	JAM, observatio n notes, slip test

Course Focussing on Employability/Entrepreneurship/Skill Development:(Mention) Activities (Em/ En/SD): **Entrepreneurship**

Course Focussing on Cross Cutting Issues(ProfessionalEthics/HumanValues/Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: Demonstration of gardens, construction of ornamental garden, Preparation of Mushroom receipes.

Assignment: Gardening – types of gardens, ornamental, indoor garden, kitchen garden, terrace garden, vegetable garden for marketing.

Seminar Topic: Types of mushrooms (button mushroom, oyster mushroom). Spawn isolation and preparation.

Sample questions

Part :A

1. Which organic manure is known for its high nitrogen content?
   a. Bone meal b. Cow dung c. oil cakes d. Poultry waste
2. Panchakaviyam includes which of the following components?

a. Milk, curd, ghee, cow urine, and cow dung b. Milk, ghee, honey, water, and compost c. Milk, oil, leaves, water, and compost d. Milk, water, cow urine, leaves, and ghee

3. The tool commonly used for digging and turning soil in the garden is called a _____.
4. The hormone commonly used to stimulate root formation in cuttings is _____.
5. Rockeries are gardens that primarily feature rocks and alpine plants, whether the statement is True/ False

6. A kitchen garden is specifically designed to grow herbs, vegetables, and fruits for household use, whether the statement is True/ False
7. What is the primary purpose of drying fruits and vegetables?.

   a. To enhance their flavor b. To improve their color c. To reduce their moisture content d. To increase their weight
8. Which chemical is commonly used for the preservation of fruits and vegetables?

   a. Sodium chloride b. Sodium benzoate c. Calcium carbonate d. Potassium chloride

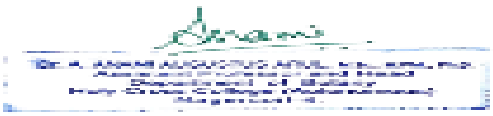
Part: B

1. Compare and contrast cow dung and poultry waste as organic manures in terms of their nutrient content and application
2. Interpret the composition and NPK content of bone meal and its use in agriculture.
3. Assessing five common garden tools and their primary uses in gardening.
4. Describe the concept of a terrace garden and its advantages?
5. Role of acetic acid bacteria in the production of vinegar.– justify
6. Explain the characteristics and uses of button mushrooms.
7. Analyze the spawn preparation for mushroom cultivation.

Part :C

1. Summarize the steps involved in the preparation of Panchakaviyam and its benefits in organic farming.
2. Discuss the process of vermicompost preparation and the benefits of vermicomposting over traditional composting methods.
3. Compare and contrast the different methods of vegetative propagation, including cuttings, grafting, budding, and layering.
4. Analyze the economic and environmental impacts of vegetable gardens for marketing purposes.
5. Determine the process of making wine from grapes and the biochemical changes that occur during fermentation.
6. Distinguish the different packaging materials used for fruits and vegetables and their impact on shelf life and quality?
7. Compare and contrast button mushrooms and oyster mushrooms in terms of their cultivation requirements and market potential.

Head of the Department



Course Instructor

Dr. S. Kala Vetha Kumari

Teaching Plan

Department : Botany

Class : II M.Sc. Botany

Title of the Course: SKILL ENHANCEMENT COURSE II: AGRICULTURE AND FOOD MICROBIOLOGY

Semester : III

Course Code : BP233SE1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
BP233SE1	3	-	-	-	3	45	25	75	100

Objectives

1. To provide comprehensive knowledge about plant – microbe interactions.
2. To provide basic understanding about factors affecting growth of microbes

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	Recognize the general characteristics of microbes and factors affecting its growth	PSO-1	K1 &K3
CO- 2	Explain the significance of microbes in increasing soil fertility	PSO-2	K3 & K4
CO- 3	Elucidate concepts of microbial interactions with plant and food.	PSO-3	K3 & K5
CO- 4	Analyze the impact of harmful microbes in agriculture and food Industry.	PSO-3	K2
CO- 5	Determine and appreciate the role of microbes in food preservation and as biocontrol.	PSO-3	K1 & K3

Teaching plan

Total Contact Hours:45 (Including Lectures, Assignments and Tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1.	Role of symbiotic and free-living bacteria and cyanobacteria in agriculture.	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test, MCQ, True/False, Short essays, Short summary or overview
	2.	Mycorrhiza, Plant Growth Promoting Micro-organism (PGPM) and	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps, Concept definitions
	3.	Phosphate Solubilizing Micro-organism (PSM).	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples

II						
	1.	Biocontrol of plant pathogens, pests and weeds.	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test, MCQ Short summary
	2.	Restoration of waste and degraded lands.	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Concept definitions
	3.	Biofertilizers: Types, technology for their production and application.	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Vermi-compost.	4	K4(An)	Lecture using videos	Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
III						
	1.	Intrinsic and extrinsic factors influencing growth of microorganisms in food.	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test
	2.	Microbes as source of food: Mushrooms	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, Concept definitions
	3.	Single cell protein.	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
IV						
	1.	Microbial spoilage of food and food products: Cereals.	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test, MCQ, True/False, Short essays,

						Concept explanations, Short summary or overview
	2.	Vegetables, prickles, fish and dairy products.	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps, Concept definitions
	3.	Food poisoning and food intoxication.	3	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Food preservation processes.	3	K4(An)	Lecture using videos	Finish a procedure in many steps, Differentiate between various ideas, Map knowledge
	5.	Microbes and fermented foods: Butter.	3	K5(E)	PPT	Longer essay/ Evaluation essay
	6.	Cheese and bakery products.	4	K5(E)	PPT	Evaluation essay
V						
	1.	PREDICTIVE METHODS: Food quality control Act and Regulations ,	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test, MCQ, True/False, Short essays, Concept explanations, Short summary or overview
	2.	Food safety, trade regulation of	3	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps, Concept definitions

	3.	Food materials,	5	K3(Ap)	Lecture and Chalk method	Suggest idea/concept with examples
	4.	Instrumentation in food analysis...	3	K4(An)	Lecture using videos	Differentiate between various ideas, Map knowledge

Course Focussing on Employability/Entrepreneurship/Skill Development: Activities (Em/ En/SD): **Skill Development**

Course Focussing on Cross Cutting Issues (Professional Ethics /Human Values/ Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues: **Field Visit**

Assignment: Microbial spoilage of food and food products: Cereals.

Seminar Topic: Food poisoning and food intoxication.

Sample Question

Part-A

1. What is the role of symbiotic bacteria in agriculture?
   a) Fixation of atmospheric nitrogen b) Decomposition of organic matter
   c) Pest control d) Soil aeration
2. Which of the following is not a benefit of mycorrhizal associations in agriculture?
   a) Improved nutrient uptake b) Enhanced tolerance to drought
   c) Prevention of soil erosion d) Increased resistance to pathogens
3. Plant Growth Promoting Microorganisms (PGPM) primarily enhance plant growth by:
   a) Providing mechanical support to roots b) Suppressing weed growth
   c) Enhancing nutrient availability d) Increasing water content in soil
4. Phosphate Solubilizing Microorganisms (PSM) play a crucial role in agriculture by:
   a) Increasing soil pH b) Converting organic matter into inorganic phosphorus
   c) Facilitating the uptake of phosphorus by plants d) Inhibiting plant growth
5. Cyanobacteria contribute to agriculture by:
   a) Producing antibiotics for plant protection b) Fixing atmospheric carbon dioxide
   c) Enhancing soil fertility through nitrogen fixation d) Providing natural colors for crop protection

Part-B

1. Discuss the role of mycorrhiza in agriculture and how it enhances plant growth.
2. Explain the technology used for the production and application of biofertilizers.
3. Describe the intrinsic and extrinsic factors influencing the growth of microorganisms in food.

4. How do microbes contribute to the spoilage of dairy products?
5. What are the different trade regulations of food materials?

Part-C

1. Discuss the significance of plant growth-promoting microorganisms (PGPM) in agriculture, highlighting their mechanisms of action and potential benefits for crop production.
2. Explain the concept of biocontrol in agriculture, focusing on its role in managing plant pathogens, pests, and weeds. Provide examples of biocontrol agents and their modes of action.
3. Evaluate the importance of vermicompost in sustainable agriculture, detailing its production process, benefits for soil health, and potential challenges.
4. Compare and contrast the microbial spoilage of cereals, vegetables, fruits, fish, and dairy products, discussing common spoilage microorganisms and their effects on food quality.
5. Analyze the Instrumentation in food analysis.

Head of the Department **Course Instructor**

Dr. W. Vincy