

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
EVEN 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 various ecosystems.
PSO3	identify the potency of plant resources in contemporary research and visualize future thrust areas in Botany.
PSO4	design scientific experiments independently and to generate useful information to address various issues in Botany.
PSO5	acquire basic knowledge on principles and applications of laboratory instruments and adequate skills to handle them.
PSO6	choose and apply appropriate tools, techniques, resources, etc. to perform various experiments in Botany.
PSO7	carry out scientific experiments independently or in collaboration with interdisciplinary 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 the bioethical norms.
PSO10	demonstrate proficiency in communicating with various stakeholders like students, teachers, scientists and society.

PG BOTANY
TEACHING PLAN –EVEN SEMESTER

Department	:	Botany
Class	:	II M.Sc. Botany
Title of the Course	:	PLANT PHYSIOLOGY AND METABOLISM
Semester	:	IV
Course Code	:	BP234CC1

Course Code	L	T	P	Credits	Inst. Hours	Total Hours	Marks		
							CIA	External	Total
BP231CC2	4	2	-	5	6	90	25	75	100

Objectives

1. To acquire knowledge on the functional aspects of plants
2. To understand the biophysical and biochemical processes of plants

.Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	Relate understand properties and importance of water in biological system, nutrients and its translocation.	PSO-1	K1 &K3
CO- 2	demonstrate the importance of light in plant growth and the harvest of energy.	PSO-2	K3 & K4
CO- 3	explain the energy requirement and nitrogen metabolism.	PSO-3	K3 & K5
CO- 4	compare the various growth regulators that influence plant growth.	PSO-3	K2
CO- 5	discuss the senescence and plant response to environmental stress.	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.	Water Relations: Physical and chemical properties of water – Components of water Potential.	4	K2(U)	Lecture using Chalk and talk, Demonstration	Evaluation through short test, MCQ, True/False, Short Essays.
	2.	Plasmolysis - water absorption by roots – Apoplast and Symplast concept - water transport through the xylem	4	K1(R)	Introductory session, Group Discussion,	Simple definitions, MCQ, Recall steps, Concept definitions
	3.	Transpiration and evapotranspiration - stomatal structure and function – mechanism of stomatal opening and closing.	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Mineral nutrition – essential nutrients – macro and micro nutrients – deficiencies and plant disorders.	4	K4(An)	Lecture using videos	Finish a procedure in many steps.
	5.	Absorption of solutes – translocation of solutes – pathways and mechanisms.	5	K5(E)	PPT	Longer essay/ Evaluation essay
II						
	1.	Photosynthesis: The physical nature of light – the absorption and fate of light energy – absorption and action spectra- photoreceptors.	4	K2(U)	Lecture using Chalk and talk, Demonstration	Evaluation through short test, MCQ.
	2.	Ultrastructure and biochemical compartmentation of Chloroplast	4	K1(R)	Introductory session, Group Discussion	Simple definitions
	3.	Photosynthetic Electron Transport and Photophosphorylation (cyclic and noncyclic)	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Photosystems and reaction centres - Light Harvesting	4	K4(An)	Lecture using videos	Finish a procedure in many steps,

		complexes - Photosystem I & II and Oxidation of Water.				Differentiate between various ideas, Map knowledge.
	5.	Carbon metabolism: C3, C4 and CAM pathways and their distinguishing features - photorespiration and its significance.	5	K5(E)	PPT	Longer essay/ Evaluation essay
III						
	1.	An overview of plant respiration – Glycolysis.	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test
	2.	TCA cycle– Electron Transport – oxidative phosphorylation and ATP synthesis	4	K1(R)	Introductory session, Group Discussion.	Simple definitions, Concept definitions.
	3.	Chemiosmotic Theory - Pentose Phosphate Pathway– Respiration and its significance in crop improvement.	4	K3(Ap)	Mind mapping,	Suggest idea/concept with examples
	4.	Nitrogen fixation (Biological - symbiotic and non-symbiotic).	5	K4(An)	Lecture using videos	Differentiate Between various ideas, Map knowledge.
IV						
	1.	Growth and development – Phases of plant growth – growth types- Growth Substances.	4	K2(U)	Lecture using Chalk and talk Demonstration	Evaluation through short test, MCQ.
	2.	Auxins, gibberellins, cytokinins, abscisic acid, ethylene, brassinosteroids	4	K1(R)	Introductory session, Group Discussion.	Simple definitions, MCQs, Recall steps, Concept definitions.
	3.	physiological effect and mechanism of action in agricultural and horticultural crops	3	K3(Ap)	Mind mapping,	Suggest idea/ concept with examples
	4.	–Photoperiodism – Classification of plants and mechanism of	3	K4(An)	Lecture using videos	Finish a procedure in many steps,

		flowering – Phytochrome and their action on flowering – Vernalization.				Differentiate between various ideas, Map knowledge
	5.	Mechanism and its practical application, biological rhythms and movements.	3	K5(E)	PPT	Longer essay/ Evaluation essay
	6.	Seed dormancy and causes and Seed germination and their biochemical changes.	4	K5(E)	PPT	Evaluation essay
V						
	1.	Plant senescence – Types and Mechanism of senescence-	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.	Abscission: Morphological and biochemical changes – Significance.	3	K1(R)	Introductory session, Group Discussion	Simple definitions, MCQ, Recall steps, Concept definitions.
	3.	Fruit ripening- Biochemical, Physiological changes and control of fruit ripening.				
	4.	Plant response to environmental stress: Biotic and Abiotic stress – Water, temperature, light and salinity-				

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: Abscission: Morphological and biochemical changes

Seminar Topic: **Study of abiotic stress**

Part-A

1. Write an example for antitranspirants. (C)
2. In ascent of sap water and dissolved minerals are taken up by leaves through_. (An).
3. Ethylene accelerates fruit ripening – State True or False.(R)
4. Photosynthesis takes place inside mitochondria. – State True or false.
5. Define Anaerobic respiration.

Part-B

1. Explain passive transport of water absorption (U)
2. Describe diffusion process in plant.
3. Summarize water oxidation complex.
4. Evaluate cyclic electron transport system.
5. Construct the oxidative phosphorylation.
6. Describe the anaerobic respiration.

Part-C

1. Demonstrate opening and closing mechanism of stomata.
2. Indicate macro nutrients? Write their role and deficiency syndrome.
3. Construct the photosynthetic carbon reduction pathway in C3.
4. Interpret photorespiration process in plants and its significance?
5. Justify Glycolysis cycle and its steps.

Head of the Department

Course Instructor

Dr. W. Vincy

Teaching Plan

Department : Botany
Class : II M.Sc. Botany
Title of the Course : BIOCHEMISTRY AND APPLIED BIOTECHNOLOGY
Semester : IV

Course Code : BP234CC2

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
BP234CC2	4	2	-	-	5	6	90	25	75	100

Objectives:

1. To study the fundamentals and significance of Plant Biochemistry
2. To know the structure and properties of plant biomolecules

Course Outcomes

CO	Upon completion of this course, the students will be able to:	PSO Addressed	Cognitive level
CO- 1	knowledge on the fundamentals and significance of Plant Biochemistry	PSO-1	K1 (K)
CO- 2	understanding on the structure and properties of plant biomolecules.	PSO-2	K2 (U)
CO- 3	explain the role of enzymes in plants.	PSO-3	K3 (AP)
CO- 4	compare and contrast the methods of transgenic plants production and natural plants.	PSO-3	K4 (AN)
CO- 5	discuss and develop skills for effective utilization of microbial/plant enzymes and their role in biological cells	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.	Atomic structure: chemical bonds - ionic bond, covalent bond, coordinate covalent bond, hydrogen bond,	4	K2(U)	Lecture using Chalk and talk Mind mapping,	Evaluation through short test, MCQ, True/False,
	2.	Hydrogen ion concentration (pH), buffers.	4	K 3(Ap)	Interactive PPT Demonstration	Simple definitions, Online quiz, slip test
	3.	Thermodynamics principle, First Law of Thermodynamics a) energy (b) Enthalpy	5	K1(K)	Group Discussion, Lecture using videos	Short essays, MCQ, True/False
	4.	(ii) second law of thermodynamics (a) entropy (c) free energy, redox potential.	5	K4(An)	Group Discussion, Mind mapping Peer teaching	Differentiate between various ideas, Map knowledge
II						
	1.	Classification of carbohydrates; Structure and properties of monosaccharides,	4	K2(U)	Lecture using Chalk and talk ,Introductory session,	Concept explanations, class test
	2.	Oligosaccharides, Polysaccharides – Glycoproteins..	4	K 3(Ap)	Mind mapping, Peer tutoring, PPT,	MCQ, True/False, online quiz(mentimeter)
	3.	Protein and Amino acids: Structure, Classification and properties; Peptides - Structure: Primary, secondary, Ramachandran plot, tertiary and quaternary structures	4	K1(K)	Lecture using videos, Demonstration, Interactive PPT	Suggest idea/concept with examples,
	4.	Classification of Lipids: Structure and properties of fatty acids,	3	K4(An)	Interactive PPT Flow Chart	Differentiate between various lipids, Open book test

	5.	Phospholipids, glycolipids, lipoproteins, cholesterol - structure and functions.	3	K5(E)	Lecture using Chalk and talk PPT,	Slip test, Oral Presentation
III						
	1.	Enzymes- Classification and nomenclature chemical nature of enzymes –	6	K 3(Ap)	Peer tutoring, Lecture using videos, Demonstration,	Evaluation through short test, MCQ, True/False,
	2.	factors affecting enzyme action – Michaelis – Menton constant, Secondary	6	K1(K)	Lecture using Chalk and talk Brainstorming	Simple definitions, Observation note, Dictation
	3.	Metabolites: Structure, classification and properties of alkaloids, steroids, terpenoids, flavonoids. Glycosides - their chemical nature and role.	6	K4(An)	PPT, Interactive e-book, Interrogative Learning	Creative writing, Quiz, slip test
IV						
	1.	Transgenic plants - pest resistance, herbicidal resistance	4	K4(An)	Lecture using Chalk and talk ,Demonstration,	Short summary or overview, panel discussion, Peer review
	2.	Disease resistant, abiotic and biotic stress tolerant, in improving crop yield, food quality- Golden rice	5	K5(E)	Demonstration, PPT, Review	Evaluation through short test, MCQ, True/False,
	3.	Edible vaccines, Cytoplasmic male sterility and fertility restoration, terminator Seed technology	5	K2(U)	PPT, Review, youtube videos	Suggest idea/concept with examples,
	4.	Antisense technology for Delayed fruit ripening,	4	K 3(Ap)	Lecture using Chalk and talk ,Introductory session,	Oral presentation, observation notes
V						
	1.	Fermentation techniques- Types. Industrial Production of enzymes-amylase, protease & lipase and their applications.	5	K2(U)	Mind mapping, Peer tutoring, PPT, Review	Evaluation through short test, MCQ, problem solving
	2.	Immobilization for enzymes production. Antibiotic – Penicillin Production	4	K 3(Ap)	Lecture using videos,Demonstration,	Oral presentation, observation notes,

3.	Amino acid - Glutamic acid production. Bioreactors for culturing Plant cells and production of Secondary metabolites,	5	K1(K)	Mind mapping, Peer tutoring, Problem solving	Assignments, slip test, home work- flow chart
4.	Super bug and its role in biodegradation. Bioremediation - <i>In situ</i> and <i>Ex situ</i> .	4	K4(An)	PPT, solving problems, Research projects	Observation notes, class test, Mind map

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 : Protein and Amino acids: Structure, Classification and properties

Seminar Topic: Super bug and its role in biodegradation. Bioremediation - *In situ* and *Ex situ*.

Sample questions

Part : A

1. Define an ionic bond.
2. What is the pH scale used for?
3. Explain the term "buffer."
4. State the First Law of Thermodynamics.
5. Define entropy.

Part: B

1. Describe the process of ionic bonding and give an example.
2. Explain the role of hydrogen bonds in water's properties.
3. Discuss the importance of buffers in biological systems.
4. Describe the concept of enthalpy and its significance in biological reactions.
5. Explain the Second Law of Thermodynamics and the concept of free energy. Describe in situ and ex situ bioremediation techniques.

Part: C

1. Compare and contrast ionic, covalent, coordinate covalent, and hydrogen bonds, with examples.
2. Explain the pH scale and the role of buffers in maintaining pH stability in biological systems.
3. Discuss the First and Second Laws of Thermodynamics with respect to biological systems, including the role of entropy and free energy.
4. Explain bioremediation in detail, discussing both in situ and ex situ methods and the role of engineered organisms (like superbugs) in biodegradation and environmental cleanup.
5. Discuss different fermentation techniques and the industrial production of enzymes, including applications in biotechnology and bioreactors for culturing plant cells and secondary metabolites.

Head of the Department

Course Instructor

Dr. S. Kala Vetha Kumari

M.Sc. BOTANY

Teaching Plan

Department : Botany

Class : II M.Sc. Botany

Title of the Course : ELECTIVE COURSE VI a) - FORESTRY AND WOOD TECHNOLOGY

Semester : IV

Course Code : BP234EC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
BP234EC1	4	-	-	-	3	4	60	25	75	100

Objectives

To study various aspects of Forest Botany.

To raise student awareness of the need to create a sustainable way of living and the current Global issues with forestry caused by human interference.

Course outcomes

Course outcomes:	On completion of this course, the students will be able to: CO	PSO addressed	Cognitive level
CO 1	gain knowledge on various aspects of forest botany	PSO -1	K1
CO2	understand the importance and of different forests.	PSO -1	K2
CO3	apply the ecological significance of forests in creating it	PSO -2	K3
CO4	analyse the dynamics of the forest.	PSO -2	K4
CO5	describe and concentrate on various Indian forests laws and acts.	PSO-4	K5 & K6

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I						
	1	Introduction and scope of Forest Botany - Merits of combining traditional Botany and Forestry practices.	5	K1(R)	Lecture using Chalk and talk ,Introductory session, Mind mapping,	Short essays, MCQ, Quiz
	2	Forest and gene conservation - Forest and ecosystem -	4	K2(U)	PPT, Lecture	Short summary
	3	Forest and civilization. Geographical history of the forest vegetation - natural vs. artificial.	4	K1(R)	Review, Lecture	MCQ, Quiz, Short Essay, True or false
	4	Special emphasizes on social forestry, Industrial forestry and multi-purpose forestry.	4	K3(Ap)	Demonstration, PPT, Review	Discussion, Debating or Presentations
	5	Preservation of natural forestry - Pollution control.	4	K4(An)	Group discussion	Essay
II	1	Forest genetics, Forest physiology,	4	K1(U)	Lecture using videos, Group discussion	Definitions, MCQ, Assignment
	2	Forest ecology – strong interrelationships.	4	K2(R)	Lecture using videos,	Essay, Discriminating the concepts
	3	Seedlings, leaves, bark branching pattern architectural models of trees.	4	K3(An)	Lecture using Chalk and talk	Explain,
	4	Major and minor forest products, use and misuse of forests by man,	4	K3(Ap)	Group discussion	Concept with examples, short essay, Seminar
	5	Direct And Indirect Forest Wealth, Forest Policies, Forest Protection Through Peoples Committee.	5	K4(An)	Group discussion	Seminar,
III	1	Silviculture: concept and scope of study, forest in general form, composition,	5	K1 (U)	Lecture using Chalk and talk ,Introductory session,	MCQ, Concepts, short essay

	2.	classification of world forests and Indian forests.	4	K2(R)	Lecture using Chalk and talk Method	MCQ, Quiz
	3.	Classification based on its quality density, tolerance, crown; water cycles of forest.	4	K4(An)	Group discussion	Diagrammatic representation, Essays
	4.	Photosynthetic processes in forest: nitrogen and mineral nutrition in forests.	4	K4(An)	Lecture using Chalk and talk method	Differentiating the characters, short essays
IV	1	Seed dynamics in forest: seed production, dissemination, germination, establishment and mortality,	4	K1(U)	Lecture using Chalk and talk ,Introductory session,	MCQ, Quiz,Group discussion,
	2.	Growth of trees in general terms – height, diameter, volume, growth of stands	4	K4(An)	Lecture using Chalk and talk ,Introductory session,	MCQ, Quiz,Group discussion,
	3.	G– gross increment, net increment, stand reaction to various types of cuttings.	5	K2(R)	Group discussion	Differentiating the characters, short essays
V	1	Measurement: definition, direct measurements, direct and indirect estimate.	5	K3(Ap)	Group Discussion,	Short essays, MCQ, Quiz, True or false, Assignments
	2.	Measurement of volume – common units, different methods and procedures of volume measurements.	4	K4(Ap)	Group Discussion	Short essays, MCQ, quiz
	3.	Measurement of age: direct estimate. Progress to be achieved in social forestry, industrial forestry and multiple forestry. Forest Laws- Indian Forest Act, 1927; Forest conservation Act. Wild Life Protection Act, 1972.	4	K4(Ap)	Group Discussion	Short essays, MCQ, quiz
	4.	Forest Laws- Indian Forest Act, 1927; Forest conservation Act. Wild Life Protection Act, 1972.	4	K5(Ev)	Group Discussion,	Summarize, Slip test

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Skill Development**

Activities (Em/ En/SD): Eco Trip

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

Activities related to Cross Cutting Issues : -

Assignment : **Forest Laws/ online**

Seminar Topic: **Silviculture**

Sample questions

Part A

1. Which of the following best describes the primary aim of social forestry?
 - a) Conservation of wildlife
 - b) Industrial production of timber
 - c) Involving communities in forest protection and sustainable use
 - d) Regulation of forest laws
2. The Indian Forest Act of 1927 was primarily enacted to:
 - a) Protect rare species of wildlife
 - b) Promote forest conservation and sustainable use
 - c) Encourage industrial forestry practices
 - d) Facilitate timber trade and regulate forest usage
3. In forest genetics, one of the main focuses is:
 - a) Studying soil composition
 - b) Improving tree species for specific traits
 - c) Monitoring animal populations
 - d) Analyzing weather patterns
4. The main difference between natural and artificial forests is:
 - a) Artificial forests are denser than natural forests
 - b) Natural forests require regular maintenance

- c) Artificial forests are established by human intervention
- d) Natural forests have lower biodiversity

5. Which of the following acts aims to protect endangered species in India?

- a) Forest Conservation Act, 1980
- b) Indian Forest Act, 1927
- c) Wild Life Protection Act, 1972
- d) Water Prevention and Control of Pollution Act, 1974

Part B

1. What is the significance of integrating traditional botany and forestry practices?
2. Define multi-purpose forestry and list two of its objectives.
3. Briefly explain the concept of "forest and gene conservation."
4. How do peoples' committees contribute to forest protection?
5. Describe the importance of seed dynamics in the forest ecosystem.

Part C

1. Discuss the scope of forest botany and its importance in today's environmental context. Include in your answer the role of forest ecosystems in civilization.
2. Examine the geographical history of forest vegetation, focusing on the differences between natural and artificial forests.
3. How does social forestry differ from industrial forestry? Discuss the goals and advantages of each, particularly in the context of environmental sustainability
4. Analyze the key physiological and ecological interactions within forest ecosystems, especially concerning seedlings, leaves, bark, and branching patterns in trees.
5. Describe the Indian Forest Act of 1927, the Forest Conservation Act, and the Wild Life Protection Act of 1972. Discuss their implications for forest and wildlife

Head of the Department

Course Instructor

Dr. J. Celin Pappa Rani

Department : Botany
Class : II M.Sc. Botany
Title of the Course : ELECTIVE COURSE VII: a) INDUSTRIAL BOTANY
Semester : IV
Course Code : BP234EC4

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
BP234EC4	4	-	-	-	3	4	60	25	75	100

Learning Objectives:

1. To learn the applied aspects of industrial application of algae, fungi, bacteria, plants, molecular biology and recombination technology.
2. To acquire knowledge on *in vitro* cultivation techniques to develop protocols targeted towards commercialization.

Course Outcomes

On the successful completion of this course, the students will be able to:		PSO addressed	Cognitive level
1.	understand the basics of algae in industrial applications.	PSO-1	K1
2.	demonstrate and to recollect the uses in fungi in industries.	PSO-2	K2
3.	use bacterial role in industries.	PSO- 3	K3
4.	compare and contrast the use of plants in industries.	PSO -4	K4
5.	discuss and develop skills for working in industries specializing in biomolecules.	PSO -4	K5 & K6

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
1	1	Algae in industries: Fertilizer industry- Seaweeds, pharmaceutical industry – antibiotics,	5	K1(R)	Lecture using Chalk and talk ,Introductory session	Short essays, MCQ, Quiz
	2	agar, carageenin, alginin, diatomate earth,	5	K1(R)	Lecture using Chalk and talk ,Introductory session	Short essays, MCQ, Quiz
	3	mineral industry, fodder industry	4	K1(R)	Lecture using Chalk and talk ,Introductory session	Short essays, MCQ, Quiz

II	1	FUNGI IN INDUSTRIES: Beneficial use of yeast, Fermentation of alcohol,	5	K3(An)	Group discussion	Explain, Model making
	2	preparations of enzyme, organic acid preparation	5	K3(Ap)	Model making	Concept with examples, short essay
		cheese production, protein manufacture, vitamins, fats.	4	K3(Ap)	Model making	Class test
III	1	PLANT PRODUCTS: Fibres and Fibre-Yielding Plants, wood and cork	5	K2(R)	Lecture using Chalk and talk Method	MCQ, Short Essay
		tannins and dyes, rubber, fatty oils and.	4	K2(R)	Lecture using Chalk and talk Method	Short Essay
	2	Vegetable fats, sugars and starches, pulp and paper, gums and resins	5	K4(An)	Group discussion	Diagrammatic representation , Essays
IV	1	Bacteria in industry: Food industry, dairy products	5	K3(Ap)	Group Discussion,	MCQ, Quiz, True or false, Assignments
		Biobleaching, biogas production, bioremediation	5	K3(Ap)	Group Discussion,	MCQ, Quiz, Class test
V	1	Recombinant plants: Tissue culture:	4	K4(Ap)	Group Discussion	Quizziz, Essay questions
		Micropropagation, somatic seeds, cell culture.	4	K4(Ap)	Role play	Essay questions

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Skill**

Development

Activities (Em/ En/SD): Lab visit

Course Focussing on Cross Cutting Issues (Professional Ethics/ Human

Values/Environment Sustainability/ Gender Equity): **Environment Sustainability**

Activities related to Cross Cutting Issues : -

Assignment : Micropropagation

Sample questions

Part A

1. Which of the following is the most common cause of air pollution in urban areas?
 - a) Industrial emissions
 - b) Agricultural activities
 - c) Vehicle emissions
 - d) Natural disasters
2. Which of the following elements is commonly found in the Earth's core?
 - a) Oxygen
 - b) Iron
 - c) Silicon
 - d) Carbon
3. The process of photosynthesis primarily takes place in which part of the plant?
 - a) Roots
 - b) Stems
 - c) Leaves
 - d) Flowers
4. Which of the following is a characteristic of a prokaryotic cell?
 - a) Presence of a nucleus
 - b) Lack of a membrane-bound nucleus
 - c) Larger in size compared to eukaryotic cells
 - d) Presence of chloroplasts
5. The theory of plate tectonics explains the movement of Earth's lithosphere. Which layer of the Earth is directly involved in this movement?
 - a) Mantle
 - b) Inner core
 - c) Outer core
 - d) Crust

PART B

1. Explain the difference between renewable and non-renewable energy sources with examples.
2. Describe the process of cellular respiration and its importance to living organisms.
3. What are the key differences between plant and animal cells?
4. Discuss the greenhouse effect and its potential impact on global climate change.
5. What is the significance of biodiversity in an ecosystem? Provide two examples of how biodiversity benefits the environment.

PART C:

1. Explain the process of evolution by natural selection. How does it contribute to the diversity of species on Earth?
2. Discuss the impact of human activities on the environment. What measures can be taken to reduce the negative effects of these activities?
3. Describe the water cycle in detail. How does this cycle contribute to sustaining life on Earth?
4. Examine the role of technology in modern society. What are the benefits and potential drawbacks of technological advancements?
5. Explore the causes and consequences of deforestation. How can we balance the need for resources with environmental preservation?

Head of the Department

Course Instructor

Dr. J. Celin Pappa Rani

Department : Botany
Class : II M.Sc. Botany
Title of the Course : SKILL ENHANCEMENT COURSE III:
PROFESSIONAL COMPETENCY IN BIOLOGY
Semester : IV
Course Code : BP234SE1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
BP234SE1	4	-	-	-	2	4	60	25	75	100

Learning Objectives: To understand the concept of agronomy and sustainable agriculture.

1. To learn the mechanism underlying the shift from vegetative to reproductive phase.

Course outcomes

Course outcomes :	On completion of this course, the students will be able to: CO	PSO addressed	Cognitive level
CO 1	learn about the structure of atoms, molecules, and chemical bonds.	PSO -1	K1
CO2	demonstrate both the theoretical and practical knowledge in cell biology and molecular biology.	PSO -1	K2
CO3	explain and use the methods of recombinant technology.	PSO -2	K3
CO4	compare and contrast the physiological functions and metabolism.	PSO -2	K4
CO5	discuss and develop skills for effective comprehension and communication.	PSO-4	K5 & K6

Teaching plan

Total Contact hours: 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Cognitive level	Pedagogy	Assessment/ Evaluation
I	1	Molecules and their interaction relevant to biology: Structure of atoms, molecules, and chemical bonds.	5	K1(R)	Lecture using Chalk and talk , Introductory session	Short essays, MCQ, Quiz
	2	Composition, structure, and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids, and vitamins).	4	K2(U)	Lecture using charts and models	Short summary

	3	Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).	4	K1(R)	Interactive PowerPoint presentation	Quiz, Short Essay, True or false
	4	Principles of catalysis, enzymes and enzyme kinetics,	4	K3(Ap)	Demonstration, PPT, Review	Discussion, Debating or Presentations
	5	Enzyme regulation, mechanism of enzyme catalysis, isozymes	4	K4(An)	Group discussion	Essay
II	1	CELLULAR ORGANIZATION: Membrane structure and function	4	K1(U)	Lecture using videos, Group discussion	Definitions, MCQ, Assignment
	2	structure of model membrane, lipid bilayer, and membrane protein diffusion, osmosis;	4	K2(R)	Lecture using videos,	Essay, Discriminating the concepts
	3	ion channels; active transport; membrane pumps; mechanism of sorting and regulation of intracellular transport; electrical properties of membranes.	4	K3(An)	Lecture using Chalk and talk	Explain, Model making
	4	Structural organization and function of intracellular organelles (cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast,	4	K3(Ap)	Group discussion	Concept with examples, short essay, Seminar
	5	Organization of genes and chromosomes: Operon, unique and repetitive DNA.	5	K4(An)	Group discussion	Seminar
III	1	FUNDAMENTAL PROCESSES: DNA replication, repair, and recombination: Unit of replication, enzymes involved, replication	5	K1 (U)	Lecture using Chalk and talk, Introductory session,	MCQ, Concepts, short essay
	2.	origin and replication fork, the fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms,	4	K2(R)	Lecture using Chalk and talk Method	MCQ, Quiz

		homologous and site-specific recombination.				
	3.	Protein synthesis and processing: Ribosome, the formation of initiation complex, initiation factors and their regulation,	4	K4(An)	Group discussion	Diagrammatic representation, Essays
	4.	elongation and elongation factors, termination, genetic code, aminoacylation of tRNA,	4	K4(An)	Lecture using Chalk and talk method	Differentiating the characters, short essays
IV	1	CELL COMMUNICATION AND CELL SIGNALING: Host-parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells,	4	K1(U)	Lecture using Chalk and talk ,Introductory session,	MCQ, Quiz,Group discussion,
	2.	Alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.	4	K4(An)	Lecture using Chalk and talk ,Introductory session,	MCQ, Quiz,Group discussion,
	3.	Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer, and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis.	5	K2(R)	Group discussion	Differentiating the characters, short essays
V	1	Basic concepts of development: Potency, commitment, specification, induction, competence, and determination, and differentiation; morphogenetic gradients; cell fate and cell lineages.	5	K3(Ap)	Group Discussion,	Short essays, MCQ, Quiz, True or false, Assignments
	2.	Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf	4	K4(Ap)	Group Discussion	Short essays, MCQ, quiz

		development and phyllotaxy				
3.		; transition to flowering, floral meristems and floral development in .	4	K4(Ap)	Group Discussion	Short essays, MCQ, quiz
4.		Arabidopsis and Antirrhinum Programmed cell death, aging, and senescence	4	K5(Ev)	Group Discussion,	Summarize, Slip test

Course Focussing on Employability/ Entrepreneurship/ Skill Development : **Skill Development**

Activities (Em/ En/SD): Eco Trip

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

Activities related to Cross Cutting Issues : -

Assignment : Programmed cell death, aging, and senescence/ **online**

Seminar Topic: apoptosis.

Sample questions

Part A

- Which type of bond is primarily responsible for stabilizing the secondary structure of proteins? a) Ionic bond b) Hydrogen bond c) Covalent bond d) Hydrophobic interaction
- The lipid bilayer structure of cell membranes is primarily stabilized by:
 - Hydrophobic interactions
 - Hydrogen bonds
 - Covalent bonds
 - Ionic bonds
- During DNA replication, which enzyme is responsible for unwinding the DNA double helix? a) DNA polymerase b) Helicase c) Ligase d) Primase
- In protein synthesis, the process of forming a peptide bond between two amino acids occurs at _____.
 - The nucleus
 - The ribosome
 - The Golgi apparatus
 - The endoplasmic reticulum

5. The tumor suppressor gene that plays a critical role in preventing cancer development by regulating the cell cycle is_____.

a) TP53 b) MYC c)RAS d) BCL-2'

Part B

1. Describe the role of Van der Waals interactions in the stabilization of biomolecular structures.
2. Explain the difference between active transport and passive transport in cellular membranes.
3. What is the significance of DNA repair mechanisms in maintaining genetic stability?
4. Outline the main stages of translation in protein synthesis.
5. Briefly define the concept of morphogenetic gradients in developmental biology.

Part C

1. Discuss the composition, structure, and function of the major classes of biomolecules: carbohydrates, lipids, proteins, nucleic acids, and vitamins.
2. Describe the structure and function of the lipid bilayer in cell membranes, focusing on membrane protein diffusion, osmosis, and active transport.
3. Explain the processes involved in DNA replication, including the roles of key enzymes, the replication fork, and fidelity mechanisms. Describe the significance of DNA repair and recombination.
4. Examine the genetic and molecular basis of cancer, detailing the roles of oncogenes, tumor suppressor genes, and the cell cycle in tumor development and metastasis.
5. Analyze the process of morphogenesis and organogenesis in plants, covering apical meristem organization, shoot and root development, and the transition to flowering.

Head of the Department

Course Instructor

Dr. J. Celin Pappa Rani