

Semester - II
Biofertilizers, Biofuels and Biopesticides (NMEC)
Sub. Code: BNM202
Modules

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
Biofertilizer						
I	1	Scope and importance of biofertilizers	1	To provide an insight on the importance of biofertilizers	Lecture Group Discussion	Formative assessment
	2	Reasons for preference of biofertilizer to chemical fertilizer	1	To compare biofertilizers with chemical fertilizers	Lecture PPT	Assignment Quiz Short test
	2	Biofertilizers using nitrogen fixing microbes	1	To learn more number of nitrogen fixing microbes	Lecture Video clippings	
	4	Mass Multiplication of <i>Azolla</i>	2	To produce Commercially available Biofertilizer using <i>Azolla</i>	Hands on training in the field	
Biofuel Production						
II	1	Major algal species for biofuel production	1	To know the important algae involved in biofuel production	Lecture and Hands on training	Assessing their practical knowledge in field work
	2	Downstream processing for the biofuel production	2	To practice the production of biofuel	Lecture with video clippings and Hands on training	Short test

	3	Advantages of biofuel production	1	To understand the need of future fuel	Lecture	
Vesicular Arbuscular Mycorrhizae (VAM) & Vermicomposting						
III	1	Isolation, multiplication,	1	To understand the importance of VAM fungi and its isolation	Lecture	Classroom quiz CIA
	2	Application Carrier-based inoculants, Quality control, agronomic importance.	2	To utilise the theory knowledge in the field by applying Carrier-based inoculants to crops	Lecture with hands on training in field	
	3	Methods and preparation of vermicomposting and its application.	3	To provide students with the knowledge and skills of preparation of vermicompost	Lecture with hands on training in field	
Biopesticides:						
IV	1	Advantages and disadvantages of biopesticides	1	To know the advantages and disadvantages of biopesticides	Lecture	Formative assessment Quiz
	2	Biological methods of pest control	1	To be aware of the biological methods to control pest	Lecture PPT	

	3	Mode of action of <i>Bacillus thuringiensis</i> .	2	To learn how the bacterium <i>Bacillus thuringiensis</i> works as a pest biocontrol	Lecture, Video clippings and Hands on Training	
Biological Control						
V	1	Microbial control of plant pathogens- <i>Trichoderma</i>	1	To understand the importance of Microbial control of plant pathogens	Lecture with Hands on Training	Formative assessment Assignment Quiz Short test
	2	Use of Baculovirus and protozoa in biological control.	2	To know the use of Baculovirus and protozoa in biological control measures	Lecture with Hands on Training	
	3	Use of fungi in biological control	2	To realise the importance of fungi as biocontrol	Lecture	

Course Instructor: Dr. C. Anitha

HoD: C. Jespin Ida

**Major Core III - Archegoniate
Course. Code: BC2031**

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
Bryophytes						

I	1	Unifying features of Bryophytes, transition to land habit	2	To analyse the unifying factors of bryophytes	Lecture PPT	Short test Assignment
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				and its transition to land		Quiz Open Book Test
2	Classification by Rothmaler (1951).	1	To understand the basics of classification of bryophytes	Lecture Group Discussion		
3	Distribution, systematic position, morphology, anatomy, reproduction and life cycle of <i>Marchantia</i>	2	To learn about the <i>Marchantia</i>	Lecture, Demonstration with live specimen		
4	Distribution, systematic position, morphology, anatomy, reproduction and life cycle of <i>Polytrichum</i>	2	To understand a type specimen of bryophyte- <i>Polytrichum</i>	Lecture Slides and Specimen of <i>Polytrichum</i>		
5	Ecological and economic importance of Bryophytes.	2	To analyse the importance of bryophytes to ecology and economy	Lecture PPT		

Pteridophytes

II	1	General characteristics of Pteridophytes	2	To understand the characteristics of Pteridophyta	Lecture	Class test Assignment Formative assessment
	2	Classification by Smith (1955) and life cycle patterns.	4	To analyze the classification of Pteridophyta and its life cycle patterns	Lecture PPT	Quiz Open Book Test

	3	Distribution, systematic position, morphology, anatomy, reproduction and life cycle of <i>Psilotum</i>	3	To learn about <i>Psilotum</i>	Lecture Video Specimen of <i>Psilotum</i>	
Pteridophytes						
III	1	Distribution, systematic position, morphology, anatomy, reproduction and life cycle of <i>Selaginella</i>	3	To understand a type specimen of Pteridophyte - <i>Selaginella</i>	Lecture Demonstration with <i>Selaginella</i>	Class test Assignment Formative assessment Quiz Open Book Test CIA-I
	2	Distribution, systematic position, morphology, anatomy, reproduction and life cycle of <i>Marsilea</i>	3	To be familiarize with <i>Marsilea</i>	Lecture With slides and specimen of <i>Marsilea</i>	
	3	Heterospory, seed habit, stelar evolution and types of stele.	1	To learn about Heterospory, seed habit, stelar evolution and types of stele.	Lecture Group Discussion	
	4	Ecological and economical importance of Pteridophytes.	3	To understand the importance of Pteridophytes to ecology and economy.	Lecture PPT	
Gymnosperms						
IV	1	General characteristics of Gymnosperms	1	To learn about general characteristics of Gymnosperms	Lecture PPT	Class test Assignment

	2	Classification by Chamberlain (1935).	2	To understand the classification of Gymnosperms	Lecture Group Discussion	Formative assessment Quiz Open Book Test
	3	Distribution, systematic position, morphology, anatomy and reproduction of <i>Pinus</i>	3	To understand a type specimen of gymnosperms - <i>Pinus</i>	Lecture Field Visit	
	4	Ecological and economical importance of Gymnosperms.	3	To understand the importance of Gymnosperms to ecology and economy.	Lecture Video	
Fossils						
V	1	Geological time scale.	1	To introduce the students to geological time scale	Lecture Video	Class test Assignment Formative assessment Quiz Open Book Test CIA-II
	2	Fossils –Types and methods of fossilization and importance of fossils.	3	To understand the importance and types of fossils and its methods	Lecture PPT	
	3	Distribution, systematic position, morphology, anatomy and reproduction of <i>Rhynia</i>	2	To understand fossil with the study of <i>Rhynia</i>	Lecture PPT	

4	Distribution, systematic position, morphology, anatomy and reproduction of <i>Lyginopteris</i> .	3	To analyze about a fossil <i>Lyginopteris</i> .	Lecture with slide of <i>Lyginopteris</i> .	
2	Fossils –Types and methods of fossilization and importance of fossils.	3	To understand the importance and types of fossils and its methods	Lecture PPT	

Course Instructor: Dr.A. Anami Augustus Arul

HOD: Dr. C. Jespin Ida

Major – Elective I (a) Herbal Botany
Subject code:BC2032

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
knowledge on Ethnomedicine						
I	1	History and scope of Herbal medicines, Brief Knowledge on-Ayurveda, Siddha, Unani and Homeopathy.	5	To have an insight into the herbal medicine and the underlying principles and practices	Lecture Group Discussion	Classroom quiz Short test Formative assessment Quiz Evaluation through find out the ethnomedicinal plants
	2	Brief knowledge on Ethnomedicine	4	To provide a thorough	Lecture with PPT	

		, Most commonly used Ethnomedicinal plants of Kanyakumari District.		understanding of ethnomedicine.		
Folk medicines						
II	1	Folk medicines including grandmother medicinal practices for common ailments like cold, fever, cough, diarrhoea	3	To practice the grandmother medicinal practices	Lecture Demonstration and Hands on training	Assignment Quiz Practical knowledge Formative Assessment
	2	Introduction to Ayurvedic formulations with methods of preparation: Churna, Arishta, Taila and Lehyam.	3	To produce Ayurvedic formulations	Lecture Demonstration and Hands on training	
	3	Skin and hair care: Herbal preparation of oils, shampoos and powders.	2	To produce herbal products of skin and hair care	Lecturing with PPT	
Drug yielding plants						
III	1	Botanical name, family, morphology of medicinally important parts, active principles	4	To identify medicinal plants and understand the effects of plant chemical constituents on humans.	Lecture with presentation	Class test Quiz Formative assessment Short test Formative assessment

		and utilization of <i>Catharanthus roseus</i> , <i>Ocimum sanctum</i> , <i>Curcuma longa</i> and <i>Centella asiatica</i> .				CIA-I
	2	Drug yielding plants: therapeutic and habit forming drugs with special reference to <i>Cinchona officinalis</i> , <i>Withania somnifera</i> , and <i>Cannabis sativa</i>	5	To understand the therapeutic and habit forming drugs	Lecture cum demonstration using live specimen	
IV Physico chemical properties of herbal drugs.						
	1	Evaluation and standardization of herbal drugs. Physico chemical properties - Ash, Fluorescence analysis.	3	To provide students with the knowledge and skills concerning authentication and quality assurance of medicinal plants	Lecture Group Discussion	Short test Assignment Formative assessment Quiz Assessing their practical knowledge Mini Projects
	2	Analytical pharmacognosy: Drug adulteration and detection.	2	To identify some of the common food adulterants	Lecture PPT Demonstration	

	3	Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, terpenoids and phenolic compounds).	4	To identify the secondary metabolites through simple tests.	Lecture Hands on Training	
Cultivation and utilization of medicinal plants						
V	1	Cultivation, harvesting, processing, storage, marketing and utilization of medicinal plants - <i>Trigonella foenum-graecum</i> (Seed), <i>Adathodavasicica</i> (Stem)	4	To understand the cultivation methods, collection, storage and uses of <i>Trigonella foenum-graecum</i> and <i>Adathodavasicica</i>	Lecturing Field Visit	Multiple choice questions Formative assessment Evaluation through short test Assignment CIA-II
	2	Cultivation, harvesting, processing, storage, marketing and utilization of medicinal plants Rhizome – <i>Zingiber officinale</i>	2	To understand the cultivation methods, collection, storage and uses of <i>Zingiber officinale</i>		
	3	Conservation of medicinal plants: <i>in situ</i> and <i>ex situ</i> .	3	To distinguish between <i>in situ</i> and <i>ex situ</i> ..	Lecturing with PPT	

Course Instructor: Dr. A.R. Florence

H.O.D: C. Jespin Ida

Sub. Code: BC2042

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
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Biofertilizer						
I	1	Brief introduction of biological resources and types. Biofertilizers: Scope and importance.	2	To Know the scope and importance of biofertilizers.	Lecture	Formative assessment Assignment Short test Assessing their creative knowledge Assessing their practical knowledge Quiz
	2	Bacteria – <i>Rhizobium</i> – mass production and uses.	1	To understand the methods of Mass production of <i>Rhizobium</i>	Lecture Video clippings,	
	3	Algae- <i>Nostoc</i> - mass production and application.	2	To be familiarize with various methods and application of Mass production of <i>Nostoc</i>	Lecture Illustrations	
	4	Pteridophyte <i>Azolla</i> -mass production and application.	2	To know the novel methods of mass production of	Lecture PPT presentation	
	5	Vermicompost – Mass production and application.	2	To know the importance of vermicompost	Lecture, PPT, demonstration	
Mass Cultivation						
II	1.	Single Cell Protein and Mycoprotein: Sources of single cell protein, Nutritive value of single cell protein.	2	To understand the sources and Nutritive value of single cell protein.	Lecture' Images	Formative assessment Assignment Short test Assessing their creative knowledge Assessing their practical knowledge Quiz Field Visit
	2.	Mass Cultivation of <i>Spirulina</i> .	2	To distinguish the Mass production of <i>Spirulina</i> .	demonstration	
	3.	Mushroom Cultivation- <i>Pleurotus</i> and <i>Agaricus</i> ,	3	To develop the Mass cultivation of <i>Pleurotus</i> and <i>Agaricus</i> mushroom	demonstration	
	4.	Nutritional values and value-added products.	2	To realize the Nutritional values and value-added products.	Lecture with images	

Forest Cover, Management and Conservation

III	1	Forest cover, forest resources – Utility (Major and Minor Products) and Values of forests:	3	To recall the Forest cover and forest resources	Video clippings	Formative assessment Assignment Short test Assessing their creative knowledge Assessing their practical knowledge Quiz
	2	Commercial benefits, ecological benefits and aesthetic benefits.	3	To know to value the uses of forests	Lecture, PPT	
	3	Forest management and conservation - Regeneration - Tending operations - Sustainable utilization of forest resources.	3	To realize the various benefits of forests	Lecture	

Biofuels

IV	1.	Biofuels: Importance of biofuel	2	To understand Importance of biofuels	Lecture	Formative assessment Assignment Short test Assessing their creative knowledge Assessing their practical knowledge Quiz
	2.	Biodiesel Production – <i>Pongamia</i> and <i>Jatropha</i> .	2	To extract the production of Biodiesel from plants	Lecture with PPT	
	3.	Alcohols – liquid fuel-bioethanol production.	2	To know the liquid fuel produced from ethanol	Lecture with Video clippings	
	4.	Gaseous fuels: Biogas production and Hydrogen fuel.	3	To develop biogas fuel from organic wastes and study the hydrogen fuel.	Lecture with demonstration	

Biopesticides

V	1	Biopesticides: Introduction, desirable qualities of biopesticides.	2	To realize the importance of biopesticides	Lecture	Formative assessment Assignment Short test
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	2	Microbial Pesticides – fungi, viruses and bacteria.	2	To understand the activity of Microbial Pesticides	Lecture, PPT,	Assessing their creative knowledge Assessing their practical knowledge Quiz
	3	Advantages and disadvantages of Microbial Pesticides,	3	To analyze the advantage and disadvantage of Microbial Pesticides	Lecture, PPT,	
	4	Application of Biopesticides.	2	To apply biopesticides to various plants	Lecture, group discussion	

Elective - II (b) Food Science

Sub. Code: BC2043

Module

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
Food science						
I	1	Definition, aim, constituents of food and their value.	1	To understand the constituents of food and their value.	Lecture	Short test Assignment Formative assessment Quiz Open Book Test
	2	Energy value of balanced diet, carbohydrates, proteins, lipids, enzymes and vitamins.	3	To analyse the Energy value of balanced diet	Lecture, PPT	
	3	Cooking- Objectives of cooking, Preliminary	2	To be familiarize with objectives of	Lecture, PPT	

		preparations		cooking		
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	4	Cooking methods, (Moist heat methods, Dry heat methods, Microwave cooking, Solar cooking).	3	To learn about cooking methods	Lecture Video	
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Food colourants and Food additives

II	1	Food colourants - Natural, Artificial and Safety measures of food additives.	2	To study the different types of food colourants	Lecture Video	Class test Assignment Formative assessment Quiz Open Book Test
	2	Special flavours: Spices and Condiments.	2	To understand about spices and condiments	Lecture PPT	
	3	Food additives – Sweeteners, Emulsifiers and Stabilisers, Antioxidants, Flavour improvers	2	To learn about different types of condiments	Lecture Video	
	4	Fermented Food Products: Milk (butter and cheese), Vegetable (sauerkraut and cucumber).	2	To analyse the fermented products of milk	Lecture Group Discussion	
	5	Food Enrichment - Fortification.	1	To be familiar with fortification	Lecture with chart	

Preparation of Jam, Jelly, Squash and Pickle

III	1	Preparation of Jam: Tomato and Pineapple	2	To understand about the preparation of jam	Lecture PPT	Class test Assignment Formative assessment Quiz
	2	Preparation of Jelly: Grapes and Plums	3	To be familiarize with the process of	Lecture PPT	

				preparation of jelly		Open Book Test CIA-I
3	Preparation of Squash: Grapes and Mango	2	To understand the science behind squash preparation	Lecture Group Discussion		
4	Preparation of Pickle: Gooseberry and Lemon	3	To learn the preservation gooseberry and lemon by pickling.	Lecture Practical Preparation		

Food Preservation

IV	1	Food preservation: Aims and objectives of preservation & processing of foods, Foodspoilage	2	To learn the process of food preservation	Lecture PPT	Class test Assignment Formative assessment Quiz Open Book Test
	2	Methods of food preservation – preservation by low (freezing, types of freezing i.e. slow freezing, quick freezing, introduction to thawing, changes during thawing and its effecton food).	3	To understand method of preservation by low temperature	Lecture PPT	
	3	Methods of food preservation – preservation by high temperature (Sterilization, Pasteurization, and Blanching).	3	To realize the method of preservation by high temperature	Lecture PPT	

	4	Canned food.	1	To learn the process of canning food	Lecture Group Discussion	
Beneficial microorganisms in Agriculture						
V	1	Industrial production of the following:Alcoholic beverages –Beer and Wine	5	To introduce the students with alcoholic beverages	Lecture Video	Class test Assignment Formative assessment
	2	Industrial production of the following:Non-alcoholic beverages - Coffee and Tea.	4	To understand the industrial production of coffee and tea	Lecture PPT	Quiz Open Book Test CIA-II

Course Instructor: Dr. A. Anami Augustus Arul

H.O.D: C. Jespin Ida

Elective – II (c) Biodiversity and Human Welfare
Sub. Code: BC2044

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
Biodiversity						
I	1	scope and types of Genetic diversity	2	To understand the different types of genetic diversity	Lecture Group discussion	Short test Quiz Formative assessment
	2	species diversity and ecosystem biodiversity.	2	To know the types of species and ecosystem biodiversity	Lecture	Assignment

	3	Agro biodiversity and cultivated plant taxa, wild taxa.	3	To learn about the agrobiodiversity and cultivated and wild taxa	Lecture PPT,	
	4	Values of biodiversity; Ethical and aesthetic values of biodiversity	2	To understand the ethical and aesthetic values of biodiversity	Lecture video	
Biodiversity Hot spots						
II	1	History and origin of hotspots.	1	To learn the history and origin of hotspots	Lecture Group discussion	Group discussion Formative assessment Short test Assignment
	2	Critical role of hotspots in species richness and endemism.	2	To understand the role of hotspots	Lecture PPT	
	3	Biodiversity in tropics, National biodiversity hotspots, hottest biospots of Western Ghats,	3	To be familiarize with the biodiversity hotspots and hottest biospots	Lecture	
	4	Biodiversity of Tamilnadu.	3	To realize the biodiversity of Tamilnadu	Lecture video	
Economical values of biodiversity						
III	1	Economical values of biodiversity-plants, animals and microbes.	3	To study the values of biodiversity	Lecture	Class test Formative assessment Quiz Short test CIA-I
	2	Loss of genetic diversity, loss of species diversity, loss of ecosystem diversity, loss of agro biodiversity,	3	To realize the loss of different biodiversity.	Lecture PPT	
	3	Consequences and implications;	1	To learn the consequences and implications of biodiversity	Lecture PPT	
	4	projected scenario for biodiversity loss.	2	To understand the projected scenario for biodiversity loss.	Lecture	

Organizations associated with Biodiversity management						
IV	1	IUCN, UNEP, UNESCO, WWF, NBPGR, CITES and CBD;	4	To study about the various organizations associated with biodiversity management	Lecture, PPT	Quiz Class test Assignment Formative Assessment
	2	National Biodiversity Authority,	2	To understand about the National Biodiversity Authority	Lecture	
	3	Nature Conservation Foundation. Rio de Janeiro, 2012	3	To know about the Nature Conservation Foundation	Lecture, PPT	
Conservation of Biodiversity						
V	1	Role of NGOs in biodiversity conversation,	2	To understand the Role of NGOs	Lecture	Quiz Assignment Group discussion Class test CIA-II
	2	Conservation of genetic diversity, species diversity and ecosystem diversity,	3	To study the conservation of diversity	Lecture, PPT	
	3	in situ and ex situ conservation, social approaches for conservation,	2	To learn about the conservation of biociversity	Lecture, PPT Video	
	4	biodiversity awareness programmes, sustainable development.	2	To realise the importance of awareness programmes	Lecture	

Course Instructor: Dr. A.R. Florence

H.O.D: C. Jespin Ida

Allied II- Theory

Plant Diversity – II (Gymnosperms, Angiosperms) and Plant Physiology

Subject Code: BA2041

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment / Evaluation
Gymnosperms						

I	1	General characteristics of Gymnosperms.	1	To analyse the General characteristics of Gymnosperms	Lecture	Formative assessment Assignment Short test Assessing their creative knowledge Quiz
	2	Distribution, Systematic Position, Morphology, Anatomy of <i>Pinus</i> .	3	To understand the morphology and anatomy of <i>Pinus</i>	Lecture Video clippings	
	3	Reproduction and Life History of <i>Pinus</i> .	3	To be familiar with reproduction and life history of <i>Pinus</i>	Lecture Illustrations	
	4	Economic importance of Gymnosperms.	2	To be familiarize with the importance of gymnosperms	Lecture PPT presentation	

Morphology

II	1	Morphology of root, stem,	3	To compare the different types of root and stem and its modification	Lecture with PPT	Formative assessment Assignment Short test Assessing their creative knowledge Quiz
	2	Morphology of leaf, inflorescence,	3	To realize the morphology of leaf and inflorescence	Lecture with Video clippings	
	3	Morphology of flower and fruit – their modifications.	3	To understand the morphology of flower and fruit	Lecture with live specimen	

Taxonomy

III	1	Study of the following families and their economic	3	To compare the difference between	Lecture, PPT, demonstration	Formative assessment Assignment Short test
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		importance- Brassicaceae, Rutaceae,		Brassicaceae and Rutaceae		Assessing their creative knowledge Quiz
	2	Study of the following families and their economic importance - Lamiaceae, and Arecaceae	3	To recall the importance of Lamiaceae and Arecaceae	Lecture, PPT, demonstrati on	
	3	Study of the following families and their economic importance - Euphorbiaceae	3	To know the family details of Euphorbiaceae	Lecture, PPT, demonstrati on	

Photosynthesis

IV	1	Pigment systems	2	To understand the structure and uses of pigment systems	Lecture	Formative assessment Group discussion Short test Quiz
	2	Light dependent (cyclic and non- cyclic photophosphoryla tion)	3	To understand the light dependent photosynthesis	Lecture with PPT	
	3	Light independent (C ₃ cycle).	3	To correlate light independent photosynthesis	Lecture with Video clippings	
	4	Factors affecting photosynthesis.	1	To know the factors affecting photosynthesis	Lecture with demonstrati on	

Respiration and Phyto hormones

V	1	Anaerobic (Fermentation), Glycolysis	2	To understand the different types of anaerobic respiration	Lecture PPT,	Group discussion Formative assessment, Quiz Short test
	2	Aerobic (Kreb's cycle)	2	To realize the importance of Kerb's cycle	Lecture, video	

	3	Electron Transport System and Oxidative phosphorylation.	2	To analyze electron Transport System and Oxidative phosphorylation.	Lecture with Video clippings	
	4	Factors affecting respiration.	1	To understand the factors affecting respiration	Lecture, Group discussion	
	5	Physiological role of auxins, gibberellins and ethylene.	2	To learn about the physiological role of auxins, gibberellins and ethylene.	Lecture PPT	

Course Instructor: Dr. A. Anami Augustus Arul

HoD: Dr. C. Jespin Ida

Semester - VI

Major Core IX - Biotechnology and Molecular Biology

Sub. Code: BC1762

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
I. Gene cloning, cloning vectors, restriction enzymes & Gene transfer						
	1	Definition and scope of biotechnology. Introduction to genetic engineering- Principles of recombinant DNA technology, gene cloning.	3	To understand the importance of recombinant molecules	Lecture with PPT	Classroom quiz Short test Formative assessment
	2	cloning vectors- plasmids, cosmids, binary and shuttle vectors	3	To learn and categorize different types of cloning vectors	Lecture with PPT	Quiz Slip test
	3	restriction enzymes – exonucleases, endonucleases: type I, II and III. and Ligases.	3	To understand the functions and importance of restriction enzymes	Lecture with PPT	Short test
	4	Gene transfer methods- Fragmentation, Microinjection, Shot Gun Method.	3	To know the different Gene transfer methods	Lecture with PPT	Formative assessment
II Plant Tissue Culture						
	1	Scope and importance, laboratory requirements for plant tissue culture, Sterilization techniques	4	To practice the plant tissue culture, Sterilization techniques and Culture media preparation in laboratory	Lecture Demonstration and Hands on training	Practical knowledge

		Culture media preparation (M.S. Medium).				
	2	Concept of totipotency – differentiation, de-differentiation and redifferentiation..	4	To know the Concept of totipotency	Lecture with images	Assignment Quiz
	3	Explants- culture of explants, callus induction and maintenance, callus sub culture on a fresh nutrient medium, Organogenesis	4	To provide students with the knowledge and skills of preparation of sub culture	Lecture Demonstration and Hands on training	Practical knowledge
UNIT III Plant tissue culture and Transgenic plants						
	1	Protoplast culture- Isolation and purification, culture and regeneration, uses of cultured protoplasts. Somatic hybridization- methods, production of Hybrids and Cybrids.	4	To identify, isolate and purify the Protoplast and culturing methods	Lecture Demonstration and Hands on training	Class test Quiz Practical knowledge
	2	Production of haploid plants – Anther culture and Pollen culture. Production of somatic embryos	3	To learn different culture methods	Lecture Demonstration and Hands on training	Practical knowledge
		GM crops (Bt – Cotton and Golden rice) Transgenic plants- merits and demerits; Cryopreservation, Brief knowledge on IPR	5	To know the GM crops, merits and demerits of Transgenic plants	Lecture with live specimen and PPT	Classroom quiz Short test Formative assessment
IV DNA Replication and Protein Synthesis						

	1	DNA Replication in prokaryotes and transcription in prokaryotes,	6	To understand the DNA Replication and transcription	Lecture and video clippings	Memory power test Formative assessment
	2	Protein Synthesis- Translation, post translation processing, inhibitors of protein synthesis	6	To acquire knowledge on Protein Synthesis	Lecture and video clippings	Assessing their knowledge through diagrammes
V Gene regulation and mutation						
	1	Characteristic of Genetic Code, Codons, anticodons. Degeneracy of codons, Wobble hypothesis.	6	To understand the Gene regulation, mutation and characteristics of codons	Lecturing With PPT	Multiple choice questions Formative assessment
	2	Gene regulation in Prokayotes- Lac Operon. Gene Mutation- Molecular mechanism, Mutagens, DNA Repair mechanisms.	6	To understand the Gene regulation and Gene Mutations		Evaluation through short test

Course Instructor: Bojaja A. Rosy

HOD: C. Jespin Ida

Semester - VI
Organic farming
Sub. Code: BC2065

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I.						
	1	Introduction, A legacy of damaged soils.	1	To understand the legacy of damaged soils.	Lecture	Class test
	2	Retail chemicals farming made cheap and easy.	2	To know about chemical farming	Lecture PPT	Assignment
	3	Contamination of food products by pesticides and chemicals. Threat to biodiversity.	3	To know the Contamination of food and biodiversity.	Lecture PPT, video	Formative assessment
	4	Present status of organic farming in India	3	To study the Present status of organic farming	Lecture PPT,	Quiz
II.						
	1	Assessment of soil, Fertility of soil,	3	To be familiarize with the assessment of soil	Lecture PPT	Assignment
	2	Importance of organic matter, Water retentivity	3	To realize the importance of Water retentivity	Lecture PPT	Formative assessment
	3	aeration of soil, Soil pH, Soil reclamation	3	To understand soil aeration, pH and reclamation.	Lecture PPT	Short test
III.						
	1	Balanced Nutrient Supply- Sources of nutrients for organic farming. FYM, Rural Compost, City Compost, Oil cakes, Animal waste,	2	To learn the types of manure	Lecture	Short test
	2	Bio-fertilizer and Vermicompost.	3	To understand the biofertilizers	Lecture PPT	Quiz

				and vermicompost		
	3	Nutrient content of the above source (data chart).	2	To learn the nutrient content of different fertilizers	Lecture PPT Video	Formative assessment
	4	Green manure, Liquid manure (Panchagavya)	2	To understand about green manure and liquid manure.	Lecture PPT	Class test

IV.

	1	Plants: Choosing the right crop for the environment	1	To know the plants suitable for a particular environment	Lecture, PPT	Class test
	2	Best management practices for organic farming	3	To understand the management of the organic farm.	Lecture, PPT	Assignment
	3	Definition, Concepts, and benefits	3	To know the definition, concepts and benefits of organic farming	Lecture	Quiz
	4	Pure Organic Farming, Integrated Organic system (Combination of organic and inorganic) and mixed farming	2	To learn about the types of farming	Lecture, PPT	Formative assessment

V. Pteridophytes:

	1	Pest management – Integrated pest and disease management	1	To know about the pest management practices	Lecture	Group discussion
	2	Organic pesticides, Bio-pesticides	3	To classify the types of organic and biopesticides	Lecture, PPT	Assignment
	3	Feasibility of complete dependence of organic sources.	3	To study the feasibility of complete dependence of organic sources.	Lecture, PPT Video	Quiz

	4	Required management practices for organic farming certification	2	To learn the required management practices for organic farming certification	Lecture, PPT	Short test
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Course constructor: Dr. Sr. Leema Rose

HOD: C. Jespin Ida

Major Core VIII

Semester : VI

Name of the Course: Genetics, Biostatistics, and Bioinformatics

Subject code: BC1761

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I GENES AND ITS INTERACTIONS						
	1	Mendel's laws of heredity with reference to monohybrid and dihybrid crosses.	3	To differentiate monohybrid and dihybrid crosses and solve the problems	Lecture , Problem based learning	Class test, Group Discussion, Quiz.
	2	Gene interactions - complementary genes (flower colour in sweet Pea). Supplementary genes – inheritance (Comb shapes in fowls)	3	To solve the problems in gene interactions	Lecture , Problem based learning	
	3	Epistasis – Dominant Epistasis (12:3:1), Recessive Epistasis (9:3:4), Lethal genes (Dominant Coat colour in Mice, Recessive – Chlorophyll content in Maize) (Seminar)	3	To analyze different forms of epistasis	Lecture , PPT, Problem based learning	

	4	Incomplete dominance (<i>Mirabillis jalapa</i>), and Codominance (Coat colour in cattle)	2	To distinguish incomplete dominance and co-dominance	Lecture , PPT	
II GENE INHERITANCE						
	1	Sex Linkage inheritance (eye colour in <i>Drosophila</i>)	3	To distinguish the sex linked characters	Lecture , Charts	Diagrammatic representation, Short test.
	2	Polygenic inheritance with reference to (ear length in maize)	2	To analyze polygenic inheritance with examples	Lecture , Models	
	3	Multiple alleles with reference to (ABO blood group in man), Rh factor	3	To evaluate the multiple allele mechanisms in human blood	PPT, Charts	
	4	Non Mendelian inheritance cytoplasmic, shell coiling in snails. Morgon's views on linkage	2	To understand the non-mendelian inheritance pattern	Lecture , Video clippings	
	5	Crossing over – types, mechanism of crossing over and its significance, Holiday model	3	To learn about crossing over and mapping	Lecture, Video clippings	
III REPLICATION AND MUTATION						
	1	Cell division (mitosis and meosis)	3	To understand basics of cell division	Lecture , PPT, Videos	Short test, Question – Answer session,
	2	DNA as the genetic material, double helical DNA structure , semi conservative method of replication of DNA	3	To differentiate the different forms of DNA	Lecture , Models	Group discussion, Continuous Internal Assessment

				replication		I (CIA -I).
3	Chromosomal aberrations- addition, deletion, translocation, inversion, polyploidy	3	To understand the different patterns of chromosomal aberrations	Lecture , PPT		
4	Types of point mutations, mutagenic agents - physical and chemical. Chromosomal abnormality- Down Syndrome and Klinefelter Syndrome	3	To identify and critically analyse genetic diseases in terms of mutation	Lecture , Charts		

IV BIOSTATISTICS

1	Importance of statistics in Biology, sampling - random sampling, collection and interpretation of data, tabulation, presentation of data	3	To know and categorize the biological data collection	Lecture, Problem solving	Quiz, Group discussions
2	Frequency distribution, frequency curve, frequency polygon, histogram and bar diagrams	3	To understand the different forms of frequency distribution	Lecture , PPT, Problem solving	
3	Measures of central tendencies -mean, median and mode	3	To acquire skills in performing statistical analysis	Lecture, Problem solving	
4	Measures of dispersion – standard deviation, standard error, Null hypothesis - Chi - square test	3	To acquire skills in analyzing measures of dispersion	Lecture , PPT, Problem solving	

V BIOINFORMATICS

	1	Introduction to Bioinformatics: aims and scope and applications- Virtual library, e-books and e-journals	3	To differentiate e-library, e-books and e-journals	Lecture, PPT	Multiple Choice Questions, Group discussions, Continuous Internal Assessment II (CIA - II).
	2	Major areas of Biological data bases- classification; primary, secondary, specialized.	3	To understand the major areas of Biological data bases	Lecture, PPT	
	3	Importance data bases- NCBI, SWISS-PROT, DDBJ. Tools and softwares in Bioinformatics	3	To construct the databases using softwares	Lecture, Video clips	
	4	Similarity search – BLAST – FASTA sequence alignment tools. Application of Bioinformatics.	3	To evaluate the similarity searches of biological data	Lecture, Video clips	

Course Instructor: Dr. J. Albino Wins

HOD: Dr. C. Jespin Ida

Semester: VI

Major Core - X

Name of the Course: Plant Physiology and Metabolism

Subject code: BC1763

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I PLANT-WATER RELATIONS						
	1	Importance of water	2	To understand the importance of water to plants	Lecture, PPT	Class test, Group Discussion, Quiz.
	2	Imbibition, diffusion, osmosis and plasmolysis.	3	To analyze the various actions of water in plants	Lecture, Experimental Learning	
	3	Concepts of water potential and its components.	2	To analyze the concepts of water potential and its components	Lecture, PPT	
	4	Transpiration and its significance, guttation. Factors affecting transpiration	4	To distinguish between transpiration and guttation and its importance	Lecture, PPT, Experimental Learning	
II MINERAL NUTRITION						
	1	Essential elements, macro and micronutrients Ascent of sap.	3	To understand the essential elements for plants	Lecture, PPT	Quiz, Class Test, Short test.
	2	Criteria of essentiality of elements; Role of essential elements	3	To analyze the criteria and role of essential elements	Lecture, PPT	

	3	Mechanism SPAC Concept	2	To learn SPAC concept	PPT, Lecture, Model	
	4	Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps, root pressure theory.	3	To understand the transport of ions	Lecture, Animation Video	
	5	Hydroponics	1	To acquire the skill of hydroponics	Lecture, Experimental model	

III PHOTOSYNTHESIS

	1	Ultrastructure of chloroplast	1	To learn the structure of chloroplast	Lecture, Chart	Short test, Question – Answer session, Group discussion, Continuous Internal Assessment I (CIA -I).
	2	Photosynthetic pigments structure; Photosystem I and II, reaction centre, antenna molecules	3	To understand the pigments and photosystem	Lecture, PPT	
	3	Electron transport (cyclic and non cyclic) and photophosphorylation	3	To differentiate cyclic and non-cyclic photophosphorylation	Lecture, PPT	
	4	C3, C4 and CAM pathways of carbon fixation	4	To understand the various pathways of carbon fixation	Lecture, PPT	
	5	Photorespiration	1	To learn about photorespiration	Lecture	

IV RESPIRATION						
	1	Ultrastructure of mitochondria	1	To learn the structure of mitochondria	Lecture, Chart	Quiz, Group Discussion Class test
	2	Glycolysis, anaerobic respiration, TCA cycle	4	To understand Respiration	Lecture, PPT, Animation Video	
	3	Oxidative phosphorylation, GS-GOGAT pathway	3	To acquire knowledge on GS-GOGAT pathway	Lecture, PPT, Chart	
	4	Nitrogen metabolism: Biological nitrogen fixation; Nitrate and ammonia assimilation	4	To learn about the nitrogen metabolism	Lecture, PPT,	

V PLANT GROWTH REGULATORS						
	1	Growth, Growth curve	3	To understand the plant growth	Lecture, PPT	Multiple Choice Questions, Group discussions, Continuous Internal Assessment II (CIA - II).
	2	Physiological roles of Auxin, Gibberellin, Abscisic acid and Ethylene	3	To analyze the physiological role of plant hormones	Lecture, PPT	
	3	Photoperiodism (SDP, LDP, Day neutral plants);	3	To evaluate different photoperiods effect on plants	Lecture, PPT	
	4	Vernalization, Phytochrome	3	To learn about vernalization and phytochrome	Lecture, Experiment learning	

Course Instructor: Dr. A. Anami Augustus Arul

HOD: Dr. C. Jespin Ida