

## 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
<b>I. Gene cloning, cloning vectors, restriction enzymes &amp; Gene transfer</b>						
	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
<b>II Plant Tissue Culture</b>						
	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
<b>UNIT III Plant tissue culture and Transgenic plants</b>						
	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
<b>IV DNA Replication and Protein Synthesis</b>						

	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
<b>V Gene regulation and mutation</b>						
	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 Prokaryotes- 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: Bojasa 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
<b>I.</b>						
	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
<b>II.</b>						
	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
<b>III.</b>						
	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**

<b>Unit</b>	<b>Module</b>	<b>Topics</b>	<b>Lecture hours</b>	<b>Learning outcome</b>	<b>Pedagogy</b>	<b>Assessment/ Evaluation</b>
<b>I GENES AND ITS INTERACTIONS</b>						
	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>Mirabilis 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	
<b>III PHOTOSYNTHESIS</b>						
	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, Absciscic 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**