B.SC. PROGRAMME OUTCOME (POs)

PO	Upon completion of B.Sc Programme, the graduates will be able to:
PO - 1	utilize scientific knowledge to pursue higher studies in the relevant field.
PO - 2	create innovative ideas to enhance entrepreneurial skills for economic independence.
PO - 3	face challenging competitive examinations that offer rewarding careers.
PO - 4	reflect upon green initiatives and take responsible steps to build a sustainable environment.
PO - 5	handle ethical issues with social responsibility.
PO - 6	communicate effectively and collaborate successfully with peers to become competent professionals.

Programme Specific Outcomes (PSO)

PSOs No.	Upon completion of B.Sc. Degree Programme, the graduates of Botany will be able to :	PO Addressed
PSO - 1	develop a strong and competent knowledge in Botany.	1
PSO - 2	communicate appropriately and effectively in science and also interact productively with people from diverse background.	6
PSO - 3	understand the basic professional skills through various laboratory technical training, to analyze the relevant biological situations.	2
PSO - 4	create green environment to protect nature for future sustenance.	4
PSO - 5	seek entrepreneurship through skill based, value added and related courses.	2
PSO - 6	understand the professional, ethical, legal and social issues related to gender.	5
PSO - 7	integrate the related topics from other branches of science to carry out projects to have a successful career.	3

Teaching Plan for the Academic Year 2020-2021

Odd Semester

Semester - III

Name of the Course : **Archegoniate**
Subject code : **BC1731**

No. of hours per week	Credit	Total no. of hours	Marks
4	4	60	100

CO	**Upon completion of this course the students will be able to :**	**PSO addressed**	**CL**
CO- 1	Describe the general characters of land plants	PSO-1, 7	U
CO- 2	Interpret the ecological and economic importance of archegoniate	PSO-2,4,7	Ap
CO- 3	Describe the external, internal and reproduction of archegoniate	PSO-1,5	U
CO -4	Understand the unique characters of Bryophytes	PSO-1,7	An
CO- 5	Classify pteridophytes based on spore formation	PSO-1,3	U
CO-6	Comment on the stelar evolution in Pteridophytes and compare with gymnosperms	PSO-1, 7	An
CO -7	Compare the fossil of pteridophytes and gymnosperms	PSO-1, 2	An

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

Unit	**Section**	**Topics**	**Lecture hours**	**Learning outcome**	**Pedagogy**	**Assessment/Evaluation**
I Bryophytes						
	1	Unifying features of bryophytes, transition to land habit Classification by Rothmalar (1951).	2	To familiarize with the characteristics of Bryophytes and its classification	Lecture Chart PPT	Quiz Short test Formative assessment
	2	Distribution,morphology, anatomy reproduction of *Marchantia*	3	To identify the structural features and different methods of	Lecure Group Discussion	

				reproduction in *Marchantia*		
	3	Distribution, morphology, anatomy, reproduction and life cycle of *Polytrichum*	2	To characterize the structural features and reproduction in *Polytrichum.*	Demonsration Model	
	4	Ecological and economic importance of Bryophytes	2	To imbibe the Ecological and economic importance of Bryophytes	Lecture Group Discussion	
II Pteridophytes						
	1	General characteristics of Pteridophytes Classification by Smith (1955)	3	To familiarize with the unique features of pteridophytes and also its classification	Lecture Classroom Discussion	Class test Assignment Formative assessment
	2	Types of stele and life cycle patterns of pteridophytes	2	To learn about the stelar evolution and life cycle patterns in pteridophytes	Lecture with PPT	
	3	Distribution, morphology, anatomy, reproduction and life cycle of *Psilotum*	4	To review the structure and life cycle of *Psilotum*	Lecture, demonstrating and showing charts	
III Pteridophytes						
	1	Distribution, morphology, anatomy, reproduction and life cycle of *Selaginella*	4	To apprehend the life cycle of *Selaginella.*	Lecture PPT	Class test Quiz Formative Assessment
	2	Distribution, morphology, anatomy, reproduction and life cycle of *Marsilea* Heterospory, seed habit and stelar evolution	3	To know the life cycle of Marsilea and to recognize the seed habit.	Lecturing, demonstration Charts	
	3	Ecological and economical importance of Pteridophytes	2	To grasp the ecological and economical importance of Pteridophytes	Lecture Classroom discussion	
IV Gymnosperms						

	1	General characteristics of Gymnosperms Classification by Chamberlain (1935)	3	To realize the general characters and the classification of Gymnosperms	Lecture Flow Chart	Class test Classroom quiz Formative assessment
	2	Salient features, distribution, morphology, anatomy and reproduction of *Pinus*.	4	To be aware of the special features and reproduction in *Pinus*	Lecture PPT	
	3	Ecological and economical importance of Gymnosperms.	2	To grasp the ecological and economical importance of Gymnosperms	Lecture Presentation	
V Fossils						
	1	Geological time scale	2	To understand the concept of eras	Lecture with PPT	Short test Multiple choice questions Choose the correct answer Formative assessment
	2	Methods of fossilization and importance of fossils.	2	To interpret the types of fosilization	Lecture PPT	
	3	Distribution, morphology, anatomy and reproduction of *Rhynia*	2	To figure-out the characteristics of pteridophytic fossil Rhynia	Lecturing, Chart	
	4	Distribution, systematic position, morphology, anatomy and reproduction of *Lyginopteris*	3	To get knowledge about the gymnosperm fossil- *Lyginopteris*	Lecture Fossil Specimen	

Course Instructor: **HoD: Dr. C. Jespin Ida**

Dr. Bojaxa. A. Rosy

Semester : **III**

Name of the Course: Major Elective – I (b)Nursery and Gardening

Sub. Code: BC1733

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks

4	4	60	100

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	incorporate lab to land programme by raising home garden and nurseries	PSO - 5	Ap
CO - 2	evaluate seed dormancy	PSO - 4	E
CO - 3	practice the different techniques in propagating horticultural plants	PSO - 5	Ap
CO - 4	explain the needed fertilizers in soil management	PSO - 7	U
CO - 5	understand the external factors necessary for plant growth	PSO - 3	U
CO - 6	explain the cultivation of different vegetable	PSO - 5	U

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I. Nursery:						
	1	Definition, objectives and scope of nursery	1	To know the definition, objectives and scope of nursery	Lecture Chalk and Talk	Formative assessment Assignment Quiz Short test
	2	Building up of infrastructure for nursery	1	To understand the building up of infrastructure for nursery	Lecture Video Clippings	
	3	Planning and seasonal activities - Planting	1	To be familiarize with planning and seasonal activities like planting	Lecture PPT	
	4	Planning and seasonal activities - Direct seeding and transplants.	2	To study the direct seeding and transplanting	Lecture Group discussion	
	5	Nursery practices for some important crops – Coconut and Arecanut	2	To practice the cultivation of Coconut and Arecanut	Lecture PPT	

	6	Nursery practices for some important crops – Pepper and Cardamom.	2	To practice the cultivation of Pepper and Cardamom.	Lecture PPT	
1I. **Seed**						
	1	Structure and types of seeds	2	To Know the Structure and types of seeds	Chalk and talk	Formative assessment Assignment Short test Quiz Assessing their creative knowledge
	2	Seed dormancy; causes and methods of breaking dormancy	2	To be familiarize the causes and methods of breaking dormancy of seeds	Lecture Illustrations	
	3	Seed banks and factors affecting seed viability	2	To understand the importance of Seed banks and seed viability	Lecture	
	4	Seed production technology; seed testing and certification.	3	To analyze the testing and certification of seeds	Lecture Video Clippings	
III. Hardening of plants**:**						
	1	Vegetative propagation: Layering - air and ground layering,	1	To understand the different types of vegetative propogation	Lecture, PPT	Group Discussion Formative Assessment Assignment Quiz Short test
	2	Vegetative propagation: Cutting, selection of cutting, collecting season	1	To learn about the cutting and its selection	Lecture, Video Clippings	
	3	Treatment of cutting, rooting medium and planting of cuttings.	1	To know the treatment and planting of cuttings	Lecture, Chalk and Talk	

	4	Greenhouse	1	To realize the importance of greenhouse	Lecture, PPT	
	5	Mist chamber	1	To practice the plants grow through mist chamber	Lecture, Video clippings	
	6	Shade house	2	To know the importance of shade house	Lecture, Video clippings	
	7	Glass house	2	To apply the various methods to make glass house	Lecture, Group discussion	
IV. Gardening:						
	1	Gardening -Definition and scope	1	To learn about the definition and scope of gardening	Lecture	Formative Assessment Assignment Quiz Short test Group Discussion
	2	Formal - Mughal	2	To understand the formal type of gardening with reference to Mughal gardens	Lecture PPT Video clippings	
	3	Informal - Japanese	1	To understand the informal type of gardening with reference to Japanese gardens	Lecture PPT Video clippings	
	4	Rock garden and water garden,	1	To learn about the construction of rock and water garden	Lecture PPT Video clippings	
	5	Bog or Marsh garden, Sunken garden and Roof garden.	2	To know about Marsh, Sunken and Roof garden	Lecture PPT Video clippings	
	6	Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.	2	To realize the importance of gardening operations	Lecture PPT Video clippings	

V. Cultivation of crops:						
	1	Cultivation of vegetable crops – Tomato, Brinjal	2	To know the Cultivation of vegetable crops – Tomato, Brinjal	Lecture, demonstration	Assessing their practical knowledge Formative Assessment Assignment Quiz Short test
	2	Cultivation of root crops– Radish, Carrot	2	To study the Cultivation methods of Radish and Carrot	Lecture, demonstration	
	3	Cultivation of Cucumber, Bitter gourd	2	To practice the cultivation of Cucumber and Bitter gourd	Lecture, demonstration	
	4	Storage and marketing procedures of economic important edible crops	3	To apply the Storage and marketing procedures of edible crops	Lecture, videos	

Course Instructor: **HoD: Dr. C. Jespin Ida**

Dr. A. Anami Augustus Arul

Semester : **III**
Name of the Course : **Taxonomy of Angiosperms and Plant Physiology (Allied –II)**

Subject code : **BA1731**

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
4	4	60	100

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO-1	Recall the main features of angiosperms	PSO-2,6	R
CO-2	Understand the respiratory processes carried out by plants	PSO-4,7	U

CO-3	Apply their physical and biochemical knowledge to evaluate the processes involved in photosynthesis	PSO-1,2,4	Ap
CO-4	Analyze the various processes involving in water uptake and transport in plants.	PSO-3,4	An
CO-5	Classify the different plants by the natural, artificial and phylogenetic classification	PSO-1,2,6	An
CO-6	Interpret the role of growth hormones in plants	PSO-2,4,9	Cr

Modules

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

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
I Taxonomy						
	1	Morphology: Root, stem, leaf	3	To identify modifications in root, stem, leaf	Using models Lecture	Multiple choice Short test Assignment Formative assessment Quiz
	2	Inflorescence and fruit types	3	To differentiate and classify inflorescence and fruits	Lecture Presentation	
	3	Classification – artificial, natural (Bentham & Hooker's) phylogenetic, Bionomial nomenclature	3	To distinguish the different types of classification	Group discussion Lecture	
II Taxonomy						
	1	Families and their economic importance - Annonaceae	2	To analyze the floristic features of families under study and impart the economic	Demonstration Lecture	Formative assessment Quiz Short test Assignment

				importance of Annonaceae		
	2	Families and their economic importance of Rutaceae, Lamiaceae	3	To analyze the floristic features of families under study and impart the economic importance of Rutaceae, Lamiaceae	Demonstration Lecture	
	3	Families and their economic importance - Euphorbiaceae and Poaceae.	4	To analyze the floristic features of families under study and impart the economic importance of these families.	Hands on training Lecture	
III Plant Physiology						
	1	Importance of water to plant life - imbibition, diffusion,osmosis and plasmolysis. Absorption of water - passive and active mechanisms	5	To observe the water relationship in plant	Experiment Lecture	Formative assessment. Short test Assignment Quiz
	2	Ascent of sap, transpiration – types	2	To analyze the ascent of sap and types of transpiration	Experiment Video Clippings	
	3	Brief note on stomatal movement.	2	To infer the stomatal movement	Lecture	
IV Plant Physiology						
	1	Photosynthesis: photosynthetic apparatus,	7	To know the mechanism	Lecture, Group discussion,	Formative assessment Quiz

		Mechanism of photosynthesis, Pigment systems, light dependent reactions - C_3 Cycle		of photosynthesis	Video Clippings	Assignment Group test
	2	Factors affecting photosysnthesis.	2	To Know the factors affecting photosynthesis	Lecture PPT	
V Plant Physiology						
	1	Respiration: Types - aerobic (glycolysis, Kreb's cycle and oxidative phosphorylation) Anaerobic (fermentation)	5	To understand the respiratory processes carried out by plants	Lecture, Illustration	Formative assessment Short test Multiple choice Quiz Assignment
	2	Factors affecting respiration	2	To observe the various factors affecting respiration	Demonstrration Lecture	
	3	Plant growth - Growth hormones – physiological role of auxins and Gibberellins	2	To interpret the role of growth hormones in plants	Flow Chart Lecture	

Course Instructor: Dr. A.R. Florence **HoD: Dr. C. Jespin Ida**

Semester - V

Name of the course: Taxonomy and Economic Botany Sub.

Code: BC1751

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
6	5	90	100

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	Relate the modifications in plant parts	PSO - 7	U
CO - 2	Evaluate the taxonomists of India	PSO - 1	Ev
CO - 3	Differentiate the artificial, natural and phylogenetic classification and learn about ICN rules	PSO - 1	An
CO - 4	construct digital herbarium and learn about Herbarium techniques	PSO - 5	C
CO - 5	Recall the characters of some important families	PSO - 6	R
CO - 6	Understand the economic importance of plants and their use at various levels	PSO - 1	U

Unit	Module	Topics	Lecture Hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Morphological modifications and contribution by taxonomists**					
	1.	Objectives and importance of systematic botany	2	To realizethe objectives and importance of systematic botany	Lecture	Class test Formative assessment
	2.	Morphology of root, stem, leaf and their modifications.	4	To differentiate the morphology of root, stem and leaf and their modifications	Lecture Demonstration with live Specimens	
	3.	Morphology of inflorescence, flower, fruit and their modifications	5	To learn about the different types of inflorescence, flower and fruit	Lecture Demonstration with live Specimens	

	4.	Contribution to systematic botany by Indian Taxonomist – K.M. Mathew	2	To study the renowned contribution of K.M Mathew in the field of Indian taxonomy	Lecture using chalk and board	
	5.	Contribution to systematic botany by Indian Taxonomist – HermenegildSantapau	2	To appreciate the contribution to systematic botany by HermenegildSantapau's	Lecture using chalk and board	
II	**Different systems of classification, principles of ICN and herbarium techniques**					
	1.	Systems of classification; Artificial – Linnaeus Natural – Bentham and Hooker Phylogenetic - Engler and Prantle merits and demerits	4	To gain knowledge on different types of classification	Lecture PPT	Quiz Class Test Multiple choice questions
	2.	APG Classification – an outline	3	To know the classification of families based on DNA sequences	Lecture and group discussion	
	3.	Chemotaxonomy	2	To categorizeplants on the basis of secondary metabolites present	Lecture using chalk and board	
	4.	Nomenclature – Binomial system	2	To understand *binomial system of nomenclature*	Lecture group discussion	
	5.	Principles of ICN Type method, Principle of priority and Author citation Effective and valid publication	3	To know the principles of ICN in detail	Lecture PPT	

	6.	Herbarium techniques. Digital Herbarium	1	To learn different herbarium techniques	Lecture Demonstration	
III	**Detailed study of the following families with their economic importance**					
	1.	Detailed study of the family Annonaceae with their economic importance	3	To understand the distinguishing features and economic importance of the family Annonaceae	Lecture Demonstration	Formative assessment Quiz Short test Assignment
	2.	Detailed study of the family Brassicaceae with their economic importance	2	To understand the distinguishing features and economic importance of the family Brassicaceae	Lecture PPT	
	3.	Detailed study of the family Rutaceae with their economic importance	2	To understand the distinguishing features and economic importance of the family Rutaceae	Lecture Chalk and board	
	4.	Detailed study of the family Meliaceae with their economic importance	3	To understand the distinguishing features and economic importance of the family Meliaceae	Lecture PPT	
	5.	Detailed study of the family Caesalpiniaceae with their economic importance	2	To understand the distinguishing features and economic importance of the family Caesalpiniaceae	Lecture demonstration	
	6.	Detailed study of the family Myrtaceae with their economic importance	3	To understand the distinguishing features and economic importance of the family Myrtaceae	Lecture demonstration	
IV	**Detailed study of the following families with their economic importance**					
	1.	Detailed study of the family Cucurbitaceae with their	3	To learn the distinguishing features and economic importance of the	Lecture Group discussion	Short test Multiple choice questions

		economic importance		family Cucurbitaceae		Quiz Assignment
	2.	Detailed study of the family Rubiaceae with their economic importance	3	To know the distinguishing features and economic importance of the family Rubiaceae	Lecture chalk and board	
	3.	Detailed study of the family Solanaceae with their economic importance	3	To understand the distinguishing features and economic importance of the family Solanaceae	Lecture demonstration	
	4.	Detailed study of the family Sapotaceae with their economic importance	2	To learn the distinguishing features and economic importance of the family Sapotaceae	Lecture Group discussion	
	5.	Detailed study of the family Apocynaceae and Asclepiadaceae with their economic importance	4	To know the distinguishing features and compare the characters of both the families - Apocynaceae&Asclepiadaceae	Lecture Demonstration	
V	**Detailed study of the following families with their economic importance**					
	1.	Detailed study of the family Lamiaceae with their economic importance	3	To know the distinguishing features and economic importance of the family Lamiaceae	Lecture demonstration	Quiz Formative assessment Short test
	2.	Detailed study of the family Euphorbiaceae with their economic importance	3	To learn the distinguishing features and economic importance of the family Euphorbiaceae	Lecture demonstration	

	3.	Detailed study of the family Amaranthacea e with their economic importance	3	To understand the distinguishing features and economic importance of the family Amaranthaceae	Lecture group discussion	
	4.	Detailed study of the family Arecaceae with their economic importance	2	To learn the distinguishing features and economic importance of the family Arecaceae	Lecture demonstrati on	
	5.	Detailed study of the family Cannaceaeand Orchidaceaewi th their economic importance	2	To know the distinguishing features and compare the characters of both the families – Cannaceae& Orchidaceae	Lecture PPT	
	6.	Detailed study of the family Poaceae with their economic importance	2	To learn the distinguishing features and economic importance of the family Poaceae	Lecture demonstrati on	

Course Instructor: Dr. Bojaxa A. Rosy **HOD: Dr. C. Jespin Ida**

Name of the Course: Biochemistry and Biophysics

Sub. Code: BC1752

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
6	5	90	100

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	identify the levels of structure in proteins and describe its biological roles	PSO - 3	R
CO - 2	understand the structure, properties and fundamentals of biomolecules	PSO - 3	U
CO - 3	demonstrate thermodynamic principles in biological energy conversion	PSO - 4	Ap
CO - 4	analyze enzyme activity	PSO - 9	An
CO - 5	compare the structure of saturated fatty acids with unsaturated fatty acids	PSO - 9	E
CO - 6	analyse the biological data and interpret data with the hypothesis	PSO - 3	An

Unit	Module	Topics	Lecture Hours	Learning out come	Pedagogy	Assessment/ Evaluation
I	**Carbohydrates**					
	1	Types ofbonds	2	Distinguish the different types of bonds under study	Lecture Illustration	Short test Quiz Assignment on applications. Formative assessment
	2	P^H and Buffer	2	Evaluate the importance of buffer in biological systems	Experimental learning	
	3	Monosaccharides structure and properties of glucose and fructose Isomers of monosaccha	5	Learn the structure and properties selected monosaccharides	Lecture with PPT	

		rides				
	4	Disaccharides- structure and properties of maltose, Sucrose and Lactose	3	Analyze the structure and properties of disaccharides	Lecture with PPT	
	5	Polysaccharides- structure and properties of starch and cellulose	3	Compare the structure and properties of homo and hetero polysaccharides	Lecture with PPT	
II	**Proteins and Vitamins**					
	1	Amino Acids structure and properties	3	Know the importance of Amino Acids	Lecture with PPT	Short test Quiz Short questions Multiple choice questions Formative assessment Multiple Choice Questions
	2	Protein- Primary and secondary structure and properties	3	Explain the different bonds involved in primary and secondary structure of proteins	Lecture with PPT	
	3	Protein - tertiary and quaternary structure; Biological roles of proteins	3	Learn the structure of myoglobin and haemoglobin and biological functions of Proteins	Lecture with PPT	
	4	Vitamins - structure, importance, sourcesand deficiency symptoms of Thiamine, riboflavin and niacin	3	Analyze the structure and importance of thiamine, riboflavin and niacin	Lecture Discussion with PPT illustration	
	5	Fat soluble	3	Understand the	Lecture Group	

		vitamins- A, D and Ergosterol		fat-soluble vitamins and its importance	Discussion	
III	**Lipids and Nucleic Acids**					
	1	Lipids - classification and properties	3	Understand the classification of lipid based on its characteristics	Illustration Lecture	Short Test Short questions Quiz Multiple Choice Questions Formative assessment
	2	Fatty acids structure and functions essential fatty acids.	3	Discuss the structure and properties of fatty acids and their biological functions	Lecture PPT	
	3	General account of lipids (simple lipids Compound lipids and derived lipids)	3	Compare the structure and properties of triglycerides, phospholipids and cholestrol	Lecture Discussion	
	4	Nucleic acids- Structure of DNA	2	To study the double helical model of DNA structure (Watson and Crick)	Brain Storming Lecture	
	5	Nucleic acids- Structure of RNA.	4	Differentiate the structure and role of tRNA, mRNA and rRNA	PPT 3D structure Lecture	
IV	**Enzymes**					
	1	Nomenclature and classification of enzymes	3	Discuss the classification, nomenclature of enzyme	Illustration Lecture	Listing out important terms Slip test Formative assessment Short test Quiz Formative Assessment
	2	Structure of enzymes Activesite	3	Understand the role of active site in an enzyme	Lecture PPT	
	3	Cofactors, coenzymes,	3	Compare the role of cofactors,		

		isoenzyme		coenzymes, isoenzyme		
	4	Mechanism of enzyme action (activation energy, lock and key hypothesis, Induced - fit theory),	3	Analyze the mode of action of enzyme	Lecture PPT	
	5	Enzyme inhibition and factors affecting enzyme activity	3	Recall the inhibitory properties of enzymes	Lecture PPT	
V	**Bioenergetics**					
	1	Laws concept of free energy, endergonic and exergonic reactions, coupled reactions and redox reactions.	3	Analyse the law of thermodynamics and concepts of energy	Lecture, PPT Group discussion	Quiz Formative Assessment Short test Open book test Slip test
	2	ATP: structure, its role as a energy currency molecule	3	Imbibeknowledg e on the role of ATPin human body	Lecture PPT	
	3	Photobiology - Dual nature of light and its characteristics.	2	Know the dual nature of light	Lecture	
	4	Electro Magnetic Spectrum, Action and Absorption	3	Compare the different types of spectrum based on their function	Lecture PPT Group discussion	

		spectrum,.				
	5	Emission spectrum – excitation and de-excitation Phosphorescence, fluorescence and bio-luminescence.	4	Differentiate different types of light emissions	Lecture PPT	

Course Instructor: Dr. Sr. P. Leema Rose HOD: Dr. C. Jespin Ida

Name of the Course : Microbiology and Plant Pathology
Subject Code : BC1753

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
5	4	75	100

CO	Upon completion of this course the students will be able to:	PSO addressed	CL
CO - 1	be familiarize with basic information about microbiology and microbiologists	PSO - 1	U
CO - 2	explore the role and relevance of viruses and bacteria in the field of microbiology	PSO - 4	Ap
CO - 3	work safely, competently and effectively in the microbiology laboratory	PSO - 9	An
CO - 4	undertake careers in microbiology through the hands – on - training techniques they learnt	PSO - 3	C
CO - 5	recognize the signs and symptoms of important plant diseases and the major issues that arise due to such infections	PSO - 7	U

Unit	Module	Topics	Lecture Hours	Learning Outcome	Pedagogy	Assessment /Evaluation
Bacteria- Structure, Nutrition and Reproduction						
I	1	Bacteria- size, shape and arrangement	2	To be familiarize with different types of bacteria	Lecture PPT Microslides	Formative Assessment Quiz Short test
	2	Bacterial cell wall and cytoplasmic membrane	3	To know theE.M structureof bacterial cell	Lecture Charts	
	3	Bacterial flagella, pili, capsule and mesosomes	2	To study the different types bacterial cell components	Lecture Illustration	
	4	Nutritional type of bacteria	2	To differentiate bacteria based on their mode of nutrition	Lecture Group Discussion	
	5	Reproduction in bacteria	3	To understand the bacterial reproduction	Lecture Models	
Contribution of microbiologists, Virus-Structure, reproduction and types						
II	1	Contribution of Leeuwenhoek, Pasteur and Koch	4	To apprehend the valuable contribution of microbiologists	Lecture Group discussion	Formative assessment Quiz Multiple choice questions Short test
	2	Virus- General Characters	2	To understand the characters of virus	Lecture Debate	
	3	Reproduction in bacteriophage	2	To differentiate lytic cycle from lysogenic cycle	Lecture PPT	
	4	Structure of DNA virus	2	To study the structure of T-phage DNA virus	Lecture Chart	
	5	Structure of RNA virus	2	To differentiate DNA from RNA virus	Lecture PPT	
Growth of Microorganisms, Sterilization Methods						
III	1	Growth Curve, Pure, batch and continuous culture	3	To comprehend growth of microorganisms	Lecture Demonstration	Formative Assessment Quiz Assignment
	2	Characteristics of bacteria	2	To perceive the characteristic features of bacteria	Lecture Chart	
	3	Physical and chemical agents for controlling	2	To be familiar with the various	Lecture PPT	

		microorganisms		physical and chemical agents to control the growth of microorganisms		
	4	Dry and wet sterilization	2	To know the types of sterilization methods	Lecture Demonstration	
	5	Working principles of Autoclave, Laminar Air Flow and Incubator	3	To study the principles, working mechanisms and uses of various microbiologicaleq uipments	Lecture Hands on training	
Food, Dairy and Water Microbiology						
IV	1	Food spoilage through microbes	2	To assay the food spoiled by microbes	Lecture Demonstration	Formative assessment Quiz Short test Testing their Practical skill
	2	Food borne infections and preventions- Botulism and Salmonellosis	3	To perceive food borne infection and treatment	Lecture PPT	
	3	Sources of milk contamination Test for grading milk	2	To create an awareness about sources of milk contamination and milk grading	Lecture Demonstration	
	4	Pasteurization technique	2	To understand the steps involved in pasteurization	Lecture Field Visit	
	5	Portable and nonportable water	1	To identify portable andnon-portable water	Lecture Group Discussion	
	6	Test for detection of coliform bacteria	2	To test coliform bacteria in water	Lecture Hands on training	
Plant Pathology, Study of selected plant diseases						
V	1	Introduction to plant pathology	2	To realize the importance of plant pathology	Lecture	Class test Multiple choice questions Formative assessment Identification of diseased
	2	Causal organism, symptoms, dissemination, disease cycle and control measures of citrus	2	To apprehend the characters of citrus canker and its prevention	Lecture PPT Specimen	

		canker				plants
	3	Causal organism, symptoms, dissemination, disease cycle and control measures of bunchy top of banana	2	To know the disease cycle and prevention measures of bunchy top of banana	Lecture Specimen Chart	
	4	Causal organism, symptoms, dissemination, disease cycle and control measures of tikka disease of ground nut	2	To grasp the microorganism involved in tikka disease of ground nut	Lecture PPT	
	5	Causal organism, symptoms, dissemination, disease cycle and control measures of red rot of sugarcane	2	To be aware of red rot of sugarcane and its disease cycle	Lecture Specimen	
	6	Causal organism, symptoms, dissemination, disease cycle and control measures of late blight of potato	2	To study life cycle of fungus that infects potato and causes the late blight disease	Lecture Group Discussion	

Course Instructor: Dr.A.Anami Augustus Arul H.O.D: Dr.C.Jespin Ida

Name of the course: Biological techniques(c)

Sub. Code: BC1756

Number of Hours Per week	Number of Credits	Total Number of Hours	Marks
5	5	75	100

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO - 1	determine the basic principles and techniques of instrument used in biology	PSO - 1	U
CO - 2	apply the skill ofmicrotechniques in preparing permanent slides	PSO – 3,5	Ap
CO - 3	understand the basic units of measurement	PSO - 1	U

CO - 4	recall the structure and functions of given instruments and develop creative skills for establishment	PSO – 6,9	R,C
CO - 5	demonstrate, use the techniques, skills, and tools necessary in research	PSO – 3,6	Ap
CO - 6	handle the biological instruments properly, competently and effectively in the laboratory	PSO - 9	An

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
Microscopy and micrometry						
I	1	General introduction of Microscopy and micrometry	2	To Know the importance of Microscopy and micrometry	Lecture	Assessing their knowledge through simple questions Formative assessment Short test
	2	Principles and techniques of Light microscope	3	To understand the working mechanism of Light microscope	Lecture Illustrations	
	3	Principles and techniques of EM	2	To study the Principles, specimen preparation for EM	Lecture, Video clippings	
	4	Principles and techniques of TEM and SEM	3	To be familiarize the Principles, working mechanism and comparison of TEM and SEM	Lecture Video clippings	
	5	Principles and techniques of Fluorescent microscopy	2	To study the principle and the applications of Fluorescent microscope	PPT presentation	
Microtechniques						
II	1.	Introduction to microtechniques	1	To recall the scope ofmicrotechnique	Chalk and talk method	Formative assessment Quiz Assessing
	2.	Aims, types and mechanism of fixation and common cytological fixatives	3	To understand the importance of fixation and common fixatives	Lecture	

	3.	Dehydration, embedding and sectioning with rotary microtome. Types of stains and staining; mechanism of staining	5	To learn and demonstrate the various stepsinvolved in permanent slide preparation	Demonstration	their practical knowledge
	4.	Principles and methods of microphotography	3	To understand the Principles and methods of microphotography	PPT Presentation	
Basic units and Centrifugation						
III	1	Introduction to basic units	1	To know the basic units of weights	Lecture	Quiz
	2	Atomic weight, molecular weight, Gram molecular weight, Equivalent weight and Gram equivalent weight	4	To differentiate the various units of weight	Lecture; Chalk and talk	Group discussion
	3	Preparation of solutions: Molar (M), Normal (N), Weight - volume per cent w/v, osmolar, molal (m), parts per million(ppm).	4	To learn the preparation of Normal and Molar solutions	Demonstration	Solving problem related to preparation of different concentrations of solutions
	4	Ultracentrifuge-Basic principles, types and their applications	3	To know the Centrifugation techniques, principle and working mechanism of Ultracentrifuge	Chalk and talk method	
Instrumentation						
IV	1.	Structure and functions of pH meter	2	To understand basic principle, working mechanism and usage ofpH meter	Lecture Demonstration	Group discussion Short test
	2	Structure and functions of Colorimeter	2	To understand the aim and working mechanism of	Lecture Demonstration	Assessing their practical knowledge

				Colorimeter		
	3.	Introduction to Spectroscopic techniques	2	To know the principles of light absorption	Lecture with PPT	
	4.	Basic principlesand laws of UV-Vis spectrophotometry	3	To study the working mechanism and application ofUV-Vis spectrophotometry	Lecture with demonstration	
	5.	Principle and working mechanism of Atomic Absorption Spectrophotometer	3	To learn theworking mechanism of Atomic Absorption Spectrophotometer	Lecture Video clippings	
Chromatographic & Electrophoretic Techniques						
V	1	Basic principles and applications of Paper ChromatographyandThin Layer Chromatography	2	To understand the principles behind the separation of phytochemicals through Thin Layer Chromatography	Lecture Demonstration	Group Discussion Formative assessment, Quiz Short test
	2	Basic principles and applications of Column Chromatography	2	To know the principles and applications of Column Chromatography	Lecture PPT	
	3	Basic principles and applications of HPLC	2	To study the basic principles and applications of HPLC	Lecture and PPT	
	4	Principles, types and applications of Agarose gel electrophoresis	2	To realize the principle and applications of Agarose gel electrophoresis	Lecture Video clippings	
	5	Principles, types and applications of Native PAGE and SDS –PAGE electrophoresis	2	To understand the Principles, types and applications of PAGE electrophoresis	Lecture PPT	