

Semester : II Major Core IV

Name of the Course : Plant Diversity II -Pteridophyta, Gymnosperms and Palaeobotany

Subject code : PB2021

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I. PTERIDOPHYTES – INTRODUCTION</b>						
	1	Origin and evolution of vascular plants; Stelar evolution	4	To know the basics of vascular plants	Lecture	Group discussions,
	2	Telome theory; Apogamy and apospory	4	To understand about apogamy and apospory	Lecture, Charts	
	3	Economic importance of	4	To evaluate and categorize	Lecture,	
		Pteridophytes. Classification of pteridophytes by G.M. Smith		pteridophytes	PPT	Question – Answer sessions, Quiz.
<b>II PTERIDOPHYTES – REPRODUCTION</b>						
	1	Range of thallus structure, reproduction and evolution of gametophytes and sporophytes of the following orders: <i>Psilotales</i> , <i>Lycopodiales</i>	4	To evaluate the detailed information about different orders of pteridophytes	Lecture, Microscopic slides, PPT	

	2	<i>Selaginellales, Isoetales, Equisetales.</i>	5	To correlate the different orders of pteridophytes	Lecture, microscopic slides, live specimens, PPT	Short Test, Discussions, Microscopic observation, Quiz
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### III PTERIDOPHYTES – REPRODUCTION

	1	<i>Ophioglossales, Osmundales, Filicales and Salviniiales</i>	5	To evaluate the detailed information about different orders of pteridophytes	Lecture, microscopic slides, live specimens, PPT	Open Book Test, Microscopic observation, Continuous Internal Assessment I (CIA-I)
	2	Sporangial development - Eusporangiate and Leptosporangiate types, heterospory and origin of seed habit and soral evolution	4	To understand the different forms of sporangia	Lecture, Illustrations	

### IV GYMNOSPERMS

	1	Affinities and evolution of gymnosperms; Classification of gymnosperms (K.R. Sporne, 1965);	4	To evaluate and categorize Gymnosperms	Lecture, PPT	
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	2	General characters - morphological, reproductive characters, phylogeny and interrelationship of the orders - <i>Cycadales</i> , <i>Ginkgoales</i>	4	To understand the general characters of different orders of Gymnosperms	Lecture, Illustration, Permanent slides	Microscopic observation, Short Test, Online Quiz
	3	<i>Coniferales</i> and <i>Gnetales</i> .	4	To understand the general characters of different orders of Gymnosperms	Lecture, Illustration, Permanent slides	

#### V PALAEOBOTANY

	1	Geological time scale; Methods of fossilization and determination of the geological age of fossils, carbon dating	4	To assess the different methods of fossilization	Lecture, Permanent slides	Microscopic observation, Question –
	2	A brief study of the following fossil Pteridophytes: <i>Rhynia</i> , <i>Lepidodendron</i>	4	To know about the different fossil Pteridophytes	Lecture, Permanent slides	
	3	<i>Sphenophyllum</i>	4	To know	Lecture,	
		and <i>Calamites</i> .		about the different fossil Pteridophytes	Permanent slides, PPT	Answer session, Group Discussion,

4	A brief study of the following fossil Gymnosperms: <i>Lyginopteris</i> , <i>Cycadoidea</i>	3	about the different fossil Gymnosperms	Lecture, Permanent slides	Continuous Internal Assessment II (CIA-II)
5	<i>Pentaxylon</i> and <i>Cordaites</i> .	3	about the different fossil Gymnosperms	Lecture, Permanent slides, PPT	

Course Instructor: Dr. J. Celin Pappa Rani

HOD: Dr. C. Jespin Ida

**Semester : II Major Core V**

**Name of the Course : Research Methodology**

**Subject code : PB2022**

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I. RESEARCH – INTRODUCTION</b>						
	1	Research- Objectives of research, Types of research, Significance	2	To know the objectives of research	Lecture, PPT	
	2	Literature collection- Index card, reference card and Abstract card	2	To assess the literature collection	Lecture	
	3	Literature citation- Different systems	3	To evaluate the	Lecture	

		of citing references- Name year system, Citation sequence system and Alphabet number system		Literature citation		Short Test, Quiz, Question – Answer session, Thesis evaluation.
4	Research report, components of a project report, tables, figures, foot note, thesis format, journal format- appendices	3	To understand the components of project report	Lecture, PPT, Models		
5	E- Journal and e-book. Role of supervisors/ Guides in research	3	To understand about E- journal and e- book	Lecture, Models		

## II MICROSCOPY

1	Microscopy – Principle, Instrumentation and uses of Light Microscope, Dark-Field Microscope	3	To operate microscope	Lecture, Operating microscopes	Lab test, Diagrammatic representation, Quiz
2	Phase contrast Microscope, Fluorescent Microscope	3	To operate microscope	Lecture, Operating microscopes	
3	Electron Microscope – SEM and TEM, Confocal Microscope	3	To operate microscope	Lecture, Operating microscopes	
4	Micrometry; Photomicrometry	3	To measure microscopic specimens	Lecture, PPT	

### III SPECTROPHOTOMETRY & CHROMATOGRAPHY

	1	Spectrophotometer - Principle, Instrumentation and uses of UV- Vis Spectrometry, Atomic Adsorption Spectrometry	4	Able to operate Spectrophotometer	Lecture, PPT, Operating Spectrophotometer	Lab test, Short test, Diagrammatic representation, Continuous Internal Assessment I (CIA-I)
	2	Nuclear Magnetic Resonance Spectrometry, Flame Photometer	3	Able to operate Spectrophotometer	Lecture, Operating instruments	
	3	Chromatography – Affinity Chromatography, Ion exchange chromatography and High Performance Liquid Chromatography	4	Able to perform chromatography	Lecture, Experimental approach	

### IV CENTRIFUGATION & ELECTROPHORESIS

	1	Centrifugation – Principles of sedimentation, Types of rotors, Differential centrifugation, Density gradient centrifugation, Ultracentrifuge	4	Able to operate centrifuge	Lecture, Experimental approach	Lab test, Group
	2	Electrophoresis – Agarose gel electrophoresis (AGE), Sodium Dodecyl Sulphate- Polyacrylamide Gel Electrophoresis	4	Able to perform electrophoretic analysis	Lecture, Experimental approach	

		(SDS-PAGE)				discussion, Diagrammatic representation, Open book test.
	3	PCR – Principle and technique.	2	To understand and perform PCR	Lecture, Experimental approach	
	4	Cryobiology – Lyophilization and its application in Biology	3	To know about the importance of Cryobiology	Lecture, PPT	
<b>V BIOSTATISTICS</b>						
	1	Data collection and Analysis of data – Mean, Medium, Mode, Standard deviation, Standard error	4	To analyse and interpret different data	Lecture, Problem solving methods	Problem Solving Tests, Objective type test, Continuous Internal Assessment I (CIA-II)
	2	Student ‘T’ test, Chi – square test	2	To solve statistical data problems	Lecture, Problem solving methods	
	3	Correlation, Regression	2	To solve and correlate statistical data	Lecture, Problem solving methods	
	4	ANOVA, SPSS	3	To solve statistical data	Lecture, Problem solving methods	

Course Instructor: Dr. J. Albino Wins

HOD: Dr. C. Jespin Ida

Name of the Course : Cell Biology and Biomolecules

Subject code : PB2023

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I CELL ORGANELLES</b>						
	1	Cell Type: History and origin. Difference between Prokaryotic and Eukaryotic cell	2	To know the difference between Prokaryotic and Eukaryotic cell	Lecture	Short test, Group discussions, Microscopical Observations
	2	Plasma Membrane: History, Ultrastructure, and chemical composition of plasma membrane (Lamellar-models, micellar models and fluid mosaic model). Functions of plasma membrane	4	To understand the structure and importance of plasma membrane	Lecture, model, PPT	
	3	Mitochondria: History and structure of mitochondria, biogenesis and functions of mitochondria (Respiratory chain complex and Electron transport mechanism).	4	To understand the structure and functions of mitochondria	Lecture, model, PPT	

## II CHROMOSOME AND CELL DIVISIONS

1	<p>Endoplasmic Reticulum, Ribosome, Golgi Bodies: History, structure, functions and importance.</p> <p>Lysosomes, Centrioles, Microtubules: History, structure, functions and Importance</p>	4	<p>To know the structure and functions of Endoplasmic Reticulum, Ribosome, Golgi Bodies, Lysosomes, Centrioles, Microtubules.</p>	Lecture, PPT, Video clippings	<p>Class test, Open Book Test, Group discussion</p>	
2	<p>Nucleus: History, structure, functions and importance; Chromosomes: History, types and functions of chromosomes. Giant chromosomes, Polytene chromosome and Lamp brush chromosome</p>	5	<p>To learn about nucleus and chromosome,</p>	Lecture, PPT, Experimental Approach		
3	<p>Cell Division: Mitosis (cell cycle stages, cytokinesis) Meiosis (reproductive cycle stages, synoptonemal complex, recombination nodules). Comparison</p>	3	<p>To differentiate mitosis and meiosis</p>	Lecture, PPT, Experimental Approach		

		between meiosis and mitosis				
<b>III CARBOHYDRATES</b>						
	1	Carbohydrates - structure and properties of Monosaccharides - ring structure. Oligosaccharides - sucrose and maltose	6	To know about the structure and properties of biomolecules – Monosaccharides and Oligosaccharides.	Lecture, PPT	Class Test, Open Book Test, Group discussion, Continuous Internal Assessment I (CIA-I)
	2	Polysaccharides - starch, cellulose, pectin and agar - Glycosidic linkage formation	4	To understand the structure and properties of biomolecules - Polysaccharides	Lecture, Charts	
	3	Structure and properties of amino acids and proteins – Denaturation and renaturation of proteins.	5	To evaluate the importance of proteins and to assess the difference between Denaturation and renaturation.	Lecture, PPT	
	4	Purification of proteins	4	To enhance the skill in purifying proteins	Lecture, Experimental approach	
<b>IV LIPIDS</b>						
	1	Lipids- Classification- Structure and properties- Triglycerides, compound lipids- phospholipids-	3	To understand the structure and properties of lipids	Lecture, PPT	

		cholesterol				Class Test, Question – Answer session.
	2	Structure- Biosynthesis of DNA and RNA	2	To evaluate the difference between the biosynthesis of DNA and RNA	Lecture, Video clippings	
	3	Secondary metabolites- Alkaloids, Glycosides, Steroids and Terpenoids. Vitamins	4	To assess the importance of Secondary metabolites	Lecture, Models	

#### V ENZYMES

	1	Enzyme - Nomenclature and classification - IUB system – properties, Active site	4	To categorize enzymes	Lecture, PPT	Class test, Group discussion, Continuous Internal Assessment II (CIA-II)
	2	Mechanism of enzyme action (Fisher's Lock and Key model and Koshland's Induced fit model) - Activation energy	3	To understand the mechanism of enzyme action	Lecture, Video clippings	
	3	Enzyme regulation - activators and inhibitors - coenzymes. Isoenzymes	3	To critically analyse the regulation of enzymes	Lecture, PPT	

Course Instructor: Dr. N. Benit

HOD: Dr. C. Jespin Ida

Semester : II

Elective II(a)

Name of the Course : Herbalism

Subject code : PB2024

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I TRADITIONAL MEDICINE</b>						
	1	Medicinal Botany – Definition – Aim and Scope – History – Importance – Present status and future prospects of medicinal crops	4	Able to understand the importance of medicinal crops	Lecture	Short test, Group discussions.
	2	Traditional systems of medicine – Siddha, Ayurveda and Unani	4	To know the different traditional systems of medicine	Lecture, PPT	
	3	Conservation of Medicinal plants – in situ and ex situ; Herbal gardens	4	To understand the conservation strategies	Lecture, Visit to herbal garden	
<b>II CULTIVATION OF MEDICINAL PLANTS</b>						
	1	Study the following plants with reference to their habitat, systematic position, morphology, useful parts, cultivation of <i>Aloe vera</i> , <i>Ocimum</i> ,	4	Able to cultivate medicinal plants	Lecture, PPT, Visit to botanical garden	

		<i>Zingiber</i>				Question – Answer session, Group discussion
	2	<i>Catharanthus roseus,</i> <i>Phyllanthus amarus,</i>	4	Able to cultivate medicinal plants	Lecture, PPT	
	3	<i>Embllica</i> and <i>Azadirachta.</i>	4	Able to cultivate medicinal plants	Lecture, PPT	
<b>III OIL EXTRACTION</b>						
	1	Methods of extraction of oil in the following plants – Eucalyptus, Cymbopogan	3	Able to understand the extraction procedures	Lecture, Video clippings	Short test, Multiple choice questions, Continuous Internal Assessment I (CIA-I)
	2	Rose and Santalum	3	Able to understand the extraction procedures	Lecture, Video clippings	
	3	Extraction procedures for active principles – Withaonalides, Hyocyanine, Vinblastine	4	Able to understand the extraction procedures	Lecture, Video clippings	
<b>IV PHARMACOGNOSY</b>						
	1	Pharmacognosy – Definition, Classification of drugs – Morphological, Taxonomical, Pharmacological and Chemical	4	To understand the basics of Pharmacognosy	Lecture	Group discussions, Short test,
	2	Collection and Processing of crude drugs – Antichemical, Phytochemical	5	Able to assess the processing of crude drugs	Lecture, Charts	

	3	Antimicrobial and Chemical	4	To evaluate the antimicrobial and chemical properties of drugs	Lecture, Charts	Open book test
<b>V WHO GUIDELINES</b>						
	1	Screening and WHO standardization of crude drugs (WHO guidelines)	3	To evaluate the standardization of crude drugs	Lecture, PPT	Multiple choice questions, Group discussions, Continuous Internal Assessment II (CIA-II)
	2	Physicochemical (Ash and Extraction values)	3	To assess the Physicochemical parameters	Lecture, Video clippings	
	3	Fluorescence analysis – Qualitative and Quantitative analysis	4	To differentiate Qualitative and Quantitative analysis	Lecture	
	4	Basic chromatographic and Spectroscopic analysis of crude drugs	3	To evaluate the analysis of crude drugs	Lecture, Video clippings	

Course Instructor: Dr. N. Benit

HOD: Dr. C. Jespin Ida

Semester:

IV

Major Core IX

Name of the Course:

Plant Physiology

Subject Code:

PB2041

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/Evaluation
<b>I ABSORPTION</b>						
	1	Physico-chemical properties of water - water potential; Mechanism of absorption of water - active and passive transport - Apoplast and symplast concept	4	To understand the mechanism of active and passive transport of water	Lecture, PPT, Video clippings	Class test, quiz, microscopic evaluation
	2	Transpiration - Stomatal mechanism. Antitranspirants	3	To know the basics of transpiration	Lecture, PPT, microscopic observation	
	3	Ascent of sap – SPAC; Mineral nutrition - criteria for essentiality. Macro and micro nutrients, their role and deficiency symptoms	4	To evaluate the role of micro and macronutrients in plants	Lecture, experimental approach	
	4	Absorption of solutes - passive, active diffusion and facilitated diffusion	4	To differentiate passive and active absorption of solutes	Lecture, video clippings	
	5	Hydroponics –	2	To develop	Lecture,	

		Nutrient Film Technique (NFT)		hydroponic technique	PPT, Garden visit	
<b>II PHOTOSYNTHESIS</b>						
	1	Properties of light - Interaction between radiant energy and phosphorescence	2	To correlate different radiations of light	Lecture,	Online Quiz, Group discussions, Class test
	2	Photosynthetic apparatus and thylakoid organization; Two pigment systems - Light harvesting systems. Reaction center, P680, P700, water oxidation complex	3	To understand the structure and organization in thylakoid	Lecture, PPT	
	3	Electron transport system - cyclic - non cyclic – photophosphorylation	3	To differentiate cyclic and noncyclic phosphorylation	Lecture, video clippings	
	4	Photosynthetic carbon reduction pathways in C3, C4 and CAM plants  Photorespiration and its significance	4	To categorize different carbon reduction pathways	Lecture, PPT	

<b>III RESPIRATION &amp; NITROGEN METABOLISM</b>						
	1	Respiration - Glycolysis – Anaerobic (Fermentation) and Aerobic (Kreb’s cycle)	3	To understand aerobic and anaerobic respiration	Lecture, Chart	Class test, diagrammatic representation, Continuous Internal Assessment I(CIA-I)
	2	Electron transport system and oxidative phosphorylation – mechanism, Energetics - Respiratory inhibitors - Cyanide resistant respiration; Integration of metabolic pathways	5	To know the basics and energetic mechanism of electron transport system	Lecture, PPT, Chart	
	3	Nitrogen Metabolism – Sources of nitrogen. Biological nitrogen fixation – symbiotic and asymbiotic, Nitrate and Ammonia assimilation (GS-	5	To learn nitrogen metabolism in plants	Lecture, Video clippings	

		GOGAT pathway)				
<b>IV PLANT GROWTH REGULATORS</b>						
	1	Plant growth regulators and elicitors: Physiological effect and mechanism of action of auxin, gibberellins, cytokinins, Ethylene, abscissic acid, morphactins, brassinosteroids	5	To know the basics of plant growth regulators and elicitors	Lecture, Chart	Class test, Group discussion, multiple choice questions, assignment on plant growth hormones
	2	Photomorphogenesis – phytochrome mediated photoresponses, Physiology of flowering; Fruit ripening	5	To learn about photomorphogenesis	Lecture, PPT	
<b>V STRESS PHYSIOLOGY</b>						
	1	Physiology of senescence and abscission; Biological clock	4	To understand the process of ageing in plants	Lecture, Video clippings	Class test, Online quiz, Continuous
	2	Stress physiology – biotic and abiotic stress- salinity stress, drought stress, water stress, freezing stress, radiation stress, and	4	To categorize different stress factors	Lecture, PPT	

		heavy metal stress, Stress proteins in plants – stress resistance mechanism				Internal Assessment II(CIA-II)
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Course Instructor: Dr. N. Benit

HOD: Dr. C. Jespin Ida

**Semester:**  
X

**IV**

**Major Core**

**Name of the Course:** Plant Ecology and Phytogeography

**Subject Code:** PB2042

Number of hours per week	Number of credits	Total number of hours	Marks
6	5	90	100

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I HABITAT ECOLOGY</b>						
	1	Habitat Ecology - Freshwater and Marine water ecology (ecosystems), Wetlands and their Characteristics – Classification of Wetlands and Examples	3	To know the basics of habitat ecology	Lecture, PPT	Group discussion, Class test.
	2	Succession - Causes of succession,	3	To learn the different parameters of	Lecture, Charts	

		Types of succession; Process of succession; Concept of Climatic Climax		succession		
	3	Hydrosere; Xerosere; Applications of ecology	3	To correlate and categorize hydrosere and xerosere	Lecture, PPT	

## II ECOSYSTEM

	1	Structure of Ecosystem; Productivity of ecosystem; Food chains in ecosystem; Ecological Pyramids; Energy flow in ecosystem	3	To learn the basics of ecosystem	Lecture, Charts	Online quiz, Group discussion, Assignment on biogeochemical cycle
	2	Biogeochemical cycle – Water cycle, Gaseous cycle (Carbon cycle, Oxygen cycle, Nitrogen cycle); Sedimentary cycle	4	To correlate the different biogeochemical cycle	Lecture, PPT	
	3	Ecological Genetics of Population – Ecads, Ecotypes, Ecoclines, Ecospecies, Population Ecology -	4	To understand the characteristics and structure of population ecology	Lecture, Charts, PPT	

		Characteristics of a population; Population Structure – Population Dispersal and interactions among population				
<b>III PHYTOGEOGRAPHY</b>						
	1	Phytogeography: Definition and Principles of Phytogeography, Distribution – Wides, Endemics and Discontinuous species; Theories of Discontinuous distribution; Factors affecting distribution of species	4	To learn the basics of Phytogeography	Learn, PPT	Group discussions, Class test, Continuous Internal Assessment I (CIA-I)
	2	Climate of India; Vegetation of India	3	To understand the climatic condition and vegetation of India	Lecture, Video clippings	
	3	Global environment changes – Global warming and Ozone depletion; Bioremediation	3	To know about the global environmental changes	Lecture, PPT	

	4	Biofouling, Biofilm and Biocorrosion, Carbon sequestration method, Carbon trading	4	To categorize Biofouling, Biofilm and Biocorrosion	Online quiz, Online assignments	
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#### IV CURRENT PRACTICES IN CONSERVATION

	1	Current practices in conservation: Habitat or Ecosystem Approaches - Species-based Approaches - Social Approaches: Chipko Movement	4	To understand the basics of conservation	Lecture, Field visit	Class test, assessing the report of Field visit
	2	In-situ conservation – Afforestation, Social Forestry, Agroforestry, Botanical gardens, Zoos	3	To categorize different in situ conservation methods	Lecture, PPT, Field visit	
	3	Biosphere Reserves, National Parks, Sanctuaries, Protected Area Network, Sacred Groves and Sthalavrikshas	4	To categorize different in situ conservation methods	Lecture, PPT, Field visit	
	4	Ex-situ conservation:	4	To correlate the different ex situ	Lecture, PPT	

		Cryopreservation, Gene Banks, Seed Banks, Pollen Banks, Sperm Banks, DNA Banks		conservation methods		
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**V PROTECTION OF SPECIES**

	1	Status and protection of species in National and International levels	3	To differentiate national and international level of species protection	Lecture	Continuous Internal Assessment II (CIA-II), Seminar, Online
	2	Role of CITES and IUCN – Convention on Biological Diversity (CBD)	3	To understand the role of different treaties in species protection	Lecture, PPT	
	3	Nagoya Protocol – Man and Biosphere Programme (MAB)	2	To understand the role of different treaties in species protection	Lecture, PPT	

	4	Policies implemented by MoEF for biodiversity conservation – Salient features of Biological Diversity Act 2002 – Ecosystem restoration	3	To know about the policies for conservation	Lecture, PPT	assignment
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Course Instructor: Dr. J. Celin Pappa Rani

HOD: Dr. C. Jespin Ida

**Semester:**

**IV**

**Major Core XI**

**Name of the Course:**

**Biotechnology and Bioinformatics**

**Subject Code:**

**PB2043**

Unit	Section	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I RESTRICTION ENZYMES &amp; LIBRARY CONSTRUCTION</b>						
	1	Nomenclature, classification and properties of restriction enzymes	3	To know the basics of restriction enzymes	Lecture, chart	Group Discussion, online quiz, Seminar
	2	Types of cloning vectors – Plasmids, Cosmids, ssDNA phages, Ti plasmid	3	To categorize different cloning methods	Lecture, PPT	
	3	Yeast vectors – YIP, YEP, YRP and YAC ;	3	To differentiate yeast vectors	Lecture, PPT	

		shuttle vectors				
	4	Construction of genomic library; Construction of cDNA library	3	To construct genomic and cDNA library	Lecture, Video clippings	
<b>II PLANT TISSUE CULTURE</b>						
	1	Plant tissue culture – laboratory organization; sterilization of explants; MS media composition and preparation of media	4	To construct plant tissue culture laboratory	Lecture, Video clippings	Class test, Online Assignment
	2	Meristem culture; suspension culture; protoplast culture and somatic hybridization	3	To learn different culture methods	Lecture, video clippings	
	3	Production of haploid plants, Somatic embryogenesis	3	To learn different culture methods	Lecture, video clippings	
	4	Synthetic seed production  Transgenic plants – Bt cotton, Golden rice	3	To know about transgenic plants	Lecture, video clippings	
<b>III INDUSTRIAL BIOTECHNOLOGY</b>						
	1	Industrial Biotechnology – Fermentor design	2	To design industrial fermentor	Lecture, PPT	

	2	Immobilization of enzymes; Production of ethanol, acetic acid	3	To understand the production of alcohol and acids	Lecture, video clippings, Industrial Visit	Class Test, Assessment of Industrial Visit Report, Continuous Internal Assessment I (CIA-I)
	3	Production of citric acid, Vitamin B <sub>12</sub>	2	To understand the production of antibiotics and vitamins	Lecture, Video Clippings	
	4	Biosafety – possible dangers of GEOs; biosafety guidelines; physical and biological containments, Process of patenting application	4	To differentiate the different containments and know about patenting process	Lecture	

#### IV PHARMACEUTICAL BIOTECHNOLOGY

	1	Edible vaccines, Plantibodies;  Gene therapy – types of gene therapy,	3	To understand the basics of vaccines and gene therapy	Lecture	Online Assignment, Group Discussion
	2	Production of monoclonal antibodies and its application	3	To learn the techniques for producing MAb	Lecture, Video Clippings	
	3	Production of DNA vaccine; Production of subunit vaccine	3	To differentiate the different vaccine production	Lecture, Video Clipping	
	4	Nanotechnology – nanomaterials,	3	To know the concepts of	Lecture, PPT	

		Synthesis of nanodrugs		nanotechnology		
<b>V BIOINFORMATICS</b>						
	1	The internet, World Wide Web, search engines	3	To understand the basics of internet and search engines	Lecture	Seminar, Continuous Internal Assessment II (CIA-II)
	2	Primary nucleotide sequence databases - Genbank, DDBJ;	3	To know the concept of Primary nucleotide sequence databases	Lecture, Video Clippings	
	3	Primary protein sequence databases - NCBI, PIR, EMBL; Sequence Analysis - Pair-wise alignment	3	To learn the techniques of Primary protein sequence databases	Lecture, Video Clipping	
	4	BLAST & FASTA types; Multiple sequence alignment; CADD.	3	To differentiate BLAST and FASTA	Lecture, PPT	

Course Instructor: Dr. J. Albino Wins

HOD: Dr. C. Jespin Ida

Semester: IV

Elective IV(a)

Name of the Course: Phytochemistry and Pharmacognosy

Subject Code: PB2044

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
<b>I PHYTOCHEMISTRY</b>						
	1	Phytochemistry - Definition, history, principles.	4	To understand the basics of phytochemistry	Lecture, PPT	Quiz, Online Assignment
	2	Secondary metabolites - definitions, classification	3	To differentiate primary and secondary metabolites	Lecture, PPT	
	3	Secondary metabolites - occurrence and distribution in plants, their functions, chemical constituents.	2	To know about the chemical constituents of secondary metabolites	Lecture	
	4	Alkaloids, Terpenoids, Flavonoids, Steroids, and Coumarins.	3	To characterize the different phytoconstituents	Lecture, PPT	
<b>II ISOLATION OF BIOMOLECULES</b>						
	1	Techniques for isolation of medicinally important Biomolecules -	3	To learn the different techniques for isolating biomolecules	Lecture, Model	

		solvent extraction, steam distillation,				Group Discussion , Class Test
2	Soxhlet extraction; Purification, concentration,	3	To know the techniques for extraction and purification	Lecture, PPT		
3	Determination and quantification of compounds (TLC, Column, HPLC).	3	To understand the principle and techniques of chromatography	Lecture		
4	Characterization of phytochemicals by spectroscopic methods.	4	To characterize the phytochemicals by spectroscopic methods.	Lecture, Video Clippings		

### III BIOSYNTHETIC PATHWAYS AND APPLICATION

1	Biosynthetic pathways of secondary compounds: Shikimic Acid pathway; Mevalonic Acid Pathway	3	To categorize the different biosynthetic pathways	Lecture, PPT	Class Test, Online Quiz , Continuou s internal assessment
2	Pathways for commercially important phytochemicals:Forskolin, taxol and Vinca alkaloids	4	To correlate the different pathways for commercially important phytochemicals	Lecture, PPT	
3	Applications of phytochemicals in medicine and pharmaceutical industries	3	To understand the applications of phytochemicals in medicine and pharmaceutical industries	Lecture, Video Clippings	

	4	Applications of phytochemicals in food , flavor and cosmetic industries.	4	To understand the applications of food , flavor and cosmetic industries.	Lecture, PPT	I(CIA –I)
<b>IV HERBALISM AND ETHNOBOTANY</b>						
	1	Herbs and healing; Historical perspectives local, national and global level	3	To know about the historical perspectives of herbalism	Lecture, PPT	Class test, Group Discussion , Open book test
	2	Herbal cultures: origin and development of human civilizations	4	To know about different herbal cultures	Lecture, Video Clippings , Preparati on of wine	
	3	Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	3	To learn about the usage of natural products against human diseases.	Lecture, Video Clipping	
<b>V ANALYTICAL PHARMACOGNOSY</b>						
	1	Drug adulteration - types, methods of drug evaluation - Biological testing of herbal drugs	4	To learn about drug adulteration and its evaluation	Lecture, PPT	Question
	2	Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds)	3	To know about the phytochemical screening methods	Lecture, PPT	

	3	Medicinal plant banks, micropropagation of important species ( <i>Wihania somnifera</i> , <i>Azadirachta indica</i> and <i>Ocimum sanctum</i> - Herbal foods-future of pharmacognosy)	4	To analyze the micropropagation techniques of medicinal plants	Lecture, Video Clippings	and Answer session, Continuous internal assessment II (CIA –II)
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