SACRED HEART COLLEGE (AUTONOMOUS)

Department of Botany

MSc Botany

Course plan
Academic Year 2018-19
Semester 1

COURSE PLAN (OBE) FOR MSc - SEMESTR 1

PROGRAMME	M.Sc. BOTANY	SEMESTER	1

COURSE CODE AND TITLE	16P1BOTT01: MICROBIOLOGY AND PHYCOLOGY	CREDIT	4
HOURS/WEEK	6	HOURS/SEM	Theory: 72 hrs Practical: 45 hrs
FACULTY NAME	JOSE JOHN & PRINCY MOL A. P.		

PROGRAMME OUTCOMES

PO1	Exercise their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability.
PO2	Effectively communicate the knowledge of their study and research in their respective disciplines to their stakeholders and to the society at large.
PO3	Make choices based on the values upheld by the institution, and have the readiness and knowhow to preserve the environment and work towards sustainable growth and development.
PO4	Develop an ethical view of life and have a broader (global) perspective transcending the provincial outlook.
PO5	Explore new knowledge independently for the development of the nation and the world and are able to engage in a lifelong learning process.

PROGRAM SPECIFIC OUTCOMES

PSO 1	Demonstrate a clear, comprehensive and advanced mastery in the field of Botany.
PSO 2	Understand the basic principles of biological sciences with special reference to Botany and its applied branches.
PSO 3	Explore the intricacies of life forms at cellular, molecular and nano level.
PSO 4	Appreciate the beauty of different life forms, be aware of and disseminate the concept of biodiversity conservation.
PSO 5	Develop problem solving skills and carry out innovative research projects, thereby fostering the spirit of knowledge creation.

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Students would be able to define the world of microbial diversity and their evolutionary relationships	PO1, PO4, PO5, PSO1, PSO3, PSO4	U
CO 3	Students would be able to apply the ecological significance of the lower groups of plants and protists	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO 4	Students would be able to apply the economic significance of the lower groups of plants and protists	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO 5	Students would be able to and examine various algal forms	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	R, U

CO 6	Students would be able to evaluate life cycles exhibited by different classes of algae	PO1, PO4, PO5, PSO1, PSO3, PSO4	U, A, An

CL* Cognitive Level

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
INTRODUCTION TO THE COURSE & MICROBIOLOGY - MODULE I				
1	History of Microbiology, Scope of microbiology.	Lecture, Interaction, PPT		CO1, CO3 & CO4
2	Microbial diversity: Microbial taxonomy and phylogeny	Lecture, Interaction, PPT		CO1
3	Major groups and their characteristics (Five kingdom system and three domain system of classification), Microbes in everyday life.	Lecture, Interaction, PPT		CO1
4	(a) Bacterial morphology. Classification of Bacteria according to Bergey's manual of systematic bacteriology	Lecture, Interaction, PPT	e-resource	CO1 & CO3
5	Modern trends in bacterial taxonomy- DNA barcoding.	Lecture, Interaction, PPT	Video, e-resource	CO1
6	(b) Ultra structure of Gram positive and Gram negative bacteria; cell membrane, cell wall	Lecture, Interaction, PPT, Audio visual learning, Practical	Video, e-resource	CO3
7	External structures-flagella, pili, fimbriae, capsule (glycocalyx) and slime, Internal/ cytoplasmic structures-Nucleoid, ribosome and endospores	Lecture, Interaction, PPT, Audio visual learning	Video, e-resource	CO1 & CO3
8	(c) Major groups of Bacteria: Spirochaetes, Rickettsias, Chlamydias, Mycoplasmas, Actinomycetes, Myxobacteria	Lecture, Interaction, PPT, Audio visual learning	Video, e-resource	CO1, CO3 & CO4
9	Archaebacteria. Extremophiles - thermophilic, halophilic, acidophilic and alkalophilic bacteria.	Lecture, Interaction, PPT, Audio visual learning, Assignment	Video, e-resource	CO1,CO3 & CO4
10	(d) Nutritional types - Photolithotrophs, chemolithotrophs	Lecture, Interaction,		CO1, CO3 & CO4

		PPT		
11	Photoorganotrophs, and chemoorganotrophs.	Lecture, Interaction, PPT		CO1, CO3 & CO4
12	(e) Bacterial Genetics: Organization and replication of genetic material in bacteria – bacterial chromosome, plasmid.	Lecture, Interaction, PPT	Video, e-resource	CO4
13	Recombination in bacteria - conjugation, transformation and transduction. Sexduction.	Lecture, Interaction, PPT	Video, e-resource	CO1,CO2, CO3 & CO4
14	Application of bacteria in recombinant technology and genomics.	Lecture, Interaction, PPT, Assignment		CO4
15	(f) Culture of microorganisms: Methods for isolating pure cultures, types of culture media, enrichment culture techniques, maintenance and preservation of pure cultures.	Lecture, Interaction, PPT, Practical	Video, e-resource	CO3 &CO 4
MICROBIOLOGY - MODULE II				
16	(a) Host-Microbe relationships and diseases	Lecture, Interaction, PPT	e-resource	CO1, CO3 & CO4
17	(b) Food Microbiology: food spoilage and preservation methods, Microbiology of fermented foods, Microorganisms as source of food-SCP.	Lecture, Interaction, PPT, Assignment		CO3 & CO4
18	(c) Agricultural Microbiology: Management of agricultural soils, bio-fertilizers, bio-pesticides.	Lecture, Interaction, PPT, Assignment		CO1, CO3 & CO4
19	(d) Industrial Microbiology: Production of alcohol, vinegar, antibiotics, vitamins, steroids, vaccines, organic acids and amino acids.	Lecture, Interaction, PPT, Assignment		CO1, CO3 & CO4
MICROBIOLOGY - MODULE - III				
20	(a) Nomenclature and classification	Lecture, Interaction, PPT		CO1 & CO3
21	Distinctive properties of viruses, morphology (symmetry) and a general account on different kinds of viruses.	Lecture, Interaction, PPT	e-resource	CO1
22	Capsid and their arrangements, types of envelops and their composition. Viral genome.	Lecture, Interaction, PPT		CO1
23	(b) Structure of bacteriophages belonging to 'T' series.	Lecture, Interaction, PPT	e-resource	CO1 & CO3

24	Lytic and Lysogenic phages.	Lecture, Interaction, PPT		CO3
25	Ultra structure of TMV and HIV	Lecture, Interaction, PPT	e-resource	CO3 & CO4
26	(c) Sub viral particles - prions	Lecture, Interaction, PPT	e-resource	CO1, CO3 & CO4
27	Sub viral particles - viroids, virusoid	Lecture, Interaction, PPT		CO1, CO3 & CO4
28	(d) Pathogenesis of viral infection: Stages of infection	Lecture, Interaction, PPT		CO1,CO3 & CO4
29	Epidemiology and transmission of HIV and HPV, Viral oncogenesis	Lecture, Interaction, PPT, Assignment	e-resource	CO2, CO3 & CO4
MODULE ALGAE – I INTRODUCTION				
30	(a) History of algal classification.	PPT, Lecturing		CO1, PSO1
31	Detailed study of the classification by F. E. Fritsch	PPT, Lecturing		CO1, PSO1
32	Classification by R.E. Lee	PPT, Lecturing		CO1, PSO1
33	Gene sequencing and algal systematics	PPT, Lecturing		CO1, PSO1
34	Centers of algal research in India. Contributions of Indian phycologists – M. O. P. Iyengar	PPT, Lecturing		CO1,CO3 & CO4
35	G.S. Venkataraman, T. V. Desikachary	PPT, Lecturing		CO1,CO3 & CO4
MODULE ALGAE – II GENERAL FEATURES OF ALGAE				
36	Habit, habitat and distribution of Algae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
37	Major characteristics of Cyanophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
38	Major characteristics of Chlorophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
39	Major characteristics of Chlorophyceae	PPT, Lecturing	Original Videos and	CO1, CO2, CO3, CO4

			Photos	and, CO5 PSO2,PSO4
40	Major characteristics of Xanthophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
41	Major characteristics of Bacillariophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
42	Major characteristics of Dinophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
43	Major characteristics of Phaeophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
44	Major characteristics of Rhodophyceae	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
45	Range of thallus structure	PPT, Lecturing	Original Videos and Photos	CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
46	Algal components: Cell wall, flagella, eye-spot.	PPT, Lecturing		CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
47	Algal components: Cell wall, flagella, eye-spot.	PPT, Lecturing		CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
48	Algal components: pigments, pyrenoid, photosynthetic products.	PPT, Lecturing		CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
49	Reproduction in algae: Vegetative, asexual and sexual reproduction	PPT, Lecturing		CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
50	Major patterns of life cycle and post fertilization stages in Phaeophyceae	PPT, Lecturing		CO1, CO2, CO3, CO4 and, CO5 PSO2,PSO4
51	Major patterns of life cycle and post	PPT,		CO1, CO2,

	fertilization stages in Rhodophyceae	Lecturing		CO3, CO4 and, CO5 PSO2,PSO4
52	Fossil algae	PPT, Lecturing		CO1, CO2, CO3, CO4 and, CO5 PSO1
MODULE ALGAE – III ECOLOGICAL AND ECONOMIC IMPORTANCE OF ALGAE				
53	Ecological importance of Algae. Primary productivity.	PPT, Lecturing	E-resources	CO1, CO2, CO3, CO4, PSO4, PSO5
54	Ecological importance of Algae. Algae in symbiotic association, Ultraviolet radiation absorption by algae	PPT, Lecturing	E-resources	CO1, CO2, CO3, CO4, PSO4, PSO5
55	Algae as food, fodder, biofertilizer, medicine, industrial uses and other useful.	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
56	Algae in experimental studies. (SCP, Biofuel, Live feeds, EPS.).	PPT, Lecturing	E-resources	CO1, CO2, CO3, CO4, PSO4, PSO5
57	Harmful effects of algae: Algal blooms, causative organisms, symptoms and toxins of major toxic algal blooms (Amnesic Shellfish Poisoning [ASP]	PPT, Lecturing	E-resources	CO1, CO2, CO3, CO4, PSO4, PSO5
58	Harmful effects of algae: Algal blooms, causative organisms, symptoms and toxins of major toxic algal blooms: Paralytic Shellfish Poisoning [PSP] and Cyanophycean toxins)	PPT, Lecturing	Field Visit	CO1, CO2, CO3, CO4, PSO4, PSO5
59	Harmful effects of algae: Algal blooms, causative organisms, symptoms and toxins of major toxic algal blooms: Paralytic Shellfish Poisoning [PSP] and Cyanophycean toxins)	PPT, Lecturing	Field Visit	CO1, CO2, CO3, CO4, PSO4, PSO5
60	Assessment Test	MCQ	Class Test	CO1, CO2, CO3, CO4, PSO4, PSO5
MODULE ALGAE – IV ALGAL BIOTECHNOLOGY				
61	Methods and techniques of collection, preservation and staining of Algae.	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
62	Methods and techniques of collection, preservation and staining of Algae.	Discussion	Field Visit	CO1, CO2, CO3, CO4,

				PSO4, PSO5
63	Algal culture: Importance, methods; Algal culture media.	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
64	Algal Research Station Visit	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
65	Assessment Test	MCQ	Class Test	CO1, CO2, CO3, CO4, PSO4, PSO5
66	Revision and Clarification Discussions	Group Discussion		
67	Revision and Clarification Discussions	Group Discussion		
68	Revision and Clarification Discussions	Group Discussion		
69	Revision and Clarification Discussions	Group Discussion		
70	Revision and Clarification Discussions	Group Discussion		
71	Revision and Clarification Discussions	Group Discussion		
72	Revision and Clarification Discussions	Group Discussion		
PRACTICAL				
1	Preparation and sterilization of various microbial culture media and inoculation.	Lab work		CO 3, CO 4,
2	Differential staining of bacteria using Gram stain.			CO1, CO3 & CO4
3	Isolation of Rhizobium from root nodules.			CO1, CO3 & CO4
4	Isolation of microbes from soil: Serial dilution - pour plate/spread plate method.			CO1, CO3 & CO4
5	Streak out a bacterial culture on an agar plate and isolation of colonies.			CO1, CO3 & CO4
6	Antibacterial assay - disc diffusion/agar well method.			CO1, CO3 & CO4
7-33	Practical on Algae – identification, salient features, Reproductive Structures	Lab work		CO1, CO3 & CO4
CIA – Model				
34	Revision			
35	Revision			

36	Revision

INDIVIDUAL ASSIGNMENTS/SEMINAR – DETAILS & GUIDELINES - MICROBIOLOGY

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Nature of Assignment	Course Outcome
1	15/10/2018	Archaebacteria	Review report on recent research works in the respective fields of Microbiology	CO1, CO3 & CO4
2	15/10/2018	Bacteria in recombinant technology and genomics		CO4
3	15/10/2018	Food Microbiology		CO1 & CO4
4	15/10/2018	Agricultural Microbiology		CO1, CO3 & CO4
5	15/10/2018	Industrial Microbiology		CO1 & CO4
6	15/10/2018	Viral oncogenesis		CO3 & CO4

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines - Algology

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Nature of Assignment	Course Outcome
1	15/10/2018	Algal Diversity - Thallus nature, Habitat difference, Habit; Association with other plants and animals	Visit to an Algal research station. Prepare and submit a report of the field work/research station visit	CO1, CO3 & CO4; PSO1, PSO4, PSO5
2	15/10/2018	Comparative account of life cycle patterns of Rhodophyceae, Phaeophyceae and Chlorophyceae	Standard reference books	CO1, CO3 CO4, PSO1, PSO4, PSO5
3	15/10/2018	Productivity of freshwater and marine environment	Recent journal references and web resources	CO1, CO3, CO4, PSO1, PSO4, PSO5
4	15/10/2018	Practical application of algae in agriculture and medicine	Recent journal references and web resources	CO1, CO3, CO4, PSO1, PSO4, PSO5

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PROGRAMME	**M. Sc. Botany**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**MYCOLOGY AND CROP PATHOLOGY (16P1BOTT02)**	**CREDIT**	**4**
HOURS/WEEK	**4**	**HOURS/SEM**	**Theory 27 + 45 hrs Practical 9 + 36 hrs**
FACULTY NAME	**LESLY AUGUSTINE**		

PROGRAMME OUTCOME

PO 1	**Critical Thinking:** Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO 2	**Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the word by connecting people, ideas, books, media and technology.
PO 3	**Effective Citizenship:** Demonstrate empathetic social concern and equity centered national development, and the ability to act an informed awareness of issues and participate in civic life through volunteering.
PO 4	**Environment and Sustainability:** Understand the issues of environmental contexts and sustainable development.
PO 5	**Ethics**: Recognise different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO 6	**Global Perspective:** Understand the economic, social and ecological connections that link the world's nations and people.

PROGRAM SPECIFIC OUTCOMES

PSO 1	Encourage a clear, comprehensive and advanced mastery in the field of Botany.
PSO 2	Comprehend the basic principles of biological sciences with special reference to Botany and its applied branches.
PSO 3	Develop skills in students to explore the intricacies of life forms at cellular, molecular and nano level.
PSO 4	Fuel students' motivation and enthusiasm and to help them not only to appreciate the beauty of different life forms but also to inspire them in the dissemination of the concept of biodiversity conservation.
PSO 5	Develop problem solving skills in students and encourage them to carry out innovative research projects thereby enkindling in them the spirit of knowledge creation.

	COURSE OUTCOMES	**PO/ PSO**	**CL**
CO 1	Students would define various phenomena, principles, etc. of micro and macro fungi.	PO1, PO2, PO6, PSO2, PSO3	U
CO 2	Explain different classification systems	PO1, PSO2, PSO3	A
CO 3	Apply the significance of mycotic diseases	PO1, PO2, PSO1	U
CO 4	Analyze fungal associations, their usefulness and harmfulness	PO1, PO2, PSO1, PSO2,PSO4	An
CO 5	Evaluate advanced theoretical and practical knowledge about phytopathogens and their control.	PO1, PO2, PO3, PO4, PO5, PSO2, PSO3	U

CO 6	Develop various aspects of applications of Mycology and crop pathology		

CL* Cognitive Level

MYCOLOGY (Theory 45hrs; Practical 36 hrs)

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
Introduction to Course				
	Introduction to the Course	PPT/Lecture	video	CO1
	General characters of fungi.	PPT/Lecture	Seminar	CO1
	Economic importance of fungi.	PPT/Lecture	Seminar	CO1
	Ecological importance of fungi.	PPT/Lecture	Seminar	CO1
MODULE I				
1	General characters of Fungi and their significance	PPT/Lecture		CO1
2	Principles of classification of fungi	PPT/Lecture		CO1
3	Classifications by G C Ainsworth (1973)	PPT/Lecture		CO1
4	Classifications by C. J. Alexopoulos	PPT/Lecture		CO1
5	Classification of true fungi (down to the level of class) according to the current „AFTOL" scheme (Hibbett et al. 2007)	PPT/Lecture	Article reading	CO1
6	Brief account of DNA barcoding in fungi.	PPT/Lecture		CO1
MODULE II				
7	Mycelial structure and reproduction of Myxomycota	PPT/Lecture	video	CO2
8	Mycelial structure and reproduction of Acraciomyctes	PPT/Lecture		CO2
9	Mycelial structure and reproduction of Hydromyxmycetes	PPT/Lecture		CO2
10	Mycelial structure and reproduction of Myxomycetes	PPT/Lecture		CO2
11	Mycelial structure and reproduction of Plasmodiophoromycetes	PPT/Lecture		CO2
12	Mycelial structure and reproduction of Mastigomycotina	PPT/Lecture		CO2
13	Mycelial structure and reproduction of Chitridiomycetes	PPT/Lecture		CO2
14	Mycelial structure and reproduction of Hyphochytridiomycete	PPT/Lecture		CO2
15	Mycelial structure and reproduction of Oomycetes.	PPT/Lecture		CO2
16	Mycelial structure and reproduction of Zygomycetes	PPT/Lecture		CO2
17	Mycelial structure and reproduction of Trichomycetes.	PPT/Lecture		CO2

18	Mycelial structure and reproduction of Ascomycotina			
19	Mycelial structure and reproduction of Hemiascomycetes	PPT/Lecture	video	CO2
20	Mycelial structure and reproduction of Pyrenomycetes,	PPT/Lecture	video	CO2
21	Mycelial structure and reproduction of Plectomycete	PPT/Lecture		CO2
22	Mycelial structure and reproduction of Discomycetes	PPT/Lecture	video	CO2
	CIA-1			
24	Mycelial structure and reproduction of Laboulbeniomycete	PPT/Lecture		CO2
25	Mycelial structure and reproduction of Loculoascomycetes	PPT/Lecture		CO2
26	Mycelial structure and reproduction of Basidiomycotina			
27	Mycelial structure and reproduction of Teliomycetes	PPT/Lecture		CO2
28	Mycelial structure and reproduction of Hyphomycetes	PPT/Lecture		CO2
29	Mycelial structure and reproduction of Gastromycetes	PPT/Lecture		CO2
30	Mycelial structure and reproduction of Deuteromycotina			
31	Mycelial structure and reproduction of Blastomycetes,			
32	Mycelial structure and reproduction of Hyphomycetes			
33	Mycelial structure and reproduction of Coelomycetes	PPT/Lecture		CO3
34	Types of fruiting bodies in fungi.	PPT/Lecture	video	CO3
35	Types of fruiting bodies in fungi.	PPT/Lecture	videos	CO3
36	Types of fruiting bodies in fungi.	PPT/Lecture	video	CO4
	MODULE III			
37	**Fungal associations and their significance**	PPT/Lecture		CO4
38	Symbionts - Lichens, Mycorrhiza, Fungus-insect mutualism	Lecture	video	CO4
39	Symbionts - Lichens, Mycorrhiza, Fungus-insect mutualism	PPT/Lecture	video	CO4
40	Parasites - Common fungal parasites of plants, humans, insects and nematodes	PPT/Lecture	video	CO4
41	Parasites - Common fungal parasites of plants, humans, insects and nematodes	PPT/Lecture	video	CO4
42	Saprophytes - Fungal decomposition of organic matter, coprophilous fungi, cellulolytic fungi,	PPT/Lecture	video	CO4

	lignolytic fungi.			
43	Saprophytes - Fungal decomposition of organic matter, coprophilous fungi, cellulolytic fungi, lignolytic fungi.	PPT/Lecture	video	CO4
44	Saprophytes - Fungal decomposition of organic matter, coprophilous fungi, cellulolytic fungi, lignolytic fungi.	PPT/Lecture	video	CO4
45	Agricultural significance of Fungi	PPT/Lecture	video	CO4
Practical				
46	Critical study of the following types by preparing suitable micropreparations: Stemonitis, Physarum	Hands-on Session		CO4
47	Saprolegnia, Phytophthora	Hands-on Session		CO4
48	Albugo, Mucor,	Hands-on Session		CO4
49	Aspergillus, Penicillium	Hands-on Session		CO4
50	Pilobolous, Saccharomyces	Hands-on Session		CO4
51	Taphrina, Xylaria	Hands-on Session		CO4
52	Peziza, Phyllochora	Hands-on Session		CO4
53	Puccinia, Pleurotus	Hands-on Session		CO4
54	Auricularia, Polyporus,	Hands-on Session		CO4
55	Lycoperdon, Dictyophora	Hands-on Session		CO4
56	Geastrum, Cyathus	Hands-on Session		CO4
57	Fusarium, Alternaria	Hands-on Session		CO4
58	Pestalotia, Tremella	Hands-on Session		CO4
59	Entoloma, Marasmius	Hands-on Session		CO4
60	Hexagonia, Ganoderma	Hands-on Session		CO4
61	Graphis, Parmelia, Usnea	Hands-on Session		CO4
62	Isolation of fungi from soil and water by culture plate technique.	Hands-on Session	Video	CO4
63	. Estimation of mycorrhizal colonization in root	Hands-on Session		CO4

64	Collection and identification of common field mushrooms (5 types).	Hands-on Session		CO4
65	Field Visit	Experiential learning		CO4
66	Field Visit	Experiential learning		CO4
67	Field Visit	Experiential learning		CO4
68	Field Visit	Experiential learning		CO4
69	Field Visit	Experiential learning		CO4
70	Field Visit	Experiential learning		CO4

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CROP PATHOLOGY (Theory 27hrs; Practical 18 hrs)

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
Introduction to Course				
	Introduction to the Course	PPT, Lecture	video	CO1

	A brief history of plant pathology, Koch's postulates, Concept of Disease	PPT, Lecture	Seminar	CO1
	Classification of plant diseases based on (a) Major causal agents - biotic and abiotic, (b) General symptoms, (c) Occurrence	PPT, Lecture	Seminar	CO1
MODULE I: PROCESS OF INFECTION AND PATHOGENESIS (4 HRS)				
1	(a) Disease triangle, Mazz's Disease Pyramid (b) Development of disease in plants: disease cycle (survival or persistence of pathogen between crops and during unfavorable seasons, dissemination of the pathogen, inoculation, recognition between host and pathogen, entry of pathogen (pre-penetration & penetration), colonization)	PPT, Lecture	video	CO1
2	(c) Strategies used by pathogens to attack plants. (d) Mechanism of infection- Penetration and entry of pathogen into host tissue – mechanical, Physiological and enzymatic.	PPT, Lecture	video	CO1
3	(e) Host-parasite interaction (f) Role of biochemicals in pathogenesis: enzymes, toxins (Tabtoxin, Phaseolotoxin, Tentoxin, Cercosporin, Victorin, T Toxin, HC Toxin), growth regulators and polysaccharides.	PPT, Lecture		CO1
4	(g) Detoxification of low molecular weight antimicrobial molecules produced by plants, suppression of plant defense responses, Pathogenicity and virulence factors in viruses and viroids (h) Physiology of Parasitism: Effect of pathogens on the following processes of the host plant – photosynthesis, transpiration, translocation of water and nutrients, respiration, cell membrane Permeability, transcription and translation, growth and reproduction0.	PPT, Lecture		CO1
MODULE 2: DEFENSE MECHANISM IN PLANTS (4 HRS)				
5	(a) Non-host resistance, horizontal resistance, vertical resistance	PPT, Lecture		CO2
6	Pre-existing defense mechanisms:	PPT, Lecture		CO2

	structural and biochemical (Inhibitors released by the plant in its environment, inhibitors present in plant cells before infection, Defense through lack of essential factors)			
7	Post-Infection/Induced/Dynamic defense mechanisms: structural (cell wall defense structures, histological defense structures) and biochemical (Defense through Production of Secondary Metabolites, Pathogen elicitors, Hypersensitive defense reaction)	PPT, Lecture		CO2
8	Post-Infection/Induced/Dynamic defense mechanisms: structural (cell wall defense structures, histological defense structures) and biochemical (Defense through Production of Secondary Metabolites, Pathogen elicitors, Hypersensitive defense reaction)	PPT, Lecture		CO2
1CIA				
MODULE 3: TRANSMISSION OF PLANT DISEASE (2 HRS)				
9	Mass action concept by Horsfall; Autonomous or direct or active dissemination (seed,soil&plant organs)& Passive or indirect dissemination(through Animate &inanimate agents)Plasmodiophoromycetes	PPT, Lecture		CO2
10	Spread and transmission of plant diseases by wind, water, seeds and vectors.	PPT, Lecture		CO2
MODULE 4: EFFECT OF ENVIRONMENTAL FACTORS ON THE DEVELOPMENT OF PLANT DISEASES (2 HRS)				
11	Effect of, temperature, moisture, wind, light, soil pH, host plant nutrition	PPT, Lecture		CO2
12	Effect of, temperature, moisture, wind, light, soil pH, host plant nutrition,	PPT, Lecture		CO2
MODULE 5: PLANT DISEASE MANAGEMENT (4 HRS)				
13	(a) Prophylatic methods - Exclusion, eradication and protection.	PPT, Lecture		CO2
14	(b) Therapeutic Method; Chemical means of disease control – common fungicides, antibiotics and nematicides. Pesticides, and bactericides, types of pesticides based on toxicity- red, blue, yellow, green labels and residual effect. Method of application, different types of sprayers and their	PPT, Lecture		CO2

	working.			
15	(c) Biological means of disease control - (Psudeomonas, Trichoderma, Bruvaria, PGPR, VAM)control of fungal plant pathogens by mycofungicides. (d) Production &use of disease resistant hybrids	PPT, Lecture	Group discussion	CO2
16	(e) Immunization of plants against pathogens – defense through plantibodies, induction of plant defenses by artificial inoculation with microbes or by treatment with chemicals (f) Transgenic approaches to disease resistance. Defense through genetically engineering disease resistant plants – Biotechnological approaches to disease resistance	PPT, Lecture	Group discussion	
MODULE 6: MAJOR DISEASES IN PLANTS (10 HRS)				
17	(a) Cereals: Rice - blast disease, bacterial blight; Wheat - black rust disease.	PPT, Lecture		CO2
18	(b) Vegetables: Chilly - leaf spot; Ladies finger - vein clearing disease, mosaic disease; Tomato - Damping off, Serpentine leaf miner, fusarium wilt; Cucurbita-Epinauca disease; Root knot in vegetables.	PPT, Lecture		CO2
19	(c) Fruits: Banana - bacterial leaf blight, leaf spot, Pseudo stem borer; Mango - Anthracnose; Fruit borer; Citrus - bacterial canker;Papaya – mosaic, mealy bug disease,	PPT, Lecture		CO2
20	(d) Spices: Ginger - rhizome rot; Pepper - quick wilt; Cardamom - marble mosaic disease.	PPT, Lecture		CO2
21	(e) Oil seeds: Coconut - grey leaf spot, bud rot disease.			CO2
22	(f) Rubber yielding: Hevea braziliensis - abnormal leaf fall, powdery mildew.	PPT, Lecture		CO2
23	(g) Sugar yielding: Sugarcane - red rot; root knot nematode.	PPT, Lecture		CO2
24	(h) Cash crops: Arecanut - nut fall disease.			CO2
25	(i) Beverages: Tea - blister blight; Coffee - rust.	PPT, Lecture		CO2
26	(j) Ornamental plants: Anthurium – Bacterial wilt; Rose – Fungal Black Spot;Mite attack; Orchids- bud fall	PPT, Lecture		CO2
CIA - II				
Practical				

27	Make suitable micro preparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO5
28	Make suitable micro preparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO5
29	Make suitable micro preparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO5
30	Make suitable micro preparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO5
31	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO5
32	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO5
33	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO5
34	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO5
35	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO5
36	Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.	Hands-on Session		CO5
37	Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.	Hands-on Session		CO5
38	Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.	Hands-on Session		CO5
39	Tests for seed pathology – seed purity test.	Hands-on Session		CO5
40	Tests for seed pathology – seed purity	Hands-on		CO5

	test.	Session		
41	Tests for seed pathology – seed purity test.	Hands-on Session		CO5
42	Calculation of Spore load on seeds using Haemocytometer.	Hands-on Session		CO5
43	Calculation of Spore load on seeds using Haemocytometer.	Hands-on Session		CO5
44	Calculation of Spore load on seeds using Haemocytometer.	Hands-on Session		CO5

REFERENCES

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COURSE PLAN (OBE) Course – 3

PROGRAMME	**M.SC. BOTANY**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**16P1BOTT03 - ECOLOGY, ENVIRONMENTAL BIOLOGY, PHYTOGEOGRAPHY & RESEARCH METHODOLOGY**	**CREDIT**	**4**
HOURS/WEEK	**6**	**HOURS/SEM**	**THEORY 72 HRS; PRACTICAL 36 HRS**
FACULTY	**DR. GIBY KURIAKOSE & MS. ANNIE XAVIER**		

NAME		

PROGRAMME OUTCOMES

PO1	Exercise their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability.
PO2	Effectively communicate the knowledge of their study and research in their respective disciplines to their stakeholders and to the society at large.
PO3	Make choices based on the values upheld by the institution, and have the readiness and knowhow to preserve the environment and work towards sustainable growth and development.
PO4	Develop an ethical view of life and have a broader (global) perspective transcending the provincial outlook.
PO5	Explore new knowledge independently for the development of the nation and the world and are able to engage in a lifelong learning process.

PROGRAM SPECIFIC OUTCOMES

PSO1	Demonstrate a clear, comprehensive and advanced mastery in the field of Botany.
PSO2	Understand the basic principles of biological sciences with special reference to Botany and its applied branches.
PSO3	Explore the intricacies of life forms at cellular, molecular and nano level.
PSO4	Appreciate the beauty of different life forms, be aware of and disseminate the concept of biodiversity conservation.
PSO5	Develop problem solving skills and carry out innovative research projects, thereby fostering the spirit of knowledge creation.

	COURSE OUTCOMES	**PO/ PSO**	**CL**
CO1	Define the basics of ecology and environmental science	PO1, PO4, PO5, PSO1, PSO3, PSO4	U
CO2	Explain the theoretical and practical knowledge on ecology and environmental science	PO1, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO3	Demonstrate with different mathematical and statistical models and indices to explain natural phenomena and theoretical principles with which several ecological processes	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	U, A, An

	are explained.		
CO4	Analyse global environment problems.	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO5	Explain origin of the Western Ghats and diversity and conservation in the Western Ghats	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	R, U
CO6	Define biodiversity, phytogeography, ecosystem functioning etc.	PO1, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO7	Evaluate methods of conservation managements of natural ecosystems and rare, endemic and threatened species in the Western Ghats.	PO 1, PO 2, PO 4, PO 5, PSO1, PSO 2, PSO5	U, A, An
CO8	Develop scientific aptitude and apply methodologies to pursue scientific researches.	PO 1, PO 4, PO 5, PSO1, PSO 2, PSO 4, PSO5	U, A, An, R

CL* Cognitive Level

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE 1 INTRODUCTION TO ECOLOGY				
1	Definition, history and scope of ecology, sub divisions of ecology	Lecture, Interaction, PPT		CO1, CO3 & CO4, PSO1
2	Ecology vs environmental science, Interdisciplinary nature of environmental science	Lecture, Interaction, PPT	e-resources	CO1, CO2, PSO1 & PSO2
3	Scope of ecology; interdisciplinary aspects of ecology	Lecture, Interaction, PPT		CO1, CO6, PSO2 & PSO3
4	Applications of ecology in different fields (EIA, Research, education, agriculture, healthy life, etc.)	Lecture, Interaction, PPT	e-resource	CO1 CO2, CO3, PSO2
MODULE-2, AUTECOLOGICAL CONCEPTS				
5	Characteristics of populations - ecological amplitude - population size and exponential growth,	Lecture, PPT		CO1, CO5, PSO1
6	Limits of population growth, population dynamics	Lecture, Interaction, PPT		CO3 & CO4, PSO1

7	Life history pattern, fertility rate and age structure	Lecture, PPT		CO1 & CO3, PSO1
8	Competition and coexistence, intra-specific interactions	Lecture, Interaction, PPT, documentary (audio visual)	Video, e-resource	CO1, CO3 & CO7, PSO 2
9	Scramble and contest competition model	Lecture, PPT, Assignment	Video, e-resource	CO1,CO4 & CO4, PSO 2
10	Mutualism and commensalism, prey-predator interactions	Lecture, Interaction, PPT		CO1, CO3 & CO5, PSO1 & PSO2
11	Genecology - ecads, ecotypes, ecospecies, coenospecies	Lecture, Interaction, PPT	e-resources	CO1, CO2 & CO4, PSO2
12	k-selection and r-selection populations, Molecular ecology and conservation genetics	Lecture, Interaction, PPT	Video, e-resource	CO4 & CO8, PSO1 & PSO5
MODULE-3, SYNECOLOGICAL CONCEPTS				
13	Ecological processes of community formation, ecotone, edge effect	Lecture, Interaction, PPT	Video, e-resource	CO1,CO2, CO3 & CO4, PSO1 & PSO2
14	Special plant communities - quantitative, qualitative and synthetic characteristics of plant communities, Important Value Index (IVI),	Lecture, Interaction, PPT, practical,problem solving		CO2, CO3 & CO4, PSO2 & PSO5
15	Species diversity and its measurements - characteristics of plant communities	Lecture, Interaction, PPT, practical, problem solving	e-resource	CO2, CO3 &CO4, PSO2 & PSO5
16	Alpha diversity and Beta diversity; definition and measures Mergalef's index, Fishers Alpha	Lecture, Interaction, PPT, Problem solving	e-resource	CO1, CO2 CO3 & CO4, PSO1& PSO5
17	Shannon and Simpson diversity indices) of Alpha diversity with comparative data,	Lecture, Interaction, PPT, Assignment, Problem Solving		CO2, CO3 & CO4, PSO2 &

				PSO5
18	Beta diversity, Jaccard's similarity, dissimilarity index, Sorenson's Index of similarity and Evenness index	Lecture, PPT, practical, problem Solving	e-resources	CO1, CO3 CO4 & CO7, PSO1, PSO2 & PSO5
19	Ecological niche and Guild; functioning and significances in community studies,	Lecture, Interaction, PPT, Assignment		CO1, CO2 & CO6, PSO2 & PSO5
20	Functional aspects of community; co-existence, resource partitioning, spatial correlates of communities	Lecture, Interaction, PPT		CO1, CO2 CO3 & CO4, PSO 2
21	Inter specific interactions with examples, COevolution and coexistence,	Lecture, Interaction, PPT		CO2, CO3 & CO8, PSO1 &PSO2
22	Community network; competition, Predation, mutualism, symbiosis, commensalism and ammensalism,	Lecture, Interaction, PPT, Assignment		CO1, CO2 & CO6, PSO2
23	Dynamic community characteristics – cyclic replacement changes and cyclic no-replacement changes,	Lecture, Interaction, PPT		CO1, CO2 & CO5, PSO2
24	Modelling the interspecific interactions by using network analysis approach,	Lecture, Interaction, PPT, Assignment		CO1, CO2 & CO7, PSO1 &PSO2
MODULE-4, ECOLOGICAL SUCCESSION				
20	The concept – autogenic and allogeneic succession	Lecture, Interaction, PPT		CO1 & CO2, PSO1
21	primary and secondary, autotrophic and heterotrophic	Lecture, Interaction, PPT	e-resource	CO1, CO4 & CO6, PSO1 & PSO2
22	Retrogressive changes or the	Lecture, Interaction, PPT		CO1, PSO2

	concept of degradation			
23	Concept of climax or stable communities, resilience of communities, ecological balance and survival thresholds,	Lecture, Interaction, PPT	e-resource	CO1 CO2c& CO4, PSO2
MODULE-5, BIOSPHERE AND ECOSYSTEM				
30	Comparative study of the major world ecosystems	PPT, Lecturing		CO1, PSO1
31	Different aquatic and terrestrial ecosystems with regard to their productivity	PPT, Lecturing		CO1, PSO1
32	biodiversity, energy flow	PPT, Lecturing, Documentary		CO1, PSO1 & PSO2
33	food chains and trophic levels	PPT, Lecturing	e-resources	CO1, PSO1 & PSO2
MODULE-6, ENVIRONMENTAL POLLUTION AND MANAGEMENT				
36	Methods of Pollution Control - bioremediation, Phytoremediation	PPT, Lecturing	Documentary	CO1, CO2, & CO4, CO5, PSO2
37	bio-augmentation, bio-films, bio-filters	PPT, Lecturing		CO1, CO2, CO4, PSO1 & PSO2
38	bio-scrubbers and trickling filters	PPT, Lecturing		CO1, CO2 & CO4 PSO2,PSO4
39	Use of bioreactors in waste management	PPT, Lecturing	Documentary	CO1, CO2 & CO4 PSO2 & PSO4
MODULE-7, CLIMATE CHANGE AND OTHER GLOBAL ENVIRONMENTAL ISSUES				
40	Environmental Pollution and Management: Pollution Control- bioremediation, phytoremediation, bioaugmentation, biofilms	PPT, Lecturing	E-resources	CO1, CO2, & CO4, PSO4 & PSO5
41	Environmental Pollution and Management:	PPT, Lecturing	E-resources	CO1, CO2 & CO4,

	Biofilters, bio scrubbers and trickling filters, Use of bioreactors in waste management,			PSO4 & PSO5
42	Climate change and other Global Environmental Issues: Factors responsible for climate change, Climate change mitigation	PPT, Lecturing		CO1, CO4, PSO4, PSO5
43	Climate change and other Global Environmental Issues: Global conventions and protocols on climate change- El-Nino and La Nina phenomenon and its consequences	PPT, Lecturing	E-resources	CO1, CO2 & CO4, PSO4, PSO5
44	Climate change and other Global Environmental Issues: Environmental laws and biosafety, environmental monitoring and bio indicators, environmental safety provisions in Indian constitution, major environmental laws in free India	PPT, Lecturing	E-resources	CO1, CO2 & CO4, PSO4, PSO5
45	Climate change and other Global Environmental Issues: UNEP-IPCC, UNFCC,	PPT, Lecturing	Field Visit	CO1, CO2 & CO4, PSO4, PSO5
46	Climate change and other Global Environmental Issues: Annual environment summits- 1973 Stockholm conference to 2015 Paris Conference- new developments of annual UNFCC meetings in the coming years- Future Earth Programme	PPT, Lecturing	E-resources	CO1, CO2 & CO4, PSO2, PSO5
47	Environmental Pollution and Management:	PPT, Lecturing	E-resources	CO1, CO2 & CO4,

	Pollution Control- bioremediation, phytoremediation, bioaugmentation, biofilms			PSO1, PSO5
Module 8, Phytogeography				
48	Definition, principles governing plant distribution, factors affecting plant distribution, theories of species distribution, different types of vegetation on the earth continuous and discontinuous distribution	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
49	Phytogeography: b) Climate vegetation and botanical zones of Indi; Floristic provinces in the world,	Discussion	Field Visit	CO1, CO2, CO3, CO4, PSO4, PSO5
50	b) Climate vegetation and botanical zones of Indi; Floristic provinces in the world,	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
51	Remote sensing of vegetational characteristics – principle, data acquisition; GIS and GPS and their application in vegetation studies	PPT, Lecturing		CO1, CO2, CO3, CO4, PSO4, PSO5
52	Assessment Test	MCQ	Class Test	CO1, CO2, CO3, CO4, PSO4, PSO5
3,2 Conservation Biology - Biodiversity and its conservation				
53	Conservation Biology- Biodiversity and its conservation, Definition- Genetic, Species and ecosystem diversity- alpha beta and gamma diversity, Concept of endemism and hot spots- role of IUCN- rare endangered and threatened			CO1, CO2, & CO4, CO5, PSO2

	species, key stone species, flagship species;			
54	Conservation Biology- Biodiversity and its conservation: reasons for biodiversity loss; red data book- basic principles of conservation- ex-situ and in-situ conservation techniques- principles	PPT,Lecture	E-resources	CO1, CO2, CO4, PSO1 & PSO2
55	Conservation Biology- Biodiversity and its conservation: methods and uses of remote sensing in conservation of natural resources	Lecture	Documentary	CO1, CO2 & CO4 PSO2,PSO4
56	Conservation Biology- Biodiversity and its conservation: International convention on biodiversity- CITES	Lecture	E- resources	CO1, CO2 & CO4 PSO2 & PSO4
57	National wildlife conservation policy and action plan , national forest policy	PPT,Lecture		CO1, CO2 & CO4 PSO1, PSO 2 & PSO4
3,3 The Western Ghats and the Mangroves				
58	Importance, origin, geology, vegetation	PPT,Lecture		
59	(a) diversity, resources, Concept of hotspot (The Western Ghats as a biodiversity hotspot),	PPT,Lecture	E- resources	CO1, CO6 & CO7, PSO1, PSO 2 & PSO4
60	(b) Conservation biology based on case studies from the Western Ghats, (c) Vegetation types of the	PPT,Lecture		CO1, Co, 2, CO6 & CO7, PSO1, PSO

	Western Ghats,			2 & PSO4
61	(d) Sustainable development based on the resources of the Western Ghats, (e) Mangrove ecosystem and its significance in the western coast of Peninsular India,	PPT, Lecture	E- resources	CO1, CO6 & CO7, PSO1, PSO 2 & PSO4
62	Revision and Clarification Discussions	Group Discussion, Assignments		
63	Revision and Clarification Discussions	Group Discussion, Short Assignments		
64	Revision and Clarification Discussions	Group Discussion, Quick Assignments		
65	Revision and Clarification Discussions	Group Discussion, MCQ		
66	Revision and Clarification Discussions	Group Discussion		
67	Revision and Clarification Discussions	Group Discussion		
68	Revision and Clarification Discussions	Group Discussion		
PRACTICAL				
1	Analysis of water quality (a) Dissolved CO2 (b) Dissolved oxygen (c) COD (d) Total dissolved minerals (e) Quantitative estimation of dissolved mineral anions and cations in water (f) Total alkalinity & Salinity (g) conductivity (h) Colorimetric, Spectrophotometric estimation	Lab work		CO3, CO4,

	of Nitrogen, Phosphorus in water samples			
2	Quantitative and qualitative community analysis, Carry out a project on species structure and the frequency, abundance, density of different species and similarity index, basal area, IVI and eveness of different communities in a natural system			CO1, CO3 & CO4
3	Statistical analysis of diversity indices by using apt softwares			CO1, CO3 & CO4
4	Phytoplankton counting using Sedgwick Rafter counter,			CO1, CO3 & CO4
5	Network analysis to find out the possible interspecific interaction in any local plant community			CO1, CO3 & CO4
6	Interpretation of GIS, remote sensing data for landscape differentiation			CO1, CO3 & CO4
7-33	Field visit to natural ecosystem and identification of trophic levels, food webs and food chains, plant diversity (species and community)	Field visit based study		CO1, CO3 & CO4
CIA – Model				
34	Revision			
35	Revision			
36	Revision			

PRACTICAL				
1.	Analysis of water quality (a) Dissolved CO2 (b) Dissolved oxygen (c) COD (d) Total dissolved minerals (e) Quantitative estimation of dissolved mineral anions and cations in water (f) Total alkalinity & Salinity (g) conductivity (h)	Hands on session		CO2

	Colorimetric/Spectrophotometric estimation of Nitrogen/Phosphorus in water samples,			
2.	Physico-chemical analysis of soil: Total water soluble mineral ions	Hands on session		CO2
3.	Phytoplankton counting using Sedgwick Rafter counter,	Hands on session		CO2
4.	Determination of organic 'C' and organic matter (biomass) in different (at least 3) locations (forest, agro ecosystem and polluted area,	Hands on session		CO2
5.	Interpretation of GIS/remote sensing data for landscape differentiation	Hands on session		CO2
6.	Common environmental problems, their consequences and possible solutions	Hands on session		CO2

REFERENCES

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PROGRAMME	**BACHELOR OF BOTANY**	**SEMESTER**	**1**
COURSE CODE AND TITLE	**16P1BOTT04 - Cell Biology**	**CREDIT**	**3**
HOURS/WEEK	**4**	**HOURS/SEM**	**81**

FACULTY NAME	EBIN P J AND KIRAN GEORGE KOSHY	

PROGRAMME OUTCOME

PO1	Exercise their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability
PO2	Effectively communicate the knowledge of their study and research in their respective disciplines to their stakeholders and to the society at large,
PO3	Make choices based on the values upheld by the institution, and have the readiness and knowhow to preserve the environment and work towards sustainable growth and development,
PO4	Develop an ethical view of life and have a broader (global) perspective transcending the provincial outlook
PO5	Explore new knowledge independently for the development of the nation and the world and are able to engage in a lifelong learning process

PROGRAM SPECIFIC OUTCOMES

PSO1	Demonstrate a clear, comprehensive and advanced mastery in the field of Botany
PSO2	Understand the basic principles of biological sciences with special reference to Botany and its applied branches
PSO3	Explore the intricacies of life forms at cellular, molecular and nano level
PSO4	Appreciate the beauty of different life forms, be aware of and disseminate the concept of biodiversity conservation
PSO5	Develop problem solving skills and carry out innovative research projects, thereby fostering the spirit of knowledge creation

	COURSE OUTCOMES	PO/ PSO	CL
CO1	Define the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles	PO1, PO3, PO6, PSO2, PSO3	U
CO2	Explain how the cells interact among themselves and with the environment through signal molecules	PO1, PSO2, PSO3	A
CO3	Explain about cytoskeleton, endomembrane system, protein trafficking and cell cycle	PO1, PO2, PSO4	U
CO4	Analyze recent advancements in Chloroplast and Mitochondrial research	PO1, PO2, PSO1, PSO2, PSO3	An

CO5	Evaluate the molecular mechanisms of cancer	PO1, PO2, PO3, PO4, PO5, PSO2, PSO3	U
CO6	Develop basic knowledge to prepare for competitive examinations in life science	PO1, PO2, PO6, PSO2, PSO3	An

CL* Cognitive Level

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MODULE I				
1	(a) The chemical composition of membranes: Membrane lipids, proteins and carbohydrates, (b) Membrane lipids and membrane fluidity: Importance of membrane fluidity, mechanisms for maintaining membrane fluidity, (c) The dynamic nature of the plasma membrane- dynamic nature of lipids and proteins (d) Transport of molecule across cell membrane: Simple diffusion – factors affecting diffusion, Facilitated diffusion - Carrier proteins, properties of carrier proteins, uniport, antiport and symport, Channel proteins – ion channels, porins and aquaporins, Active transport – direct and indirect mechanisms, ATPases	PPT, Lecture		CO1, CO2
2		PPT, Lecture		CO1, CO2
3		PPT, Lecture		CO1, CO2
4		PPT, Lecture		CO1, CO2
5		PPT, Lecture		CO1, CO2
6		PPT, Lecture		CO1, CO2
7		PPT, Lecture		CO1, CO2
8		PPT, Lecture		CO1, CO2
MODULE II				
9	(a) Extracellular matrix and its composition: collagens, elastin, proteoglycans, fibronectin, laminin, dystrophin (b) Proteins in cell-cell interaction: cadherins, immunoglobulin super family, integrins, and selectins (c) Cell-cell interactions: adhesion junction, tight junctions, gap junctions and plasmodesmata	PPT, Lecture		CO2
10		PPT, Lecture		CO2
11		PPT, Lecture	e-resource	CO2
12		PPT, Lecture		CO2
13		PPT, Lecture		CO2
MODULE III				

14	(a) Structure of eukaryotic nucleus: Nuclear Envelope, Nuclear Pore Complex, (b) Transport into and out of the Nucleus: Nuclear-Localization Signals, Nuclear-Export Signals Ran-GTP and Ran-Independent Mechanisms, (c) Bacterial Chromatin, Compaction of bacterial chromosome – Muk B and SMC proteins, (d) Structure of chromatin and chromosomes: histones and nonhistone proteins, nucleosome, higher levels of chromatin structure, Heterochromatin and Euchromatin, (e) Molecular structure of the Centromere and Telomere,	Lecture		CO1, CO2
15		PPT, Lecture		CO1, CO2
16		PPT, Lecture		CO1, CO2
17		PPT, Lecture		CO1, CO2
18		PPT, Lecture		CO1, CO2
19		PPT, Lecture		CO1, CO2
20		PPT, Lecture		CO1, CO2
MODULE IV				
21	(a) Phases of cell cycle, (b) Cell cycle checkpoints: DNA damage checkpoints, Spindle assembly checkpoint (c) Master controllers of the cell cycle: Cyclins and cyclin dependent kinases (CDKs), Types of CDK and cyclins (d) Regulation of CDK Activity, Regulation of Cyclin Levels, CDK Inhibitors (CKIs)	Lecture		CO3, CO6
22		PPT, Lecture		CO3, CO6
23		PPT, Lecture		CO3, CO6
24		PPT, Lecture		CO3, CO6
25				CO3, CO6
26				CO3, CO6
MODULE V				
27	(a) Introduction: outline of endomembrane system,	PPT, Lecture		CO3, CO6
28	(b) The endoplasmic reticulum: smooth and rough endoplasmic reticulum, synthesis of proteins on	Lecture		CO3, CO6
29	membrane-bound and free ribosomes and processing,	Lecture		CO3, CO6
30	(c) The Golgi complex: glycosylation, movement of materials through the Golgi complex,	PPT, Lecture		CO3, CO6
31	(d) Types of vesicle transport and their	PPT, Lecture		CO3, CO6

	functions,			
32	(e) Lysosomes,	PPT, Lecture		CO3, CO6
33	(f) Peroxisomes,	PPT, Lecture		CO3, CO6
34	(g) Plant cell vacuoles,	PPT, Lecture		CO3, CO6
35	(h) Targeting of proteins to mitochondria, chloroplasts and peroxisomes,	PPT, Lecture		CO3, CO6
36	(i) The endocytic pathway: endocytosis and phagocytosis,	PPT, Lecture		CO3, CO6
37	Historical Perspectives: The Beginnings of Research on Photosynthesis, Structure of the Chloroplast, Proplastid to Chloroplast Transformation, Characteristic Components of Chloroplast Membranes,			
38	The Chloroplast Genome and Its Expression, Development of Chloroplasts: Structure and Function, Development of Chloroplasts: Biosynthetic Pathways and Regulation			
MODULE VI				
39	(a) Overview of the major functions of the cytoskeleton, (b) Microtubules: microtubule structure and organization, microtubule dynamics, microtubule-based motor proteins: kinesins and dyneins, (c) Microfilaments: microfilaments and actin structures, dynamics of actin filaments, actin-based motor proteins: myosins, (d) Intermediate filaments: intermediate filament assembly and disassembly, types and functions of	Lecture		CO3, CO6
40		PPT, Lecture		CO3, CO6
41		PPT, Lecture		CO3, CO6
42		PPT, Lecture		CO3, CO6
43		PPT, Lecture		CO3, CO6
MODULE VII				
44	(a) Cell signaling - modes of cell-cell signaling, (b) Signaling molecules and their	Lecture		CO2, CO6
45		Lecture		CO2, CO6
46		PPT, Lecture		CO2, CO6

47	receptors: Steroid hormones and the nuclear receptor superfamily, Nitric oxide and carbon monoxide, Neurotransmitters, Peptide hormones and growth factors, Eicosanoids, Plant hormones, (c) Cell Surface Receptors: G protein-coupled receptors, Receptor protein-tyrosine kinases, Cytokine receptors and nonreceptor protein-tyrosine kinases, Receptors linked to other enzymatic activities, (d) Pathways of Intracellular Signal Transduction: cAMP pathway, Cyclic GMP, Phospholipids and Ca2+,	PPT, Lecture		CO2, CO6
48		PPT, Lecture		CO2, CO6
49				CO2, CO6
50				CO2, CO6
51				CO2, CO6
	MODULE VIII			
52	(a) Programmed cell death	PPT, Lecture		CO4
53	(b) Extrinsic and Intrinsic Pathway of Apoptosis	PPT, Lecture		CO4
54	(c) Proteins involved in the Apoptotic Pathway	PPT, Lecture		CO4
PRACTICALS				
55	1. Identification of different stages of meiosis from suitable plant material (Recorded by photomicrographs), MGU 2. Identification of different stages of mitosis and study of morphology of metaphase chromosomes from Onion root meristems (Recorded by photomicrographs), MGU 3. Study of mitotic index from suitable plant material, 4. Study on chromosomal abnormalities in humans	Laboratory		CO1, CO3
56				CO1, CO3
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80				CO1, CO3
81				CO1, CO3

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