SACRED HEART COLLEGE (AUTONOMOUS)

Department of BOTANY

MASTER OF SCIENCE IN BOTANY

Course plan

Academic Year 2018-19

Semester I

COURSE PLAN

PROGRAMME	M.Sc. BOTANY	SEMESTER	1
COURSE CODE AND TITLE	**16P1BOTT01- MICROBIOLOGY AND PHYCOLOGY**	CREDIT	4
HOURS/WEEK	6.5	HOURS/SEM	Theory 27 + 45 hrs; Practical 9 + 36 hrs
FACULTY NAME	PRINCY MOL A. P.		

	PROGRAMME OUTCOME
PO 1	The students are capable of exercising their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability
PO 2	The students are able to effectively communicate the knowledge of their study and research in their respective disciplines to their employers and to the society at large.
PO 3	The students are able to make choices based on the values upheld by the college, and have the readiness and know-how to preserve environment and work towards sustainable growth and development
PO 4	The students possess an ethical view of life, and have a broader (global) perspective transcending the provincial outlook
PO 5	The students possess a passion for exploring 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	Appraise the world of microbial diversity and their evolutionary relationships	PO1, PO3, PO5, PSO1, PSO2, PSO3, PSO4	R, U, A, An, E
CO 2	Explain the reproductive behaviour in Algae and other microbes	PO1, PO2, PO5, PSO1, PSO2, PSO3, PSO4	R, U
CO 3	Examine ecological significance of the lower groups of plants and protists	PO1, PO2, PO3, PO4, PO5, PSO1, PSO3,PSO4	R, U, A, An
CO 4	Examine economic significance of the lower groups of plants and protists	PO1, PO2, PSO1, PSO2, PSO3, PSO4, PSO5	R, U, A, An
CO 5	Develop a practice to collect and identify various algal forms	PO1, PO2, PO3, PO4, PO5, PSO2, PSO3, PSO5	R, U, A

CL* Cognitive Level
R - Remember
U - Understand
A- Apply
B- An - Analyze
E - Evaluate
Cr - Create

CO -PO/PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	0	2	0	1	2	2	3	2	0
CO 2	2	2	0	0	1	2	3	2	1	0
CO 3	3	3	3	2	2	2	0	3	3	0
CO 4	2	1	0	0	0	2	1	2	2	2
CO 5	1	2	2	3	2	0	2	3	3	2
CO 6	3	0	0	0	0	3	0	3	2	0

Mapping Strength

0- No Mapping strength
1- Low
2- Medium
3- High

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
MICROBIOLOGY				
Introduction to the course				
1	History of Microbiology, Scope of microbiology. Microbial diversity: Microbial taxonomy and phylogeny	Lecture/ Interaction/ PPT		CO1, CO3, CO4
2	Major groups and their characteristics (Five kingdom system and three domain system of classification)	Lecture/ Interaction/ PPT		CO1, CO3, CO4
3	Microbes in everyday life.	Lecture/ Interaction/ PPT		CO1, CO3, CO4
MODULE I: Bacteria				
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	e resource, video	CO1
6	(b) Ultra structure of Gram positive and Gram negative bacteria; cell membrane, cell wall	Lecture/ Interaction/ PPT/ Audio visual learning/ Practical	e resource, video	CO3
7	External structures-flagella, pili, fimbriae, capsule (glycocalyx) and slime, Internal/ cytoplasmic structures-Nucleoid, ribosome and endospores	Lecture/ Interaction/ PPT/Audio visual learning	e resource	CO1, CO3
8	(c) Major groups of Bacteria: Spirochaetes, Rickettsias, Chlamydias, Mycoplasmas, Actinomycetes, Myxobacteria	Lecture/ Interaction/ PPT/Audio visual learning	e resource, video	CO1, CO3, CO4
9	Archaebacteria. Extremophiles - thermophilic, halophilic, acidophilic and alkalophilic bacteria.	Lecture/ Interaction/ PPT/Audio visual learning/ Assignment	e resource	CO1, CO3, CO4
10	(d) Nutritional types - Photolithotrophs, chemolithotrophs	Lecture/ Interaction/ PPT		CO1, CO3, CO4

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	e resource	CO4
13	Recombination in bacteria - conjugation, transformation and transduction. Sexduction.	Lecture/ Interaction/ PPT	e resource	CO1, 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	e resource	CO3, CO4
CIA I				
MODULE II: Applied Microbiology				
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	e resource	CO3, CO4
18	(c) Agricultural Microbiology: Management of agricultural soils, bio-fertilizers, bio-pesticides.	Lecture/ Interaction/ PPT/ Assignment	e resource	CO1, CO3, CO4
19	(d) Industrial Microbiology: Production of alcohol, vinegar, antibiotics, vitamins, steroids, vaccines, organic acids and amino acids.	Lecture/ Interaction/ PPT/ Assignment	e resource	CO1, CO3, CO4
MODULE III: Viruses				
20	(a) Nomenclature and classification	Lecture/ Interaction/ PPT	e resource	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	e resource	CO1
23	(b) Structure of bacteriophages belonging to 'T' series. Lytic and Lysogenic phages.	Lecture/ Interaction/ PPT	e resource	CO1, CO3
24	Ultra structure of TMV and HIV	Lecture/ Interaction/ PPT	e resource	CO3, CO4

25	(c) Sub viral particles – prions, viroids, virusoid	Lecture/ Interaction/ PPT	e resource	CO1,CO3, CO4
26	(d) Pathogenesis of viral infection: Stages of infection	Lecture/ Interaction/ PPT	e resource	CO1,CO3, CO4
27	Epidemiology and transmission of HIV and HPV, Viral oncogenesis	Lecture/ Interaction/ PPT/ Assignment	e resource	CO3, CO4
PRACTICAL				
28	Preparation and sterilization of various microbial culture media and inoculation.	Lab work		CO3, CO4
29	Differential staining of bacteria using Gram stain.	Lab work		CO1,CO3, CO4
30				
31	Isolation of Rhizobium from root nodules.	Lab work		CO1,CO3, CO4
32	Isolation of microbes from soil: Serial dilution - pour plate/spread plate method.	Lab work		CO1,CO3, CO4
33				
34				
35	Streak out a bacterial culture on an agar plate and isolation of colonies.	Lab work		CO1,CO3, CO4
36	Antibacterial assay - disc diffusion/agar well method.	Lab work		CO1,CO3, CO4
PHYCOLOGY				
MODULE I - Introduction				
37	History of algal classification. Detailed study of the classification by F. E. Fritsch	PPT/ Lecturing		CO1
38	Brief account on the classification (Upto groups and divisions) by Edward Lee (2008). Gene sequencing and algal systematics	PPT/ Lecturing		CO1
39	Centers of algal research in India. Contributions of Indian phycologists – M. O. P. Iyengar, G.S. Venkataraman, T. V. Desikachary	PPT/ Lecturing		CO1
40	Centers of algal research in India. Contributions of Indian phycologists – M. O. P. Iyengar, G.S. Venkataraman, T. V. Desikachary	PPT/ Lecturing		CO1
MODULE II - General features of Algae				
41	Habit, habitat and distribution of Algae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
42	Major characteristics of Cyanophyceae	PPT/ Lecturing	Original Video and	CO1, CO2, CO3, CO4,

			Photos	CO5
43	Major characteristics of Chlorophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
44	Major characteristics of Chlorophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
45	Major characteristics of Xanthophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
46	Major characteristics of Bacillariophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
47	Major characteristics of Dinophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
48	Major characteristics of Phaeophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
49	Major characteristics of Rhodophyceae	PPT/ Lecturing	Original Video and Photos	CO1, CO2, CO3, CO4, CO5
50	Range of thallus structure	PPT/ Lecturing	Original Photos	CO1, CO2, CO3, CO4, CO5
51	Algal components: Cell wall, flagella, eye-spot.	PPT/ Lecturing		CO1, CO2, CO3, CO4, CO5
52	Algal components: pigments, pyrenoid, photosynthetic products.	PPT/ Lecturing		CO1, CO2, CO3, CO4, CO5
53	Reproduction in algae: Vegetative, asexual and sexual reproduction	PPT/ Lecturing		CO1, CO2, CO3, CO4, CO5
54	Major patterns of life cycle and post fertilization stages in Phaeophyceae and Rhodophyceae	PPT/ Lecturing		CO1, CO2, CO3, CO4, CO5
55	Fossil algae	PPT/ Lecturing		CO1, CO2, CO3, CO4, CO5
MODULE III & IV - Algal ecology and Economic importance of Algae				
56	Ecological importance of Algae. Primary productivity.	Lecture		CO1, CO2, CO3, CO4
57	Ecological importance of Algae. Algae in symbiotic association, Ultraviolet radiation absorption by algae	PPT/Lecture		CO1, CO2, CO3, CO4
58	Algae as food, fodder, biofertilizer,	PPT/Lecture		CO1, CO2,

	medicine, industrial uses and other useful.			CO3, CO4
59	Algae in experimental studies. (SCP, Biofuel, Live feeds, EPS.)	PPT/Lecture		CO1, CO2, CO3, CO4
60	Harmful effects of algae: Algal blooms, causative organisms, symptoms and toxins of major toxic algal blooms (Amnesic Shellfish Poisoning [ASP]	PPT/Lecture		CO1, CO2, CO3, CO4
61	Harmful effects of algae: Algal blooms, causative organisms, symptoms and toxins of major toxic algal blooms: Paralytic Shellfish Poisoning [PSP] and Cyanophycean toxins)	PPT/Lecture		CO1, CO2, CO3, CO4
MODULE V - Algal biotechnology				
62	Methods and techniques of collection, preservation and staining of Algae.	PPT/Lecture/ Demo		CO1, CO2, CO3, CO4
63	Methods and techniques of collection, preservation and staining of Algae.	PPT/Lecture/ Demo		CO1, CO2, CO3, CO4
64	Algal culture: Importance, methods; Algal culture media.	PPT/Lecture/ Demo		CO1, CO2, CO3, CO4
CIA II				

ASSIGNMENTS AND SEMINARS			
	Topic	Nature of Assignment	Course Outcome
MICROBIOLOGY			
1	Archaebacteria	Review report on recent research works in the respective fields of Microbiology	CO1, CO3, CO4
2	Bacteria in recombinant technology and genomics		CO4
3	Food Microbiology		CO1, CO4
4	Agricultural Microbiology		CO1, CO3, CO4
5	Industrial Microbiology		CO1, CO4
6	Viral oncogenesis		CO3, CO 4
PHYCOLOGY			
7	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	PSO1, PSO4 and PSO5; CO1, CO2, CO3, CO4 and, CO5

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COURSE PLAN

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

	Programme Outcome
PO 1	The students are capable of exercising their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability
PO 2	The students are able to effectively communicate the knowledge of their study and research in their respective disciplines to their employers and to the society at large.
PO 3	The students are able to make choices based on the values upheld by the college, and have the readiness and know-how to preserve environment and work towards sustainable growth and development
PO 4	The students possess an ethical view of life, and have a broader (global) perspective transcending the provincial outlook
PO 5	The students possess a passion for exploring 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	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	To enable the students to collect, preserve, identify and classify different micro and macro fungi.	PO1, PO2, PO6, PSO2, PSO3	U
CO 2	To have a better understanding on different classification systems and their applications	PO1, PSO2, PSO3	A
CO 3	To enrich the significance of mycotic diseases	PO1, PO2, PSO1	U
CO 4	To have advanced learning about fungal associations, their usefulness and harmfulness	PO1, PO2, PSO1, PSO2,PSO4	An
CO 5	To develop advanced theoretical and practical knowledge about phytopathogens and their control.	PO1, PO2, PO3, PO4, PO5, PSO2, PSO3	U

CL* Cognitive Level

R- Remember; U- Understand; A- Apply; An- Analyze; E- Evaluate; Cr- Create

CO - PO/PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	1	2	3	0	2	0	3	2	2
CO 2	2	1	1	3	0	3	3	2	2	1
CO 3	2	2	1	2	2	2	1	0	3	3
CO 4	3	0	0	2	3	1	2	3	3	2
CO 5	3	1	2	2	2	3	1	2	2	2

Mapping Strength

0. No Mapping strength
1. Low
2. Medium
3. High

MYCOLOGY (Theory 45hrs; Practical 36 hrs)

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	COURSE OUTCOME
	Introduction to Course			
	Introduction to the Course	PPT/Lecture	video	CO 1
	General characters of fungi.	PPT/Lecture	Seminar	CO 1
	Economic importance of fungi.	PPT/Lecture	Seminar	CO 1
	Ecological importance of fungi.	PPT/Lecture	Seminar	CO 1
	MODULE I			
1	General characters of Fungi and their significance	PPT/Lecture		CO 1
2	Principles of classification of fungi	PPT/Lecture		CO 1
3	Classifications by G C Ainsworth (1973)	PPT/Lecture		CO 1
4	Classifications by C. J. Alexopoulos	PPT/Lecture		CO 1
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	CO 1

6	Brief account of DNA barcoding in fungi.	PPT/Lecture		CO 1
MODULE II				
7	Mycelial structure and reproduction of Myxomycota	PPT/Lecture	video	CO 2
8	Mycelial structure and reproduction of Acraciomyctes	PPT/Lecture		CO 2
9	Mycelial structure and reproduction of Hydromyxmycetes	PPT/Lecture		CO 2
10	Mycelial structure and reproduction of Myxomycetes	PPT/Lecture		CO 2
11	Mycelial structure and reproduction of Plasmodiophoromycetes	PPT/Lecture		CO 2
12	Mycelial structure and reproduction of Mastigomycotina	PPT/Lecture		CO 2
13	Mycelial structure and reproduction of Chitridiomycetes	PPT/Lecture		CO 2
14	Mycelial structure and reproduction of Hyphochytridiomycete	PPT/Lecture		CO 2
15	Mycelial structure and reproduction of Oomycetes.	PPT/Lecture		CO 2
16	Mycelial structure and reproduction of Zygomycetes	PPT/Lecture		CO 2
17	Mycelial structure and reproduction of Trichomycetes.	PPT/Lecture		CO 2
18	Mycelial structure and reproduction of Ascomycotina			
19	Mycelial structure and reproduction of Hemiascomycetes	PPT/Lecture	video	CO 2
20	Mycelial structure and reproduction of Pyrenomycetes,	PPT/Lecture	video	CO 2
21	Mycelial structure and reproduction of Plectomycete	PPT/Lecture		CO 2
22	Mycelial structure and reproduction of Discomycetes	PPT/Lecture	video	CO 2
	CIA-1			
24	Mycelial structure and reproduction of Laboulbeniomycete	PPT/Lecture		CO 2
25	Mycelial structure and reproduction of Loculoascomycetes	PPT/Lecture		CO 2
26	Mycelial structure and reproduction of Basidiomycotina			
27	Mycelial structure and reproduction of Teliomycetes	PPT/Lecture		CO 2
28	Mycelial structure and reproduction of Hyphomycetes	PPT/Lecture		CO2
29	Mycelial structure and reproduction of Gastromycetes	PPT/Lecture		CO 2

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		CO 3
34	Types of fruiting bodies in fungi.	PPT/Lecture	video	CO 3
35	Types of fruiting bodies in fungi.	PPT/Lecture	videos	CO 3
36	Types of fruiting bodies in fungi.	PPT/Lecture	video	CO 4
MODULE III				
37	**Fungal associations and their significance**	PPT/Lecture		CO 4
38	Symbionts - Lichens, Mycorrhiza, Fungus-insect mutualism	Lecture	video	CO 4
39	Symbionts - Lichens, Mycorrhiza, Fungus-insect mutualism	PPT/Lecture	video	CO 4
40	Parasites - Common fungal parasites of plants, humans, insects and nematodes	PPT/Lecture	video	CO 4
41	Parasites - Common fungal parasites of plants, humans, insects and nematodes	PPT/Lecture	video	CO 4
42	Saprophytes - Fungal decomposition of organic matter, coprophilous fungi, cellulolytic fungi, lignolytic fungi.	PPT/Lecture	video	CO 4
43	Saprophytes - Fungal decomposition of organic matter, coprophilous fungi, cellulolytic fungi, lignolytic fungi.	PPT/Lecture	video	CO 4
44	Saprophytes - Fungal decomposition of organic matter, coprophilous fungi, cellulolytic fungi, lignolytic fungi.	PPT/Lecture	video	CO 4
45	Agricultural significance of Fungi	PPT/Lecture	video	CO 4
Practical				
46	Critical study of the following types by preparing suitable micropreparations: Stemonitis, Physarum	Hands-on Session		CO 4
47	Saprolegnia, Phytophthora	Hands-on Session		CO 4
48	Albugo, Mucor,	Hands-on Session		CO 4
49	Aspergillus, Penicillium	Hands-on Session		CO 4
50	Pilobolous, Saccharomyces	Hands-on Session		CO 4
51	Taphrina, Xylaria	Hands-on Session		CO 4
52	Peziza, Phyllochora	Hands-on Session		CO 4

53	Puccinia, Pleurotus	Hands-on Session		CO 4
54	Auricularia, Polyporus,	Hands-on Session		CO 4
55	Lycoperdon, Dictyophora	Hands-on Session		CO 4
56	Geastrum, Cyathus	Hands-on Session		CO 4
57	Fusarium, Alternaria	Hands-on Session		CO 4
58	Pestalotia, Tremella	Hands-on Session		CO 4
59	Entoloma, Marasmius	Hands-on Session		CO 4
60	Hexagonia, Ganoderma	Hands-on Session		CO 4
61	Graphis, Parmelia, Usnea	Hands-on Session		CO 4
62	Isolation of fungi from soil and water by culture plate technique.	Hands-on Session	Video	CO 4
63	. Estimation of mycorrhizal colonization in root	Hands-on Session		CO 4
64	Collection and identification of common field mushrooms (5 types).	Hands-on Session		CO 4
65	Field Visit	Experiential learning		CO 4
66	Field Visit	Experiential learning		CO 4
67	Field Visit	Experiential learning		CO 4
68	Field Visit	Experiential learning		CO 4
69	Field Visit	Experiential learning		CO 4
70	Field Visit	Experiential learning		CO 4
71 – 72	Revision			

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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	CO 1
	A brief history of plant pathology, Koch‟s postulates, Concept of Disease	PPT/Lecture	Seminar	CO 1
	Classification of plant diseases based on (a) Major causal agents - biotic and abiotic, (b) General symptoms, (c) Occurance	PPT/Lecture	Seminar	CO 1
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 (prepenetration & penetration), colonization)	PPT/Lecture	vedio	CO 1
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	vedio	CO 1

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		CO 1
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		CO 1
Module 2: Defense mechanism in plants (4 hrs)				
5	(a) Non-host resistance, horizontal resistance, vertical resistance	PPT/Lecture		CO 2
6	Pre-existing defense mechanisms: structural and biochemical (Inhibitors released by the plant in its environment, inhibitors present in plant cells before infection, Defense through lack of essential factors)	PPT/Lecture		CO 2
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		CO 2
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		CO 2
1CIA				
Module 3: Transmission of plant disease (2 hrs)				
9	Mass action concept by Horsfall; Autonomous or direct or active	PPT/Lecture		CO 2

	dissemination (seed,soil&plant organs)& Passive or indirect dissemination(through Animate &inanimate agents)Plasmodiophoromycetes			
10	Spread and transmission of plant diseases by wind, water, seeds and vectors.	PPT/Lecture		CO 2
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		CO 2
12	Effect of, temperature, moisture, wind, light, soil pH, host plant nutrition,	PPT/Lecture		CO 2
Module 5: Plant disease management (4 hrs)				
13	(a) Prophylatic methods - Exclusion, eradication and protection.	PPT/Lecture		CO 2
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 working.	PPT/Lecture		CO 2
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	CO 2
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		CO 2
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		CO 2
19	(c) Fruits: Banana - bacterial leaf blight, leaf spot, Pseudo stem borer; Mango -	PPT/Lecture		CO 2

	Anthracnose; Fruit borer; Citrus - bacterial canker;Papaya – mosaic, mealy bug disease,			
20	(d) Spices: Ginger - rhizome rot; Pepper - quick wilt; Cardamom - marble mosaic disease.	PPT/Lecture		CO 2
21	(e) Oil seeds: Coconut - grey leaf spot, bud rot disease.			CO 2
22	(f) Rubber yielding: Hevea braziliensis - abnormal leaf fall, powdery mildew.	PPT/Lecture		CO 2
23	(g) Sugar yielding: Sugarcane - red rot; root knot nematode.	PPT/Lecture		CO 2
24	(h) Cash crops: Arecanut - nut fall disease.			CO 2
25	(i) Beverages: Tea - blister blight; Coffee - rust.	PPT/Lecture		CO 2
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 micropreparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO 5
28	Make suitable micropreparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO 5
29	Make suitable micropreparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO 5
30	Make suitable micropreparations and identify the diseases mentioned with due emphasis on symptoms and causative organisms.	Hands-on Session		CO 5
31	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO 5
32	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO 5
33	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO 5
34	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial	Hands-on Session		CO 5

	dilution method.			
35	Isolation of pathogens from diseased tissues (leaf, stem and fruit) by serial dilution method.	Hands-on Session		CO 5
36	Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.	Hands-on Session		CO 5
37	Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.	Hands-on Session		CO 5
38	Collection and preservation of specimens from infected plants. Submit 5 herbarium sheets/live specimens along with a report.	Hands-on Session		CO 5
39	Tests for seed pathology – seed purity test.	Hands-on Session		CO 5
40	Tests for seed pathology – seed purity test.	Hands-on Session		CO 5
41	Tests for seed pathology – seed purity test.	Hands-on Session		CO 5
42	Calculation of Spore load on seeds using Haemocytometer.	Hands-on Session		CO 5
43	Calculation of Spore load on seeds using Haemocytometer.	Hands-on Session		CO 5
44	Calculation of Spore load on seeds using Haemocytometer.	Hands-on Session		CO 5

References

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2. Gareth Johnes (1987). Plant pathology: principles and practice.
3. R S Mehrotra (2003). Plant Pathology.
4. M N Kamat (1953). Practical plant pathology.
5. V K Gupta, T S Paul (2001). Fungi and Plant disease.
6. Malhotra, Aggarwal Ashok (1986). Plant Pathology.
7. Rangaswamy, A Mahadevan (1998). Diseases of crop plants in India.
8. B P Pandey (2001). Plant Pathology.
9. George N Agrios (2006). Plant pathology (V Edn). Elsevier Academic Press.

COURSE PLAN

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 NAME	Dr. Giby Kuriakose & Mr. Anto Joseph		

Programme Outcome

	Programme Outcome
PO 1	Students are capable of exercising their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability.
PO 2	Students are able to effectively communicate the knowledge of their study and research in their respective disciplines to their employers and to the society at large.
PO 3	Students are able to make choices based on the values upheld by the college, and have the readiness and know-how to preserve the environment and work towards sustainable growth and development.
PO 4	Students possess an ethical view of life and have a broader (global) perspective transcending the provincial outlook.
PO5	Students possess a passion for exploring 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	Explain the basics of ecology and environmental science.	PO1, PO4, PO5, PSO1, PSO3, PSO4	U

CO 2	Discover the theoretical and practical knowledge on ecology and environmental science.	PO1, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO 3	Demonstrate with different mathematical and statistical models and indices to explain natural phenomena and theoretical principles with which several ecological processes are explained.	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO 4	Identify global environment problems and discover the methods of conservation managements of natural ecosystems and rare, endemic and threatened species in the Western Ghats.	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	U, A, An
CO 5	Explain origin of the Western Ghats and diversity and conservation in the Western Ghats.	PO1, PO3, PO4, PO5, PSO1, PSO3, PSO4	R, U
CO 6	Define biodiversity, phytogeography, ecosystem functioning etc. and integrate scientific aptitude and apply methodologies to pursue scientific researches.	PO1, PO4, PO5, PSO1, PSO3, PSO4	U, A, An

CL* Cognitive Level
R- Remember
U- Understand
C- Apply
An- Analyze
E- Evaluate
Cr- Create

CO – PO/PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2				3		1		
CO 2	2	1					3		2	
CO 3	3		2					2		
CO 4	2		1		1		2		1	
CO 5	3	1	1	2	2	1	1	1	1	3
CO6	3			2	1	2	3			1

Mapping Strength

0. No Mapping strength
1. Low
2. Medium
3. High

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,
2	Ecology vs environmental science. Interdisciplinary nature of environmental science	Lecture/ Interaction/ PPT	e-resources	CO1, CO2
3	Scope of ecology; interdisciplinary aspects of ecology	Lecture/ Interaction/ PPT		CO1 & CO6,
4	Applications of ecology in different fields (EIA, Research, education, agriculture, healthy life, etc.)	Lecture/ Interaction/ PPT	e-resource	CO1 CO2
Module-2. Autecological concepts				
5	Characteristics of populations - ecological amplitude - population size and exponential growth.	Lecture/ / PPT		CO1 & CO5
6	Limits of population growth, population dynamics	Lecture/ Interaction/ PPT/		CO3 & CO4
7	Life history pattern, fertility rate and age structure	Lecture/PPT		CO1 & CO3
8	Competition and coexistence, intra-specific interactions	Lecture/ Interaction/ PPT/documentary (audio visual)	Video, e-resource	CO1, CO3
9	Scramble and contest competition model	Lecture/ PPT/ Assignment	Video, e-resource	CO1,CO4
10	Mutualism and commensalism, prey-predator interactions	Lecture/ Interaction/ PPT		CO1, CO3, CO5,
11	Genecology - ecads, ecotypes, ecospecies, coenospecies	Lecture/ Interaction/ PPT	e-resources	CO1, CO2
12	k-selection and r-selection populations, Molecular ecology and conservation genetics	Lecture/ Interaction/ PPT	Video, e-resource	CO4 & CO8
Module-3. Synecological concepts				
13	Ecological processes of community formation, ecotone, edge effect	Lecture/ Interaction/ PPT	Video, e-resource	CO1,CO2, CO3, CO4
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
15	Species diversity and its measurements - characteristics of plant communities	Lecture/ Interaction/ PPT/ Practical/problem solving	e-resource	CO2, CO3, CO 4
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
17	Shannon and Simpson diversity	Lecture/ Interaction/ PPT/		CO2, CO3,

	indices) of Alpha diversity with comparative data.	Assignment/Problem Solving		CO4
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
19	Ecological niche and Guild; functioning and significances in community studies.	Lecture/ Interaction/ PPT/ Assignment		CO1, CO2, CO6
20	Functional aspects of community; co-existence, resource partitioning, spatial correlates of communities	Lecture/ Interaction/ PPT/		CO1, CO2 CO3, CO4
21	Inter specific interactions with examples, co evolution and coexistence.	Lecture/ Interaction/ PPT		CO2, CO3, CO8
22	Community network; competition, Predation, mutualism, symbiosis, commensalism and ammensalism.	Lecture/ Interaction/ PPT/ Assignment		CO1, CO2, CO6
23	Dynamic community characteristics – cyclic replacement changes and cyclic no-replacement changes.	Lecture/ Interaction/ PPT		CO1, CO2 & CO5
24	Modelling the interspecific interactions by using network analysis approach.	Lecture/ Interaction/ PPT/ Assignment		CO1, CO2 & CO7
Module-4. Ecological Succession				
20	The concept – autogenic and allogeneic succession	Lecture/ Interaction/ PPT		CO1 & CO2,
21	primary and secondary, autotrophic and heterotrophic	Lecture/ Interaction/ PPT	e-resource	CO1, CO4 & CO6
22	Retrogressive changes or the concept of degradation	Lecture/ Interaction/ PPT		CO1
23	Concept of climax or stable communities, resilience of communities, ecological balance and survival thresholds.	Lecture/ Interaction/ PPT	e-resource	CO1 CO2
Module-5. Biosphere and Ecosystem				
30	Comparative study of the major world ecosystems	PPT/ Lecturing		CO1
31	Different aquatic and terrestrial ecosystems with regard to their productivity	PPT/ Lecturing		CO1
32	biodiversity, energy flow	PPT/ Lecturing/Documentary		CO1
33	food chains and trophic levels	PPT/ Lecturing	e-resources	CO1
Module-6. Environmental Pollution and Management				

36	Methods of Pollution Control - bioremediation, Phytoremediation	PPT/ Lecturing	Documentary	CO1, CO2, & CO4, CO5
37	bio-augmentation, bio-films, bio-filters	PPT/ Lecturing		CO1, CO2, CO4
38	bio-scrubbers and trickling filters	PPT/ Lecturing		CO1, CO2 & CO4
39	Use of bioreactors in waste management	PPT/ Lecturing	Documentary	CO1, CO2 & CO4
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
41	Environmental Pollution and Management: Biofilters, bio scrubbers and trickling filters. Use of bioreactors in waste management.	PPT/ Lecturing	E-resources	CO1, CO2 & CO4
42	Climate change and other Global Environmental Issues: Factors responsible for climate change, Climate change mitigation	PPT/ Lecturing		CO1, CO4,
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
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
45	Climate change and other Global Environmental Issues: UNEP-IPCC, UNFCC,	PPT/ Lecturing	Field Visit	CO1, CO2 & CO4
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-	PPT/ Lecturing	E-resources	CO1, CO2 & CO4

	Future Earth Programme			
47	Environmental Pollution and Management: Pollution Control- bioremediation, phytoremediation, bioaugmentation, biofilms	PPT/ Lecturing	E-resources	CO1, CO2 & CO4
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
49	Phytogeography: b) Climate vegetation and botanical zones of Indi; Floristic provinces in the world.	Discussion	Field Visit	CO1, CO2, CO3, CO4
50	b) Climate vegetation and botanical zones of Indi; Floristic provinces in the world.	PPT/ Lecturing		CO1, CO2, CO3, CO4
51	Remote sensing of vegetational characteristics – principle, data acquisition; GIS and GPS and their application in vegetation studies	PPT/ Lecturing		CO1, CO2, CO3, CO4
52	Assessment Test	MCQ	Class Test	CO1, CO2, CO3, CO4
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 species, key stone species, flagship species;			CO1, CO2, & CO4, CO5,
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

55	Conservation Biology- Biodiversity and its conservation: methods and uses of remote sensing in conservation of natural resources	Lecture	Documentary	CO1, CO2 & CO4
56	Conservation Biology- Biodiversity and its conservation: International convention on biodiversity- CITES	Lecture	E- resources	CO1, CO2 & CO4
57	National wildlife conservation policy and action plan , national forest policy	PPT/Lecture		CO1, CO2 & CO4
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
60	(b)Conservation biology based on case studies from the Western Ghats. (c) Vegetation types of the Western Ghats.	PPT/Lecture		CO1, Co, 2, CO6 & CO7
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
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		
69 – 72	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) Colorimetric/Spectrophotometric estimation of Nitrogen/Phosphorus in water samples.	Lab work		CO 3, CO 4,
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	Field visit based study		CO1, CO3 &

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

1. Ahmedullah M, Nayar M P (1987). *Endemic plants of India*.
5. Clarke G L (1954). *Elements of Ecology*. John Wiley Pub.
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11. IUCN (2007). *The 2000 IUCN red list of threatened species*. IUCN. England.
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17. Michael P (1984). *Ecological methods of field and laboratory investigations*. Tata McGraw Hill.
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COURSE PLAN

PROGRAMME	MASTERS IN BOTANY	SEMESTER	1
COURSE CODE AND TITLE	16P1BOTT04: CELL BIOLOGY	CREDIT	3
HOURS/WEEK	4	HOURS/SEM	81
FACULTY NAME	KIRAN GEORGE KOSHY		

Programme Outcome

	Programme Outcome
PO 1	Students are capable of exercising their critical thinking in creating new knowledge leading to innovation, entrepreneurship and employability.
PO 2	Students are able to effectively communicate the knowledge of their study and research in their respective disciplines to their employers and to the society at large.
PO 3	Students are able to make choices based on the values upheld by the college, and have the readiness and know-how to preserve the environment and work towards sustainable growth and development.
PO 4	Students possess an ethical view of life and have a broader (global) perspective transcending the provincial outlook.
PO5	Students possess a passion for exploring 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 and be aware of 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

	COURSE OUTCOMES	PO/ PSO	CL
CO 1	Design the model of a cell, Explain the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.	PO1, PO2, PSO1, PSO3,	U
CO 2	Understand how the cells interact among themselves and with the environment through signal molecules.	PO1, PO2, PSO2,	U
CO 3	Explain about cytoskeleton, endomembrane system, protein trafficking and cell cycle.	PO1, PO3, PSO3,	R
CO 4	Explain the process of cell damage and death		U
CO 5	Develop basic knowledge to prepare for competitive examinations in life science.	PO1, PO5, PSO4, PSO5	A

CL* Cognitive Level
R- Remember
U- Understand
D- Apply
An- Analyze
E- Evaluate
Cr- Create

CO - PO/PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2				3		1		
CO 2	2	1					3		2	
CO 3	3		2					2		
CO 4	2		1		1		2		21	
CO 5	3	1	1	2	2	1	1	1	1	3

Mapping Strength

0. No Mapping strength
1. Low
2. Medium
3. High

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.	PPT	video	CO1, CO6
2		PPT/Lecture		CO1, CO6
3		PPT/Lecture		CO1, CO6
4		PPT/Lecture	e-resource	CO1, CO6
5		PPT/Lecture		CO1, CO6
6	(c) The dynamic nature of the plasma membrane- dynamic nature of lipids and	PPT/Lecture		CO1, CO6
7		Lecture		CO1, CO6

8	proteins	Lecture		CO1, CO6
9		Lecture		CO1, CO6
10		Lecture		CO1, CO6
11	(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, CO6
12		PPT/Lecture		CO1, CO6
13		PPT/Lecture		CO1, CO6
14				CO1, CO6
MODULE II				
15	(a) Extracellular matrix and its composition: collagens, elastin, proteoglycans, fibronectin, laminin, dystrophin.	PPT/Lecture		CO2, CO6
16		Lecture		CO2, CO6
17		Lecture		CO2, CO6
18		Lecture		CO2, CO6
19		Lecture		CO2, CO6
20	(b) Proteins in cell-cell interaction: cadherins, immunoglobulin super family, integrins, and selectins.	PPT/Lecture		CO2, CO6
21		PPT/Lecture		CO2, CO6
22		PPT/Lecture		CO2, CO6
23	(c) Cell-cell interactions: adhesion junction, tight junctions, gap junctions and plasmodesmata.	PPT/Lecture		CO2, CO6
24		Lecture		CO2, CO6
25		Lecture		CO2, CO6
26				
	MODULE III			
27	(a) Structure of eukaryotic nucleus: Nuclear Envelope, Nuclear Pore Complex.	Lecture		CO1
28	(b) Transport into and out of the Nucleus: Nuclear-Localization Signals, Nuclear-Export Signals, Ran-GTP and Ran-Independent Mechanisms.	Lecture		CO1
29		PPT/Lecture		CO1
30	(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.	PPT/Lecture		CO1
31		PPT/Lecture		CO1
32				CO1
MODULE IV				
33	(a) Phases of cell cycle.	PPT/Lecture		CO3
34	(b) Cell cycle checkpoints: DNA damage checkpoints, Spindle assembly checkpoint	PPT/Lecture		CO3
35		PPT/Lecture		CO3
36		Lecture	Quiz	CO3

37	(c) Master controllers of the cell cycle: Cyclins and cyclin dependent kinases (CDKs), Types of CDK and cyclins	Lecture	Q & Ans Session	CO3
38		PPT/Lecture		CO3
39		PPT/Lecture		CO3
40	(d) Regulation of CDK Activity, Regulation of Cyclin Levels, CDK Inhibitors (CKIs)	PPT/Lecture		CO3
41		PPT/Lecture		CO3
MODULE V				
42	(a) Introduction: outline of endomembrane system. (b) The endoplasmic reticulum: smooth and rough endoplasmic reticulum, synthesis of proteins on membrane-bound and free ribosomes and processing.	Lecture		CO3
43		PPT/Lecture		CO3
44	(c) The Golgi complex: glycosylation, movement of materials through the Golgi complex. (d) Types of vesicle transport and their functions.	PPT/Lecture		CO3
45		PPT/Lecture		CO3
46		PPT/Lecture		CO3
47	(e) Lysosomes. (f) Peroxisomes. (g) Plant cell vacuoles	PPT/Lecture		CO3
48		PPT/Lecture		CO3
49		PPT/Lecture		CO3
50		PPT/Lecture		CO3
51	(h) Targeting of proteins to mitochondria, chloroplasts and peroxisomes. (i) The endocytic pathway: endocytosis and phagocytosis.	PPT/Lecture		CO3
52		PPT/Lecture	Video	CO3
53		PPT/Lecture		CO3
54		PPT/Lecture		CO3
MODULE VI				
55	(a) Overview of the major functions of the cytoskeleton			
56	(b) Microtubules: microtubule structure and organization, microtubule dynamics, microtubule-based motor proteins: kinesins and dyneins.	Lecture	Debate	CO3
57	(c) Microfilaments: microfilaments and actin structures, dynamics of actin filaments, actin-based motor proteins: myosins	PPT/Lecture		CO3
58		PPT/Lecture		CO3
59	(d) Intermediate filaments: intermediate filament assembly and disassembly, types and functions of intermediate filaments.	PPT/Lecture		CO3
MODULE VII				
60	(a) Cell signaling - modes of cell-cell signaling. (b) Signaling molecules and their	PPT/Lecture		CO2
61		PPT/Lecture		CO2

	receptors: Steroid hormones and the nuclear receptor superfamily, Nitric oxide and carbon monoxide, Neurotransmitters, Peptide hormones and growth factors, Eicosanoids, Plant hormones.			
62		PPT/Lecture		CO2
	CIA - II			
63	(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+.	Lecture	Demo video	CO2
64		Lecture		CO2
65		Lecture	Group discussion	CO2
	MODULE VIII			
66	(a) Programmed cell death (b) Extrinsic and Intrinsic Pathway of Apoptosis (c) Proteins involved in the Apoptotic Pathway	Lecture		CO 5
67		PPT/Lecture		CO 5
68		PPT/Lecture		CO 5
69		PPT/Lecture		CO 5
70				
71 – 72	Revision			
	PRACTICALS			
73	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.	Demonstration/ Hands on		
74		Demonstration/ Hands on		
75		Demonstration/ Hands on		
76		Demonstration/ Hands on		
77		Demonstration/ Hands on		
78		Demonstration/ Hands on		
79		Demonstration/ Hands on		
80		Demonstration/ Hands on		
81		Demonstration/ Hands on		
82		Demonstration/ Hands on		
83		Demonstration/ Hands on		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Course Outcome
1	By October	Extracellular matrix	CO 2
2		Cytoskeleton	CO 3

References

- Gerald Karp (2013). Cell and Molecular biology: Concepts and experiments (VII Edn). John Wiley &Sons.
- Harvey Lodish, Arnold Berk, Lawrence Zipursky, Paul Matsudaira, David Baltimore, James Darnell (2013). Molecular cell biology (VII Edn). W H Freeman & Company.
- Geoffrey M Cooper, Robert E Hausman (2013). The Cell: A molecular approach (VI Edn). Sinaeur.
- Wayne M Becker, Lewis J Kleinsmith, Jeff Hardin (2012). The world of the cell (VIII Edn). Pearson
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter (2008). Molecular biology of the cell (V Edn). Garland Science, Taylor and Francis group.
- Leland H Hartwell, Leroy Hood, Michael L Goldberg, Ann E Reynolds, Lee M Silver, Ruth C Veres (2011). Genetics from genes to genomes (IV Edn). McGraw Hill.
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- J. Kenneth Hoober (1990). Chloroplasts, Plenum Press · New York and London.