

Sacred Heart College (Autonomous)

Department of Zoology

MASTER OF SCIENCE [ZOOLOGY]

Course plan

Academic Year: 2016 - 17

Semester II

COURSE 05: 16P2ZOOT05: ECOLOGY - PRINCIPLES AND PRACTICES

PROGRAMME	Master of Science [Zoology]	SEMESTER	2
COURSE CODE AND TITLE	16P2ZOOT05: ECOLOGY, PRINCIPLES AND PRACTICES	CREDIT	3
HOURS/WEEK	3	HOURS/SEM	54
FACULTY NAME	RAJU M.K, MATHEW M.J. & RAAGAM P.M.		

COURSE OBJECTIVES

To perceive the fundamentals of ecology and environment – Physical environment, concept of homeostasis

To relate the cybernetic nature of ecosystem - feedback control & redundancy of components; resistance and resilience stability, Gaia hypothesis.

To discuss the structure and function of Ecosystem – Ecological energetics, Animals and nutrient acquisition Biomass and productivity measurement, Biogeochemical cycles

To explain the concepts of population ecology – Population group properties, growth forms, life history strategies, population structure,

To examine the concepts of population interactions and the concept of metapopulation

To explain the concepts of community - community structure and attributes, ecotone and edge effect. Development and evolution of the ecosystem, guild

To differentiate the different kinds of natural resources: Soil, mineral resources, forest resources, aquatic resources, depletion of resources and impacts on quality of life.

To differentiate different types energy resources- Energy use pattern, recent issues and concepts in energy production and utilization.

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I: Ecology and Environment				
1	Physical Environment- biotic and abiotic interactions.	Lecture	e-resource	
2	Concept of Homeostasis	Lecture with interaction		
3	Concepts of habitats- host as habitat,	Lecture		
4	Niche, niche width and overlap	Lecture and interaction	e-resource	
5	Fundamental and realized niche	Lecture	Video	
6	Resource partitioning,	Lecture	e-resource	
7	character displacement	Lecture		
8	Cybernetic nature of ecosystem	Lecture	e-resource	
9	Cybernetic nature of ecosystem contd...	Lecture		
10	stability through feedback control and through redundancy of components;	ICT Enabled (ppt & images, video clippings); discussion	e-resource	
11	Resistance and resilience stability	ICT Enabled (ppt & images, video clippings); discussion		
12	Gaia hypothesis	ICT Enabled (ppt & images, video clippings); discussion	Video	
13	Revision			
14	CIA I			
Module II: Ecosystem - Structure and Function				
15	Pathways in ecosystem	ICT Enabled (ppt&images, charts, video clippings)	e-resource	

16	Energy in the environment-Laws of thermodynamics,	ICT Enabled (ppt&images, video clippings)		
17	Laws of thermodynamics contd...	ICT Enabled (ppt&images, video clippings)	e-resource	
18	Energy flow in the ecosystem	ICT Enabled (ppt&images, video clippings)	Video	
19	Primary productivity	ICT Enabled (ppt&images, charts, video clippings)		
20	Primary productivity contd..	ICT Enabled (ppt&images, video clippings)	e-resource	
21	Biomass and productivity measurement. Contd...	ICT Enabled (ppt&images, video clippings)		
22	Biomass and productivity measurement. Contd...	ICT Enabled (ppt, images, animations & video clippings)	Video	
23	Pathways in ecosystem	ICT Enabled (ppt&images, charts, video clippings)		
24	Biogeochemical cycles- patterns and types (CNP).	ICT Enabled (ppt&images, charts, video clippings)		
25	Biogeochemical cycles- patterns and types (CNP). Contd.. Tropical versus Temperate Ecology	ICT Enabled (ppt&imag	Video	

		es, video clippings)		
26	Revision	ICT Enabled (ppt&imag es, video clippings)		
Module III: Population Ecology				
27	Population group properties, density and indices of relative abundance	ICT Enabled (ppt&imag es, video clippings)	e-resource	
28	Concept of rate. Natality and mortality	ICT Enabled (ppt&imag es, video clippings)		
29	Population age structure, Growth forms and concept of carrying capacity	ICT Enabled ppt, images, video clippings	Video	
30	Population fluctuations, density dependent and density independent controls	ICT Enabled ppt, images, video clippings		
31	Life history strategies, r & k selection	ICT Enabled ppt, images, video clippings		
32	CIA- II			
33	Population structure	ICT Enabled (ppt&imag es, video clippings)		
34	Aggregation, Allee's principle, isolation, dispersal and territoriality.	ICT Enabled (ppt&imag es, video clippings)	Video	
35	Population interactions- types, positive and negative	ICT Enabled (ppt&imag es, video clippings)		

36	Population interactions- interspecific and intraspecific interactions	ICT Enabled (ppt&images, video clippings)		
37	Ecological and evolutionary effects of competition	ICT Enabled (ppt&images, video clippings)		
38	Concept of metapopulation. Levin's model of metapopulation	ICT Enabled (ppt&images, charts, video clippings)	e-resource	
39	Comparison of Metapopulation and Logistic population model	ICT Enabled (ppt&images, video clippings)		
40	Metapopulation structure.	Lecutre	Video	
Module IV: Community Ecology				
41	Concept of community - community structure and attributes, ecotone and edge effect	ICT Enabled (ppt&images, video clippings)		
42	Development and evolution of the ecosystem, concept of climax	ICT Enabled (ppt&images, charts, video clippings)		
43	Guild and its functioning in the community.	ICT Enabled (ppt&images, video clippings)		
Module V: Resource Ecology				
44	Natural Resources; Physical and chemical properties of soil.	Lecture and interaction		
45	Significance of soil fertility.	Lecture and interaction		
46	Mineral resources with reference to India; Impact of mining on environment;	Lecture and interaction	e-resource	

47	Forest resources- deforestation, forest scenario of India.	Lecture and interaction	e-resource	
48	Aquatic resources - Freshwater and water scarcity, water conservation measures - case studies from India	Lecture and interaction		
49	Wetlands and its importance, international initiatives for wetland conservation - Ramsar sites.	Lecture		
50	Sand mining and its impacts. Wetland reclamation-causes and consequences.	Lecture and interaction	e-resource	
51	Depletion of resources and impacts on quality of life.	Lecture and interaction		
52	Energy Resources- solar, fossil fuels, hydro, tidal, wind, geothermal and nuclear. Energy use pattern in different parts of the world	Lecture and interaction		
53	Recent issues in energy production and utilization; Energy audit, Green technology and sustainable development.	Lecture and interaction	e-resource	
54	Revision			

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	5/1/2017	Primary productivity in pond ecosystem
2	12/1/2017	Wetland degradation

GROUP ASSIGNMENTS/ACTIVITIES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	11/12/2017	Study of a pond ecosystem

References

- Abbasi, S.A. and Ramasami, E.V.1998. Biotechnological Methods of Pollution Control. Oxford University Press, Hyderabad.
- Benton, A.H. and Werner, W.E. 1976. FieldBiology and Ecology. Tata McGraw Hill, New Delhi. Boitani, L and T.K.Fuller.2000.Research Techniques in Animal Ecology. Columbia University Press, USA
- Daniel,C.D. 2010.Environmental Science.(8thedn).Jones and Bartlett Publishers.
- Mani,M.S. Ecology and Biogeography in india.1974. Dr.W. Junk, The Hague.
- Misra, S P and Pandey S. N.2009. Essential Environmental Studies. Ane BooksPvt. Ltd.
- Odum, E P .1996.Fundamentals of Ecology. W.B Saunders College Publishing, Philadelphia.
- Peter, H.R., Berg, L.R., and Hassenzahl, D.M. 2008. Environment. (5thedn.).John Wiley Publishers. Pianka, E. R. 1981. Competition and Niche Theory in "Theoretical Ecology". (2ndedn.).In: May, R.M. (Ed.). Blackwell, London.
- Rana,S.V.S. 2009.Essentials of Ecology and Environmental Science.(4thedn.). PHI learning Pvt. Ltd., New Delhi
- Simons, I.G. 1981. Ecology of Natural Resources. Edwin-Arnold Ltd., London.
- Tietenberg, T.2004. Environmental and Natural Resource Economics.(6thedn.). Pearson, New Delhi. Tyler, M. G. 2007. Living in the Environment. (15thedn). Thomson Brooks/cole, New York.

COURSE 06: 16P2ZOOT06: GENETICS AND BIOINFORMATICS

PROGRAMME	MASTER OF SCIENCE [ZOOLOGY]	SEMESTER	2
COURSE CODE AND TITLE	16P2ZOOT06: GENETICS AND BIOINFORMATICS	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	RAAGAM PM, JOBIN C THARIAN, MONCEY VINCENT		

COURSE OBJECTIVES

To understand the principles of Genetic Transmission

To understand the Molecular Organization of Chromosomes and Fine structure of Genes

To understand Genetic Linkage, Recombination and Chromosome mapping

To understand DNA replication and Gene Mutation

To understand the concepts of Human Genetics, Extra-chromosomal Inheritance, Epigenetics, Quantitative and Population Genetics

To understand various Bioinformatics databases and their functional areas

To understand the idea of sequence similarity search and sequence analysis methodology

To understand the basic idea of Genomics, Proteomics, systems biology and metabolomics

Session	Topic	Methods of Teaching	Value Addition	Remarks
Module I. Principles of Genetic Transmission				
1	Extension of Mendel's principles	Lecture and animation videos		
2	Allelic variation and gene function- incomplete dominance and codominance	Lecture and animation videos		
3	Gene action-from genotype to phenotype	Lecture and animation videos		
4	Penetrance and expressivity, gene interaction epistasis	Lecture and animation videos		
5	Pleiotropy, genomic imprinting, phenocopy	Lecture and animation videos		
Module II. Molecular Organization of Chromosomes				
6	Genome size and C-value Paradox	Lecture and animation videos		
7	Structure of eukaryotic chromosome, nucleosome model	Lecture and animation videos		
8	Chromosome Condensation - euchromatin and heterochromatin	Lecture and animation videos		
9	Repetitive nucleotide sequences in eukaryotic genomes	Lecture and animation videos		
10	Kinetics of renaturation: Cot and Cot curve	Lecture and animation videos		
11	Unique and repetitive sequences. Mini and micro Satellites.	Lecture and animation videos		
12	Molecular structure of centromere and telomere. Polytene chromosomes and Lampbrush chromosomes. Chromosome banding techniques.	Lecture and animation videos		
Module III. Gene Fine Structure				
13	Evolution of the concept of gene function and structure. The definition of gene	Lecture and animation videos		
14	The standard genetic code, Redundancy and Wobble	Lecture and animation videos		
15	DNA Structure- alternate forms of the Double Helix	Lecture and animation videos		
16	Gene synthesis (in vitro Synthesis) – works of Khorana and Kornberg. Modern findings on the nature of gene	Lecture and animation videos		
17	Interrupted genes In eukaryotes, exons and introns-R loops, significance of introns. Genes-within-genes (overlapping genes)	Lecture and animation videos		
18	Bacteriophage ϕ X174. Transposable elements in Bacteria –IS elements, composite transposons, Tn3 elements, medical significance	Lecture and animation videos		
19	Transposable elements in Eukaryotes-P elements	Lecture and animation videos		

20	Retrotransposons, significance of transposons	Lecture and animation videos		
Module IV. Genetic Linkage, Recombination & Chromosome Mapping				
21	Chromosome theory of heredity, Linkage and recombination of genes in a chromosome	Lecture and animation videos		
22	Crossing over as the physical basis of recombination, Stern's Experiment	Lecture and animation videos		
23	Molecular mechanisms of recombination (Holliday model), Gene conversion	Lecture and animation videos		
24	Recombination mapping with two-point and three-point test cross in <i>Drosophila</i>	Lecture and animation videos		
25	Coincidence and Interference	Lecture and animation videos		
26	Genetic mapping by tetrad analysis in <i>Neurospora</i>	Lecture and animation videos		
27	Mitotic recombination. Genetic recombination in Phage, rII locus	Lecture and animation videos		
28	Complementation test, deletion mapping, conjugation mapping	Lecture and animation videos		
29	Mapping by interrupted mating	Lecture and animation videos		
30	Mapping with molecular markers and mapping using somatic cell	Lecture and animation videos		
Module V. Gene Mutation				
31	Molecular basis of gene mutation	Lecture and animation videos		
32	Mutant types- lethal, conditional	Lecture and animation videos		
33	Loss of function, gain of function, germinal versus somatic mutants	Lecture and animation videos		
34	Induced mutation, The Ames test for mutagen/carcinogen detection.	Lecture and animation videos		
35	DNA damage and repair mechanisms	Lecture and animation videos		
Module VI. DNA Replication				
36	The Meselson-Stahl experiment	Lecture and animation videos		
37	Semi conservative replication of DNA in chromosomes	Lecture and animation videos		
38	Theta replication	Lecture and animation videos		
39	Rolling-circle replication	Lecture and animation videos		
40	Molecular mechanisms of eukaryotic replication	Lecture and animation videos		
Module VII. Human Genetics				

41	Karyotype, pedigree analysis	ICT (ppt & images, video clippings) and discussion		
42	Lod score for linkage testing	ICT (ppt & images, video clippings) and discussion		
43	Genetic analysis of complex traits - complex pattern of inheritance,	ICT (ppt & images, video clippings) and discussion		
44	Threshold traits; human genome and mapping.	ICT (ppt & images, video clippings) and discussion		
Module VIII. Extra Chromosomal Inheritance				
Module VIII. Extra Chromosomal Inheritance				
45	Inheritance of mitochondrial and chloroplast genes	ICT (ppt & images, video clippings) and discussion		
46	Maternal inheritance	ICT (ppt & images, video clippings) and discussion		
Module IX. Epigenetics				
47	Epigenetics - from phenomenon to field, a brief history of epigenetics - overview and concepts	ICT (ppt & images, video clippings) and discussion		
48	Chromatin modifications and their mechanism of action	ICT (ppt & images, video clippings) and discussion		
49	Concept of 'histone-code' hypothesis	ICT (ppt & images, video clippings) and discussion		
50	Epigenetics in <i>Saccharomyces cerevisiae</i>	ICT (ppt & images, video clippings) and discussion		
51	Position effect variegation, heterochromatin formation and gene silencing in <i>Drosophila</i>	ICT (ppt & images, video clippings) and discussion		
Module X. Quantitative and Population Genetics				
52	Polygenic inheritance, analysis of quantitative traits	ICT (ppt & images, video clippings) and discussion		
53	Quantitative traits and natural selection	ICT (ppt & images, video clippings) and discussion		
54	Estimation of heritability, QTL mapping	ICT (ppt & images, video clippings) and discussion		

55	Genotype-environment interactions	ICT (ppt & images, video clippings) and discussion		
56	Molecular analysis of quantitative traits	ICT (ppt & images, video clippings) and discussion		
57	Phenotypic plasticity	ICT (ppt & images, video clippings) and discussion		
BIOINFORMATICS: Module I. Biological Databases				
58	Introduction- Biological databases	Lecture with PowerPoint		
59	Primary databases - Nucleotide sequence databases: GenBank, EMBL, DDBJ	Lecture with PowerPoint		
60	Protein sequence databases: SWISSPROT, PIR	Lecture with PowerPoint		
61	Structure databases: PDB, NDB	Lecture with PowerPoint		
62	Secondary databases: PROSITE, Pfam, CATH	Lecture with PowerPoint		
63	Composite databases: OWL Literature database: PubMed; Database searching – Entrez	Lecture with PowerPoint		
64	Database sequence submission – BankIt.	Lecture with PowerPoint		
Module II. Sequence Analysis				
65	Types of sequence alignment and Methods of sequence alignment	Lecture with PowerPoint		
66	Scoring schemes, gaps and gap penalties	Lecture with PowerPoint		
67	Construction of phylogenetic trees using BIOEDIT and Construction of phylogenetic trees using PHYLIP; Evaluation of phylogenetic trees	Lecture with PowerPoint		
Module IV. Genomics and Proteomics				
68	Structural genomics and Functional genomics	Lecture with PowerPoint		
69	Comparative genomics-Data mining in proteomics	Lecture with PowerPoint		
70	Microarrays	Lecture with PowerPoint		
71	Introduction- metabolomics	Lecture with PowerPoint		
72	Gene network, Synthetic biology.	Lecture with PowerPoint		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

S. No	Date of completion	Topic of Assignment & Nature of assignment (Individual – Written/Presentation – Graded or Non-graded etc)
		Assignment Topics
1	30-01-2017	Transposons
2	02-02-2017	Extra chromosomal inheritance
3	10-02-2017	Metabolomics

REFERENCES

- Brooker , 1999. Genetics: Analysis and Principles. Addison- Wesley, NY.
- David Allis and Thomas Jenuwein, 2007.Epigenetics.Cold Spring Harbor Laboratory Press.
- Hartl, D.L. 2000.A Primer of Population Genetics.Suinaer Associate, Inc, Massachusetts.
- Gardner. J.E.,Simmons, J.M and D.P.Snustad.2007. Principles of Genetics (8thedn). John Wiley,India.
- Gilbert, S.F. 2006.Developmental Biology (9th edn).Sinauer Associates, Inc., Publishers, Masachusetts.
- Griffiths et al., 2002. Modern Genetic Analysis.W.H. Freeman, NY, USA.
- Hartl, L.D., and E.W. Jones.2009.Genetics:Analysis of Genes and Genomes (7thedn). Jones & Bartlett Pub.,Inc. MA,USA.
- Herskowitz I.H, 1977. Principles of Genetics .Collier Macmillan.
- Lewin B, 2008 .Genes (9thedn). Jones and Barlett Publishers Inc.
- Klug, W.S. and Michael R. Cummings, 2009.Concept of Genetics.Pearson Education.Inc.
- Russel,J,P., 2010. Genetics.Pearson International Edn.
- Snustard,P and M. J. Simmons, 2010. Principles of Genetics. John Wiley and Sons
- Strickberger, M.W.1968.Genetics. Macmillan Publishing Co.
- Watson et al., 2004. Molecular Biology of Gene (5thedn.). Pearson Education Inc

COURSE 07: 16P2ZOOT07 DEVELOPMENTAL BIOLOGY

PROGRAMME	MASTER OF SCIENCE [ZOOLOGY]	SEMESTER	2
COURSE CODE AND TITLE	16P2ZOOT07 DEVELOPMENTAL BIOLOGY	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	SMITHA S & JOBI MJ		

COURSE OBJECTIVES
To define gametogenesis and the process of formation of embryos, and molecular mechanisms that regulate embryo formation
To assess the process of fertilization and molecular mechanisms working for keeping the identity of species
To recall the critical nature of axis and structure formation during early embryonic life
To illustrate the factors and molecules that have critical roles in normal formation of embryos
To discuss the process of post embryonic development and regeneration
To identify the different perturbations during embryo formation
To discover the applied aspects of embryogenesis for treatment of infertility in human beings
To examine the potential of stem cells and scope of therapeutic cloning

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Module 1 Early development at molecular level				
1.	Introduction	Discussion to test the pre-requisite		
2.	Molecular biology of gametogenesis	Lecture and PPT		
3.	Germ plasm and determination of primordial germ cells	ICT Enabled (PPT)		
4.	Germ cell determination – in nematodes, insects, mammals	ICT Enabled (PPT)		
5.	Germ cell migration in insects, mammals	Discussions from Text – Gilbert	Video	
6.	Primordial germ cells into functional gametes	PPT		

7.	Biochemicals involved in maintaining species – specificity	Lecture and PPT		
8.	Electrical and biochemical mechanisms to ensure monospermy	Lecture and PPT	Video	
9.	Biochemistry of egg activation	Lecture and PPT		
10.	Control mechanism in cleavage	Lecture and ppt		
11.	Blastulation - significance of mid-blastula transition	Lecture and PPT		
12.	Molecular basis of gastrulation	Discussion and teaching		
13.	Discussion			
Module II. Axis and Pattern Formation – vertebrate model				
14.	Anterior posterior axis	Lecture and PPT		
15.	Dorsal ventral axis	Lecture and PPT		
16.	Left right axis	Lecture and PPT		
17.	Spemann's constriction experiments	Lecture and PPT		
18.	Transplantation experiments	Lecture and PPT		
19.	Embryonic induction, competence – Spemann organizer	Lecture and PPT		
20.	Nieuwkoop centre and mesodermal signaling	Lecture and PPT		
21.	Inducer molecules associated with organizer such as paracrine factors (FGF factors, Hedgehog proteins)	Lecture		
22.	Wnt proteins, TGF – β factors, BMP proteins	Lecture		
23.	Justacrine factors, transcription factors	Lecture		
24.	Role of these molecules in development. Left-right axis formation	Lecture and PPT	Video	
25.	Significance of axis formation in embryonic patterning	Lecture and PPT		
26.	CIA- I	1Hr.		
Module III. Axis and Pattern Formation – invertebrate models				
27.	Early development and axis specification in <i>caenorhabditis elegans</i> .	Lecture and PPT		
28.	Early development of <i>drosophila</i> .	Lecture and PPT		

29.	Molecular mechanism of anterior-posterior patterning in <i>drosophila</i> - introduction	Lecture and PPT		
30.	Maternal effect genes	Lecture and PPT		
31.	Zygotic genes,	Lecture and PPT		
32.	Gap genes	Lecture and PPT		
33.	Pair rule genes, segment polarity genes	Lecture and PPT		
34.	Homeotic selector genes, realisator genes	Lecture and PPT		
35.	Dorsal-ventral patterning in <i>drosophila</i>	Lecture and PPT		
36.	Left right patterning in <i>drosophila</i>	Lecture and PPT		
37.	Revision			
Module IV. Postembryonic Development				
38.	Metamorphosis- Introduction	Lecture and PPT		
39.	Morphological changes associated with Amphibian metamorphosis	Lecture and PPT		
40.	growth of new structures, cell death and remodelling during metamorphosis.	Lecture and PPT		
41.	Hormonal regulation of amphibian metamorphosis.	Lecture and PPT		
42.	Insect metamorphosis – role of imaginal discs	Lecture and PPT		
43.	Hormonal control of insect metamorphosis.	Lecture and PPT	Video	
44.	Regeneration -Introduction	Lecture		
45.	stem cell mediated, epimorphosis,	Lecture and PPT		
46.	morpholaxis, and compensatory.	Lecture and PPT		
47.	Mechanism of epimorphic regeneration in Salamander leg	Lecture and PPT		
48.	Morpholactic regeneration in Hydra,	Lecture and PPT		
49.	Compensatory regeneration in mammalian liver	Lecture and PPT		
50.	Lens regeneration in amphibia	Lecture and PPT		

51.	Revision			
Module 5 Teratogenesis				
52.	Malformations and disruptions	Seminar		
53.	Gene – phene relationship	Seminar		
54.	Alcohol, retinoic acid as teratogens	Seminar		
55.	CIA- II	2 hrs		
56.	Drugs and chemicals, heavy metals as teratogens	Seminar		
57.	Pathogens and environmental oestrogens as teratogens	Seminar		
58.	Revision			
Module VI. Applied aspects of Developmental Biology				
59.	Human Infertility – types and causes	Lecture and PPT		
60.	<i>In vitro</i> fertilization	Lecture and PPT		
61.	Other assisted reproductive technologies (ART).	Lecture and PPT		
62.	Cloning experiments- (Amphibians, Mammals and Human)	Lecture and PPT		
63.	Ethical issues.	Lecture and PPT		
64.	Revision			
Module VII. Stem cells				
65.	Definition, Pluripotent, multipotent stem cells,	Lecture and PPT		
66.	embryonic stem cells & adult stem cells	Lecture and PPT		
67.	Types of embryonic stem cells	Lecture and PPT		
68.	Stem cells and therapeutic cloning	Lecture and PPT		
69.	Stem cells and regenerative medicine,	Lecture and PPT		
70.	Transgenic stem cells	Lecture and PPT		
71.	Stem cell banks	Lecture and PPT		
72.	Ethical issues associated with stem cell experiment	Lecture and PPT		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual – Written/Presentation – Graded or Non-graded etc)	Course Outcome
1	2/2/2017	Stem cells	
2	4/2/2017	Regeneration	

GROUP ASSIGNMENTS/ACTIVITES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Course Outcome
1	15/2/2017	Development in chick	

References

- Balinsky, B.I.2004. An Introduction to Embryology. .B.SaundersCo.,Philadelphia.
- Berril, N.J. 1979. Developmental Biology.Tata McGraw-Hill Pub.Co.Ltd.,New Delhi.
- Gilbert, S.F. 2006. Developmental Biology (9thedn).Sinauer Associates Inc., Publishers, Massachusetts, USA
- Hopper, A.F. and Hart ,N.H.1985. Foundations of Animal Development.Oxford University Press, Oxford.

COURSE 08: 16P2ZOOT08 BIOCHEMISTRY

PROGRAMME	MASTER OF SCIENCE [ZOOLOGY]	SEMESTER	2
COURSE CODE AND TITLE	16P2ZOOT08 BIOCHEMISTRY	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	GISHA SIVAN & JOBI M J		

COURSE OBJECTIVES
To understand structure and classification of different biomolecules – protein, lipid, carbohydrate and nucleic acid.
To examine the metabolic pathways of different biomolecules
To discuss the disorders of the biomolecules
To evaluate the different enzymes and its kinetics
To analyze the biological roles of biomolecules
To discuss the synthesis and derivatives of biomolecules

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Module I. Carbohydrates				
1	Reactions of monosaccharides: Oxidation, reduction, ester formation, osazone formation. Glycosidic bond.	ICT Enabled (ppt&images, video clippings)	e-resource	
2	Disaccharides: Sucrose, Lactose, Maltose, Isomaltose, Cellobiose and Trehalose.	ICT Enabled (ppt&images, charts, video clippings)		
3	Polysaccharides: Homopolysaccharides- Starch, Glycogen, Cellulose, Chitin, Dextran, Inulin, Pectin.	ICT Enabled (ppt&images, video clippings)		
4	Heteropolysaccharides- Hyaluronic acid, Heparin, Chondroitin sulphate, Keratansulphate, Dermatan sulphate and Agar-agar.	ICT Enabled (ppt&animations, images, video clippings)	e-resource	

5	Glycoproteins and Mucoproteins.	ICT Enabled (ppt& animations, images, video clippings)	Video	
Module II. Proteins				
6	Structure, classification and properties of amino acids.	ICT Enabled (ppt&images, video clippings)	e-resource	
7	Amphoteric properties of amino acids, pK value and iso-electric point of amino acids. Peptide bond formation and peptides.	ICT Enabled (ppt&images, video clippings)		
8	Reactions (due to carboxyl group, amino group and side chains).	ICT Enabled (ppt&images, video clippings)	e-resource	
9	Colour reactions of amino acids and proteins.	ICT Enabled (ppt&images, video clippings)		
10	Primary structure of protein (e.g. insulin). Classification and properties of proteins. Conformation of proteins- chemical bonds involved,	ICT Enabled (ppt&images, video clippings)	e-resource	
11	Secondary structure- Alpha helix, Collagen helix, Beta pleated sheet, Ramachandran angles and Ramachandran map.	ICT Enabled (ppt&images, video clippings)		
12	Fibrous proteins- examples (Keratin, Collagen, Elastin, Resilin, Fibrous muscle proteins). Chaperons.	ICT Enabled (ppt&images, video clippings)	Video	
13	Tertiary structure- e.g. Myoglobin. Quaternary structure - e.g. Haemoglobin	ICT Enabled (ppt&images, video clippings)		
14	CIA I	1 hr; descriptive answers only		
Module III. Lipids				

15	Classification of lipids: simple, compound and derived lipids. Biological importance of lipids.	ICT Enabled (ppt&images, charts, video clippings)	e-resource	
16	Fatty acids: classification, nomenclature. Simple fats: Triacylglycerol (Triglycerides) - Physical properties.	ICT Enabled (ppt&images, video clippings)		
17	Reactions-Hydrolysis, Saponification, Rancidity. Acid number, Saponification number, Iodine number, Polenske number and Reichert-Meissl number of lipids. Waxes.	ICT Enabled (ppt&images, video clippings)	e-resource	
18	Compound lipids: Phospholipids- Lecithin, Phosphatidyl inositol, Cephalins, Plasmalogens.	ICT Enabled (ppt&images, video clippings)	Video	
19	Glycolipids, Sphingolipids. Derived Lipids	ICT Enabled (ppt&images, charts, video clippings)		
20	Steroids: Biologically important steroids-cholesterol, Vitamin D, Bile acids,	ICT Enabled (ppt&images, video clippings)	e-resource	
21	Ergosterol, Terpenes, Lipoproteins.	ICT Enabled (ppt&images, video clippings)		
22	Prostaglandins- structure, types, synthesis and functions	ICT Enabled (ppt, images, animations & video clippings)	Video	
23	Toxicants of biological origin - Aflatoxin, Botulinum toxin	ICT Enabled (ppt&images, charts, video clippings)		
Module IV. Nucleic Acids				
24	Structural organization of DNA (Watson - Crick Model)	ICT Enabled (ppt&image		

		s, charts, video clippings)		
25	Characteristic features of A, B, C and Z DNA.	ICT Enabled (ppt&images, video clippings)	Video	
26	Structural organization of tRNA;	ICT Enabled (ppt&images, video clippings)		
27	Protein-nucleic acid interaction. DNA regulatory proteins,	ICT Enabled (ppt&images, video clippings)	e-resource	
28	folding motifs, conformation flexibilities,	ICT Enabled (ppt&images, video clippings)		
29	denaturation, renaturation,	ICT Enabled (ppt&images, video clippings)	Video	
30	DNA polymerases,	ICT Enabled (ppt&images, video clippings)		
31	Restriction endonucleases.	ICT Enabled (ppt&images, video clippings)		
32	CIA- II			
33	Biological roles of nucleotides and nucleic acids.	ICT Enabled (ppt&images, video clippings)		
34	Biological roles of nucleic acids.	ICT Enabled (ppt&images, video clippings)	Video	
35	Revision			
36	Revision			
Module V. Enzymes				

37	Co-enzymes,Iso-enzymes,Ribozymes. Enzyme specificity	ICT Enabled (ppt&images, video clippings)		
38	Mode of action of enzymes.Formation of enzyme substrate complex. Lowering of activation energy, various theories, active site.	ICT Enabled (ppt&images, charts, video clippings)	e-resource	
39	Enzyme kinetics: Michaelis-Menten equation. Km value and its significance	ICT Enabled (ppt&images, video clippings)		
40	Enzyme velocity and factors influencing enzyme velocity.	Lecture	Video	
41	Kinetics of enzyme inhibition, suicide inhibition and feedback inhibition	ICT Enabled (ppt&images, video clippings)		
42	Enzyme regulation: Allosteric regulations – Key enzymes, Covalent modifications. Enzyme engineering.	ICT Enabled (ppt&images, video clippings)	e-resource	
Module VI. Carbohydrate Metabolism				
43	Glycogen metabolism- Glycogenesis, Glycogenolysis.	ICT Enabled (ppt&images, charts, video clippings)		
44	Adenylate cascade system	ICT Enabled (ppt&images, video clippings)		
45	Ca ²⁺ Calmodulin –sensitive phosphorylase kinase. Regulation of glycogen synthesis.	ICT Enabled (ppt, images, animations & video clippings)		
46	Minor metabolic pathways of carbohydrates:Pentose Phosphate pathway,Glucuronicacidmetabolis.	ICT Enabled (ppt, images, animations)	e-resource	

		& video clippings)		
47	Galactose metabolism	ICT Enabled (ppt&image s, charts, video clippings)	e-resource	
48	Inborn errors associated with carbohydrate metabolism.	ICT Enabled (ppt&image s, video clippings)		
49	Glycogen storage diseases	Lecture		
50	Lactose intolerance, Galactosuria	ICT Enabled (ppt&image s, charts, video clippings)	e-resource	
Module VII. Metabolism of Proteins				
51	Fate of carbon skeletons of aminoacids: glucogenic	ICT Enabled (ppt, images, animations & video clippings)		
52	Ketogenic	ICT Enabled (ppt, images, animations & video clippings)		
53	Partly glucogenic and examples	ICT Enabled (ppt, images, animations & video clippings)	e-resource	
54	Partly ketogenic with examples	ICT Enabled (ppt, images, animations & video clippings)		

56	Synthesis of biologically significant compounds from different aminoacids with special reference to glycine,	ICT Enabled (ppt&image s, video clippings)	e-resource	
57	glutamic acid and phenylalanine,	ICT Enabled (ppt&image s, charts, video clippings)		
58	tyrosine and tryptophan.	ICT Enabled (ppt&image s, video clippings)	e-resource	
Module VIII. Metabolism of Lipids				
59	Alpha oxidation and omega oxidation of fatty acids.	ICT Enabled (ppt&image s, video clippings)		
60	De novo synthesis of fatty acids.	ICT Enabled (ppt&image s, video clippings)	e-resource	
61	Metabolism of cholesterol, synthesis and its regulation.	ICT Enabled (ppt&image s, video clippings)		
62	Biosynthesis of triglycerides.	ICT Enabled (ppt&image s, charts, video clippings)	e-resource	
63	Metabolism of ketone bodies - Ketogenesis, Ketolysis, Ketosis.	ICT Enabled (ppt&image s, video clippings)		
Module IX. Nucleic Acid and Mineral Metabolism				
64	Catabolism of purines and pyrimidines.	ICT Enabled (ppt, images, animations & video clippings)	e-resource	
65	Major and minor nutrients. Role of Calcium, Phosphorus,	ICT Enabled (ppt,		

		images, animations & video clippings)		
66	Magnesium, Sodium	ICT Enabled (ppt&images, charts, video clippings)		
67	Potassium, Chloride,	ICT Enabled (ppt&images, video clippings)	e-resource	
68	Sulphur and Iron.	ICT Enabled (ppt&images, video clippings)		
69	Free radicals and antioxidants, Generation of free radicals. Reactive oxygen species.	ICT Enabled (ppt&images, video clippings)	e-resource	
70	CIA II			
71	Free radical scavenger systems. Lipid peroxidation.	ICT Enabled (ppt, images, animations & video clippings)	Video	
72	Preventive antioxidants.	ICT Enabled (ppt, images, animations & video clippings)		

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	4/1/2017	Enzyme kinetics: Michaelis-Menten equation. Km value and its significance
2	21/1/2017	De novo synthesis of fatty acids.

GROUP ASSIGNMENTS/ACTIVITIES – Details & Guidelines

	Date of completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	2/2/2017	Structure, classification and properties of amino acids)
2	9/2/2017	Preventive antioxidants.

References

- Lehninger, A.L. 2008. Principles of Biochemistry. (5th edn). CBS Publishers and Distributors, New Delhi.
- Stayer, L. 2011. Biochemistry. (7th edn). W.H. Freeman & Co. NY.
- Voet, D. and J.G. Voet.2004. Biochemistry. John Wiley & Sons.,NY.

Web resource references:

- <https://www.youtube.com/watch?v=8PWF5OeB7Ec>
- <https://udmp.lf1.cuni.cz/file/5778/purinepyrimidineporphyrie-en2015.pdf>