

COURSE PLAN FOR BACHELOR OF SCIENCE PROGRAMME IN ZOOLOGY

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA					
DEPARTMENT OF ZOOLOGY					
PROGRAMME	B.Sc. Zoology			SEMESTER	1
COURSE CODE AND TITLE	15U1CRZOO01 Animal Diversity - Non Chordata I			CREDIT	2
HOURS/SEM	36				
Course Plan for Course Teacher 1 (18 Hours)					
Module I. What is Biology?				2 hrs	
Sl. No	Session	Topic	Method of Teaching	Value Additions	Remarks
1	1	History of Biology (Brief), Branches of biology and its scopes.	Class room Lecture	Scope of studying Zoology	
2	2	What is science? Method of science.	Class room Lecture	Importance of scientific methodology in the technological advancement of modern civilization	
Module II.					
Symmetry and Coelom- 1 hr					
3	1	Symmetry - Asymmetry, Spherical, Radial, Biradial and Bilateral Coelom - Acoelomates, Pseudocoelomates and Eucoelomates Schizocoelom, Enterocoelom., Protostomia and Deuterostomia	Class room Lecture with Illustrations		
Module III. Taxonomy				7 hrs	
4	1	Principles of taxonomy. Nomenclature.	Conventional classroom		

		Zoological nomenclature.(ICZN)	teaching		
5	2	Law of Priority (Brief) Homonymy and Synonymy. (Brief)	Classroom teaching		
6	3	Classification - Keys and principles	Classroom teaching	Use of Model keys	
7	4	Two kingdom and Five kingdom classification.	Classroom teaching		
8	5	Concepts and definition of classification. Approaches of taxonomy.	Classroom teaching		
9	6	Modern trends in taxonomy. (Molecular taxonomy)	Classroom teaching		
10	7	Phylogeny and taxonomy.	Classroom teaching	Showing phylograms	

Module IV :Kingdom Protista- Type: Paramecium

11	1	Salient features and classification scheme of Kingdom Protista			
12	2	1. Phylum Rhizopoda: <i>e.g.</i> Amoeba 2. Phylum Actinopoda: <i>e.g.</i> Actinophrys 3. Phylum Dinoflagellata: <i>e.g.</i> Noctiluca	Lecture with Powerpoint Presentation	Amoeba movement and food capture- HD Video Show	
13	3	4. Phylum Parabasalia: <i>e.g.</i> Trychonympha 5. Phylum Metamonada: <i>e.g.</i> Giardia 6. Phylum Kinetoplasta: <i>e.g.</i> Trypanosoma 5. Phylum Metamonada: <i>e.g.</i> Giardia 6. Phylum Kinetoplasta: <i>e.g.</i> Trypanosoma	Lecture with Powerpoint Presentation		
14	4	7. Phylum Euglenophyta: <i>e.g.</i>	Lecture with		

		Euglena 8. Phylum Cryptophyta: <i>e.g.</i> Cryptomonas 9. Phylum Opalinata: <i>e.g.</i> Opalina 10. Phylum Bacillariophyta: <i>e.g.</i> Diatoms	PowerPoint Presentatio n		
15	5	11. Phylum Ciliophora: Paramecium; Habit and Habitat; Cell structure, Organelles and their functions	Lecture with PowerPoint Presentatio n	Each student gets opportunit y for microscopi c examinatio n of live specimen	
16	6	Paramecium- Locomotion, Nutrition, Respiration, Excretion and Osmoregulation			
17	7	Paramecium- Reproduction; Asexual (Binary fission, Endomixis and Hemimixis)			
18	8	Paramecium- Reproduction; Sexual (Conjugation, Autogamy and Cytogamy); Significance of Conjugation			

Assignment Topics

ICZN
 Carolus Linnaeus- Binomial Nomenclature
 Diversity of Rhizopodan Protists
 Parasitic Rhizopodans
 Euglenids and Photosynthesis
 Structure of Cilia
 Diversity of Dinoflagellates
 Diversity of Diatoms
 Infusoria culture
 Economically important Protists (other than parasites)

Course Plan for Course Teacher-2 (18 Hours)

PROGRAMME	B.Sc. Zoology			SEMESTER	1
COURSE CODE AND TITLE	15U1CRZOO01 Animal Diversity - Non Chordata I			CREDIT	2
HOURS/SEM	18				
Sl.No	Session	Topic	Method of Teaching	Value Additions	Remarks
Kingdom: Protista 7 Hrs					
Phylums: Sporozoa, Microsporidia, Rhodophyta					
1	1	Kingdom Protista: Genera Introduction Phylum Sporozoa: Plasmodium Phylum Microsporidia: Nosema Phylum Rhodophyta: Red Alga	Lecture with PowerPoint Presentation		
2	2	Parasitic Protozoans: <i>Entamoeba histolytica</i> <i>Trypanosoma gambiense</i>	Lecture with PowerPoint Presentation		
3	3	<i>Plasmodium</i> Life cycle of Plasmodium	Lecture with PowerPoint Presentation		
4	4	<i>Plasmodium</i> Life cycle of Plasmodium	Lecture with PowerPoint Presentation		
5	5	Parasitic Protozoans: <i>Leishmania</i> <i>Giardia intestinalis</i>	Lecture with PowerPoint Presentation		
6	6	Parasitic Protozoans: <i>Trichomonas vaginalis</i> <i>Balantidium coli</i>			
Module V: Kingdom: Animalia					1hr
7	1	Outline classification of Kingdom Animalia. Three branches- Mesozoa, parazoa, Eumetazoa.	Lecture with PowerPoint Presentation		
MODULE VI: Mesozoa and Coelenterata					
8	1	Mesozoa - Eg. Rhopalura.	Lecture with PowerPoint Presentation		
9	2	Phylum Porifera. Classification up to classes. Class I- Calcarea. Eg. Sycon., Class II - Hexactinellida . Eg. Euplectella. Class III - Demospongia Eg.	Lecture with PowerPoint Presentation		

		Cliona.		
10	3	1. Reproduction in sponges 2. Canal system in sponges	Lecture with PowerPoint Presentation	
Phylum Coelenterata 7 hrs				
11	1	Phylum Coelenterata: General characters and Classification up to classes	Lecture with PowerPoint Presentation	
12	2	Type: <i>Obelia</i> Classification, Habitat and habit	Lecture with PowerPoint Presentation	
13	3	Type: <i>Obelia</i>	Lecture with PowerPoint Presentation	
14	4	Class I- Hydrozoa Eg. Halistemma. Class II - Scyphozoa Eg. Rhizostoma.	Lecture with PowerPoint Presentation	
15	5	Class III- Anthozoa Eg. Fungia. Corals- General features	Lecture with PowerPoint Presentation	
16	6	Coral reefs and conservation of reef fauna	Lecture with PowerPoint Presentation	
17	7	Polymorphism in Coelenterates	Lecture with PowerPoint Presentation	
MODULE VII 1 hr				
Phylum Ctenophora				
18	1	Phylum Ctenophora: General information Eg. Pleurobrachia.	Lecture with PowerPoint Presentation	
TEXTBOOKS AND REFERENCES				
1	Zoological Society of Kerala Study material. <i>Animal Diversity</i> 2002.			
2	Dhami. P.S. and Dhami J.K. 1979 Invertebrate Zoology. R. Chand and Co. Delhi.			
3	Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume I. Invertebrate part-I and part-II. S. Viswanathan Printers & Publishers. Pvt.Ltd.			
4	Bowler Peter J. and Iwan Rhys Morus. 2005 <i>Making Modern Science: A Historical Survey</i> . College of Chicago Press, Chicago, IL:			
5	Ernst Mayr 1982. <i>The Growth of Biological Thought: Diversity, Evolution and Inheritance</i> . Published by Harvard College Press.			
6	Ervin Schrodinger 1944. What is life? Mind and Matter. Cambridge College Press.			
7	Jacques Monod 1971. <i>Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology</i> . Vintage Pub. NY			
8	Kuhn, Thomas. 1996 <i>The Structure of Scientific Revolutions</i> 3rd ed.: College of Chicago Press, Chicago, IL			
9	Taylor, Green, Stout (2008) Biological Science, Cambridge College, Press, p 951.			
10	Thomas, A.P. (Editor) 2009. Biology - Perspectives and Methods. Green Leaf Publishers, Kottayam.			

COURSE PLAN FOR BACHELOR OF SCIENCE PROGRAMME IN ZOOLOGY

	SACRED HEART COLLEGE(AUTONOMOUS), THEVARA		
	DEPARTMENT OF ZOOLOGY		
	COURSE PLAN FOR ACADEMIC YEAR 2015-2016		
PROGRAMME	B.Sc. Zoology	SEMESTER	2
COURSE CODE AND TITLE	15U2CRZ002 Core Course 2 ANIMAL DIVERSITY – Non Chordata II	CREDIT	2
HOURS/SEM	36		
FACULTY NAME	Dr. Moncey Vincent		
	Course Plan for Course Teacher-1 (18 Hours)		
	Module I Phylum Platyhelminthes		3hrs
Sessions	Topic	Method of Teaching	Remarks
1	Introduction to Phylum Platyhelminthes- General Characteristics and taxonomy	Lecture supported with PowerPoint presentation	
2	Classification upto classes. Class I - Turbellaria. Eg. Planaria. Class II - Trematoda Eg. Fasciola Class III- Cestoda Eg. <i>Taenia saginata</i> .	Lecture supported with PowerPoint presentation	
3	1. Life history of <i>Fasciola hepatica</i> . 2. Platyhelminth parasites of Man and Dog (<i>Schistosoma</i> , <i>Taenia solium</i> , <i>Echinococcus</i>).		
Module II	Phylum Aschelminthes.		2 hrs
4	Introduction to Phylum Aschelminthes. Eg. Enterobius.	Lecture supported with PowerPoint presentation	
5	General Topic- Pathogenic nematodes.	Lecture supported with PowerPoint presentation	
Module III	Phylum Annelida		7 hrs
6	Introduction to Phylum Phylum Annelida	Lecture supported with PowerPoint presentation	
7	Classification upto classes. Class I- Archiannelida Eg. Polygordius Class II - Polychaeta Eg. Chaetopterus	Lecture supported with PowerPoint presentation	
8	ClassIII- Oligochaeta Eg. Megascolex. Class IV - Hirudinea Eg. Ozobranchus	Lecture supported with PowerPoint	

		presentation	
	Internal Examination of		1 Hour
9	Study of Type - Earthworm Habit habitat, Ecological significance	Lecture supported with PowerPoint presentation	
10	Earthworm: Nutrition and Digestion	Lecture supported with PowerPoint presentation	
11	Earthworm: Respiration, Excretion	Lecture supported with PowerPoint presentation	
12	Earthworm: Reproduction	Lecture supported with PowerPoint presentation	
MODULE -V	Phylum Mollusca		5 hrs
13	Introduction to Phylum Mollusca General features Classification up to classes Class I- Monoplacophora, Eg. Neopilina Class II- Amphineura, Eg. Chiton	Lecture supported with PowerPoint presentation	
14	Class III- Gastropoda, Eg. Aplysia Class IV- Scaphopoda, Eg. Dentalium	Lecture supported with PowerPoint presentation	
15	Class V-Pelecypoda, Eg. Pinctada Class VI- Cephalopoda, Eg. Sepia	Lecture supported with PowerPoint presentation	
16	Pearl formation	Lecture supported with PowerPoint presentation	
17	Pearl culture	Lecture supported with PowerPoint presentation	
Module VIII	Phylum Hemichordata		1 hr
18	Phylum Hemichordata Eg. Balanoglossus (Affinities)	Lecture with Powerpoint Presentation	

Course Plan for Course Teacher-2 (18 Hours)

PROGRAMME	B.Sc. Zoology		SEMESTER	2
COURSE CODE AND TITLE	15U2CRZOO02 Core Course 2 ANIMAL DIVERSITY - Non Chordata II		CREDIT	2
HOURS/SEM	18			
Sessions	Topic	Method of Teaching	Remarks	
MODULE IV	Phylum Arthropoda		12 hrs	

1	Salient features and classification scheme of Phylum Arthropoda	Class room teaching	
2	Classification up to classes. Introduction to 4 subphyla. 1. Sub Phylum - Trilobitomorpha Class - Trilobita	Lecture with Powerpoint Presentation	
3	2. Sub Phylum- Onychophora Class - Onychophora . Eg. Peripatus (Mention its affinities). 3. Sub Phylum- Mandibulata Class I - Crustacea, Eg. Sacculina	Lecture with Powerpoint Presentation	
4	Class II- Chilopoda, Eg. Centipede Class III - Diplopoda, Eg. Millipede Class IV - Insecta, Eg. Dragon fly	Lecture with PowerPoint Presentation	
	First Internal Examination	1 hour	
5	4. Sub Phylum - Chelicerata Class - Merostomata Eg. Limulus Class II - Arachnida Eg. Scorpion	Lecture with PowerPoint Presentation	
6	Type: Penaeus Habit and Habitat, Body Structure and Appendages	Lecture with PowerPoint Presentation	
7	Penaeus: Digestive System	Lecture with PowerPoint Presentation	
8	Penaeus: Respiratory system and Excretory system	Lecture with PowerPoint Presentation	
9	Penaeus: Circulatory system	Lecture with PowerPoint Presentation	
10	Penaeus: Reproduction	Lecture with PowerPoint Presentation	
11	Larval forms of Penaeus	Lecture with PowerPoint Presentation	
12	General Topic Vectorial Arthropods	Lecture with PowerPoint Presentation	
Module VI	Phylum Echinodermata		4 hrs
13	Classification upto classes Class I- Asteroidea, Eg. Astropecten Class II- Ophiuroidea, Eg. Ophiothrix	Lecture with PowerPoint Presentation	
14	Class III- Echinoidea, Eg. Echinus Class IV- Holothuroidea, Eg. Holothuria	Lecture with PowerPoint Presentation	
15	Class V - Crinoidea, Eg. Antedon Brief account on larval forms.	Lecture with PowerPoint Presentation	

16	Water vascular system in Echinodermates	Lecture with PowerPoint Presentation	
	Second Internal Exam	2 hours	
Module VII	Minor Phyla		2 hrs
17	General account and examples	Lecture with PowerPoint Presentation	
18	General account and examples	Lecture with PowerPoint Presentation	
	TEXTBOOKS AND REFERENCES		
1	Zoological Society of Kerala Study material. <i>Animal Diversity</i> 2002.		
2	Dhami. P.S. and Dhami J.K. 1979 Invertebrate Zoology. R. Chand and Co. Delhi.		
3	Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume I. Invertebrate part-I and part-II. S. Viswanathan Printers & Publishers. Pvt.Ltd.		
4	Bowler Peter J. and Iwan Rhys Morus. 2005 <i>Making Modern Science: A Historical Survey</i> . College of Chicago Press, Chicago, IL:		
5	Ernst Mayr 1982. <i>The Growth of Biological Thought: Diversity, Evolution and Inheritance</i> . Published by Harvard College Press.		
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7	Jacques Monod 1971. <i>Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology</i> . Vintage Pub. NY		
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**COURSE PLAN FOR B.Sc PROGRAMME IN ZOOLOGY
SACRED HEART COLLEGE(AUTONOMOUS), THEVARA**

DEPARTMENT OF ZOOLOGY

COURSE PLAN: ZY3B03U

SEMESTER III: Animal Diversity – Non Chordata

COURSE OBJECTIVES

1. To acquire knowledge on the taxonomic status of various Invertebrate animals and animal groups.
2. To familiarize the students with the diverse group of organisms around us.
3. To develop an aptitude for understanding nature and its rich bio-diversity.

Basic Reference

1. Animal Diversity (2002). Zoological Society of Kerala Study material. Published by Zoological Society of Kerala.

Teacher I

Sessions	Topic	Method	Remarks/Reference
	Module I:		
1	General Introduction, 5 Kingdom classification, Classification in general	ICT Enabled (ppt & images, video clippings)	
2	Classification upto Classes	ICT Enabled (ppt & images, charts, video clippings)	
	Module 2:		
3	Kingdom Protista; Salient features and classification up to phyla	ICT Enabled (ppt & images, video clippings)	
4	1. Phylum Rhizopoda : Amoeba 2. Phylum Actinopoda : Actinophrys 3. Phylum Dinoflagellata :	ICT Enabled (ppt & animations, images, video clippings)	

	Noctiluca		
5	4. Phylum Parabasalia : Trypanosoma 5. Phylum Metamonada : Giardia 6. Phylum Kinetoplasta : Trypanosoma	ICT Enabled (ppt & images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	7. Phylum Euglenophyta : Euglena 8. Phylum Cryptophyta : Cryptomonas 9. Phylum Opalinata : Opalina	ICT Enabled (ppt & images, video clippings)	
8	10. Phylum Bacillariophyta : Diatoms 11. Phylum Chlorophyta : Volvox 12. Phylum Choanoflagellata : Proterospongia 13. Phylum Ciliophora : Paramecium	ICT Enabled (ppt & images, video clippings)	
9	14. Phylum Sporozoa : Plasmodium 15. Phylum Microsporidia : Nosema 16. Phylum Rhodophyta : Red Alga Pathogenic protista – Plasmodium, Entamoeba	ICT Enabled (ppt & images, video clippings)	
	Module 3:		
10	Mesozoa – eg. Rhopalura Parazoa Phylum Porifera – eg Leucosolenia Phylum Placozoa –e g. Trycoplax adherens.	ICT Enabled (ppt & images, charts, video clippings)	
	Module 4:		
11	Phylum : Coelenterata Salient features, Classification up to classess 1. Hydrozoa – Physalia	ICT Enabled (ppt & images, video clippings)	
12	2. Scyphozoa – Aurelia 3. Anthozoa – Adamsia	ICT Enabled (ppt, images, animations & video	

		clippings)	
13	Corals and coral reefs.		
	Module 5:		
13	Phylum - Platyhelminthes Salient features, classification upto classes 1. Turbellaria – Planaria	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Discussion on CIA-II; 2.Trematoda – Fasciola 3. Cestoda – Taenia solium	ICT Enabled (ppt & images, video clippings)	
	Module 6:		
16	Phylum Nematoda Salient features, classification up to classes	ICT Enabled (ppt & images, charts, video clippings)	
17	1. Phasmodia - Wuchereria 2. Aphasmodia – Trichinella	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

Teacher 2

Ses sio ns	Topic	Method	Remarks/Refe rence
	Module 7 Phylum : Annelida		
1	Phylum Annelida: Salient features and classification up to class.	ICT Enabled (ppt & images, video clippings)	
2	Class 1: Polychaeta (eg: Nereis) Class 2: Oligochaeta (eg: Pheretima) Class 3: Hirudinomorpha (eg: Hirudinaria)	ICT Enabled (ppt & images, video clippings)	

	Module 8 – Phylum : Arthropoda		
3	Arthropoda: Salient features. Fenneropenaeus (Penaeus) habitat, morphology,	ICT Enabled (ppt & images, charts, video clippings)	
4	Appendages, sexual dimorphism, digestive system, respiratory system, circulatory system, excretory system,	ICT Enabled (ppt & images, video clippings)	
5	Nervous system, sense organs	ICT Enabled (ppt & animations, images, video clippings)	
6	reproductive system, larval stages.	ICT Enabled (ppt & images, video clippings)	
7	Classification up to class with one example	ICT Enabled (ppt & images, video clippings)	
8	Phylum Onychophora – eg. Peripatus (Mention Insect pests)	ICT Enabled (ppt & images, video clippings)	
9	1. Pests of coconut – Oryctes rhinoceros, Rhynchophorus ferrugineus, Nephantis serinopa, Eriophid mite	ICT Enabled (ppt & images, video clippings)	
10	2. Pests of paddy – Leptocorisa acuta, Spodoptera mauritius 3. Pests of stored grains - Trogoderma granarium, Tribolium castaneum, Sitophilus oryzae	ICT Enabled (ppt & images, video clippings)	
	Module 9: Phylum : Mollusca		
11	Salient features and classification up to class	ICT Enabled (ppt & images, video clippings)	
12	Class 1: Aplousobranchia (eg: Neomenia) Class 2: Monoplousobranchia (eg: Neopilina) Class 3: Polyplousobranchia (eg: Chiton)	ICT Enabled (ppt & images, charts, video clippings)	
13	Class 4: Bivalvia (eg: Perna) Class 5: Gastropoda (eg: Xancus) Class 6: Cephalopoda (eg: Sepia) Class 7: Scaphopoda (eg: Dentalium)	ICT Enabled (ppt & images, charts, video clippings)	
	Module 10: Phylum : Echinodermata		

14	Salient features and classification up to class.		
15	Class 1: Asteroidea (eg: Astropecten) Class 2: Ophiuroidea (eg: Ophiothrix) Class 3: Echinoidea (eg: Echinus)		
16	Class 4: Holothuroidea (eg: Holothuria) Class 5: Crinoidea (eg: Antedon)		
17	Revision		
18	Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Session 10	Individual assignment	

Additional Reading List

1. Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.

**COURSE PLAN FOR B.Sc PROGRAMME IN ZOOLOGY
SACRED HEART COLLEGE(AUTONOMOUS), THEVARA**

DEPARTMENT OF ZOOLOGY

ZY4B04U - ANIMAL DIVERSITY – CHORDATA

COURSE OBJECTIVES

1. To acquire knowledge on the taxonomic status of the various vertebrate animals and animal groups.
2. To familiarise the students with the diverse groups of organisms around us.
3. To develop an aptitude for understanding nature and its rich biodiversity.

Basic Reference

1. Animal Diversity (2002). Zoological Society Of Kerala Study Material Series. Published by Zoological Society of Kerala

COURSE OUTCOMES:

At the end of the course, the students would

1. Become conscious and aware of the chordate diversity
2. Appreciate the role of chordate in the sustenance of nature
3. Develop the skills to identify chordate animals around them
4. Develop respect for nature and a positive attitude towards protection of our environment
5. Become aware of chordates beneficial to humans

6. Become ambassadors of love towards animals

Teacher I : 18hrs

Sessions	Topic	Method	Remarks/Reference
	Module I: Phylum Chordata		
1	General Characters	ICT Enabled (ppt & images, video clippings)	
2	Classification upto Classes	ICT Enabled (ppt & images, charts, video clippings)	
3	Sub phylum I: Urochordata	ICT Enabled (ppt & images, video clippings)	
4	Sub phylum I: Urochordata contd...	ICT Enabled (ppt & animations, images, video clippings)	
5	Sub phylum II: Cephalochordata	ICT Enabled (ppt & images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	Sub phylum II: Cephalochordata contd..	ICT Enabled (ppt & images, video clippings)	
8	Sub phylum II: Cephalochordata contd., Sub phylum III: Vertebrata	ICT Enabled (ppt & images, video clippings)	
9	Sub phylum III: Vertebrata contd.,	ICT Enabled (ppt & images, video clippings)	
	Module IV: Class Reptilia		
10	General characters, Sub class I: Anapsida Eg. Chelone	ICT Enabled (ppt & images, charts, video clippings)	
11	Sub class II Diapsida Eg. Chameleon, Subclass III Parapsida eg. Ichthyosaurus	ICT Enabled (ppt & images, video clippings)	

12	Poisonous and non-poisonous snakes of India	ICT Enabled (ppt, images, animations & video clippings)	
	Module V: Class Aves		
13	General characters, Sub class I : Archeornithes Eg: Archaeopteryx	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Discussion on CIA-II; Sub class II. Neornithes Eg: Struthio, Flight adaptations of birds	ICT Enabled (ppt & images, video clippings)	
	Module VI: Class Mammalia		
16	General characters, Sub class I Prototheria eg. Echidna, Sub Class II Metatheria eg. Macropus	ICT Enabled (ppt & images, charts, video clippings)	
17	Sub class III Eutheria eg. Elephas, Aquatic mammals	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

Teacher II : 18hrs

Sessions	Topic	Method	Remarks/Reference
	Module I: Phylum Chordata		
1	General Characters	ICT Enabled (ppt & images, video clippings)	
2	Classification upto Classes	ICT Enabled (ppt & images, charts, video clippings)	
3	Sub phylum I: Urochordata	ICT Enabled (ppt & images, video clippings)	

4	Sub phylum I: Urochordata contd...	ICT Enabled (ppt & animations, images, video clippings)	
5	Sub phylum II: Cephalochordata	ICT Enabled (ppt & images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	Sub phylum II: Cephalochordata contd..	ICT Enabled (ppt & images, video clippings)	
8	Sub phylum II: Cephalochordata contd., Sub phylum III: Vertebrata	ICT Enabled (ppt & images, video clippings)	
9	Sub phylum III: Vertebrata contd.,	ICT Enabled (ppt & images, video clippings)	
	Module IV: Class Reptilia		
10	General characters, Sub class I: Anapsida Eg. Chelone	ICT Enabled (ppt & images, charts, video clippings)	
11	Sub class II Diapsida Eg. Chameleon, Subclass III Parapsida eg. Ichthyosaurus	ICT Enabled (ppt & images, video clippings)	
12	Poisonous and non-poisonous snakes of India	ICT Enabled (ppt, images, animations & video clippings)	
	Module V: Class Aves		
13	General characters, Sub class I : Archeornithes Eg: Archaeopteryx	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Discussion on CIA-II; Sub class II. Neornithes Eg: Struthio, Flight adaptations of birds	ICT Enabled (ppt & images, video clippings)	
	Module VI: Class Mammalia		
16	General characters, Sub class I Prototheria eg. Echidna, Sub Class II Metatheria eg. Macropus	ICT Enabled (ppt & images, charts, video clippings)	
17	Sub class III Eutheria eg. Elephas,	ICT Enabled (ppt & images, video	

	Aquatic mammals	clippings)	
18	Revision & Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weighttage
1	Session 10	Individual assignment	

Additional Reading List

1. Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.
2. Young J.Z. 1981. The life of Vertebrate s (Oxford University Press).

COURSE PLAN: CORE ZOOLOGY- SEMESTER 5
ZY5B05U:CELL BIOLOGY AND MOLECULAR BIOLOGY

COURSE OBJECTIVES

1. To emphasize the central role of Cell biology and Molecular biology, being the most developing areas of biological science.
2. To make aware of different cell organelles, their structure and role in living organisms.
3. To introduce the nature of genetic materials at molecular level, their expression and regulation.
4. To develop critical thinking, skill and research aptitudes.

Basic Reference

Zoological Society of Kerala Study material. 2002. Cell Biology and molecular biology

COURSE OUTCOMES

At the end of the course, the students would

- Would understand the role of cell and molecular biology as a developing science
- Would get an awareness of different cell organelles, their structure and role in living organisms
- Would be introduced to the nature of genetic materials at a molecular level their expression and regulation
- Would develop critical thinking, skill and research aptitudes

TEACHER I

Sessions	Topic	Method	Remarks/Reference
	CELL BIOLOGY		
	Module I History of cell and molecular biology		
1	Cell theory, Prokaryotes, Eukaryotes	ICT Enabled (ppt& images, charts, video clippings)	
2	Actinomycetes, Mycoplasmas, Virus, Virion and Viroids, Prions	ICT Enabled (ppt& images, charts, video clippings)	
	Module II Cell membrane & Permeability		
3	Molecular models of cell membrane (Sandwich model, Unit membrane model, Fluid mosaic model)	ICT Enabled (ppt& images, charts, video clippings)	
4	Modifications of plasma membrane. (Microvilli, tight junction, gap junction, desmosomes)	ICT Enabled (ppt& images, charts, video clippings)	
5	Cell permeability - Diffusion, Osmosis, Passive transport, Active transport, Cell coat and Cell	ICT Enabled (ppt& images,	

	recognition	charts, video clippings)	
	Module III Ultrastructure of Cytoplasm		
6	Cytoskeleton - Microtubules, microfilaments, intermediate filaments	ICT Enabled (ppt& images, charts, video clippings)	
7	Endoplasmic reticulum - Structure and functions	ICT Enabled (ppt& images, charts, video clippings)	
8	Ribosomes (Prokaryotic and Eukaryotic)	ICT Enabled (ppt& images, charts, video clippings)	
9	Golgi complex - Structure and functions	ICT Enabled (ppt& images, charts, video clippings)	
10	Lysosomes - Polymorphism - GERL concept, functions	ICT Enabled (ppt& images, charts, video clippings)	
11	Mitochondria - Structure and functions	ICT Enabled (ppt& images, charts, video clippings)	
12	Symbiont hypothesis	ICT Enabled (ppt& images, charts, video clippings)	

13	I CIA	Descriptive test 1 hr	
	Module IV Nucleus		
14	Structure and functions of interphase nucleus,	ICT Enabled (ppt& images, charts, video clippings)	
15	Nuclear membrane, pore complex	ICT Enabled (ppt& images, charts, video clippings)	
16	Structure and functions of nucleolus	ICT Enabled (ppt& images, charts, video clippings)	
17	Chromosomes	ICT Enabled (ppt& images, charts, video clippings)	
18	Structure - Heterochromatin, Euchromatin, Nucleosomes	ICT Enabled (ppt& images, charts, video clippings)	
19	Polytene chromosomes-Balbiani rings, Endomitosis	ICT Enabled (ppt& images, charts, video clippings)	
20	Lamp brush chromosomes	ICT Enabled (ppt& images, charts, video clippings)	
	Module V Cell Division		
21	Cell cycle - G ₁ , S, G ₂ and M phases	ICT Enabled (ppt& images,	

		charts, video clippings)	
22	Mitosis	ICT Enabled (ppt& images, charts, video clippings)	
23	Meiosis	ICT Enabled (ppt& images, charts, video clippings)	
24	Meiosis	ICT Enabled (ppt& images, charts, video clippings)	
	Module VI Cell Communication		
25	Cell signalling - Signalling molecules	ICT Enabled (ppt& images, charts, video clippings)	
26	Neuro- transmitters, hormones, growth factors, cytokines, vitamin A and D derivatives	ICT Enabled (ppt& images, charts, video clippings)	
27	Role of cyclic AMP	ICT Enabled (ppt& images, charts, video clippings)	
	PART II - MOLECULAR BIOLOGY		
	Module IX Gene regulations		
28	Prokaryotic (inducible, repressible systems)	ICT Enabled (ppt& images, charts, video clippings)	

29	Operon concept -Lac operon	ICT Enabled (ppt& images, charts, video clippings)	
30	Tryptophan operon	ICT Enabled (ppt& images, charts, video clippings)	
31	Brief account of Eukaryotic gene regulation	ICT Enabled (ppt& images, charts, video clippings)	
32	Definitions- Global control – Stimulon and modulon	ICT Enabled (ppt& images, charts, video clippings)	
33	Catabolite repression (Glucose effect)	ICT Enabled (ppt& images, charts, video clippings)	
34	Class Test 1	Descriptive	
35	Class Test 2	Descriptive	
	II CIA		
36	Revision and Evaluation		
	PART II - MOLECULAR BIOLOGY		
	Module VII		
	Nature of Genetic Materials		

TEACHER II

1	Discovery of DNA as genetic material – Griffith’s transformation experiments.	ICT Enabled (ppt& images, charts, video clippings)	
2	Hershey Chase Experiment of Bacteriophage infection	ICT Enabled (ppt& images, charts, video clippings)	
3	Structure and.types of DNA& RNA .	ICT Enabled (ppt& images, video clippings)	
4	DNA replication.	ICT Enabled (ppt& animations, images, video clippings)	
5	Modern concept of gene (Cistron, muton, recon, viral genes). Prokaryotic genome,Eukaryotic genome,	ICT Enabled (ppt& images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	Split genes (introns and exons), Junk genes, Pseudogenes, Overlapping genes, Transposons	ICT Enabled (ppt& images, video clippings)	
	Module VIII Gene Expressions		
8	Central Dogma of molecular biology,	ICT Enabled (ppt& images,	

		video clippings)	
9	One gene-one enzyme hypothesis, One gene-one polypeptide hypothesis.	ICT Enabled (ppt& images, charts, video clippings)	
10	Characteristics of genetic code, Contributions of Hargobind Khorana.	ICT Enabled (ppt& images, charts, video clippings)	
11	Protein synthesis-Transcription (Prokaryotic& eukaryotic)	ICT Enabled (ppt& images, charts, video clippings)	
12	Protein synthesis-Transcription (Prokaryotic& eukaryotic)	ICT Enabled (ppt& images, charts, video clippings)	
13	Reverse transcription, post transcriptional modifications,	ICT Enabled (ppt & images, video clippings)	
14	CIA- II	2hrs	
15	Translation,	ICT Enabled (ppt, images, animations & video clippings)	
16	Translation contd...		
17	Post translational modifications.		

18	Revision and Evaluation of course		
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ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Session 10	Individual assignment	

Additional Reading List

1. Veer BalaRastogi. (2008). *Fundamentals of Molecular Biology*, Ane's Books, India Chapter 15, pp343--378.
2. De- Robertis E.D. and De Robertis Jr.E.M.F (2002) *Cell and Molecular Biology* (Lea &Febiger/Info-Med)
3. Karp G. (1996) *Cell and Molecular Biology: Concepts and Experiments* John Wiley and Sons m, New York

Sacred Heart College, Thevara

DEPARTMENT OF ZOOLOGY			
PROGRAMME	B.Sc. Zoology	SEMESTER	5
COURSE CODE AND TITLE	ZY5B06U CORE COURSE 6-- ENVIRONMENTAL BIOLOGY, TOXICOLOGY AND DISASTER MANAGEMENT	CREDIT	3
HOURS/SEM	54		
OBJECTIVES OF THE COURSE	<ul style="list-style-type: none"> • To impart basic knowledge on ecosystems and their functioning • To learn about various types of anthropogenic pressures on ecosystem, related degradation and management measures • To generate awareness on the fragility of indigenous ecosystem in which we live. 		
COURSE OUTCOMES	<p>At the end of the course, the student</p> <ul style="list-style-type: none"> • Would get an overall understanding of different types of ecosystems • Shall be aware of the resources and clever use of these resources for the well being of mankind • Shall change their life style according to the eco-consciousness they gained through these classes. 		

Course Plan for Course Teacher 1 (36 Hours)			
Term - I (Before I Internal Exams) - 30 % of the syllabus			
Sessions	Topic/Module	Method of teaching *	Remarks: Books, reference <i>etc.</i>
1	Introductory Session – Ecosystems- Concept, classification	Lecture and interactions through general questions on Environment and development	Definition of Ecosystem Components of ecosystem Functions of ecosystem
2	Freshwater ecosystem Physico-chemical nature (Brief description only) Types Lentic Lotic		

3	Freshwater ecosystem adaptations	Lecture with Power point presentation	
4	Adaptations of lentic water animals	Lecture with Power point presentation	
5	Adaptations of lotic water animals	Lecture with Power point presentation	
6	Ground water	Lecture and videos	
7	Watershed management	Lecture with Power Point Presentation	Types of watersheds Management strategies
8	Watershed management	Lecture with Power Point Presentation	Land management Water management Biomass anagement
9	Marine ecosystem Physico chemical nature	Lecture with Power Point Presentation	Types of marine habitations
10	Intertidal zone Rocky shore Muddy shore Sandy shore	Lecture with Power Point Presentation	Adaptations of animals in different types of marine habitats
11	Coral reefs	Lecture with Power Point Presentation	Types, diversity, importance. Threats and conservation measures
CIA 1	First Internal Examination		20 marks
	Term II		
12	Open sea Pelagic realm Benthic realm	Lecture with Power Point Presentation	Animals and their adaptations
13	Estuaries-Characteristics and Importance Adaptations of animals living in estuarine habitats	Lecture with Power Point Presentation	
14	Wetlands and mangroves	Lecture with Power Point Presentation	Importance of wetlands and mangroves
15	Convention on wetlands (Ramsar, 1971) Ramsar mission	Lecture with Power Point Presentation	
16	Ramsar sites in Kerala –threats and conservation aspects	Lecture with Power Point Presentation	Locations, extend and diversity

17	Terrestrial ecosystem Abiotic/ biotic components (Brief description only) Interactions Classification (Types)	Lecture with Power Point Presentation	
18	Biomes Forest Desert	Lecture with Power Point Presentation	Significance of climatic factors
19	Grassland Tundra	Lecture with Power Point Presentation	Adaptations of animals
20	Causes of land degradation with special reference to Kerala	Lecture with photographs and videos	
21	Discussions on landscape changes and their socio-economic basis		
22	Module III – Man and Environment Natural resources Introduction (concept)	Lecture with Power Point Presentation	
23	Energy resources Conventional	Lecture with Power Point Presentation	
24	Non conventional energy resources	Lecture with Power Point Presentation	
25	Inexhaustible resources	Lecture with Power Point Presentation	
26	Energy conservation measures	Interactive session	
27	Assignments	Guidelines	
CIA II	Second Internal Examination		2 hour test
28	Module IV – Global environmental changes Uniqueness of the earth	Lecture with Power Point Presentation	
29	Global warming	Lecture with Power Point Presentation	Impact on human civilization
30	Green house effect	Lecture with Power Point Presentation	
31	Ozone layer formation and depletion	Lecture with Power Point Presentation	

32	Climate change (Brief description only) Definition- recent developments	Lecture with Power Point Presentation	Impact on ecosystems
33	Kyoto protocol IPCC/UNFCC Emission reduction	Lecture with Power Point Presentation	Legal aspects
34	Carbon credit Carbon trading	Lecture with Power Point Presentation	Economic aspects
35	Carbon sequestration	Lecture with Power Point Presentation	Methods for carbon dioxide capturing
36	Module V – Local environmental issues Landscape changes in Kerala Impact of tourism on ecology with special reference to aquatic ecosystems	Lecture with Power Point Presentation	Urbanization, Industrialization Agricultural degradation

Course Plan for Course Teacher 2 (18 Hours)

Sessions	Topic	Method	Remarks/Reference
	Module I - Introduction		
1	History, development Scope, branches	ICT Enabled (ppt&images, video clippings)	
	Module V - Municipal Solid Waste		
2	Plastic pollution Types of plastics Problems of plastics Management Strategies	ICT Enabled (ppt&images, charts, video clippings)	
3	Biowastes and their management. -aerobic and anaerobic systems.	ICT Enabled (ppt&images, video clippings)	
4	e-waste: Major types and sources - Toxic	ICT Enabled (ppt& animations, images,	

	ingredients - Effects on environment and human health Management strategies	video clippings)	
	Module V - Local environmental issues		
5	Impact of tourism on ecology	ICT Enabled (ppt&images, video clippings)	
6	Landscape changes	ICT Enabled (ppt&images, video clippings)	
7	CIA I		1 hr; descriptive answers only
	Module VI - Disaster Management		
8	Definition, Classification- Natural, Anthropogenic, Hybrid.	ICT Enabled (ppt&images, video clippings)	
9	Earthquake, Landslide, Flood, Drought	ICT Enabled (ppt&images, video clippings)	
10	Cyclone, Tsunami - Mitigation measures.	ICT Enabled (ppt&images, charts, video clippings)	
	Module VII: Toxicology		
11	Definition, History of toxicology, Classification - occurrence/ source	ICT Enabled (ppt&images, video clippings)	
12	Role of toxicology	ICT Enabled (ppt, images, animations & video clippings)	
13	Toxicants of biological origin - Aflatoxin, Botulinum toxin	ICT Enabled (ppt&images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Heavy metal toxicants	ICT Enabled (ppt&images, video clippings)	
16	Food additives	ICT Enabled (ppt&images, video clippings)	
17	Revision		

18	Evaluation of the course		
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ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group - Written/Presentation - Graded or Non-graded etc)	Weighttage
1	Session 10	Individual assignment	
2			
3			
4			

Basic Reference

Environmental Biology and Ethology(2002). Zoological Society of Kerala Study material. Published by Zoological Society of Kerala.

Additional Reading List

1. Odum, E.P. 1971.Fundamentals of Ecology.W.B. Saunders College Publishing, Philadelphia.
2. Pandey Kamleshwar , J.P. Shukla and S.P.Trivedi.2005. *Fundamentals of Toxicology*. New Central Book Agency (P) Ltd. Kolkata, India

COURSE PLAN: ZOOLOGY CORE COURSE 7 (SEMESTER 5)
ZY5B07U: EVOLUTION, ZOOGEOGRAPHY AND ETHOLOGY

COURSE OBJECTIVES

- To acquire knowledge about the evolutionary history of earth (living and non living)
- To learn various tools and techniques for evolutionary studies
- To study the distribution of animals on earth, its pattern, evolution and causative factors
- To impart basic knowledge on animal behavioural patterns and their role

Basic Reference

1. Andrews. M.I and Joy, K.P. 2003. *Environmental biology, evolution, ethology and Zoogeography*. St.Mary's press and book dept
2. Mani, M.S. 1974.*Ecology and Biogeography of India*. Dr. W. Junk b..v. Publishers , The Hague.
3. Nair, C.S.1991. *The Southern Western Ghats : A Biodiversity Conservation Plan*. INTACH, New Delhi.
4. Ramesh,B.R and Rajan Gurukkal., 2007.*Forest Landscapes of the Southern Western Ghats, India Biodiversity, Human Ecology and management Strategies*. French Institute of Pondicherry, India.
5. Tiwari, S. 1985. *Readings in Indian Zoogeography*
6. Wilson, E.O. 1975. *Sociobiology*. Harvard University Press, Cambridge, Mass. USA.
7. Zoological Society of Kerala Study material. 2002. *Environmental Biology and Ethology* Published by Zoological Society of Kerala (Module 6, 7, 8 & 9)

COURSE OUTCOMES:

At the end of the course, the student

- Would be able to understand the key concepts of origin and evolution of earth and life, oceans and continents etc

- Would Identify and discuss early theories of life and evolution
- Would identify the evolutionary relationships between organisms
- Would gain basic principles of zoogeography
- Would have the knowledge about zoogeographic regions and their faunal compositions
- Would understand the basics about the dispersal and migrations of animals
- Would appreciate the biogeography and biodiversity of India, in general and Western Ghats, in Particular
- Would demonstrate the various factors affecting the geographical distribution of animals
- Would demonstrate a current understanding of the ethology of humans and animals
- Would be able to analyse and differentiate between different theories of learning
- Would appreciate the range of interactions existing between animals and man

Faculty 1

Sessions	Topic	Method	Remarks/Reference
1	Module I – Origin of life Introduction	Lecture	
2	Origin of universe	Lecture with interaction	
3	Chemical evolution	Lecture	
4	Miller-Urey experiment	Lecture and interaction	
5	Haldane and Oparin theory	Lecture	
6	Module II – Theories of organic evolution Lamarckism	Lecture	
7	Critical analysis of Lamarck's propositions , Weisman's germplasm theory	Lecture	
8	Mutation theory.	Lecture	
9	Darwinism	Lecture	
10	Critical analysis of Darwinism	Lecture	
11	Modern Synthetic theory(Neo Darwinism)	Lecture	
12	Neutral theory of molecular evolution	Lecture and interaction	
13	Module III – Population genetics and evolution Genetic basis of variation	Lecture	
14	Continue	„	
15	Hardy Weinberg equilibrium	Lecture	
16	Continue	Lecture	

17	Change in gene frequencies Factors affecting gene frequencies (brief account only)	Lecture	
18	Continue	„	
19	Module IV – Evolution above species level Adaptive radiation	Lecture	
20	Microevolution	Lecture	
21	Macroevolution	Lecture	
22	Evolution of horse	Lecture with ppt	
23	Continue	„	
24	Mega evolution	Lecture	
25	Punctuated equilibrium	Lecture	
26	Speciation -Phyletic and True- Sympatric and Allopatric	Lecture	
27	Module V – Geological time scale Geological dating with radioactive elements	Lecture	
28	Continue	„	
29	Mass extinction	Lecture	
30	Continue	„	
	PART II – ZOOGEOGRAPHY AND ETHOLOGY Module VII – Animal distribution		
31	Types and means of animal distribution	Lecture	

32	Continue	„	
33	Barriers in animal distribution.	Lecture	
34	Continue	„	
35	Revision of Evolution Module I,II,III	Asking questions and Clearing doubts	
36	Revision of Evolution Module IV,V,& Zoogeography module VII	„	

Faculty II

1	Zoogeography: Introduction; Origin of oceans and continents; Plate tectonics – continental drift	ICT Enabled (ppt & animations, video clippings)	
2	Zoogeographical realms	ICT Enabled (ppt, maps, images & video clippings)	
3	Zoogeographical realms contd...	ICT Enabled (ppt, maps, images & video clippings)	
4	Insular fauna-Continental Islands & Oceanic Islands	ICT Enabled (ppt, maps, images & video clippings)	
5	Biogeography of India – with special reference to Western Ghats	ICT Enabled (ppt, maps, images & video clippings)	
6	CIA - I	1 hr; descriptive answers only	
Module VIII – Ethology			
7	Ethology: Definition; History and scope of ethology	ICT Enabled (ppt & video clippings)	
Module IX – Learning and imprinting			

8	Types of learning: Habituation, sensitization	ICT Enabled (ppt, animations & video clippings)	
9	Types of learning: Classical conditioning	ICT Enabled (ppt, animations & video clippings)	
10	Types of learning: Operant conditioning	ICT Enabled (ppt, animations & video clippings)	
11	Types of learning: Taste aversion; Latent learning	ICT Enabled (ppt, animations & video clippings)	
12	Types of learning: Insight Learning; Learning set learning	ICT Enabled (ppt, animations & video clippings)	
13	Imprinting; experiments by K. Lorenz	ICT Enabled (ppt, animations & video clippings)	
14	CIA- II	2 hrs	
Module X – Ethology of man			
15	Discussion on CIA-II; Ethology of man - Sociobiology and evolution of human behaviour	ICT Enabled (ppt, images & video clippings)	
16	Primates and human socio groups	ICT Enabled (ppt & images, video clippings)	
17	Human pheromones; Revision	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Session 10	Individual assignment	

Additional Reading List

- Barnes, C.W. 1988. *Earth, Time and Life*. John Wiley & Sons, New York.
- Bendall, D. S. (ed.) 1983. *Evolution from Molecules to Man*. Cambridge University Press, U.K.
- Bonner, J.T. 1980. *The Evolution of Culture in Animals*. Princeton University Press, NJ, USA.
- Briggs, J.C. 1996. *Global Biogeography*. Elsevier Publishers.
- Bull J.J and H.A. Wichman. 2001. Applied Evolution. *Annu. Rev. Ecol. Syst.* 32:183-217 (Visit the Annual Reviews home page at www.AnnulReviews.org.)
- Chandran, Subash M .D. 1997. On the ecological history of the Western Ghats. *Current Science*, Vol.73, No.2. 146-155.
- Chattopadhyay Sajib. 2002. *Life Origin, Evolution and Adaptation*. Books and Allied (P) Ltd. Kolkata, India.
- Chundamannil, Mammen. 1993. *History of Forest management in Kerala*. Report number 89. Kerala Forest Research Institute, Peechi, India.
- Daniels, R.J.R and J.Vencatesan .2008. *Western Ghats Biodiversity. People. Conservation*. Rupa & Co. New Delhi, India
- David McFarland. 1999. *Animal Behaviour*. Pearson Education Ltd . Essex, England. (Module 8 and 9)
- Dawkins, M.S. 1995. *Unravelling Animal Behaviour*. Harlow: Longman.

Dunbar, R. 1988. *Primate Social Systems*. Croom Helm, London.

Goodwin, B. 1996. *How the Leopard Changed its Spots: The Evolution of Complexity*. Simon & Schuster, NY, USA.

Jerry A. Coyne and H. Allen Orr. 2004. *Speciation*. Sinauer Associates

Manning Aubrey and Marian Stamp Dawkins 1998. *An Introduction to Animal Behaviour*. Cambridge University Press, UK.

Paul W. Sherman and John Alcock., 2001 *Exploring Animal Behaviour- Readings from American Scientist* 3rd Edn. Sinauer Associates Inc. MA, USA.

Rob Desalle and Ian Tattersall 2008. *Human Origins: What Bones and Genomes Tell Us about Ourselves*. Texas A&M University Press, USA.

Sean B. Carroll and David M. Kingsley .2005 *Evolution: Constant Change and Common Threads*. Holiday Hrs on Science. Webcast or DVD available at www.hhmi.org/biointeractive/evolution.

Strickberger, M.W. 2000. *Evolution*. Jones and Bartlett, Boston.

Thomas A P (Editor) 2011 *Evolution, Zoogeography and Ethology*. Green leaf publications TIES Kottayam.

Wilson, E.O. 1975. *Sociobiology*. Harvard University Press, Cambridge, Mass. USA.

ZY5B08U: CORE COURSE 8
BIOCHEMISTRY, HUMAN PHYSIOLOGY AND ENDOCRINOLOGY

COURSE OBJECTIVES:

This course will provide students with a deep knowledge in biochemistry, physiology and endocrinology.

2. Defining and explaining the basic principles of biochemistry useful for biological studies for illustrating different kinds of food, their structure, function and metabolism.

3. Explaining various aspects of physiological activities of animals with special reference to humans.

4. Students will acquire a broad understanding of the hormonal regulation of physiological processes in invertebrates and vertebrates.

Basic Reference:

Guyton 2002: Text Book of Medical Physiology Saunders pp.718-833

Prosser & Brown 2006: Comparative Animal Physiology

Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Endocrinology* Published by Zoological Society of Kerala

Harper's Illustrated Biochemistry, 27th Ed, Mc Graw Hill

COURSE OUTCOME:

At the end of the course, the student would

Be aware about the basic physiology, especially human physiology

Number of Course Teachers: 3

Teacher 1

Session	Topic	Method	Remarks
	Part I. BIOCHEMISTRY		

	Module 1 - GENERAL BIOCHEMISTRY, BIOELEMENTS AND BIOMOLECULES		
1.	Introduction To Biomolecules	Discussion and lecture	
2.	Carbohydrates- structure of basic compounds, classifications with examples and its biological importance.	Lecture	
3.	Protein–classifications and its biological importance.	Lecture	
4.	Protein– structure,	Lecture and powerpoint presentation	
5.	Lipids–structure classifications with examples and its biological importance	Lecture	
	Module -2 METABOLISM		
6	Carbohydrate metabolism- Glycolysis	Lecture and powerpoint presentation	
7	Citric acid cycle		
8	ATP synthesis		
9	Glycogenesis, glycogenolysis,	Lecture and powerpoint presentation	
10	Gluconeogenesis , HMP shunt	Lecture and powerpoint presentation	
11	Lipid metabolism- Biosynthesis	Lecture and powerpoint presentation	

12	Oxidation of fatty acids- Beta oxidation,	Lecture and powerpoint presentation	
13	Physiologically important compounds synthesized from cholesterol	Lecture and powerpoint presentation	
14	Protein metabolism- Deamination, transamination, transmethylation, decarboxylation,	Lecture and powerpoint presentation	
15	Ornithine cycle	Lecture	
	Module 3- ENZYMES		
16	Chemical nature of enzymes,	Lecture and powerpoint presentation	
17	Mechanism of enzyme action,	Lecture and powerpoint presentation	
18	Factors influencing enzyme action	Lecture and powerpoint presentation	
19	Enzyme activation, enzyme inhibition, allosteric enzyme, isoenzymes, co-enzyme	Lecture and powerpoint presentation	

Teacher : 2

Session	Topic	Method	Remarks
1	Food adulteration	Lecture and PowerPoint presentation	
2	Defects of modern food habits	Lecture and PowerPoint presentation	
3	Importance of fibers in food	Lecture and PowerPoint presentation	

4	Weight control	Lecture and PowerPoint presentation	
5	Nutrition during pregnancy, breast feeding	Lecture and PowerPoint presentation	
6	Anorexia, acidity and ulcers, flatulence, fasting and its significance	Lecture and PowerPoint presentation	
7	Malfunctions of gastro intestinal tract	Lecture and PowerPoint presentation	
8	Gas transport, Factors affecting transport of respiratory gases through blood	Lecture and PowerPoint presentation	
9	Oxy-hemoglobin curve, Bohr effect, reverse Bohr effect, Haldane effect	Lecture and PowerPoint presentation	
10	Neural (voluntary and automatic) and chemical control (mention the role of carotid and aortic bodies) of respiration	Lecture and PowerPoint presentation	
11	Smoking and its physiological effects, carbon monoxide poisoning, oxygen toxicity, nitrogen narcosis, dysbarism,	Lecture and PowerPoint presentation	

	oxygen therapy		
12	Artificial respiration, respiratory disorders – hypoxia, hypocapnia, hypercapnia, asphyxia	Lecture and PowerPoint presentation	
13	Cerebral circulation, blood brain barrier and cerebrospinal fluid	Lecture and PowerPoint presentation	
14	Haemo dynamic principles, formation and fate of blood cells	Lecture and PowerPoint presentation	
15	Blood composition ,blood clotting mechanism – intrinsic and extrinsic pathways, clotting factors, anticoagulants	Lecture and PowerPoint presentation	
16	Blood transfusion, safety and security problems, heamostasis	Lecture and PowerPoint presentation	
17	Haemolysis, jaundice, thrombosis, ESR.	Lecture and PowerPoint presentation	
18	Urea cycle (in detail), renal handling of individual substances eg. glucose, sodium, urea, water	Lecture and PowerPoint presentation	
19	Factors affecting GFR, concept of plasma clearance, acid base balance	Lecture and PowerPoint presentation	

20	Kidney disorders – acute renal failure, chronic renal failure- glomerular nephritis	Lecture and PowerPoint presentation	
21	Pyelonephritis, nephrotic syndrome and kidney stones	Lecture and PowerPoint presentation	

Teacher : 3

Sessions	Topic	Method	Remarks/Reference
	Module VIII. MUSCLE PHYSIOLOGY		
1	Ultra structure of striated muscle. Mechanism of muscle contraction.	ICT Enabled (ppt & images, video clippings)	
2	Biochemistry of muscle contraction, isotonic and isometric contraction.	ICT Enabled (ppt & images, charts, video clippings)	
3	Electrical, chemical and morphological changes and ionic fluxes during contraction of striated muscle fibre, Cori cycle, electrophysiology of muscle, threshold and spike potentials, simple muscle twitch, whole muscle contraction, isotonic and isometric contraction, latent and refractory periods, summation, beneficial effect, superposition curve, tetanus, tonus, staircase phenomenon, fatigue, oxygen debt, rigor mortis.	ICT Enabled (ppt & images, video clippings)	
	Module 9 NEUROPHYSIOLOGY		
4	Synaptic transmission & properties of synapses,	ICT Enabled (ppt & images, video clippings)	
5	neurotransmitters, role of dopamine and serotonin.	ICT Enabled (ppt & images, video clippings)	
6	EEG, memory, short term and long term sleep, dream,	ICT Enabled (ppt & images, video clippings)	

7	Neural disorders- dyslexia, Parkinson's disease, epilepsy, Alzheimer's disease, schizophrenia.	ICT Enabled (ppt & images, video clippings)	
	Module 10 -SPORTS PHYSIOLOGY		
8	Muscular, Respiratory and cardiovascular changes during exercise, dope test, drug abuse.	ICT Enabled (ppt & images, video clippings)	
9	Significance of exercise in body fitness.	ICT Enabled (ppt & images, video clippings)	
	Module 11:ENDOCRINOLOGY		
10	Hormones as messengers, classification and types of hormones	ICT Enabled (ppt & images, charts, video clippings)	
11	General principles of hormone action,	ICT Enabled (ppt & images, video clippings)	
12	Concept of hormone receptors,	ICT Enabled (ppt, images, animations & video clippings)	
13	hormonal control of homeostasis	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Secretion, Regulation, Functions and Disorders of hormones of Hypothalamus, Hypophysis,	ICT Enabled (ppt & images, video clippings)	
16	Secretion, Regulation, Functions and Disorders of hormones of Pineal, Thyroid, Parathyroid,	ICT Enabled (ppt & images, charts, video clippings)	
17	Secretion, Regulation, Functions and Disorders of hormones of Thymus, Islets of Langerhans, Adrenal, Gonads, Placenta, Gastro intestinal hormones.	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

ASSIGNMENTS

	Date	of	Topic of Assignment & Nature	Weightage
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	submission/completion	of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	
1	Session	Individual assignment	

Additional Reading List

- Barrington, E.J.W. General and Comparative Endocrinology, Oxford, Clarendon Press.
- Bentley, P.J. Comparative Vertebrate Endocrinology, Cambridge University Press. Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

OPEN COURSE FOR OTHER STREAMS

ZY5D02U: HUMAN GENETICS, NUTRITION, COMMUNITY HEALTH AND SANITATION

72 hrs

4hrs/Week

COURSE OBJECTIVES

- To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.
- To emphasize the central role that biological sciences plays in the life of all organisms.
- To introduce the student to some of the present and future applications of bio-sciences

Core Readings

Zoological Society of Kerala Study Material Series 2002

Cell biology Genetics & Biotechnology published by Zoological Society of Kerala.

K Park, (2008) Park's Text Book of Preventive and Social

COURSE OUTCOMES:

At the end of the course, the student

- Would acquire the basic knowledge of Health and its dimensions
- Would understand the various community health programmes
- Would understand fundamental concepts behind physical activity and health
- Would acquire a basic knowledge of a balanced diet
- Would gain understanding of safety education and health promotion principles
- Would have an overview of life style diseases Would understand the basic techniques employed in gene cloning
- Would be capable of appreciating the benefits of physical activity, meditation and yoga

TEACHER 1: 18 HRS

Sessions	Topic	Method	Remarks/Reference
	Part- I HUMAN GENETICS		
	Module I		
1.	Human normal chromosome complement	Lecture and ppt	
2.	Chromosomal anomalies	Lecture	
3.	Down Syndrome and Cri du chat syndrome	Lecture and ppt	
4.	Sex chromosomal anomalies – Syndromes- Klinefelters Syndrome and Turners Syndrome	Lecture and ppt	
5.	Genetic disorders in man. Single gene mutation disorders- Eg. Sickle Cell anaemia	Lecture and ppt	
6.	Polygenic disorders – Cleft lip and palate	Lecture and ppt	
7.	Sex linked inheritance – Haemophilia and Colour blindness	Lecture and ppt	
	CIA I	1 hr	

8.	Pre – natal Diagnosis -Significance	Lecture	
9.	Amniocentesis, Chorionic Villus Sampling, Ultra sound scanning and Fetoscopy	Lecture and ppt	
10.	Genetic Counselling. Eugenics and Euthenics	Lecture	
	Module II		
11	Human blood groups and their inheritance pattern	Lecture and black board	
12.	Blood transfusion – Universal Donor, Universal recipient – Importance of Blood donation	Lecture and ppt	
13.	DNA finger printing and applications – Probing for criminals – Method to resolve paternity and maternity disputes	Lecture and ppt	
14.	Human Reproductive system	Lecture and ppt	
15.	Causes of human infertility – a brief account	Lecture and ppt	
	CIA II	2 hrs	

16.	Human genome project – a brief account	Lecture	
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TEACHER 2: 18 HRS

Sessions	Topic	Method	Remarks/Reference
1	PART – II NUTRITION AND COMMUNITY HEALTH	Lecture	
	Module III		
2	Definition and meaning of health. Dimensions of health, physical activity and health benefits	Lecture	
3	Effect of exercise on body systems – Circulatory and Respiratory	Lecture	
4	Effect of exercise on body systems – Endocrine and Skeletal	Lecture	
5	Effect of exercise on body systems – Muscular	Lecture	
6	Programmes on Community health promotion – individual and family	Lecture	
7	Programmes on Community health promotion – Society	Lecture	
8	Dangers of alcoholic and drug abuse, medico legal implications.	Lecture and ppt	
	CIA -I	1 hr.	
	Module IV		

9	Introduction to concept of food and nutrition.	Lecture	
10	Balanced diet.	Lecture	
11	Vitamins and malnutrition	Lecture and ppt	
12	Deficiency diseases	Lecture and ppt	
13	Determining of caloric intake and expenditure	Lecture	
14	Obesity causes and preventive measures	Lecture	
15	Role of diet and exercise. BMI	Lecture	
	Module V		
16	Introduction to safety education	Lecture	
17	Principles of accident prevention	Lecture	
18	Health and safety in daily life and at work	Lecture	
19	First aid and emergency care	Lecture and ppt	
20	Modern lifestyle and hypokinetic diseases- Prevention and Management	Lecture and ppt	
	Module VI		
21	Introduction to life skill education	Lecture	
22	Physical activity, emotional adjustment and well being	Lecture	
	CIA II	2 hrs	
23	Yoga, meditation and relaxation	Lecture and ppt	
24	Psychoneuroimmunology	Lecture	

TEACHER 3: 36 HRS

	PART III. COMMUNITY HEALTH AND SANITATION	
	Module VII	
1.	Potable water quality monitoring and waste water management.	ICT Enabled (ppt & animations, images, video clippings); discussion
2	Potable water quality monitoring and waste water management. Contd..	
3	Determination of sanitary quality of drinking water	ICT Enabled (ppt & animations, images, video clippings); discussion
4	Water purification techniques.	ICT Enabled (ppt & animations, images, video clippings); discussion
5	Water purification techniques.Contd...	
6	Water purification techniques Contd...	
7	Faecal bacteriae and pathogenic microorganisms transmitted by water.	ICT Enabled (ppt & animations, images, video clippings); discussion
8	Faecal bacteriae and pathogenic microorganisms transmitted by water.Contd...	
9	Cholera and Typhoid.	ICT Enabled (ppt & animations, images, video clippings); discussion
10	Cholera and Typhoid. contd...	
11	Vermicomposting a method of solid waste management	ICT Enabled (ppt & animations, images, video clippings); discussion

	Module VIII	
12	Public Health and Food borne diseases	ICT Enabled (ppt & animations, images, video clippings); discussion
13	Public Health and Food borne diseases contd...	
14	Food Poisoning causes and prevention	ICT Enabled (ppt & animations, images, video clippings); discussion
	CIA I	1 hr
15	Food poisoning caused by toxins produced by microbes eg Staphylococcal food poisoning,	
16	Botulism, Salmonellosis	ICT Enabled (ppt & animations, images, video clippings); discussion
17	Botulism, Salmonellosis contd...	
18	CIA II	2hrs
19	Food infection caused by growth of microorganisms in the human body after the contaminated food has been eaten.	ICT Enabled (ppt & animations, images, video clippings); discussion
20	E Food Infection hepatitis (hepatitis A)	ICT Enabled (ppt & animations, images, video clippings); discussion
21	Food Infection hepatitis (hepatitis A). Contd...	ICT Enabled (ppt & animations, images, video clippings); discussion
22	Waterborne diseases and food borne diseases :Revision	ICT Enabled (ppt & animations, images, video clippings); discussion

	Module IX	
23	Emerging pathogens and diseases – Introduction	Lecture and PPT
24	Emerging pathogens and diseases – Swine flue (H1N1), bird flue (H5N1)	Lecture and PPT
25	Emerging pathogens and diseases –SARS, Anthrax	Lecture and PPT
26	Reemerging pathogens and diseases – TB	Lecture and PPT
27	Vector borne diseases (mosquito) and their control measures Mosquito eradication	Lecture and PPT
28	Vector borne diseases mosquito- Chikungunya , Malaria	Lecture and PPT
29	Vector borne diseases mosquito- Filariasis and Dengu fever	Lecture and PPT
30	Leptospirosis and preventive measures – Rodent control measures	Lecture and PPT
	CIA II	2 hrs
31	Cancer different types	Lecture and PPT
32	Causes of cancer, carcinogens, diet & cancer	Lecture and PPT
33	(e) HIV, AIDS – causes & preventive measures	Lecture and PPT

ASSIGNMENTS

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage	
1	Individual assignment		

Selected Further Readings

Fashey, Tomas D, Insel, Paul M and Roth Walt (2005) Fit and Well. New York; Mc Graw Hill Inc

Greenberg, Jerol S and Dintiman George B (1997) Wellness Creating a life of Health and Fitness , London Allyn and Bacon Inc.

Edlen Gordon Janes and Barttlet. Human Genatics a modern Synthesis. Published by Boston.

Monica Cheesbrough, Laboratory Manual for Tropical Counties Vol.II LBS.

Norman Bezzaant HELP First Aid for everyday emergencies. Jaico Publishing House, Bombay, Delhi

Pelczar M.J. Jr. E.C.S. Chane & N.R. Krieg, Microbiology (Concept & Applications)

Rai. B.C. Health Education and Hygiene. Published by Prakashan Kendra, Lucknow

B.Sc. Zoology

SEMESTER VI

COURSE TITLE – DEVELOPMENTAL BIOLOGY

COURSE CODE – ZY6B06U

OBJECTIVES OF THE COURSE

1. To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.
2. To emphasize the central role that biological sciences plays in the life of all organisms.
3. To introduce the student to the process of embryonic development of organisms.

COURSE OUTCOMES

At the end of the course, the student

- Would get an overall understanding of **the developmental process of organisms**
- Shall be aware of the research methodology in this field
- Shall understand the contributions of the developmental biologists to human welfare.

Sessions	Date	Topic	Method
1	3 rd Nov. 15 1Hour	Introductory Session - Scope of developmental biology, definition, sub-divisions, Early history of embryology.	Lecture, introductory general questions on Developmental Biology
2	5 th Nov.15 1Hour	Human reproductive organs and gametogenesis significance.	Lecture, Power point presentation
3	10 th Nov. 15 1Hour	Egg types - Classification of eggs, based on the amount, distribution and position of yolk. Influence of yolk on development.	Power point presentation

4	12 th Nov.15	Mosaic, regulative and cleidoic eggs, Polarity, symmetry and egg content.	Power point presentation
5	17 th 1Hour 15	Giving assignment topics	
6	7 th Jul. 15 2 Hrs	Sexual cycle - Estrus cycle (non-primate) and menstrual cycle (primate cycle). Hormonal control of menstrual cycle.	Power point presentation
7	14 th Jul. 15 2 Hrs	Fertilization- Approach and binding of spermatozoa, activation of the egg, amphimixis.	Power point presentation
8	21 st Jul. 15 2 Hrs	Parthenogenesis-natural and artificial, Arrhenotoky, Thelytoky, Obligatory and Facultative	Lecture, Interactive discussion
9	28 th Jul. 15 2 Hrs	Cleavage - Types, planes of cleavage, Cell lineage, Holoblastic and Meroblastic cleavage, Patterns of cleavage, Influence of yolk on cleavage.	Lecture, Power point presentation
10	30 th Jul. 15 1 Hour	CIA – I	1 hr; class test short & descriptive answers only
11	4 th Aug. 15 2 Hrs	Blastulation - Blastula formation, Types of blastula	Lecture, Power point presentation
12	11 th Aug. 15 2 Hrs	Fate maps- Concept of fate maps, construction of fate maps. A typical vertebrate fate maps. Significance of fate map.	Lecture, Power point presentation
13	18 th Aug. 15 2 Hrs	Gastrulation - Definition, Morphogenetic cell movements, Epiboly, Emboly, Concept of germ layers and its derivatives.	Lecture, Presentation with clippings
14	1 st Sept.15	Submission of assignments	
15	1 st Sept.15 2 Hrs	Cell differentiation and gene action - Totipotency, Pleuripotency, Unipotency of embryonic cells. Determination and differentiation in embryonic development, Gene action, control of gene expression.	Lecture, Interactive discussion
16	8 th Sept.15	Embryology of Frog – Gametes, fertilization, cleavage,	Lecture, Power point presentation

	2 Hrs	blastulation, gastrulation, neurulation	
17	15 th Sept.15 2 Hrs	Embryology of Frog – organogenesis, development of nervous system, eye, ear, metamorphosis	Lecture, Power point presentation
18	22 nd Sept.15 2 Hrs	CIA - II	2 Hours
19	29 th Sept.15 2 Hrs	Embryology of chick - Structure of egg, fertilization, cleavage, blastulation, gastrulation.	Lecture, Power point presentation
20	6 th Oct.15 2 Hrs	Embryology of chick - 18 hour chick embryo and 24 hour chick embryo. Extra embryonic membranes in chick.	Power point presentation
	13 th Oct.15 2 Hrs	Seminar presentation by students	Interactive discussion
	27 th Oct.15 2 Hrs	Seminar presentation by students	Interactive discussion

References

1. Balnisky B.I 1981 An Introduction to Embryology, W.B. Saunders and Co.
2. Berril, N.J and Kars G. 1986. Developmental biology, Mc Graw Hills, New Delhi.
3. Gilbert, S.F. 2006. *Developmental Biology* (9th edn). Sinauer Associates Inc., Publishers, Massachusetts, USA
4. Melissa A – Gibbs, A practical Guide to Developmental Biology, Oxford university press (Int. student edition) 2006
5. Pattern M.B. and Carlson B.C. 1974 Foundations of Embryology, TMH, New Delhi.
6. Vijayakumarn Nair K. and P. V George. A manual of developmental biology, Continental publications, Trivandrum
7. Zoological Society of Kerala, Study material 2002. *Biochemistry, Physiology and Developmental Biology* Published by Zoological Society of Kerala

COURSE PLAN: CORE COURSE (Semester 6)
ZY6B10U:GENETICS AND BIOTECHNOLOGY

COURSE OBJECTIVES

- To emphasize the central role the genetics and biotechnology plays in the life of all organisms.
- To introduce the student to some of the present and future applications of bio-sciences.
- To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.

Basic Reference

- Cell Biology, Genetics and Biotechnology. (2002). Zoological Society of Kerala Study Material Series. Published by Zoological Society of Kerala.
- Gardner, E. J. and Snustad, D. P. (1984). Principles of Genetics (John Wiley and Sons), New York.

COURSE OUTCOMES:

At the end of the course, the student

- Would acquire the basic knowledge of Biotechnology.
- Would understand the various differences between blotting techniques.
- Would understand fundamental concepts of genetic engineering.
- Would acquire a basic knowledge of the tools of biotechnology.
- Would appreciate the applications of biotechnology.
- Would have an overview of transgenic animals.

- Would be capable of understanding the various organisms employed in biotechnology

TEACHER I			
Sessions	Topic	Method	Remarks/Reference
1	Module I Introduction: Scope and importance of genetics, Brief explanation of the following terms- gene, alleles, genotype, phenotype, genome, homozygous and heterozygous, wild type and mutant alleles, dominant and recessive traits, test cross and back cross, reciprocal cross,	Lecture	
2	Mendelism – Mendel’s laws ,Mendelian traits in man Chromosome theory of heredity.	Lecture with interaction	
3	Module II Interaction of genes: Allelic and non Allelic. Allelic- incomplete dominance and Co-dominance	Lecture	
4	Non allelic interactions, – complementary, supplementary, epistasis – dominant (feather colour in fowl) and recessive (coat colour in mice) Polygenes (Skin colour inheritance in man)	Lecture and interaction	
5	Pleiotropism, modifying genes, lethal genes (Brief account with one example each)	Lecture	
6	Multiple alleles(eg) Coat Colour in rabbits. Man ABO blood group Rh factor	Lecture	
7	Blood group and its inheritance . Revision of Module II.	Lecture	
8	Module III Linkage and recombination of genes based on Morgan’s work in Drosophila (Complete and incomplete linkage) .	Lecture	
9	Linkage map	Lecture	
10	Chromosome mapping	Lecture	
11	Module IV	Lecture	

	Sex determination: Chromosome theory of sex determination (sex chromosomes and autosomes) chromosomal mechanism (XX-XO, XX-XY, ZW-ZZ)		
12	Barr bodies and Lyon hypotheses : Sex determination in man- role of Y chromosome. Sex determination in honey bees. Genic balance theory.	Lecture and interaction	
13	Drosophila- intersex, gynandromorphs. Hormonal Influence on sex determination Environmental influence - Hermaphroditism	Lecture	
14	Module V Mutations, Types of Mutations.		
15	Germinal, Sex linked mutations	Lecture	
16	Chromosomal mutations - structural and numerical changes.	Lecture and ppt	
17	Gene mutation (point mutation) Molecular basis of gene mutations – tautomerism- Induced mutations Physical and chemical mutagens	Lecture	
18	Revision of Module V &VI	Questions &doubt clearing	
TEACHER II			
1	Extra nuclear inheritance, Mitochondrial and plastid DNA	Lecture	
2	Kappa particles in Paramecium	Lecture	
3	Bacterial genetics - Recombination, Transformation,	Lecture and ppt	
4	Transduction, Conjugation, F mediated sex duction, Resistance transfer factor (RTF)	Lecture and ppt	
5	Mechanism of drug resistance in bacteria, Transposable genetic elements in bacteria	Lecture and ppt	

6	Basic components and mechanisms of transposition in bacteria.	Lecture and ppt	
7	Class test – Module VI	Descriptive test	
8	Karyotyping, Pedigree analysis, Aneuploidy and non-disjunction, genetic disorders in man	Lecture and ppt	
9	Chromosomal anomalies – autosomal and sex chromosomal, single gene disorders, gene mutation and disorders	Lecture	
10	Autosomal single gene disorders, inborn errors of metabolism	Lecture and ppt	
11	Sex linked inheritance, pseudoautosomal genes, multifactorial disorders	Lecture	
12	Sex limited and sex influences traits, prenatal diagnosis, ultrasound scanning and fetoscopy	Lecture and ppt	
13	Genetic counselling, eugenics and euthenics	Lecture and ppt	
14	Class test – Module VII	Descriptive test	
15	Introduction to biotechnology and basic aspects of genetic engineering	Lecture and ppt	
16	Tools and vectors in genetic engineering	Lecture and ppt	
17	Isolation of genes/DNA, techniques of rDNA, techniques of production of rDNA	Lecture and ppt	
18	rDNA transfer, cloning and DNA mediated gene transfer	Lecture and ppt	
19	Class test – Module VIII	Descriptive	

		test	
20	PCR and DNA amplification	Lecture and ppt	
21	Blotting techniques – Southern, Northern and Western Blotting	Lecture and ppt	
22	Identification of DNA, mRNA and Protein	Lecture and ppt	
23	DNA hybridization and DNA finger printing	Lecture and ppt	
24	RFLP markers, Gene libraries,	Lecture and ppt	
25	Construction of genomic library and cDNA library	Lecture and ppt	
26	Stem cell cultures – types and uses	Lecture and ppt	
27	Class test – Module IX and X	Descriptive test	
28	Applications of Biotechnology, SCP, Tissue culture,	Lecture and ppt	
29	Gene therapy, Stem cell therapy	Lecture and ppt	
30	Monoclonal antibodies, Hormones, Antibiotics, Vaccines	Lecture and ppt	
31	Class test – Module XI and XII	Descriptive test	
32	Agricultural biotechnology, microbial insecticides	Lecture and ppt	

		ppt	
33	Hazards of biotechnology, problems, patenting and patent protection	Lecture and ppt	
34	Biowar and biopiracy	Lecture and ppt	
35	Class test – Module XIII	Descriptive test	
36	Revision and Evaluation		

ASSIGNMENTS

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Individual assignment	2
2	Individual assignment	2
3		
4		

Additional Reading List

- Cell Biology, Genetics and Biotechnology. (2002). Zoological Society of Kerala Study Material Series. Published by Zoological Society of Kerala.
- Gardner, E. J. and Snustad, D. P. (1984). Principles of Genetics (John Wiley and Sons), New York.
- Stern, C. (1973). Human Principles of Human Genetics, W.H. Freeman and co,

- Veer Bala Rastogi. (2008). Fundamental of Molecular Biology. Ann Students Education.
- Verma, P.S. and Agarwal, V. K. (1988). Genetics. S. Chand and Co. New Delhi.

SEMESTER VI
ZY6B11U - MICROBIOLOGY AND IMMUNOLOGY

COURSE OBJECTIVES

1. To inspire the students in learning the frontier areas of biological sciences
2. To make them aware of the pathogens, health related problems, their origin and treatment.
3. To equip the students with the knowledge of immune system of our body
4. To make them aware of vaccine and their importance

Basic Reference

Microbiology and Immunology, Study Material Series published by Zoological Society of Kerala

COURSE OUTCOMES:

At the end of the course, the students would

1. Become aware of the wider and newer trends in zoology
2. Have knowledge of the disease, their causative agents, prevention and control
3. Identify/diagnose the diseases caused due to disorders in our immune system- deficiency, hypersensitivity auto immune disorders
4. Develop skills in immunological and microbiological techniques
5. Appreciate the role of vaccines in control of diseases

TEACHER 1: 18 HRS

Sessions	Topic	Method	Remarks/Reference
	Module I : Microbiology		
1	Introduction and Scope of Microbiology	ICT Enabled (ppt & images, video clippings)	
2	Classification of bacteria, Fungi, Viruses	ICT Enabled (ppt & images, video clippings)	
	Module II : Methods in Microbiology		
3	Sterilisation and disinfection	ICT Enabled (ppt & images, charts, video clippings)	
4	Different methods- Physical	ICT Enabled (ppt & images, video clippings)	
5	Chemical	ICT Enabled (ppt & animations, images, video clippings)	
6	Culture media, Culture techniques	ICT Enabled (ppt & images, video clippings)	
7	Culture Preservation Techniques	ICT Enabled (ppt & images, video clippings)	
8	CIA-1	1 hr; descriptive answers only	

	Module III: Bacteria Structure		
9	Morphology and Fine structure of bacteria. Size, Shape and arrangement of Bacterial cells	ICT Enabled (ppt & images, video clippings)	
10	Anatomy-Structures External to the cell wall	ICT Enabled (ppt & images, video clippings)	
11	Cell wall	ICT Enabled (ppt, images, animations & video clippings)	
12	Structures internal to the Cell wall	ICT Enabled (ppt & images, video clippings)	
13	Spores and Cysts	ICT Enabled (ppt & images, charts, video clippings)	
	Module IV		
14	Bacterial Growth, Effect of Various factors on bacterial growth.	ICT Enabled (ppt & images, video clippings)	
15	Cell Division, Nutrition requirements; Total count, viable count, Bacterial Growth Curve.	ICT Enabled (ppt & images, video clippings)	
	Module V: Basic Virology		
16	Properties, Classification and Nomenclature of Viruses	ICT Enabled (ppt & images, video clippings)	

17	Replication of Viruses, Cultivation of Viruses	ICT Enabled (ppt & images, video clippings)	
18	Viral Assay	ICT Enabled (ppt & images, video clippings)	
	Revision & Evaluation of the course		

TEACHER 1: 36 HRS

Sessions	Topic	Method	Remarks/Reference
	Module 6: Infections		
1	Types of infections	Discussion to test the pre-requisite ICT Enabled (PPT & images)	
2	Contagious diseases	Lecture and PPT	
3	Modes of transmission of diseases	Discussion and lecture	
4	Different types of carriers	Lecture	
	Module 7: Diseases caused by different pathogens		
5	Bacterial diseases: Tuberculosis & Typhoid	Seminar (3)	
6	Viral : Influenza & Polio	Seminar (3)	

7	Fungal:Dermatophytoses & Candidiasis	Seminar (3)	
	PART II IMMUNOLOGY Module 8: Introduction to Immunology		
8	Types of immunity	Testing the pre- requisite	
9	Mechanism of innate immunity	Lecture and PPT	
10	Acquired - passive & active	Lecture	
11	Vaccines types of vaccines , live, killed	Seminar (2)	
12	Vaccines- toxoids, recombinant DNA	Seminar (2)	
13	CIA- I	1 hr descriptive test	
	Module 9: Antigens Antibodies Complements		
14	Types of Antigens, haptens, antigenic determinants	Demonstration	
15	Basic structure of immunoglobulins.	ICT Enabled (PPT, images)	
16	Different classes of immunoglobulins and functions	ICT Enabled (PPT & images)	
17	Complement system, biological effects of complements	Lecture and black board use	
	Module 10: Antigen-antibody reactions		
18	Precipitation test, Agglutination Test	ICT Enabled (PPT & images)	
19	Widal , VDRL, Coombs test	ICT Enabled (PPT & images)	
20	HIV test (ELISA) Complement fixation test	ICT Enabled (PPT & images)	
	Module 11: Immune Response system		

21	Primary lymphoid organs	Lecture and PPT	
22	Secondary lymphoid organs	Lecture and PPT	
23	Lymphocytes T & B cells	Lecture and reading	
24	Macrophages, Plasma cells, Memory cells	Lecture and reading	
25	MHC Antibody synthesis	ICT Enabled (PPT & images)	
26	Primary and secondary responses	ICT Enabled (PPT & images)	
27.	Monoclonal antibodies – Hybridoma technology , uses	ICT Enabled (PPT & images)	
	Module 12: Immunopathology- immune disorders		
28	Different types of hypersensitivity reactions	Lecture	
29	Different types of hypersensitivity reactions contd.	Lecture	
30	CIA-II	2 hrs descriptive	
31	Autoimmunity, mechanisms of autoimmunization	ICT Enabled (PPT & images)	
32	Lymphadenoid goiter, thyrotoxicosis	Seminar (2)	
33	Rheumatoid arthritis and systemic lupus erythromatosis	Seminar (2)	
34	Transplantation Immunity	Lecture	
35	Immunology of blood transfusion, Erythroblastosis	Lecture	

	foetalis		
36	Revision and Evaluation		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weighttage
1	Day 15	Individual assignment	
2			
3			
4			

Additional Reading List

Anthanarayan R & C.K. Jayaram Panicker. Textbook of Microbiology (2008) Orient Longman Private Ltd.

Ivan Roitt: 2002 Essentials of Immunology ELBS.

Michael J. Pelczar ECS, Chan & Noel. R. Kreig, Microbiology, Tata McGraw Hill 5th ed. 1996.

Prescott. Microbiology 2nd edition

Sacred Heart College, Thevara

DEPARTMENT OF ZOOLOGY			
PROGRAMME	B.Sc. Zoology	SEMESTER	6
COURSE CODE AND TITLE	ZY6B12U : CORE COURSE 12 GENERAL INFORMATICS, BIOINFORMATICS, BIostatISTICS AND RESEARCH METHODOLOGY	CREDIT	3
HOURS/SEM	54		
FACULTY NAME			
OBJECTIVES OF THE COURSE	<ol style="list-style-type: none"> 1. To inspire the students in learning the frontier areas of biological sciences 2. To update and expand basic informatics skills and attitudes relevant to the emerging knowledge of society and also to equip the students to effectively utilize the digital knowledge resources in learning. 3. To equip the students with the knowledge of modern developments and recent trends in biological sciences 4. To familiarize with the basic tools and techniques of scientific study with emphasis on biological sciences 		

	Teacher 1 (36 Hours)		
Sessions	Topic	Method	
	General Informatics (6 Hours) Bioinformatics (18 Hours) Research Methodology (12 Hours)		
1	Module-1.Introduction (2 hrs) Microprocessors RAM, ROM, EPROM, Memory systems, input, output devices.	Lecture and PowerPoint presentation	
2	Disk operating systems, Booting and formatting. Use of information technology in biological research	Lecture and PowerPoint presentation	
3	Module-2. Operating Systems (4 hrs) (DOS, Windows, Linux (only basics))	Lecture and PowerPoint presentation	
4	Application programs MS Office (MS word, Excel, Access and PowerPoint)	Lecture and PowerPoint presentation	
5	Computer programming, Networking (LAN, WAN), Internet, World Wide Web	Lecture and PowerPoint presentation	
6	Databases and information retrieval. New technology in Internet	Lecture and PowerPoint presentation	
	Bioinformatics (18 hrs)		
7	Module-3 (6 hrs) Definition, Key events in the history of Bioinformatics	Lecture and PowerPoint presentation	
8	Nature & Scope of Bioinformatics -	Lecture and PowerPoint	

	Contrast between Bioinformatics and Computational Biology	presentation	
9	Key Bio-sequences in Molecular Biology - DNA, RNA and Amino-acid sequences	Lecture and PowerPoint presentation	
10	Popular Databases in Bioinformatics - NCBI, DDBJ, PDB, OMIM	Lecture and PowerPoint presentation	
	First Internal Examination	1 hr; class test short & descriptive answers only	
11	BLAST & FASTA sequence file formats, Approach of Comparative Biology based on sequence comparison	Lecture and PowerPoint presentation	
12	The basic idea of sequence comparison algorithms (mention only) - idea of scoring matrices	Lecture and PowerPoint presentation	
13	Module 4 (6 hrs.) The Blast search engine - important features	Lecture and PowerPoint presentation	
14	BLAST-Important features	Lecture and PowerPoint presentation	
15	Idea of Multiple sequence alignment	Online demonstration	
16	Proteomics: Basic ideas of Protein Structure prediction	Lecture and PowerPoint presentation	
17	Concept of Homology Modeling Threading <i>Ab initio</i> method	Lecture and PowerPoint presentation	
18	Idea of Molecular Phylogenetics - advantages and computational procedure (only description of use of a package such as Phylip)	Lecture and demonstration	
	Module 5 (6 hrs.)		
19	Basic concepts of computer Aided Drug Discovery- General description of drug discovery pipeline- concept of Personalized medicine	Lecture and PowerPoint presentation	
20	Bioinformatics tools: (i) Molecular Visualization Software - Rasmol (Basic features only) - (ii) ORF finding (iii) gene finding, (iv) BLAST	Lecture and PowerPoint presentation	
21	(iv) Hydrophobicity Prediction- Methods and Applications	Lecture and PowerPoint presentation	
22	(v) Single Nucleotide Polymorphism (SNP) prediction using GENSNP	Lecture and PowerPoint presentation	
23	Module 6 Future Prospects: 2 hrs. 1. Human brain Project Computer simulation and visualization of molecular structure	Lecture and PowerPoint presentation	
24	Future Prospects: 3. Protein function	Lecture and PowerPoint presentation	

	prediction.	presentation	
	Research Methodology (12 Hours)		
	Module I. Tools and Techniques in Biological Research (7 hrs)		
25	Scientific drawing -Purpose and principle Basic understanding on principle and uses of Microscopy (a) Light microscopy, Bright field (Compound Microscope)	Lecture and PowerPoint presentation	
26	Phase contrast microscopy, Dark field microscopy, Fluorescence microscopy, Polarization microscopy, Video microscopy.	Lecture and PowerPoint presentation	
27	(b) Electron - Scanning (SEM), Transmission (TEM) and STEM	Lecture	
28	Micrometry - Stage and Eyepiece micrometers Camera Lucida Instrumentation - pH Meter	Lecture and PowerPoint presentation	
29	Separation Techniques - Centrifugation	Lecture and PowerPoint presentation	
30	- Chromatography - Electrophoresis	Lecture and PowerPoint presentation	
31	Analytical techniques Colorimeter Spectrophotometer X-ray crystallography	Lecture and PowerPoint presentation	
	Module II. Research Methodology (4 hrs)		
32	Scientific method Research Projects- Steps and process. Types.	Lecture and PowerPoint presentation	
33	Research Communication-Research report writing (Structure of a scientific paper) Presentation techniques	Lecture and PowerPoint presentation	
34	Project proposal writing Assignment, seminar, debate, workshop, colloquium, Conference-Brief description and major differences	Lecture and PowerPoint presentation	
35	Module III. Units of measurements (1 hr) Calculations and related conversions of each: Metric system- length; surface; weight	Lecture and PowerPoint presentation	

	- Square measures - Cubic measures (volumetric) - Circular or angular measure		
36	Concentrations- percent volume; ppt; ppm - Chemical – molarity, normality - Temperature- Celsius, centigrade, Fahrenheit	Lecture and PowerPoint presentation	
	CIA-II	2 hour test	

Teacher 2 (18 Hours) BIOSTATISTICS

Session	Topic	Method	Remarks
1	Collection of data, Classification of data,	Lecture	
2	Frequency distribution tables	Lecture	
3	Graphical representation: - Bar diagrams, Histogram	Lecture	
4	Pie diagram and Frequency curves	Lecture	
5	Mean	Lecture	
6	Median	Lecture	
7	Mode	Lecture	
8	Range, Quartile Deviation	Lecture	
9	Mean Deviation, Standard Deviation	Lecture	
10	Standard error	Lecture	
11	Normal, distribution and Binomial distribution	Lecture	
12	Poisson distribution	Lecture	
13	Correlation- Types of correlation	Lecture	
14	Basic concept of hypothesis testing	Lecture	
15	Levels of significance, test of significance	Lecture	
16	Procedure for testing hypothesis	Lecture	
17	Types of hypothesis- Null hypothesis and Alternate hypothesis	Lecture	
18	Chi- square test	Lecture	

Basic Reference:

Sinha, Pradeep K. and Sinha, Priti. [2003], *Computer Fundamentals – concepts systems and applications*, Third Edition, BPB publications, New Delhi

Gupta, Vikas [2002], *Comdex –computer course kit*, Eight Edition, Dramtech, New Delhi.

Claverie & Notredame, *Bioinformatics - A Beginners Guide*, Wiley-Dreamtech India Pvt Ltd, 2003

Dan E. Krane and Michael L. Raymer, *Fundamental Concepts of Bio-informatics*, Pearson Education.

Dutta, Naren. [2002], *Fundamental of Biostatistics- Practical Approach*, Kanishka Publishers, New Delhi.

Rastogi, V.B .2009. *Fundamentals of Biostatistics*, Ane Books Pvt. Ltd. New Delhi.

COURSE PLAN FOR B.Sc PROGRAMME IN ZOOLOGY
SACRED HEART COLLEGE(AUTONOMOUS), THEVARA
DEPARTMENT OF ZOOLOGY
COURSE PLAN FOR ACADEMIC YEAR 2015-2016

SEMESTER VI : ELECTIVE PAPER

ZY6B14U: NUTRITION, COMMUNITY HEALTH AND SANITATION

72 hrs

4 hrs/week

COURSE OBJECTIVES

- To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.
- To emphasize the central role that biological sciences plays in the life of all organisms.
- To introduce the student to some of the present and future applications of bio-sciences

Core Readings

Zoological Society of Kerala Study Material Series 2002

Cell biology Genetics & Biotechnology published by Zoological Society of Kerala.

K Park, (2008) Park's Text Book of Preventive and Social

COURSE OUTCOMES:

At the end of the course, the student

- Would acquire the basic knowledge of Health and its dimensions
- Would understand the various community health programmes

- Would understand fundamental concepts behind physical activity and health
- Would acquire a basic knowledge of a balanced diet
- Would gain understanding of safety education and health promotion principles
- Would have an overview of life style diseases
- Would be capable of appreciating the benefits of physical activity, meditation and yoga

Sessions	Topic	Method	Remarks/Reference
1	PART – 1 NUTRITION AND COMMUNITY HEALTH	Lecture	
	Module III		
2	Definition and meaning of health. Dimensions of health, physical activity and health benefits	Lecture	
3	Effect of exercise on body systems – Circulatory and Respiratory	Lecture	
4	Effect of exercise on body systems – Endocrine and Skeletal	Lecture	
5	Effect of exercise on body systems – Muscular	Lecture	
6	Programmes on Community health promotion – individual and family	Lecture	

7	Programmes on Community health promotion – Society	Lecture	
8	Dangers of alcoholic and drug abuse, medico legal implications.	Lecture and ppt	
	Module IV		
9	Introduction to concept of food and nutrition.	Lecture	
10	Balanced diet.	Lecture	
11	Vitamins and malnutrition	Lecture and ppt	
12	Deficiency diseases	Lecture and ppt	
13	Determining of caloric intake and expenditure	Lecture	
14	Obesity causes and preventive measures	Lecture	
15	Role of diet and exercise. BMI	Lecture	
	Module V		
16	Introduction to safety education	Lecture	
17	Principles of accident prevention	Lecture	
18	Health and safety in daily life and at work	Lecture	
19	First aid and emergency care	Lecture and ppt	
20	Modern lifestyle and hypokinetic diseases- Prevention and Management	Lecture and ppt	
	Module VI		
21	Introduction to life skill education	Lecture	
22	Physical activity, emotional adjustment and well being	Lecture	

	CIA I	1 hr	
23	Yoga, meditation and relaxation	Lecture and ppt	
24	Psychoneuroimmunology	Lecture	
	PART III. COMMUNITY HEALTH AND SANITATION		
	Module VII		
1.	Potable water quality monitoring and waste water management.	ICT Enabled (ppt & animations, images, video clippings); discussion	
2	Potable water quality monitoring and waste water management. Contd..		
3	Determination of sanitary quality of drinking water	ICT Enabled (ppt & animations, images, video clippings); discussion	
4	Water purification techniques.	ICT Enabled (ppt & animations, images, video clippings); discussion	
5	Water purification techniques.Contd...		
6	Water purification techniques Contd...		
7	Faecal bacteriae and pathogenic microorganisms transmitted by water.	ICT Enabled (ppt & animations, images, video clippings); discussion	
8	Faecal bacteriae and pathogenic microorganisms transmitted by water.Contd...		
9	Cholera and Typhoid.	ICT Enabled (ppt & animations, images, video clippings); discussion	
10	Cholera and Typhoid. contd...		

11	Vermicomposting a method of solid waste management	ICT Enabled (ppt & animations, images, video clippings); discussion
	Module VIII	
12	Public Health and Food borne diseases	ICT Enabled (ppt & animations, images, video clippings); discussion
13	Public Health and Food borne diseases contd...	
14	Food Poisoning causes and prevention	ICT Enabled (ppt & animations, images, video clippings); discussion
15	Food poisoning caused by toxins produced by microbes eg Staphylococcal food poisoning,	
16	Botulism, Salmonellosis	ICT Enabled (ppt & animations, images, video clippings); discussion
17	Botulism, Salmonellosis contd...	
18	CIA II	2hrs
19	Food infection caused by growth of microorganisms in the human body after the contaminated food has been eaten.	ICT Enabled (ppt & animations, images, video clippings); discussion
20	E Food Infection hepatitis (hepatitis A)	ICT Enabled (ppt & animations, images, video clippings); discussion
21	Food Infection hepatitis (hepatitis A). Contd...	ICT Enabled (ppt & animations, images, video clippings); discussion

22	Waterborne diseases and food borne diseases :Revision	ICT Enabled (ppt & animations, images, video clippings); discussion
	Module IX	
23	Emerging pathogens and diseases – Introduction	Lecture and PPT
24	Emerging pathogens and diseases – Swine flue (H1N1), bird flue (H5N1)	Lecture and PPT
25	Emerging pathogens and diseases –SARS, Anthrax	Lecture and PPT
26	Reemerging pathogens and diseases – TB	Lecture and PPT
27	Vector borne diseases (mosquito) and their control measures Mosquito eradication	Lecture and PPT
28	Vector borne diseases mosquito- Chikungunya , Malaria	Lecture and PPT
29	Vector borne diseases mosquito- Filariasis and Dengu fever	Lecture and PPT
30	Leptospirosis and preventive measures – Rodent control measures	Lecture and PPT
31	Cancer different types	Lecture and PPT
32	Causes of cancer, carcinogens, diet & cancer	Lecture and PPT
33	(e) HIV, AIDS – causes & preventive measures	Lecture and PPT
34	Revision & Evaluation of the course	ICT Enabled (ppt); discussion

ASSIGNMENTS

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage	
1	Individual assignment		
2			
3			
4			

Selected Further Readings

Fashey, Tomas D, Insel, Paul M and Roth Walt (2005) Fit and Well. New York; Mc Graw Hill Inc

Greenberg, Jerol S and Dintiman George B (1997) Wellness Creating a life of Health and Fitness , London Allyn and Bacon Inc.

Edlen Gordon Janes and Barttlet. Human Genatics a modern Synthesis. Published by Boston.

Monica Cheesbrough, Laboratory Manual for Tropical Counties Vol.II LBS.

Norman Bezzaant HELP First Aid for everyday emergencies. Jaico Publishing House, Bombay, Delhi

Pelczar M.J. Jr. E.C.S. Chane & N.R. Krieg, Microbiology (Concept & Applications)

Rai. B.C. Health Education and Hygiene. Published by Prakashan Kendra, Lucknow

COURSE PLAN FOR B.Sc PROGRAMME IN ZOOLOGY
SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF ZOOLOGY

COURSE PLAN FOR ACADEMIC YEAR 2015-2016

COURSE PLAN: **15U1CPZOO1: SEMESTER I**
: Animal Diversity – Non Chordata

COURSE OBJECTIVES

1. To acquire knowledge on the taxonomic status of various Invertebrate animals and animal groups.
2. To familiarize the students with the diverse group of organisms around us.
3. To develop an aptitude for understanding nature and its rich bio-diversity.

Basic Reference

1. Animal Diversity (2002). Zoological Society of Kerala Study material. Published by Zoological Society of Kerala.

Teacher I : 18hrs

Sessions	Topic	Method	Remarks/Reference
	Module I:		
1	General Introduction, 5 Kingdom classification, Classification in general	ICT Enabled (ppt & images, video clippings)	
2	Classification upto Classes	ICT Enabled (ppt & images, charts, video clippings)	
	Module 2:		
3	Kingdom Protista; Salient features and classification up to phyla	ICT Enabled (ppt & images, video clippings)	
4	1. Phylum Rhizopoda : Amoeba 2. Phylum Actinopoda : Actinophrys	ICT Enabled (ppt & animations, images, video clippings)	

	3. Phylum Dinoflagellata : Noctiluca		
5	4. Phylum Parabasalia : Trypanosoma 5. Phylum Metamonada : Giardia 6. Phylum Kinetoplasta : Trypanosoma	ICT Enabled (ppt & images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	7. Phylum Euglenophyta : Euglena 8. Phylum Cryptophyta : Cryptomonas 9. Phylum Opalinata : Opalina	ICT Enabled (ppt & images, video clippings)	
8	10. Phylum Bacillariophyta : Diatoms 11. Phylum Chlorophyta : Volvox 12. Phylum Choanoflagellata : Proterospongia 13. Phylum Ciliophora : Paramecium	ICT Enabled (ppt & images, video clippings)	
9	14. Phylum Sporozoa : Plasmodium 15. Phylum Microsporidia : Nosema 16. Phylum Rhodophyta : Red Alga Pathogenic protista – Plasmodium, Entamoeba	ICT Enabled (ppt & images, video clippings)	
	Module 3:		
10	Mesozoa – eg. Rhopalura Parazoa Phylum Porifera – eg Leucosolenia Phylum Placozoa –e g. Trypanox adherens.	ICT Enabled (ppt & images, charts, video clippings)	
	Module 4:		
11	Phylum : Coelenterata Salient features, Classification up to classess 1. Hydrozoa – Physalia	ICT Enabled (ppt & images, video clippings)	
12	2. Scyphozoa – Aurelia	ICT Enabled (ppt, images,	

	3. Anthozoa – Adamsia	animations & video clippings)	
13	Corals and coral reefs.		
	Module 5:		
13	Phylum - Platyhelminthes Salient features, classification upto classes 1. Turbellaria – Planaria	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Discussion on CIA-II; 2. Trematoda – Fasciola 3. Cestoda – Taenia solium	ICT Enabled (ppt & images, video clippings)	
	Module 6:		
16	Phylum Nematoda Salient features, classification up to classes	ICT Enabled (ppt & images, charts, video clippings)	
17	1. Phasmodia - Wuchereria 2. Aphasmodia – Trichinella	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

Teacher II: 18hrs

Ses sio ns	Topic	Method	Remarks/Refer ence
	Module 7 Phylum : Annelida		
1	Phylum Annelida: Salient features and classification up to class.	ICT Enabled (ppt & images, video clippings)	
2	Class 1: Polychaeta (eg: Nereis) Class 2: Oligochaeta (eg: Pheretima) Class 3: Hirudinomorpha (eg: Hirudinaria)	ICT Enabled (ppt & images, video clippings)	
	Module 8 – Phylum : Arthropoda		

3	Arthropoda: Salient features. Fenneropenaeus (Penaeus) habitat, morphology,	ICT Enabled (ppt & images, charts, video clippings)	
4	Appendages, sexual dimorphism, digestive system, respiratory system, circulatory system, excretory system,	ICT Enabled (ppt & images, video clippings)	
5	Nervous system, sense organs	ICT Enabled (ppt & animations, images, video clippings)	
6	reproductive system, larval stages.	ICT Enabled (ppt & images, video clippings)	
7	Classification up to class with one example	ICT Enabled (ppt & images, video clippings)	
8	Phylum Onychophora – eg. Peripatus (Mention Insect pests)	ICT Enabled (ppt & images, video clippings)	
9	1. Pests of coconut – Oryctes rhinoceros, Rhynchophorus ferrugineus, Nephantis serinopa, Eriophid mite	ICT Enabled (ppt & images, video clippings)	
10	2. Pests of paddy – Leptocorisa acuta, Spodoptera mauritius 3. Pests of stored grains - Trogoderma granarium, Tribolium castaneum, Sitophilus oryzae	ICT Enabled (ppt & images, video clippings)	
Module 9: Phylum : Mollusca			
11	Salient features and classification up to class	ICT Enabled (ppt & images, video clippings)	
12	Class 1: Aplousobranchia (eg: Neomenia) Class 2: Monoplousobranchia (eg: Neopilina) Class 3: Polyplousobranchia (eg: Chiton)	ICT Enabled (ppt & images, charts, video clippings)	
13	Class 4: Bivalvia (eg: Perna) Class 5: Gastropoda (eg: Xancus) Class 6: Cephalopoda (eg: Sepia) Class 7: Scaphopoda (eg: Dentalium)	ICT Enabled (ppt & images, charts, video clippings)	
Module 10: Phylum : Echinodermata			
14	Salient features and classification up to class.		
15	Class 1: Asterozoa (eg: Astropecten)		

	Class 2: Ophiuroidea (eg: Ophiothrix) Class 3: Echinoidea (eg: Echinus)		
16	Class 4: Holothuroidea (eg: Holothuria) Class 5: Crinoidea (eg: Antedon)		
17	Revision		
18	Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Session 10	Individual assignment	

Additional Reading List

1. Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.

**COURSE PLAN FOR B.Sc PROGRAMME IN ZOOLOGY
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DEPARTMENT OF ZOOLOGY

COURSE PLAN FOR ACADEMIC YEAR 2015-2016

**COURSE PLAN: ZOOLOGY COMPLEMENTARY FOR BOTANY (SEMESTER 2)
15U2CPZ002 - ANIMAL DIVERSITY – CHORDATA**

COURSE OBJECTIVES

1. To acquire knowledge on the taxonomic status of the various vertebrate animals and animal groups.
2. To familiarise the students with the diverse groups of organisms around us.
3. To develop an aptitude for understanding nature and its rich biodiversity.

Basic Reference

1. Animal Diversity (2002). Zoological Society Of Kerala Study Material Series. Published by Zoological Society of Kerala

COURSE OUTCOMES:

At the end of the course, the students would

1. Become conscious and aware of the chordate diversity
2. Appreciate the role of chordate in the sustenance of nature
3. Develop the skills to identify chordate animals around them

4. Develop respect for nature and a positive attitude towards protection of our environment
5. Become aware of chordates beneficial to humans
6. Become ambassadors of love towards animals

Teacher I : 18hrs

Sessions	Topic	Method	Remarks/Reference
	Module I: Phylum Chordata		
1	General Characters	ICT Enabled (ppt & images, video clippings)	
2	Classification upto Classes	ICT Enabled (ppt & images, charts, video clippings)	
3	Sub phylum I: Urochordata	ICT Enabled (ppt & images, video clippings)	
4	Sub phylum I: Urochordata contd...	ICT Enabled (ppt & animations, images, video clippings)	
5	Sub phylum II: Cephalochordata	ICT Enabled (ppt & images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	Sub phylum II: Cephalochordata contd..	ICT Enabled (ppt & images, video clippings)	
8	Sub phylum II: Cephalochordata contd.., Sub phylum III: Vertebrata	ICT Enabled (ppt & images, video clippings)	
9	Sub phylum III: Vertebrata contd..,	ICT Enabled (ppt & images, video clippings)	
	Module IV: Class Reptilia		

10	General characters, Sub class I: Anapsida Eg. Chelone	ICT Enabled (ppt & images, charts, video clippings)	
11	Sub class II Diapsida Eg. Chameleon, Subclass III Parapsida eg. Ichthyosaurus	ICT Enabled (ppt & images, video clippings)	
12	Poisonous and non-poisonous snakes of India	ICT Enabled (ppt, images, animations & video clippings)	
Module V: Class Aves			
13	General characters, Sub class I : Archeornithes Eg: Archaeopteryx	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Discussion on CIA-II; Sub class II. Neornithes Eg: Struthio, Flight adaptations of birds	ICT Enabled (ppt & images, video clippings)	
Module VI: Class Mammalia			
16	General characters, Sub class I Prototheria eg. Echidna, Sub Class II Metatheria eg. Macropus	ICT Enabled (ppt & images, charts, video clippings)	
17	Sub class III Eutheria eg. Elephas, Aquatic mammals	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

Teacher II :18hrs

Sessions	Topic	Method	Remarks/Reference
Module I: Phylum Chordata			
1	General Characters	ICT Enabled (ppt & images, video clippings)	
2	Classification upto Classes	ICT Enabled (ppt & images, charts, video clippings)	
3	Sub phylum I: Urochordata	ICT Enabled (ppt & images, video	

		clippings)	
4	Sub phylum I: Urochordata contd...	ICT Enabled (ppt & animations, images, video clippings)	
5	Sub phylum II: Cephalochordata	ICT Enabled (ppt & images, video clippings)	
6	CIA - I	1 hr; descriptive answers only	
7	Sub phylum II: Cephalochordata contd..	ICT Enabled (ppt & images, video clippings)	
8	Sub phylum II: Cephalochordata contd., Sub phylum III: Vertebrata	ICT Enabled (ppt & images, video clippings)	
9	Sub phylum III: Vertebrata contd.,	ICT Enabled (ppt & images, video clippings)	
	Module IV: Class Reptilia		
10	General characters, Sub class I: Anapsida Eg. Chelone	ICT Enabled (ppt & images, charts, video clippings)	
11	Sub class II Diapsida Eg. Chameleon, Subclass III Parapsida eg. Ichthyosaurus	ICT Enabled (ppt & images, video clippings)	
12	Poisonous and non-poisonous snakes of India	ICT Enabled (ppt, images, animations & video clippings)	
	Module V: Class Aves		
13	General characters, Sub class I : Archeornithes Eg: Archaeopteryx	ICT Enabled (ppt & images, charts, video clippings)	
14	CIA- II	2 hrs	
15	Discussion on CIA-II; Sub class II. Neornithes Eg: Struthio, Flight adaptations of birds	ICT Enabled (ppt & images, video clippings)	
	Module VI: Class Mammalia		
16	General characters, Sub class I Prototheria eg. Echidna, Sub Class II Metatheria eg. Macropus	ICT Enabled (ppt & images, charts, video clippings)	

17	Sub class III Eutheria eg. Elephas, Aquatic mammals	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Session 10	Individual assignment	

Additional Reading List

1. Ekamberanatha Ayyar M. (1990) A Manual of Zoology, Volume I. Vertebrate Part I and Part II S. Viswanathan Printers & Publishers Pvt. Ltd.
2. Young J.Z. 1981. The life of Vertebrates (Oxford University Press).

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DEPARTMENT OF ZOOLOGY

COURSE PLAN: ZOOLOGY COMPLEMENTARY FOR BOTANY (SEMESTER 3)
ZY3C03U- HUMAN PHYSIOLOGY AND IMMUNOLOGY

COURSE OBJECTIVES

- To inspire the students in learning the frontier areas of biological sciences
- To appreciate the correlation between structure and function of organisms
- To make them aware of the health related problems, their origin and treatment.

BASIC REFERENCE

1. Guyton 2002: Text Book of Medical Physiology Saunders pp432-509 Zoological Society of Kerala, Study material 2002.
2. Biochemistry, Physiology and Developmental Biology Published by Zoological Society of Kerala

COURSE OUTCOMES:

At the end of the course, the students would

1. Understand nutrition and deficiency disorders
2. Understand the functional aspects of respiration and respiratory disorders
3. Understand functional aspects of cardiovascular circulation, disorders and clinical aspects.
4. Understand structure and function of human nitrogenous excretory organ and renal disorders.
5. Understand structural and functional features of neuromuscular system and its disorders.
6. Understand functional characteristics of hormonal glands and its disorders.
7. Understand the basics of immunology, antigens and antibodies, antigen antibody reactions and its clinical applications.
8. Understand the applications, new developments and recent trends in immune research.

TEACHER 1:18 HRS

Sessions	Topic	Method	Remarks/Reference
	Module 1 : Nutrition		
	Malnutrition disorders,	ICT Enabled (ppt, animations, images & video clippings)	
	Vitamin deficiencies	ICT Enabled (ppt, images)	
	Mineral deficiencies (Iron, Calcium and Iodine)	ICT Enabled (ppt, images)	
	Module 2: Respiration		
1	Transport of O ₂ and CO ₂ in blood.	ICT Enabled (ppt & images, video clippings)	
2	Respiratory disorders – Dyspnoea, Hypoxia, Asphyxia.	ICT Enabled (ppt & images, charts, video clippings)	
3	Hypo and Hypercapnia,	ICT Enabled (ppt & images, video clippings)	
4	CO poisoning,	ICT Enabled (ppt & animations, images, video clippings)	
5	Smoking and its physiological effects.	ICT Enabled (ppt & images, video clippings)	
	CIA 1	1 Hrs	
	Module 3: Circulation		
7	Blood – Composition and function.	ICT Enabled (ppt & images, video clippings)	
8	Brief account of mechanism of blood clotting.	ICT Enabled (ppt & images, video clippings)	
9	Disorders of blood clotting – Haemophilia, cerebral and pulmonary thrombosis, Cerebral haemorrhage.	ICT Enabled (ppt & images, video clippings)	
10	Blood pressure and factors controlling it; electrocardiogram. Cardiovascular disorders – Arteriosclerosis, Myocardial infraction.	ICT Enabled (ppt & images, charts, video clippings)	
11	Angiogram and Angioplasty.	ICT Enabled (ppt & images, video clippings)	
	CIA 2	2 Hrs	

TEACHER 2: 18 HRS			
	Module 4 Excretion		
	Excretion: Structure of human nephron	ICT Enabled (ppt, animations, images & video clippings)	
	composition of urine – normal and abnormal constituents	ICT Enabled (ppt, images)	
	urine formation (ultra-filtration , selective reabsorption, tubular secretion and counter current mechanism)	ICT Enabled (ppt, animations, images & video clippings)	
	CIA 1	1 Hrs	
	Module 5 Neurophysiology		
13	Structure of typical neuron, myelinated and non myelinated nerve fibres.	ICT Enabled (ppt & images, charts, video clippings)	
14	Nerve impulse – initiation and propagation of nerve impulse, All or none law, Saltatory conduction, Synaptic transmission.	ICT Enabled (ppt & images, charts, video clippings)	
15	Neurotransmitters.	ICT Enabled (ppt & images, video clippings)	
16	Brianwaves, Electroencephalogram.	ICT Enabled (ppt & images, charts, video clippings)	
17	Neural disorders – Parkinson’s disease, Epilepsy, Alzheimer’s syndrome, Dyslexia.	ICT Enabled (ppt & images, video clippings)	
18	Revision & Evaluation of the course		
	Module 6. Muscle Physiology		
	Striated, Non striated and Cardiac muscle	ICT Enabled (ppt, animations, images & video clippings)	
	Ultra structure of striated muscle fiber,	ICT Enabled (ppt, animations, images & video clippings)	
	Mechanism of muscle contraction	ICT Enabled (ppt, animations, images & video clippings)	
	Threshold and spike potential, Fatigue, O ₂ dept, Rigor mortis.	ICT Enabled (ppt, images)	

	CIA 2	2 Hrs	
TEACHER 3: 18 HRS			
	Module 7 Endocrinology		
	Endocrine glands and their hormones, mode of action (in brief) ,	ICT Enabled (ppt, animations, images & video clippings)	
	Hypothalamus, Pituitary , Thyroid, Parathyroid, Thymus ,	ICT Enabled (ppt, animations, images & video clippings)	
	Islets of Langerhands, Adrenal, Testis and ovary ,	ICT Enabled (ppt, animations, images & video clippings)	
	Hormonal disorders.	ICT Enabled (ppt, & images)	
	CIA 1	1 Hrs	
	Module 8		
	Introduction to immunology	ICT Enabled (ppt, images)	
	Types of immunity, innate immunity , acquired, passive , active	ICT Enabled (ppt, animations, images & video clippings)	
	Mechanism of innate immunity (eg. Barriers , phagocytosis , inflammation)	ICT Enabled (ppt, animations, images & video clippings)	
	Complement System, biological effects of complements.	ICT Enabled (ppt, animations, images & video clippings)	
	Module 9 Antigens and antibodies		
	Types of antigens, haptens, antigenic determinants.	ICT Enabled (ppt, animations, images & video clippings)	
	Basic structure of immunoglobulins, Different classes of immunoglobulins and functions.	ICT Enabled (ppt, animations, images & video clippings)	
	Module 10		

	Antigen antibody reactions Precipitation test, agglutination test	ICT Enabled (ppt, animations, images & video clippings)	
	Clinical applications of antigen antibody reaction, Widal, VDRL, HIV test (ELISA),	ICT Enabled (ppt, animations, images & video clippings)	
	Complement Fixation Test, and Coombs test.	ICT Enabled (ppt, animations, images & video clippings)	
	CIA 2	2 Hrs	
	Module 11 (Brief accounts of the followings)		
	Immune response system Primary and secondary lymphoid organs,	ICT Enabled (ppt, animations, images & video clippings)	
	Cells of Immune system – Leucocytes, lymphocytes, T&B cells, Macrophages, Plasma cells , Memory cells, MHC	ICT Enabled (ppt, animations, images & video clippings)	
	Antibody synthesis, Monoclonal antibodies, Hybridoma technology	ICT Enabled (ppt, animations, images & video clippings)	
	Immune disorders – hypersensitivity, Auto immunity & Immunodeficiency, AIDS,	ICT Enabled (ppt, animations, images & video clippings)	
	Vaccines - Major types of vaccines (BCG, DPT, Polio vaccine and TAB vaccines). Recent trends in vaccine	ICT Enabled (ppt, & images)	

	preparation.		
	Revision & Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Session 10	Individual assignment	

Additional Reading List

1. Coleman: Fundamentals of Immunology
2. Ivan Roitt: Essentials of Immunology ELBS.
3. Madhavankutty, Medical Physiology
4. Mahupathra, Human Physiology, Current Books
5. Michael J. Pelczar ECS, Chan & Noel. R. Kreig, Microbiology, Tata McGraw Hill 5th ed. 1996.
6. Michael J. Gibuay, Ian A. Macdonald and Helen M. Roche, Nutrition and Metabolism.
7. Monica Cheesbrough: Laboratory Manual for Tropical Countries. Vol.II Microbiology, ELBS – Cambridge Ed. 1986.
8. Paniker S., Francis G. and Abraham G.K 2008, Microbiology and Immunology, Study Material Series published by Zoological Society of Kerala.

COURSE PLAN: SEMESTER IV
Complementary Course 4
ZY4C04U - APPLIED ZOOLOGY

COURSE OBJECTIVES

1. To make students aware of the animals having economic importance
2. To acquire knowledge regarding the taxonomic position of the referred animals
3. To have a thorough knowledge of the life cycle of the animals having economic importance
4. Equip the students with skills and knowledge which can lead to self-employment opportunities.

Basic Reference

1. Animal Breeding and Rearing (2012). Published by Zoological Society of Kerala

COURSE OUTCOMES:

At the end of the course, the students would

1. Become aware of the diversity of the animals that would earn them money
2. Have thorough knowledge of the taxonomy of the animals discussed.
3. Identify the different stages in the life cycle of an animal and their requirements.
4. Develop skills and knowledge which can lead to self-employment opportunities
5. Appreciate the role of the animals in the sustenance of nature

TEACHER I

Sessions	Topic	Method	Remarks/Reference
	Module 1Aquaculture		
1	Introduction and traditional methods of aquaculture	Discussion to test the pre-requisite ICT Enabled (ppt&images)	
2	Types of aquaculture	Lecture and ppt	
3	Biotic and abiotic factors of water	Discussion and reading	
4	Importance of Alga in aquaculture	ICT Enabled (ppt& video clippings)	
5	Common Cultivable fishes of Kerala	Group discussions	
6	Morphology of culturable species- <i>Catla</i> , <i>Rohu</i> , <i>Mrigal</i> , <i>Cyprinus carpio</i> , <i>Europlus</i> & <i>Tilapia</i>	ICT Enabled (ppt&images)	
7	Morphology of culturable species- <i>Penaesus indicus</i> , <i>P. monodon</i> , <i>Pernaviridis/Pernaindicus</i> , <i>Pinctadafucata</i> .	ICT Enabled (ppt&images)	
8	Pond culture	ICT Enabled (video clippings)	

9	CIA - I	1 hr; descriptive answers only	
10	Description of Carp culture	Lecture method	
11	Composite fish culture, Integrated Fish Culture	Lecture and ppt	
12	Induced breeding in fishes	ICT Enabled (video clippings)	
13	Important Fish Diseases	Discussion and teaching	
14	Fish preservation and processing	PPT	
15	Prawn culture	ICT Enabled (ppt, images)	
16	Mussel culture	ICT Enabled (ppt, images)	
	CIA- II	2 hrs	
17	Pearl culture	ICT Enabled (ppt, videos)	
18	Revision & Evaluation of the course		
TEACHER II			
	Module 1: Aquaculture		
1	Traditional methods of aquaculture	Lecture and inter action	

2	Advantages and salient features of aquaculture	Lecture ,,	
3	Types of aquaculture,	Lecture ,,	
4	Biotic and abiotic factors of water	,,	
5	Pond culture, Brief Description of Carp culture	,,	
6	Composite fish culture	,,	
7	Integrated Fish Culture	,,	
8	Induced breeding in fishes.	,,	
	Module 4 Apiculture		
9	Species of Honey bees.	Lecture and inter action	
10	Organization of honeybee colony.	,,	
11	Bee keeping methods	,,	
12	Bee keeping equipments	Lecture ,,	
13	Apiary management	Lecture ,,	
14	Apiary maintenance		
15	Bee pasturage	Lecture ,,	

16	Byproducts of honey bees and their uses	Lecture ,,	
17	Diseases and pests of honey bees	Lecture ,,	
18	Control measures	Lecture ,,	
TEACHER III			
	Module 2 Sericulture		
1	Introduction and scope of sericulture	Discussion to test the pre-requisite ICT Enabled (ppt & images)	
2	Different kinds of silk worms	Lecture and ppt	
3	Life cycle of silk worm	Ppt and reading	
4	Rearing house and environmental conditions	ICT Enabled (ppt & video clippings)	
5	Feeding of silk worms	Group discussions	
6	Rearing techniques of young age	Ppt and videos	
7	Silk worm handling- management	ICT Enabled (ppt & images, video clippings)	

8	Rearing of late stages	ICT Enabled (ppt & images, video clippings)	
9	CIA - I	1 hr; descriptive answers only	
10	Mounting of silk worms	ICT Enabled (ppt & images)	
11	Cocoon harvesting and sorting	Lecture and ppt	
12	Diseases of silk worms	ICT Enabled (ppt, images)	
13	Diseases –preventive and control measures	Discussion and teaching	
	Module 3 Vermiculture		
14	Introduction and types of earth worms	Demonstration	
15	Life cycle of earth worms	ICT Enabled (ppt, images)	
16	Vermiculture requirements	Lecture	
	CIA- II		

17	Vermicomposting	Demonstration	
18	Revision & Evaluation of the course		

ASSIGNMENTS

	Date of submission/completion	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)	Weightage
1	Day 7 (Teacher I)	Individual assignment	
2	Day 10 (Teacher II)	Individual assignment	

Additional Reading List

Alikunhi, K.h., Fish Cluture in India (ICAR, New Delhi)

Bhosh, C.C., 1949, Silk Production and Weaving in India (CSIR), New Delhi)

Edwards, C.A. & Lafty, J.R. 1972 Biology of Earthworms (Chapman and Hall Led. London)

Jhingran, V.G., 1985 Fish and Fisheries of India (Hindustan Publ. Corporation, New Delhi)

Kurien, C.V. & Sebastian V.C., Prawn Fisheries in India (Hindustan Publ. Corporation, New Delhi)

Sinhan, V.R.P. & Ramachandran, V., 1985, Fresh water Fish Culture (ICAR, New Delhi)

Venkitaraman, P.R., 1983, Text Book of Economic Zoology (Sudarsana Publ. Cochin)

