(FOR THE CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2013 ONWARDS)

DEPARTMENT OF ZOOLOGY

I & II SEMESTERS : SCHEME OF EXAMINATIOS

(CBCS for under graduate programmes with language for 4 semesters)

Part No	Course Code	Course title	Lecture+ Tutorial/ Practical Hours/ week	Duration of Exam Hrs	Max. Marks			Credit Point
					Internal	End-of-Semester	Total	
		Semester I						
I	13UTL01/ 13UHN01/ 13UFR01	Tamil/Hindi/French Paper - I	6	3	25	75	100	3
II	13UEN01	English Paper – I	5	3	25	75	100	3
III	13UZY01	Core Major Paper –I Non-Chordata	6	3	25	75	100	4
	13UZY03	Practical – I (Non-Chordata & Chordata)	2	-	-	-	-	-
	13UBY02	Allied Zoology Paper–I: Non-Chordata & Chordata	7	3	25	75	100	3
	13UBY06	Allied Zoology Practical- (Paper–I &II)	2	-	9-	-	-	-
IV	08EVS01	Environmental Studies	1		-	-	-	-
	09HEC01	Human Excellence Paper-1 : Personal Values	1	3		75	75	1
V		Extension Activities (NSS, NCC, Sports & Games)						
		Semester II						
I	13UTL02/ 13UHN02/ 13UFR02	Tamil/Hindi/French Paper - I	6	3	25	75	100	3
II	13UEN02	English Paper – II	5	3	25	75	100	3
III	13UZY02	Core Major Paper –II : Chordata	5	3	25	75	100	4
	13UZY03	Major Practical – I (Non-Chordata & Chordata) Core II	2	3	40	60	100	5
	13UBY05	Allied Zoology Paper –II: Applied Zoology	7	3	25	75	100	3
	13UBY06	Allied Zoology Practical- (Paper I &II)	2	3	40	60	100	4
	08EVS01	Environmental Studies	1	3	-	100	100	2
IV	09HEC02	Human Excellence Paper-2 : Family Values	1	3	-	75	75	1
	09HECP01	Human Excellence Paper Practical-I (Value Education)	1	3	-	50	50	-
	12UHR01	Human Rights	1	3	-	100	100	2
V		Extension Activities (NSS, NCC, Sports & Games)						

(FOR THE CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2012 ONWARDS)

DEPARTMENT OF ZOOLOGY

III & IV SEMESTERS : SCHEME OF EXAMINATIOS

(CBCS for under graduate programmes with language for 4 semesters)

Part No	Course Code	Course title	Lecture+ Tutorial/ Practical Hours/ week	Duration of Exam Hrs	Max. Marks			Credit Point
					Internal	End-of-Semester	Total	
		Semester III						
I	12UTL03/ 12UHN03	Tamil/ Hindi Paper - III	5	3	25	75	100	3
II	12UEN03	English Paper – III	6	3	25	75	100	3
III	12UZY07	Core Major Paper –IV Cell Biology	7	3	25	75	100	4
	12UZY10	Major Practical – II (Cell biology & Genetics)	2	3	-	-	-	-
	11UZY08	Allied Chemistry Paper – I	6	3	25	75	100	3
	11UZY12	Allied Chemistry Practical	2	-	-	-	-	-
IV	12UZYSA1/ 12UZYSB1	Apiculture (SBE) / Insect pest management (SBE)	1	3	-	50	50	2
	10BTL01	*Basic Tamil paper I						2
	09HEC03	Human Excellence Paper-3 : Professional Values	1	3	-	75	75	1
V		Extension Activities (NSS, NCC, Sports & Games)						
		Semester IV						
I	12UTL04/ 12UHN04	Tamil/ Hindi Paper - IV	5	3	25	75	100	3
II	12UEN04	English Paper – IV	6	3	25	75	100	3
III	12UZY09	Core Major Paper –V Genetics	7	3	25	75	100	4
	12UZY10	Major Practical – II (Cell biology & Genetics)	2	3	40	60	100	5
	11UZY11	Allied Chemistry Paper – II	6	3	-	-	-	3
	11UZY12	Allied Chemistry Practical	2	3	-	-	-	4
IV	12UZYSA2/ 12UZYSB2	Vermiculture (SB) / Poultry science and management technology (SBE)	1	3	-	50	50	2
	10BTL02	*Basic Tamil paper II						3
	09HEC04	Human Excellence Paper-4 : Social Values	1	3	-	75	75	
	09HECP02	Human Excellence Paper Practical-2 (Value Education)	-	-	-	50	50	
V		Extension Activities(NSS/NCC/Sports and Games)	Grading only					

Department	ZOOLOGY	
Course	I B.SC	Effective from the Year:2013
Subject Code : 13UZY01 Title : NON -CHORDATA		Semester: I
Hrs/Week :	6	Credit:4
Objectives	To understand the different animal groups under different phyla To study the structure and relation of non-chordate animals.	

Unit	Content	Hrs
Unit I	Outline Classification upto class level with two examples each. General characteristics of under mentioned Non- Chordate phyla (Ekambaranatha Iyer Text book to be followed) **Phylum – Protozoa:** Plasmodium vivax – structure Life cycle – Cycle of Golgi - Cycle of Ross Pathogenicity and control of Malaria. Economic importance of Protozoa.	**(16Hrs)**
Unit II	**Phylum – Porifera** : Leucosolenia - Structure - Reproduction and Life cycle Canal system in sponges. **Phylum – Coelenterata:** Obelia – Structure - Reproduction and Life cycle. Polymorphism Coral reefs – Types and Formation.	**(16Hrs)**
Unit III	**Phylum – Helminthes:** *Taenia solium* – Structure Reproductive system and Life cycle. Parasitic adaptations in Helminth worm. **Phylum – Annelida** : Earthworm – Structure - Digestive system - Excretory system and Reproductive system. Metamerism in Annelids.	**(15Hrs)**
Unit IV	**Phylum – Arthropoda**: Cockroach – Structure - Mouth parts – Digestive – Respiratory – Circulatory - Nervous and Reproductive systems. Peripatus as a Connecting Link. Arthropod Vectors and Human diseases.	**(15Hrs)**
Unit V	**Phylum – Mollusca**: Pila – Structure Respiratory system and Reproductive Systems. Economic importance of Mollusca. **Phylum – Echinodermata** : Seastar – Structure- Digestive system Water vascular system and Reproductive systems. Larval forms of Echinoderms and their significance.	**(16Hrs)**
Total Contact Hrs		**(78Hrs)**

(CONTD.....2)

Text Books :

1. Nair N.C., Leelavathy S., Soundarapandian N and Arumugam, N. (2012) A text book of Invertebrates – Saras Publication, Nagercoil.

Reference Books:

1. Ekambaranatha Iyyer, (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition. S. Viswanathan(Printers and Publishers)
2. Jordan E.L & Verma J. K (1995) Invertebrate Zoology, S. Chand & Company, New Delhi.
3. Dhami P.S & Dhami J.K (1990) Invertebrate Zoology, S. Chand & Company
4. Ganguly B.B Sinha.A & Adhikari.S. (1977) 3rd Edition Biology of Animals, Vol –I, Invertebrates New Central Book Agencies.
5. Kotpal R. Agarwal S.K& Khetarpal R.P. (1992) 7th Edition Modern Text Book of Zoology, Invertebrata, , Rastogi Publications.
6. Nigam Shoban I Nagin H.C. Biology of Non-Chordates Shoban I Naginhand & Co Educational Publishers

Department	ZOOLOGY	
Course	I B.SC (ANCILLARY ZOOLOGY PAPER – I)	Effective from the Year:2013
Subject Code : 13UBY02 Title : Non-chordata and Chordata		Semester : I
Hrs/Week :	7	Credit:3
Objectives	To study the structure and classification of different animal kingdom. To understand the general characters of both chordate and non-chordate phyla	

Unit	Content	Hrs
Unit I	**Classification of the following Phyla up to the class level with suitable examples.** **Phylum: Protozoa**: Paramecium – Structure- Feeding- Binary fission and Conjugation. **Phylum: Coelenterata:** Obelia – Structure and Life cycle.	(19Hrs)
Unit II	**Phylum: Platyhelminthes** : Taenia solium – Structure - Reproduction and Life cycle. **Phylum:Arthropoda** :Cockroach – Structure - Mouthparts Digestive system - Respiratory system and Reproductive system.	(18Hrs)
Unit III	**Phylum: Mollusca :** Freshwater mussel – Structure – Digestive system- Respiratory system – Circulatory system – Reproductive system. **Phylum: Echinodermata:** Sea star – Structure and Water Vascular system.	(18Hrs)
Unit IV	**Phylum: Chordata** **Sub Phylum: Prochordata** – General Characters of Amphioxus Balanoglossus Ascidian **Sub Phylum: Vertebrata Class : Pisces** Tilapia - External Characters – Digestive & urinogenital systems **Class :** Amphibia Frog – External characters – Respiratory system – Heart – Reproductive system.	(18Hrs)
Unit V	**Class : Reptilia** Calotes - External characters – Circulatory system- Brain- Reproductive system. **Class : Aves** Pigeon – External Characters – Flight muscles – Respiratory system – Reproductive system. **Class : Mammal** Rabbit - External Characters– Heart – Excretory system – Reproductive system	(18Hrs)
	Total Contact Hrs	91

(CONTD.....2)

Text Books :

1. Arumugam N. (2011) Allied Zoology Part I & Part – II –, Saras Publications, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Ekambaranatha Iyyer (1995) A Manual of Zoology Vol I & II, Ananda Book Depot, "Acton Lodge",Mc Nichols Road, Chetput, Madras – 600 031
2. Jordan E.L & Verma J.K. (1997) Invertebrate Zoology, S. Chand & Company Ltd, Ram Nagar, New Delhi 110055
3. Dhami P.S & Dhami J.K. (1995) Invertebrate Zoology, S. Chand & Company
4. Ganguly B.B Sinha.A &Adhikari.S. (1977) 3rd Edition Biology of Animals, Vol –I, Invertebrates, New Central Book Agencies.
5. Kotpal R.L. (1983) Modern Text Book of Zoology, Rastogi Publications.
6. Nigam Shoban I Naginhand H.C. (1995) Biology of Non-Chordates, Shoban I Nagin hand & Co Educational Publishers.

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Department	ZOOLOGY	
Course	I B.SC	Effective from the Year:2013
Subject Code : 13UZY02		Semester: II
Title : CHORDATA		
Hrs/Week :	6	Credit:4
Objectives	To acquire a basic knowledge on chordates	

Unit	Content	Hrs
Unit I	**General characters and outline classification of Phylum chordata upto class level with suitable examples. (Ekambaranatha Iyer Text Book to be followed)** General characters and affinities of a) Amphioxus b) Balanoglossus c) Ascidian **Class: Pisces** **Type** – Tilapia **Systems:** Externals - Digestive system - Respiratory and Urino–genital system. Parental care in Fishes	**(16Hrs)**
Unit II	**Class: Amphibia** **Type – Frog** **Systems:** Externals - Girdles and Limbs - Respiratory system – Brain - Cranial nerves and Urino-genital system. Origin of Amphibia.	**(16Hrs)**
Unit III	**Class: Reptilia** **Type – Calotes** **Systems:** Externals - Digestive system - Urino–genital system. South Indian Poisonous and Non-Poisonous Snakes. Poison apparatus and Biting Mechanism in Snakes. First –Aid for Snake Bite.	**(15Hrs)**
Unit IV	**Class: Aves** **Type: Pigeon** **Systems**: Externals – Synsacrum - Flight muscles - Digestive system - Respiratory system- Brain- Eye and Urino – genital system. Flightless Birds Migration in Birds	**(15Hrs)**
Unit V	**Class: Mammalia** **Type – Homosapiens** **Systems:** Girdles - Digestive system - Respiratory system – Circulatory system- Brain - Eye- Ear - Urinary and Reproductive system. **Salient features of** a) Monotremes b) Marsupials c) Evolution of aortic arches	**(16Hrs)**
	Total Contact Hrs	**(78Hrs)**

(CONTD……..2)

Text Books :

1. Thangamani, A., Prasanna kumar, S., Narayanan, L.M., and Arumugam, N. (2013) (6th Edition)A text book of Chordata, Saras publications, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Ekambaranatha Iyer, (1995) Manual of Zoology, Vol.II (4th Edition). S.Viswanathan PVT Ltd., Parts I & II. Viswanathan & Co.
2. Jordan, E.L. and Verma, P.S. (2006) Chordate Zoology. S. Chand & Company LTD., Ram Nagar, New Delhi. 110055.

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Department	ZOOLOGY	
Course	I B.SC	Effective from the Year:2013
Subject Code : 13UZY03		
Title	: MAJOR PRACTICAL –I NONCHORDATA AND CHORDATA	Semester: I & II
Hrs/Week :	2	Credit:5
Objectives	To study the morphology and anatomy of invertebrate and vertebrate	

Content	Hrs
DISSECTION **Cockroach:** Externals (male and female), Digestive system, Nervous system, Reproductive system, Mouth parts, Salivary apparatus **Fish:** Externals, Digestive system, Urino-genital system, Scales and Gills Mounting	
SPOTTERS **A. Classify giving reasons:** 1) Plasmodium 2) Paramecium 3) *Tania solium* 4) Earth worm 5) Sea star 6) Amphioxus 7) Frog 8) Calotes 9) Pigeon	
B. Draw labeled sketch: 1) Obelia colony 2) T.S of *Taenia solium* 3) T.S of Earthworm 4) T.S of Through arm of sea star 5) Cockroach leg 6) Frog – Pectoral girdle 7) Poison apparatus - snake 8) Pigeon – Synsacrum 9) Human eye	
C. Biological significance: 1) *Entamoeba histolytica* 2) Sponge- Gemmule 3) Obelia – Medusa 4) Taenia mature proglottid 5) Peripatus 6) Limulus 7) Balanoglossus 8) Axolotl larva 9) Chameleon	

(CONTD……..2)

D. Write descriptive notes: 1) *Taenia solium* – Scolex 2) Earth worm - setae 3) Pila – Radula 4) Sea star 5) Mosquito - Culex 6) Rhacophorous 7) Draco 8) Cobra 9) Emu	
Total Contact Hrs	**52**

Reference Books:

1. Lal, S. S. (2004) A text book of Practical Zoology Invertebrate . Rastogi Publications, Shivaji Road, Meerut, 250 002, India
2. Lal, S. S. (2004) A text book of Practical Zoology Vertebrate . Rastogi Publications, Shivaji Road, Meerut, 250 002, India

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Department	ZOOLOGY	
Course	I B.SC ANCILLARY ZOOLOGY PAPER II	Effective from the Year:2013
Subject Code : 13UBY05 Title : APPLIED ZOOLOGY		Semester : II
Hrs/Week :	7	
Objectives	To understand the applications of zoology for developing skills	Credit:3

Unit	Content	Hrs
Unit I	**Food and Nutrition** Food – Types – Sources – Functions Physiology of Digestion in man Energy values of various food Balanced diet Food borne diseases	(19Hrs)
Unit II	**Vermiculture** Earthworm – Externals and Life cycle. Commercially important species of Earthworm Biological waste materials used for Vermiculture Preparation of Vermibed Maintenance of Vermibed Economic importance of vermicomposting	(18Hrs)
Unit III	**Apiculture** Brief account of *Apis indica - A. mellifera & A. dorsata* Social organization of Honey bee colony Structure of Bee Hive Products of Bee keeping – Royal Jelly- Honey- Wax - Bee venom Appliances for modern method of Bee keeping	(18Hrs)
Unit IV	**Sericulture** Optimum conditions for mulberry Mulberry cutting preparation Structure of silk worm Structure of Silk gland Life cycle of Bombyx mori Rearing equipments Disinfection Diseases of silkworm: Pebrine and Viral Flacherie Cocoon market	(18Hrs)
Unit V	**Home Aquarium** Common varieties of fresh water ornamental fishes Ornamental fish culture Selection of fish material and locomotion Construction of Fish Tank and set up of Home Aquarium Maintenance of Home Aquarium Types of feed Aesthetics and professional value of aquarium	(18Hrs)
	Total Contact Hrs	91

(CONTD.....2)

Department	ZOOLOGY	
Course	I B.SC ANCILLARY ZOOLOGY PAPER II	Effective from the Year:2013
Subject Code : 13UBY05 Title : APPLIED ZOOLOGY		Semester : II
Hrs/Week :	7	
Objectives	To understand the applications of zoology for developing skills	Credit:3

Unit	Content	Hrs
Unit I	**Food and Nutrition** Food – Types – Sources – Functions Physiology of Digestion in man Energy values of various food Balanced diet Food borne diseases	(19Hrs)
Unit II	**Vermiculture** Earthworm – Externals and Life cycle. Commercially important species of Earthworm Biological waste materials used for Vermiculture Preparation of Vermibed Maintenance of Vermibed Economic importance of vermicomposting	(18Hrs)
Unit III	**Apiculture** Brief account of *Apis indica - A. mellifera & A. dorsata* Social organization of Honey bee colony Structure of Bee Hive Products of Bee keeping – Royal Jelly- Honey- Wax - Bee venom Appliances for modern method of Bee keeping	(18Hrs)
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	Total Contact Hrs	91

(CONTD.....2)

Text Books :

1) Shukla and Upadhya, (2001) Economic Zoology, Rastrogi Publication, Shivaji Road, Meerut, 250 002, India

Reference Books:

1. Arumugam, N. (2012) Aquaculture by SARAS Publications, Nagercoil, Tamilnadu.
2. Kanyakumari. (2010) Applied Zoology- 4 Authors, Saras Publication, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002,
3. Ezhili, N. and Thirumathal, K. (2008) A hand book for sericulture –, Shrishti Impression, Coimbatore
4. Tripaty, S.N. (2004) Food biotechnology. Doarinant Publishing and distributions, New Helhi. 110 002.

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Department	ZOOLOGY	
Course	I B.SC ANCILLARY ZOOLOGY	Effective from the Year:2013
Subject Code : 13UBY06 Title : ANCILLARY ZOOLOGY PRACTICAL – (Paper I & II)		Semester- II
Hrs/Week :	2	Credit:4
Objectives	To study the morphology and anatomy of invertebrate and vertebrate	

Content	Hrs
Cockroach - Externals Digestive system Nervous system Reproductive system Mouthparts **Fish** - Externals Digestive system Urino-genital system **Silkworm** - Silkgland **SPOTTERS** **Paramecium** - Entire - Binary fission- Conjugation **Obelia** - Colony- Medusa **Taenia solium**- Entire- Scolex **Earthworm** - Entire **Penaeus** - Entire **Honey bee** - Entire **Bee hive** **Culex mosquito** **Silkworm** - Entire **Sericulture** - Netrikka **Octopus** - Entire **Starfish** - Oral- Aboral **Amphioxus** - Entire **Balanoglossus**- Entire **Gold Fish** - Entire **Frog** - Entire - Pectoral girdle- Pelvic girdle **Draco** - Entire **Cobra** - Entire **Pigeon** - Quill feather **Rabbit** - Dentition **Man** - Digestive system	
Total Contact Hrs	**65**

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Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2012
Subject Code :12UZY07		Semester : III
Title	: CELL BIOLOGY	
Hrs/Week :	7	Credit:4
Objectives	To study the basic concepts of cell biology	

Unit	Content	Hrs
Unit I	• Cell Theory: Salient features - Protoplasm theory - Germplasm theory and organismal theory. • Scope of Cell Biology: - Virus – HIV - Prokaryotic Cell (*E.coli* bacterium) - Eukaryotic Cell (Typical animal cell) • Organelles: Plasma membrane – structure – Trilaminar model - Bimolecular leaflet model and Fluid mosaic model. General functions of plasma membrane.	(19Hrs)
Unit II	• Endoplasmic Reticulum: Ultra Structure – Rough and Smooth types - Functions. • Ribosomes: Types – Chemical composition – Biogenesis of 70s - Function • Golgi complex: Structure and Functions. • Lysosomes: Polymorphism – Enzymes and Functions	(18Hrs)
Unit III	• Mitochondria: Structure – mDNA - Origin – General functions. • Nucleus: Ultra structure of interface nucleus and function. • Nucleolus: Ultra structure and function. • Chromosomes: Structure – Giant chromosomes – Polytene and Lamp brush.	(18Hrs)
Unit IV	• Nucleic acids – DNA Structure (Watson & Crick model) - Replication of DNA (Semi-conservative model) - Types of RNA • Genetic Code – Salient features • Protein synthesis – Central dogma and Central dogma reverse - Mechanism of protein synthesis – Components – - Transcription and Translation.	(18Hrs)
Unit V	• Cell division – Cell cycle – Amitosis – Mitosis and Meiosis • Cell aging – Causes – Changes and Apoptosis • Cancer cells – Characteristics – Properties – Types – Diagnosis – Treatment and Oncogenes.	(18Hrs)
	Total Contact Hrs	**91**

(CONTD.....2)

Text Books :

1. Arumugam N. (2012) Cell Biology — Saras Publication, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Verma P.S.& Agarwal V.K. (1993) Cytology–.S.Chand & Company LTD. Ram Nagar, New Delhi -110055
2. Verma P.S.&.Agarwal V.K (2006) Cell Biology , Genetics, Molecular Biology, Evolution and Ecology–S.Chand & Company LTD. Ram Nagar, New Delhi -110055
3. Singh & Tomar, (2007 -08). 9th revised edition Cell Biology –Rastogi Publications, Shivaji road, Meerut – 250 002, India.

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Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2012
Subject Code : 12UZY10 Title : MAJOR PRACTICAL – II: CELL BIOLOGY AND GENETICS		Semester: III
Hrs/Week :	5	Credit:5
Objectives	To know the measurements of microscopic objects. To identify the different stages of mitosis. To understand the concepts genetics through experiments.	

Content	Hrs
CELL BIOLOGY ♣ Measurements of cell using ▪ Stage Micrometer ▪ Ocular Micrometer ♣ Squash preparation from Onion – Root tip – Mitosis ♣ Identification of squamous epithelial cells in buccal smear. **GENETICS** ♣ Human Traits survey and gene frequency calculations. ♣ ABO Blood grouping in man – Slide method. ♣ Probability Test – Two coin tossing experiment. ♣ Law of Segregation – Using color beads. ♣ Law of Independent Assortment – Using color beads. **SPOTTERS:** **CELL BIOLOGY** ♣ Human Immuno Deficiency Virus. ♣ E. Coli Bacterium ♣ A typical animal cell ♣ Interface Nucleus ♣ Lamp brush chromosome ♣ Mitosis – stages ♣ Meiosis - stages ♣ DNA – Watson & Crick Model **GENETICS** ♣ Drosophilla – Male and Female ♣ Gynandromorph ♣ Hairy Pinna ♣ Twins ♣ Erythroblastosis Foetalis ♣ Kleinfelter's Syndrome ♣ Down Syndrome ♣ Turner's Syndrome ♣ Free – martin ♣ Sickle cell anemia	
Total Contact Hrs	**52**

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Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2012
Subject Code : 12UZYSA1 Title : APICULTURE		Semester: III
Hrs/Week :	5	Credit:2
Objectives	To examine the scope of beekeeping in India and other countries To identify major bee keeping challenges and opportunities.	

Unit	Content	Hrs
Unit I	History of Apiculture Classification of honey bees Species of honey bees – *Apis dorsata- Apis indica - Apis florae- Apis mellifera* Biology of honey bee (Structure) Life cycle of honey bee	(3Hrs)
Unit II	Social organization of honey bee colony (Queen - Drones and Workers) Structure of Beehive Primitive bee hives – Wall type- Movable- Bamboo Modern bee hive – Langstroth hive - Newton's hive Selection of Bees for Apiculture Extraction of honey	(3Hrs)
Unit III	Bee keeping equipments Extraction of honey Honey – Formation - Chemical composition - Value of honey	(2Hrs)
Unit IV	Royal jelly – Composition and functions Bee wax – Production - Characteristics and uses Bee venom – Characteristics and uses.	(2Hrs)
Unit V	Diseases of honey bee – Bacterial disease - Viral disease - Acarine disease - Nosema disease - Paralysis - Ants - Bee lice - Wax moths Formation of new colonies	(3Hrs)
	Total Contact Hrs	**13**

Text Books :

1. Arumugam N. (2010) Applied Zoology, Saras Publication, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari.

Reference Books:

2. Bhamrah Kavita Juneja H.S. (2001) 2nd edition.An Introduction to Arthropoda-, Anmol Publications Pvt. Ltd., New Delhi,
3. Shukla. Upadhyay (2003). Economic Zoology –. Rastogi Publications, Shivaji Road, Meerut- 250002. India.
4. Dhurm Singh & Sevender Pratap Singh, (2006) edition. A handbook of Bee Keeping –Agrobios (India), Jodhpur,
5. Rajendra Singh & Sachan G.C. (2010) 1st edition.Elements of Entomology, , Rastogi Publications, Meerut,

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2012
Subject Code : 12UZYSB1		
Title	: INSECT PEST MANAGEMENT	Semester : III
Hrs/Week :	1	
Objectives	To study the insect available in the agricultural field	Credit: 2

Unit	Content	Hrs
Unit I	Pest definition – Definition - Classification Reasons for insect pest Insect pest out break Injuries and Damage caused by insect pest	(3Hrs)
Unit II	Assessment of insect pest population Assessment of insect pest damage Pest surveillance and forecasting pest outbreak Need for insect pest management	(3Hrs)
Unit III	Pest control Climatic factors Natural enemies Physical Mechanical Cultural - biological and legal control	(2Hrs)
Unit IV	Insecticide- Definition - Formulation of insecticides Classification based on modern entry Classification based on modern action Brief account of Attractants- Antifeedants and Chemosterilants Integrated Pest Management	(2Hrs)
Unit V	(Major Local Agricultural pest and their Management) Cotton – The cotton Boll worm – Helicoverpa armigera Coconut – The Rhinoceros beetle – Oryctes rhinoceros Groundnut – The Red hairy caterpillar – Amsacta albistriga Sugarcene – The sugarcane stem bore- Chilo infuscatellus	(2Hrs)
	Total Contact Hrs	**13**

Reference Books:

1. Shukla. Upadhyay (2003). Economic Zoology –. Rastogi Publications, Shivaji Road, Meerut- 250002. India.

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Department	**ZOOLOGY**	
Course	**II B.SC**	**Effective from the Year:2012**
Subject Code : 12UZY09 **Title : GENETICS**		**Semester : IV**
Hrs/Week :	**5**	**Credit:4**
Objectives	To Study the basic concepts of hereditary and variations. To know about the genetic disorders in man.	

Unit	Content	Hrs
Unit I	• Mendel's monohybrid and dihybrid experiments - Mendel's Laws - Problems. • Interaction of genes: Lethal genes – Epistasis • Polygenic inheritance: Skin colour in man 1:4:6:4:1 • Multiple alleles : ○ Coat colour in Rabbit ○ ABO blood groups in man – Rh factor – problems	**(19Hrs)**
Unit II	• Linkage: Complete and incomplete linkage • Chromosome maps: Interference and Coincidence - chromosome map in Drosophila (Three Point Cross) • Sex determination:- ○ XX – XY type – Human ○ ZZ –ZW type – Silk worm moth ○ Bridge's genic balance theory ○ Hymenopteran type – Honey bee ○ Gynandromorph – Drosophila ○ Hormonal control – Free Martin Cattle.	**(18Hrs)**
Unit III	• Sex linked inheritance: ○ Eye colour in Drosophila ○ Haemophilia and colour blindness in man – problems • Non – disjunction:- Mitotic and Meiotic non – disjunction • Variation in chromosome number:- Euploidy and Aneuploidy	**(18Hrs)**
Unit IV	• Pedigree analysis • Syndromes: ○ Autosomal – Down syndrome and Patau's syndrome. ○ Allosomal – Klienfelter's syndrome and Turner's syndrome. • Twins • Inborn Errors of metabolism: Phenylketoneuria – Alcaptonuria - Albinism. • Eugenics: Positive and Negative eugenics.	**(18Hrs)**

(CONTD.....2)

Unit V	• Nucleic acids as genetic material: DNA and RNA. • Mutation: o Detection of mutations – CIB method in Drosophila o Molecular basis of gene mutation – Substitution mutations and Frame shift mutations • Population Genetics: Gene pool - Gene frequency and genotype frequency - Hardy Weinberg law.	**(18Hrs)**
	Total Contact Hrs	**91**

Text Books :

1. Meyyan R. P. (2012) 6th Edition, Genetics– Saras Publications, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Miglani G. S. (2002) 1st edition. Advanced Genetics . Narosa Publishing House, New Delhi, 110002.
2. Russell, J. (1987) 2nd edition. Essential Genetics . Black well Scientific Publication London
3. Verma and Agarwal (2008) 3rd edition. Genetics . S. Chand & Company, Ltd. New Delhi, 110055
4. Veer Bala Rastogi (2008) 9th edition. A text book of genetics. Kedar Nath Ram Nath. Meerut.
5. Gupta, P. K. (2007) 3rd edition .Genetics. Rastogi Publication, Meerut.
6. Kottari, L., et al., (2009) 5th edition Essentials of Human Genetics. University Press Pravate Ltd. Hydrabad, 500029.

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Department	ZOOLOGY	
Course	II B.SC	
Subject Code : 12UZYSA2		Effective from the Year:2012
Title : VERMICULTURE		Semester : IV
Hrs/Week :	1	
Objectives	To study the importance of importance of vermiculture	Credit:2

Unit	Content	Hrs
Unit I	Systematic position of Earthworm – Habit and Habitat Commercial varieties of Earthworm for Vermicomposting Economic importance of vermiculture	(3Hrs)
Unit II	Type study: Earthworm: Megascolex sp External character - Digestive system Respiratory system Excretory system Reproductive system	(3Hrs)
Unit III	Life cycle of Earthworm Diseases and Predators of Earthworm Control measures	(2Hrs)
Unit IV	Types of soil Biomass Biodegradable wastes Nutrient content of Soil and Biomass	(2Hrs)
Unit V	Preparation of Vermibed Maintenance of Composting pit Collection of vermicompost Nutrient value of vermicompost Marketing of vermicompost	(3Hrs)
	Total Contact Hrs	13

Reference Books:

1. Annelida – H.S Bhamrah Kavita Juneja
2. Modern text book of Zoology – R.L. Kotpal
3. A manual of Zoology – M. Ekambaranatha Iyer (Part -I)
4. Fundamentals of Ecology – E.P. Odum

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Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2012
Subject Code : 12UZYSB2		
Title	: POULTRY SCIENCE AND MANAGEMENT TECHNOLOGY	Semester : IV
Hrs/Week :	1	Credit:2
Objectives	To know the basic concept of poultry science	

Unit	Content	Hrs
Unit I	• Importance and role of the poultry in rural development and employment potential. • Anatomy and physiology of poultry birds (hen) with reference to digestive and reproductive systems.	(3Hrs)
Unit II	• Poultry house and equipment • Space requirements • Types of houses • Number of birds • Summer management - Winter management • Sterilization of room	(3Hrs)
Unit III	• Classification of feed stuffs • Availability of raw materials and their cost • Feed formulation and Feeding programme • Equipment for feeding and drinking.	(2Hrs)
Unit IV	• Management of Broilers • Management of layers • Breeders • Optimum conditions • Common diseases – Bird flu disease • Antibiotics - Vaccination and deworming • Insecticide treatment and Bio-remedies	(3Hrs)
Unit V	• Nutritive value of poultry meat and egg • Grading and Preservation of eggs • Packing and Transport and Marketing • Relationship with customers • Different uses of eggs • Poultry manure.	(2Hrs)
	Total Contact Hrs	**13**

Reference Books:

1. Hine. EJ and Botosford . H. E. Practical poultry management . John Wiley, Hansen Inc. N.Y.
2. Gnanmani. J . Profitable poultry product ; Pyton publ. Co. Madurai, Tamilnadu
3. Siddiqui. H.M Manual of poultry production Practicals : College of Veterinary Science, Andrapradesh.
4. Shukla. Upadhyay (2003). Economic Zoology –. Rastogi Publications, Shivaji Road, Meerut-250002. India.

(FOR THE CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2011 ONWARDS)

DEPARTMENT OF ZOOLOGY

V & VI SEMESTERS : SCHEME OF EXAMINATIONS

(CBCS for under graduate programmes with language for 4 semesters)

Part No	Course Code	Course title	Lecture+ Tutorial/ Practical Hours/ week	Duration of Exam Hrs	Max. Marks			Credit Point
					Internal	End-of-Semester	Total	
		Semester V						
III	11UZY13	Core Major Paper – VII Developmental Biology & Endocrinology	5	3	25	75	100	4
	11UZY14	Core Major Paper – VIII Biotechnology	5	3	25	75	100	5
	11UZY15	Core Major Paper – IX Biostatistics& Biophysics	5	3	25	75	100	4
		Major Practical - III	2	-	-	-	-	-
		Major Practical - IV	2	-	-	-	-	-
	11UZY16	Core Major Paper – X Medical Laboratory Technique (MLT)	4	3	25	75	100	3
	11UZY17	Core Elective I : Computer Applications in Biology & Bioinformatics	3	3	25	75	100	3
	11UZY18	Core Elective Practical Computer Practical	2	3	-	-	50	1
IV	11UZYNA1/ 11UZYNB1	Vectors and human diseases (SBE) / Food and nutrition (SBE)	1	3	-	50	50	2
	08GKL01	General Knowledge & General Awareness (SBE)	SS	3	-	100	100	2
	09HEC05	Human Excellence Paper-1 : National Values	1	3	-	75	75	1
		Semester VI						
III	11UZY19	Core Major Paper – XII Animal Physiology & Biochemistry	5	3	25	75	100	5
	11UZY20	Core Major Paper – XIII Ecology & Evolution	5	3	25	75	100	4
	11UZY21	Core Major Paper – XIV Microbiology & Immunology	5	3	25	75	100	4
	11UZY22	Major Practical - III	2	3	40	60	100	5
	11UZY23	Major Practical - IV	2	3	40	60	100	5
	11UZY24	Core Elective - III: Aqua culture	5	3	25	75	100	3
	11UZY25	Core Elective – IV: Sericulture	4	3	25	75	100	3
IV	11UZYNA2/ 11UZYNB2	Ornamental fish culture (SBE) / Biopharmaceuticals (SBE)	1	3	-	50	50	2
		Core Elective Practical						
	09HEC06	Human Excellence Paper-1 : Global Values	1	3	-	75	75	1
	09HECP03	Human Excellence Paper Practical-3 (Value Education)	-	-	-	50	50	-
		**Grand total						140

(CONTD.....2)

* The credits given are applicable only to the students who opt for BasicTamil paper and the credits for Human Excellence papers can not be given to them.

**Grand total should be equal/below 3950 (For UG Programmes); 2550 (For PG Programmes)

SS – Self study, SBE – Skill Based Elective

General Question Pattern

(Elective) papers

Max. Marks:100	Internal : 25	External : 75	
Section	Pattern	Mark	Total
Part A	One word question/multiple choice/ true/false (10 Questions)	10X1	10
Part B	Either (or) choice (5 Questions)	5X5	25
Part C	Either (or) choice (5 Questions)	5X8	40
		Total :	75

Question Pattern for EVS & Skill Based

Max. Marks:50		External
Section	Pattern	Mark
Part A	Short answer/multiple choice (10 Questions)	10X1
Part B	Open choice (5 out of 8 Questions)	5X8
		Total :

- GK & Communicative English and General Awareness papers include 60% objective type of questions and 40% descriptive type of questions

The marks and credits for Extension activities are given by the concerned departments

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY13 Title : DEVELOPMENTAL BIOLOGY AND ENDOCRINOLOGY		Semester : V
No. of Hours/Week :	5	Credit:4
Objectives	To understand the basic concepts and definitions of modern developmental biology Identify and define the landmark events in developmental biology Able to discuss the historical and societal impact of advances in developmental biology including stem cell biology cloning and assisted reproduction. To know about the endocrine glands and their functions.	

Unit	Content	Hrs
Unit I	• Definition-Ontogeny - Phylogeny. • Theroies- Preformation - Spemann's experiments on Organizer • Gametogenesis- Spermatogenesis- Oogenesis • Fertilization– Mechanism - InVitro Fertilization(IVF)- Hormonal control - Parthenogenesis- Natural and Artificial	(13Hrs)
Unit II	• Cleavage- Planes- Meridional – Vertical - Equatorial and latitudinal • Patterns of cleavage holoblastic and meroblastic • Example : Cleavage in frog • Gastrulation- Types of morphogenic movements (Epiboly - Emboly). Mechanism of morphogenetic movements • Example: Gastrulation in frog • Exo-gastrulation in frog • Development and significance of foetal membranes in chick	(13Hrs)
Unit III	• Organogenesis in Frog- Ectodermal (Brain) o Mesodermal (Heart) o Endodermal (Alimentary canal) • Placentation in mammals- Classification based on foetal membranes - Distribution of villi and histology • Functions of placenta • Embryonic stem cells	(13Hrs)
Unit IV	• Endocrinology-Definition • Endocrine glands (Structure & Functions) – Thyroid – Parathyroid – Pancreas - Testes & ovary. • Chemical nature of hormones – Steroid -Biogenic & peptide. • Hormonal interactions- Feedback control mechanisms.	(13Hrs)

(CONTD.....2)

Unit V	• Mechanism of hormone action- peptide- steroid and thyroid. • Hormonal disorders – Pancreas (Diabetes mellitus) - Thyroid (Goiter) - Pituitary (Gigantism - Dwarfism) and Sex hormones (Infertility)	**(13Hrs)**
Total Contact Hrs		**65**

Text Books :

1.Arumugam .N. (2006) Embryology- Saras Publication,114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India, 2011

2.Verma P S & Agarwal V K S Chordate embryology-Chand Publication,

Reference Books:

1. Berrill, W. J. and Graw M. C. (2010) Developmental biology - Hill Book Co, New York
2. Wesley, (1979) An Outline of animal development – Davenport, Addison –publishers, University of Michigan,
3. Balinsky, 5th Edition ,Embryology - Philadelphia, Saunders College Publishing.
4. Stem cell biology - Damel R Marshak, Richard l Gardner, David Gottlieb
5. Sreekumar S. (2010) Edition. Basic Physiology –, PHI Learning Pvt. Ltd, New Delhi..
6. Sastry, K.V. (2009-2010) Endocrinology & Reproductive Biology –Rastogi Publications, Shivaji road, Meerut-250002, India.

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY14		
Title : BIOTECHNOLOGY		Semester V
Hours/Week : 5		Credit:5
Objectives	• To study the basics of biotechnology • To understand the different application of biotechnology.	

Unit	Content	Hrs
Unit I	• Introduction- scope and importance of biotechnology • Plasmids pBR 322 • Cosmids • Transposons • Gene map of λDNA • Construction of recombinant DNA	(13Hrs)
Unit II	• **Blotting Techniques:** ➢ Southern Blotting ➢ Northern Blotting ➢ Western Blotting • Polymerase Chain Reaction (PCR) – Applications of PCR in Biotechnology • DNA Finger printing • Genomic library	(13Hrs)
Unit III	• Establish cell lines • Kinetics of cell growth • Hybridoma technology • Monoclonal antibodies • Transgenic animals – Mice Retroviral method Microinjection method Embryonic stem cell method Applications of transgenic animals	(13Hrs)
Unit IV	• Animal tissue culture ○ Explants ○ Culture media ○ Culture of animal tissues • Animal bioreactors ○ Selection and modification of micro-organisms ○ Preparation of animal ○ Product harvest ○ Application of animal bio-reactors ○ Nano- biotechnology	(13Hrs)

(CONTD……..2)

Unit V	• Bacillus thuringensis as a pesticide
	• Biofertilizer
	• Biosensors- Biochips
	• Biodegradable plastics
	• Biosafety
	  o Possible dangers of GEO's
	  o Implementation of biosafety guidelines
	• Bioethics
	  o Monitering the welfare of transgenic animals
	  o Keeping of transgenic animals
		(13Hrs)

Total Contact Hrs		**65**

Text Books :

1.Kumaresan V. (2012) Biotechnology –Saras publications, 114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil – 629002 , Tamilnadu, India

2.Gupta. P.K. (2004) Elements of biotechnology – Rastogi publications, Meerut

Reference Books:

1. Ignacimuthu, S. (1995), Basic Biotechnology, Tata McGraw Hill Publishing Company Ltd, New Delhi.
2. Dubey, R. C. (1996) A text book of Biotechnology, Cambridge University Press
3. Molecular Biology and Biotechnology (1993) S.Chand & Company Ltd, NewDelhi
4. John.E.Smith, (1993) Biotechnology, Vikas Publishing House Pvt. Ltd, New Delhi

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY15 Title : BIOSTATISTICS AND BIOPHYSICS		Semester : V
Hrs/Week :	5	Credit:4
Objectives	To understand the concepts of Biostatistics. To know about the applications of statistics in biology. Discuss about the basic principles of physics in biology. To understand the working principles of the instruments in biological laboratory	

Unit	Content	Hrs
Unit I	• **Collection of data** ➢ Methods of collection – Random and non-random sampling ➢ Primary and secondary data • **Tabulation** ➢ Parts of table ➢ Simple and complex table • **Diagrammatic presentation** ➢ Line diagram ➢ Bar diagram ➢ Pie diagram • **Measures of central tendency** ➢ Arithmetic mean ✓ Individual - Discrete and continuous series ➢ Median ➢ Mode	(13Hrs)
Unit II	• **Standard deviation** ➢ Merits and demerits ➢ Individual - discrete and continues series • **Correlation** ➢ Positive and negative correlation ➢ Karl Pearson's coefficient of correlation • **Regression analysis** ➢ Types and methods	(13Hrs)
Unit III	• **Chi-square Test** ➢ Degree of freedom ➢ Null hypothesis • **Student's T- test** – Properties and Applications • **Analysis of Variance (ANOVA)** - One-way analysis	(13Hrs)
Unit IV	• **Scope of biophysics** • **Thermodynamics principles** ➢ First and second law • **Bioluminescence** ➢ Types ➢ Mechanisms ➢ Functions	(13Hrs)

(CONTD.....2)

Unit V	• **Instrumentation** ➢ Compound microscope ➢ Electron microscope - Transmission Electron Microscope (TEM) and Scanning Electron Microscope (SEM) ➢ Chromatography - Thin layer chromatography (TLC) ➢ Electrophoresis – Polyacrylamide Gel Electrophoresis (PAGE)	**(13Hrs**
	Total Contact Hrs	**65**

Text Books :

1. Arumugam N. (2011) 3rd edition. Basic concepts of Biostatistics - Saras publication 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. and Kumaresan V. (2012) 1st edition Biophysics and Bioinstrumentation -, Saras publication, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Veer Bala Rastogi,(2009) 2nd edition. Fundamentals of biostatistics. Ane Books, Pvt. Ltd. New Delhi.
2. Rana, S. V. S. (2009) 2nd edition. Biotechniques – Theory and Practice. Rastogi Publication, Meerut.
3. P. K. Srivastava,(2005) 1st edition. Elementary Biophysics – Narosa Publishing House, New Delhi, 110 002.
4. Subramanian, M. A. (2005) 1st edition. Biophysics – Principles and Techniques- MJP Publishes, Chennai, 600 005

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY16 Title : MEDICAL LABORATORY TECHNIQUES (MLT)		Semester : V
Hrs/Week :	4	Credit: 3
Objectives	To understand the basic principles and applications of MLT.	

Unit	Content	Hrs
Unit I	• **Introduction & instruments** ○ Code of conduct for laboratory personnel ○ Structure of a laboratory • **Laboratory instruments** ○ Centrifuge ○ Autoclave ○ Albuminometer ○ Urinometer ○ Haemocytometer ○ Sahil's haemometer ○ ECG ○ B. P. apparatus and stethoscope ○ General procedure – cleaning -Sterilization and disposal of infected materials ○ Safety measures and first aid	(13Hrs)
Unit II	• **Hematology** ○ Blood collection ○ Staining of bold films ○ Estimation of haemoglobin ○ Blood cell total count - RBC and WBC ○ Erythrocyte Sedimentation Rate (ESR) ○ Glucose Tolerance Test (GTT) ○ Blood glucose ○ Bleeding time and clotting time ○ Anemia	(13Hrs)
Unit III	• **Urine analysis** ○ Collection & preservation of urine ○ Physical examination ○ Chemical examination ○ Microscopic analysis	(13Hrs)
Unit IV	• **Sputum collection** ○ Collection & preservation ○ Naked eye inspection ○ Microscopic examination ○ Chemical examination • **Faeces** ○ Collection & preservation ○ Physical examination ○ Microscopic examination	(13Hrs)

(CONTD.....2)

Unit V	• **Semen analysis** o Collection of semen o Physical examination o Microscopic analysis o Preparation of smear and staining • **Pregnancy test** • **Histopathology** o Section cutting & fixation o Dehydration - Embedding and Sectioning o Staining &Mounting	**(13Hrs)**
	Total Contact Hrs	**65**

Text Books :

1. Samuel, K. M. (1982) Notes on Clinical Lab Techniques. K. Gopalan publishers, Madras
2. Ramnik Sood, MLT. (1999) 5th edn. Jaypee Brothers Medical publishers (P) Ltd. Delhi

Reference Books:

1. Sachdev, K. N. (1991) Clinical pathology and bacteriology. Jaypee brothers- medical publishers, New Delhi
2. John Macleod and John Munro, (1988) Clinical Examination. ELBS publishers

Department	ZOOLOGY	
Course	III B.Sc.	Effective from the Year:2011
Subject Code : 11UZY17 Title : COMPUTER APPLICATION IN BIOLOGY AND BIOINFORMATICS		Semester : V
Hrs/Week :	5	Credit:3
Objectives	• To understand the basic operations of MS Office in computer applications • The concepts of computer science related with the statistical analysis • To study the basic bioinformatics tools and it uses • To know the sequence analysis, phylogenetic analysis and genomic studies	

Unit	Content	Hrs

Unit I	• Scope of Computer Technology
	• Components of Computer
	  ○ Input devices
	  ○ Output devices
	• Internet – LAN / WAN/WWW
	• Search engines
	• Types of modern computers
		(7Hrs)

Unit II	• Ms – Word : Creating and editing a document Creation of table • Ms Excel : Creation of table and chart • Ms Power point: Preparation of slide presentation • MS - Access : Creating a database Querying a database	(8Hrs)

Unit III	• Scope of Bioinformatics
	• Databases
	  ➢ Biological database (Properties and classification)
	  ➢ Specialized database
	• Protein sequence database – SWISS-PROT
	• Data mining
	• Virtual Library
		(8Hrs)

Unit IV	• Genomics
	• Proteomics
	• Drug designing
	• Human genome project
	  ➢ Goals and techniques
	  ➢ Potential benefits
	• Bioinformatics tools and its uses
		(8Hrs)

Unit V	• Similarity tool : BLAST • Visualizing tool : RasMol • Miscellaneous tool : Webcutter • Phylogenetic analysis • Construction of phylogenetic tree	(8Hrs)
	Total Contact Hrs	39

(CONTD.....2)

Text Books :

1. Joyce Cox and Polly Urban. (2001) Microsoft Office-
2. Rajaraman, V. (1986) Fundamentals of computer –Prentice Hall of India Pvt.Ltd, New Delhi -110001
3. Sundaralingam R.& Kumaresan V. (2012) 2nd edition Bioinformatics , Saras Publication, 114/35G . A.R.P Camp road, Periavillai, Kottar PO, Nagercoil, Kanyakumari,

Reference Books:

1. Ron Mansfield, (2009) Working in Microsoft office- McGraw-Hill Book Co, New York
2. Simminder Kaur Thukral, (2007) Bioinformatics-Orpita Bosu, Oxford University Press, New Delhi 110001
3. Attwood T.K. and Parrysmith D.J. (1999) Introduction to Bioinformatics – Addison Wesley Longman, Harlow.
4. Fuelker , M.H. (2009) Bioinformatics – Applications in Life and Environmental Sciences Capital Publishing Company, New Delhi.
5. Ignacimuthu, S. (2005) Basic Bioinformatics –Narosa Publishing House, New Delhi.
6. Sharma, Munjal & Shankar (2008) A text book of Bioinformatics –, Rastogi Publications, Meerut, India,
7. Jin Xiong, (2006) Essential Bioinformatics Cambridge University Press
8. Subramanian C. (2010) Genomic Bioinformatics- Dominent Publisher, New Delhi

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY18 Title : COMPUTER APPLICATION IN BIOLOGY AND BIOINFORMATICS		Semester : V
Hrs/Week :	2	Credit:1
Objectives	To know the basic operations in computer and to study the sequence of protein and nucleotides using bioinformatics tools.	

Content	Hrs
1. MS Word: Creating - editing and printing a document 2. MS Word: Creating a table 3. MS Word: Mail Merging 4. Ms – Excel :Preparation of worksheet 5. Ms – Excel : Creation of chart 6. Ms – Power Point : Preparation of slides for presentation 7. Ms – Access : Creation of database 8. Ms – Access : Querying a database 9. Web browsing (Demonstration) 10. E-Mailing (Demonstration) 11. Gene finding (Demonstration) 12. Protein prediction(Demonstration) 13. Bio-molecular visualization using RasMol.(Demonstration) 14. Retrieving biological database (Demonstration) 15. Sequence alignment using BLAST(Demonstration)	
Total Contact Hrs	**26**

Reference Books:

1. Attwood T.K. and Parrysmith D.J. (1999) Introduction to Bioinformatics - Addison Wesley Longman, Harlow.
2. "A practical guide to the analysis of genes and proteins (1997) Wiley Inter science.
3. Joyce Cox and Polly Urban. (2001) Microsoft Office.

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZYNA1		Semester : V
Title	: VECTORS AND HUMAN DISEASES	
Hrs/Week :	1	Credit:2
Objectives	To understand the basic knowledge on vectors and communicable diseases	

Unit	Content	Hrs
Unit I	Vectors and their morphological adaptation Mosquito (*Culex* and *Anolopheles*) Life cycle- mosquitoes and diseases - control of mosquitoes	(3hrs)
Unit II	Malaria Human species of plasmodium-Life cycle of Plasmodium-Symptoms and pathogenicity-Diagnosis - control of malaria	(3hrs)
Unit III	Filariasis *Wuchereria bancrofti* life cycle- Diagnosis and disease-pathogenicity- Treatment and prevention	(3hrs)
Unit IV	House fly Life cycle- Economic importance *Entamoeba histolytica*- pathogenecity- symptom-Diagnosis- Treatment -Prevention	(2hrs)
Unit V	• Problems of vector control ➢ Insecticide resistance • Integrated vector management approaches.	(2hrs)
	Total Contact Hrs	13

Reference Books:

1. Ekambaranatha Iyar and Ananthakrishnan. T.N.(1992)A Manual of Zoology, Vol.I(Invertebrata). Parts I & II. Viswanathan & Co.
2. Jordon, E.L. and Verma. P.S. (1995) Invertebrate Zoology. 12th edn. Sultan Chand & Co.
3. Shukla.G.S and Upadhyay, V.B. (1998) Economic Zoology, Rastogi Publication, Meerut
4. Zulfikar S Patel, (2010) Chemical toxicology, Dominant publishers and distributors, New Delhi.

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZYNB1 Title : FOOD AND NUTRITION		Semester:V
Hrs/Week :	1	Credit:2
Objectives	To understand the nutritive values of various foods. To know the importance of balanced diet.	

Unit	Content	Hrs
Unit I	• The scope of food and nutrition • Composition of food (Protein –Carbohydrate – Fat-Vitamins and Minerals) • Function and sources of food	(3Hrs)
Unit II	• Measurement of energy and energy values of various food • Energy requirements • Balances diet • Digestion and absorption	(3Hrs)
Unit III	• Milk – Types – importance in the diet • Eggs – Structures and composition – importance in the diet • Meat – Types – importance in the diet • Cereals and pulses– Types – importance in the diet	(2Hrs)
Unit IV	• Fish – Types - importance in the diet • Vegetables – Types - importance in the diet • Fruits – Types - importance in the diet • Cereals and pulses – Types- importance in the diet	(2Hrs)
Unit V	• Food spoilage • Food poisoning- food borne diseases • Food preservation • Methods of purification of potable water • Food laws	(2Hrs)
	Total Contact Hrs	**13**

Text Books :

1. Anita Tull, (1987) 1st edition. Food and nutrition – Oxford University press. Cambridge

Reference Books:

2. Swaran pasran pasricvha, (2000) 1st edition. Count what you eat – NIN – Hyderabad
3. Tripathy, S. N. (2004) 1st edition. Food Biotechnology. Dominant Publishes and distributators, New Delhi. 110002

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY19 Title : ANIMAL PHYSIOLOGY AND BIOCHEMISTRY		Semester : VI
Hrs/Week :	5	Credit: 5
Objectives	The complete understanding of all the chemical process associated with living cell To study the basis for various organ systems in the animal kingdom	

Unit	Content	Hrs
Unit I	• **Respiration:** Anaerobic & Anaerobic respiration Respiratory pigments in animals Transport of gases - O2 and CO2 • **Circulation:** Myogenic & Neurogenic heart Pacemaker and electrical activity of heart in man Composition and functions of blood Composition and functions of Lymph • **Excretion:** Structure of mammalian kidney Structure of Nephron Synthesis of ammonia - urea and uric acid Formation of urine in Human	(13Hrs)
Unit II	• **Water Balance:** Osmatic and Ionic regulations in aquatic animal (Fish) • **Receptors:** Chemoreceptors - Gustatoreceptors & Olfactoreceptors Photoreceptor (Eye) Phonoreceptor (Ear) • **Effectors:** ➢ Types of muscles : Striped- unstriped and cardiac muscles Structure and properties of striped muscle Mechanism of muscular contraction- sliding filament theory.	(13Hrs)
Unit III	• **Nervous system:** ➢ Structure of vertebrate neuron ➢ Conduction of nerve impulse through : Non-myelinated neuron Synapse ➢ Neuromuscular junction ➢ Reflex action and reflex arc • **Reproductive system:** ○ Sexual cycle in human: Puberty – Spermiation – Ovulation - Menstrual cycle - Pregnancy and Parturition.	(13Hrs)

(CONTD.....2)

Unit IV	• **Classification of Carbohydrates:** ➢ Monosaccharides - Pentoses- Hexoses ➢ Disaccharides - Non-reducing sugar C1- C1 – Sucrose - Reducing Sugar C1 – C4 – Lactose ➢ Polysaccharides - Homopolysaccharide - Starch Heteropolysaccharide - Heparin • **Classification of Lipids:** ➢ Simple Lipids - Fats and Waxes ➢ Compound lipids -Phospholipids- Glycolipids ➢ Derived lipids -Glycerol - Fatty acids and Cholesterol • **Classification of Proteins:** ➢ Based on structure - Simple – Conjugated- Derived ➢ Based on solubility- Globular - Fibrous	**(13Hrs)**
Unit V	• **Metabolism:** ➢ Metabolism of carbohydrates: Glycolysis- Glycogenesis- Kreb's cycle & Glycogenolysis ➢ Metabolism of lipids :β-oxidation of fatty acids ➢ Metabolism of proteins :Transamination- Deamination ➢ Vitamins: Water soluble & Fat soluble.	**(13Hrs)**
Total Contact Hrs		**65**

Text Books :

1. Thulsi Fatima, (2009) Biochemistry - Saras Publication,114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India
2. Arumugam N. (2009) Animal physiology- Saras Publication, 114/35G, A.R.P Camp Road, Periavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India

Reference Books:

1. Parameswaran, Ananthakrishnan& Ananthasubramaniam, (1991) Outline of animal physiology - S. Viswanathan printers & Publishers Pvt. Ltd,
2. Verma, P. S ., Tyagi and Agarwal. (1997) Animal physiology - Chand& company ltd
3. S. Sree Kumar, (2010) Basic Physiology –PHI Learning Pvt. Ltd, New Delhi, 110001, Edition.
4. Berry, A.K. A text book of Animal Physiology –EMKAY Publication, New Delhi-110051
5. Rastogi, S. C. (1995) Biochemistry - Tata McGraw-Hill Education,
6. Sathyanarayana U.& Chakrapani, U. (2009) 2nd Edition, Essential of biochemistry - Books & Allied pvt.ltd 83/1, Beliaghata main road, Kolkata 700010, India

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY20 Title : ECOLOGY AND EVOLUTION		Semester :VI
Hrs/Week :	5	Credit:4
Objectives	To study about the importance of abiotic factors and biogeochemical cycles. To understand the basic concepts of animal relationship. Able to discuss the biochemical origin of life and principles of evolution	

Unit	Content	Hrs
Unit I	• **Scope of ecology** • **Abiotic factors** ➢ Soil: Pedogenesis - Soil texture- Soil profile – Soil fauna. ➢ Water: Prosperity of water ➢ Temperature: Range of temperature- Thermal stratification- biological effects of temperature ➢ Light: light on water – biological effects of light	(13Hrs)
Unit II	• **Biogeochemical cycle** ➢ Gaseous cycle : Carbon cycle- Nitrogen cycle ➢ Sedimentary cycle: Sulphur cycle- Phosphorus cycle • **Anima relationship** ➢ Commensalism ➢ Mutualism ➢ Parasitism • **Animal population** ➢ Characteristics of population - Natality- mortality- growth- density- dispersion-population fluctuation • **Human population** ➢ Population explosion and control measures	(13Hrs)
Unit III	• **Biochemical origin of life** • **Urey and Miller's experiment** • **Geological time scale** • **Fossils**: Types and Dating of fossils	(13Hrs)
Unit IV	• **Evidences of evolution** ➢ Morphological: Homologous structures – vestigial organs – connecting links ➢ Embryological: Recapitulation theory ➢ Palaeontological : Missing links	(13Hrs)
Unit V	• **Darwinism :** Over production – variation – survival of the fittest – struggle for existence – origin of species • **Isolating mechanism** ➢ Geographic isolation ➢ Reproductive isolation • **Organic evolution of man**	(13Hrs)
	Total Contact Hrs	65

(CONTD.....2)

Text Books :

1. Arumugam N. (2011) 2nd edition. Saras publication Concept of ecology. 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Arumugam N. (2009) 7th edition. Organic Evolution-- Saras publication 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Odum E. P. (1971) 1st edition. Fundamentals of ecology . W. B. Saunders Company, London.
2. Verma and Agarwal. (2003) 5th edition. Principles of Ecology. S. Chand & Company, Ltd. New Delhi, 110055
3. Tomar and Singh, (2010) 8th edition. Evolutionary Biology – Rastogi Publication, Meerut. 250 002
4. Saha, T. K. (2002) 1st edition. Life: Origin, evolution and adaptation. Books and allied (P) Ltd. Kolkata – 700 010

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Department	
Course	
Subject Code : Title	:
Hrs/Week :	
Objectives	

Unit
Unit I
Unit II
Unit III
Unit IV
Unit V

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY21 Title : MICROBIOLOGY AND IMMUNOLOGY		Semester - 6
Hrs/Week :	5	Credit:4
. Objectives	To acquire a basic knowledge of microbiology and immunology	

Unit	Content	Hrs
Unit I	• Introduction and scope of microbiology • Classification of microorganisms • Basic methods in Microbiology • Staining procedure and types of staining	(13Hrs)
Unit II	• **Bacteria**: o Major features and structure of bacteria o Economic importance of bacteria o Bacterial growth and Growth curve o Bacterial culture – Culture of *E.Coli* • **Viruses**: o Characteristic and structure of viruses o classification of virus	(13Hrs)
Unit III	• **Applied microbiology** o **Agricultural microbiology**: ▪ Role of microorganism in soil fertility ▪ Biofertilizers ▪ Harmful role of microorganism. o **Food microbiology**: ▪ Microorganisms of food ▪ Factors influence microbial growth- food spoilage- Food preservation o **Medical microbiology** ▪ Normal microflora of human body ▪ Diseases - Bacterial (any 2) ▪ Viral (any 2)	(13Hrs)
Unit IV	• **Immunology** • Introduction and scope of immunology • Classification of Immunity – Innate and Acquired • Lymphoid Organs • Cells and organs of the immune system	(13Hrs)
Unit V	• Structure and classes of immunoglobins • General functions of immunoglobulins • Classification of Major Histocompatability Complex-(MHC) • Tumour immunology o Properties of tumour cells o Immune diagnosis and immunotherapy of tumour	(13Hrs)
	Total contact Hrs	65

(CONTD.....2)

Text Books :

1. Mani. A., Selvaraj. A.M., Narayanan, L. M. and Arumugam, N. (2007) Microbiology. Saras publications, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil - 629 002, Kanyakumari
2. Dulsy Fatima and N. Arumugam. Immunology, (2001) Saras Publications, 114/35 G, A.R.P Camp Road, Periavillai, Kottar PO, Nagercoil -629 002, Kanyakumari

Reference Books:

1. Dubey R. C. and Maheswari, D.K. (2006) A Text book of Microbiology, Cambridge University Press
2. Ignacimuthu, S. (1995) Basic Biotechnology –Tata McGraw Hill Publishing Company Ltd, New Delhi.
3. Dubey, R. C. (1996) A text book of Biotechnology –Cambridge University Press
4. John.E.Smith, (1993) Biotechnology –, Vikas Publishing House Pvt. Ltd, New Delhi
5. Gupta. P. K. (2004) Elements of biotechnology –Rastogi Publications, Meerut

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY22 Title : MAJOR PRACTICAL III (DEVELOPMENTAL BIOLOGY AND ENDOCRINOLOGY, BIOSTATISTICS& BIOPHYSICS, BIOCHEMISTRY & ANIMAL PHYSIOLOGY & MLT)		Semester :V & VI
Hrs/Week :	2	Credit:5
Objectives	To know the practical knowledge about the general principles of Practical III (Developmental Biology& Endocrinology, Biostatistics& Biophysics, Biochemistry & Animal Physiology & MLT)	

Content

Major

- Survey of digestive system in cockroach
- Estimation of oxygen consumption in an aquatic animal (Fish)
- Qualitative detection of Excretory products
- Total count of RBC
- Total count of WBC

Minor

- Estimation of carbohydrates(Benedicts test) -Protein and Lipid
- Find the mean and Standard deviation of the given samples
- Estimation of heamoglobin
- Qualitative test of albumin and urobilinogen in urine samples
- Detection of bile salts and bile pigments in urine samples
- Preparation of Blood smear

SPOTTERS

Developmental Biology& Endocrinology

- Frog- Egg – Cleavage - Yolk plug
- Chick- Egg - 24 hours - 72 hours - 96 hours
- Mammal- Placenta of sheep and Human foetus
- Mammal
    - T. S. of Thyroid gland
    - T. S. of Ovary
    - T. S. of Testis

Biochemistry & Animal physiology

- Structure of sucrose
- Structure of cholesterol
- Mammalian Ear
- Mammalian Heart
- Mammalian Kidney

Biostatistics and Biophysics

- Multiple bar diagram
- Frequency polygon
- Compound microscope
- Electron microscope (TEM)
- Thin Layer Chromatography (TLC)
- Electrophoresis - PAGE

Medical Laboratory Technique (MLT)

- Heamocyto meter
- Sahli's heamometer
- Albuminometer
- BP apparatus
- Urinometer
- Centrifuge
- Autoclave
- Oven

Total Contact Hrs	**52**

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY23 Title : MAJOR ZOOLOGY PRACTICAL – IV (ECOLOGY AND EVOLUTION, BIOTECHNOLOGY AND MICROBIOLOGY, SERICULTURE AND AQUACULTURE)		Semester:V &VI
Hrs/Week :	2	Credit:5
Objectives	To obtain some practical knowledge in ecology and evolution, biotechnology and microbiology, sericulture and aquaculture	

Content

MAJOR

- Estimation of dissolved oxygen in water samples.
- Milk Methylene Blue Test
- Silkworm: Digestive system - Nervous system
- Silk pupa: Reproductive system
- Morphology and morphometric measurements of fish (demonstration only)

MINOR

- Estimation of salinity in water samples
- Determination of pH in water samples
- Culture medium preparation
- Hanging drop preparation
- Silkworm – Silk gland

SPOTTERS

Ecology

- Sacculina on Crab
- Leech
- Taenia
- Physalia
- Albunea
- Hippa
- Anguilla

Biotechnology

- E-Coli
- Plasmids
- Bt – Bacillus thuringiensis
- Biodiesel Plant – Jatropha
- PCR
- Laminar Air Flow
- Gel Electrophoresis

Sericulture

- Life cycle of Bombyx mori
- Silkworm
- Cocoon
- Mulberry leaf
- Chandrika / Netrika
- Leaf chamber

Aquaculture

- Common Carp
- Preservation method – sundrying
- Fish parasite – Argulus
- Gill net
- Chinese dip net

Evolution

- Coccyx
- Forelimb modifications.
- Fossil
- Peppered moth
- Vermiform appendix

Total Contact Hrs	**52**

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY24 Title : AQUACULTURE		Semester : VI
Hrs/Week :	5	Credit:3
Objectives	To study the nature and habitat of different aquatic animals	

Unit	Content	Hrs
Unit I	• Scope of aquaculture • Aquaculture in India • Aquaculture in World • General character and adaptations in fishes • General Organisation of fish ➢ Teleost – Mullet ➢ Morphology and anatomy ▪ Digestive system ▪ Circulatory system ▪ Reproductive system • Pond culture- different kinds of fish ponds in a model fish farm.	(12hrs)
Unit II	• Culture methods ➢ mono culture ➢ poly culture ➢ integrated culture • Brackish water culture • Fresh water culture • Marine culture • Age and growth study • Induced spawning • Fish feed ➢ Classification of feed ➢ Composition of feed ➢ Live feed	(10hrs)
Unit III	• Bionomics of some important aquatic animals o Fresh water fishes ▪ Indian major carps- Catla, Mrigal, Rohu ▪ Exotic fishes- Common carp, Tilapia o Marine fish- Oil Sardine o Estuarine fish- Mullet o Prawn culture o Oyster culture o Pearl culture	(10hrs)

Unit IV	**(2) (11 UZY 24)** • Fish crafts – different types of fishing boats. • Gears ➢ Hooks ➢ Simple dipnets ➢ Chinese dipnets ➢ Gill nets ➢ Purse seine ➢ Trawl nets • Fish processing ➢ Identification of good and spoiled fish ➢ Refrigeration ➢ Freeze drying ➢ Fumigation ➢ Canning ➢ Salting	**(10hrs)**
Unit V	• Ornamental fish culture ➢ Requirements and setting of an aquarium ➢ Aquarium fishes • Fish pathology and major diseases ➢ Bacterial diseases ➢ Viral diseases ➢ Fungal diseases ➢ Fish parasites • Principles of harvesting- transport and marketing • By-products of fishes • Role of fishes in mosquito control • Transgenic fishes	**(10hrs)**
Total Contact Hrs		**52**

Text Books :

5. Arumugam, N. (2012) Aquaculture SARAS Publications, Nagercoil, Tamilnadu.
6. Shanmugham, K. (1992) Fishery biology and aquaculture, LEO Pathippagam, Madras.

Reference Books:

1. Vadapalli and Satyanarayanan, (1996) Fish culture. Narendra publishing house, Delhi.
2. Mary Chandy, (1994) Fish. Published by the director, National Book Trust, India.
3. Datta Munshi and Srivastava, (1988) Natural history of fishes and systematic of Fresh-water fishes of India. Narendra Publishing House, New Delhi.
4. Jordan E. L. And Verma. P. S. (2000) Chordate Zoology. S. Chand and company LTD, New Delhi
5. Agarwal. S. C. (1994) A hand book on fish farming. Narendra publishing house. Delhi
6. Pandey and Shukla, (2010) Fish and fisheries. Rastogi publication
7. Charls L Cutting, (1999) Fish processing and preservation. Agrobotanical publishers (India)
8. ICAR Publication (2006) 1st edition. Hand book of fisheries and aquaculture, Directorate of information and publicatios of agriculture. Indian Council of Agricultural Research, New Delhi
9. Jhingran, V.G. Fish and Fisheries of India

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZY25 Title : SERICULTURE		Semester: VI
Hrs/Week :	5	Credit:3
Objectives	To study the culture of silkworm and mulberry plantation To study the diseases of mulberry and silkworm	

Unit	Content	Hrs
Unit I	• Definition and History of Sericulture • Varieties of silkworms: Mulberry silk worm: Bombyx mori Non- Mulberry silk worm: Tasar- Muga and Eri silk worms • Uses of silk • Moriculture: Optimum conditions for mulberry growth • Planting direction and season Planting systems	(10 Hrs)
Unit II	• Methods of vegetative Propagation – Cutting- Layering- grafting • Pruning: Low cut–High cut and Rejuvenation pruning • Methods of Leaf harvesting • Preservation of leaves • Diseases of Mulberry: Fusarium Root Rot – Powdery Mildew – Leaf Blight - Dwarf disease	(11 Hrs)
Unit III	• Life cycle of Bombyx mori • Structure of silk worm • Structure of Silk gland • Grainages • Incubation and Brushing • Silkworm rearing appliances	(10 Hrs)
Unit IV	• Disinfection • Rearing of mature larvae: Shelf- Floor and shoot rearing • Characteristics features of ripeworm • Mounting: Methods and precaution during mounting • Diseases of silk worms: o Pebrine o Viral Flacherie (IFV) o Grasserie :Nuclear Polyhedrosis (NPV) • Indian Uzi fly (Pest of silk worm)	(11 Hrs)
Unit V	• Physical characteristics of cocoons • Defective cocoons • Reeling appliance - Country Charkha • Cocoon Markets • Raw silk testing	(10 Hrs)
Total Contact Hrs		52

(CONTD.....2)

Text Books :

1. Ganga G. and Sulochana Chetty. J. An Introduction to sericulture – Second Edition Oxford and IBH Publishing Co. PVT. LTD.

Reference Books:

1. Ullal and Narasimhanna. M.N. 2nd Ed. Hand Book of practical sericulture –SBS Publishers, Bangalore
2. Manual on sericulture – FAO, Central Silk Board Bangalore.
3. Ezhili N. & Thirumathal K. A hand book for sericulture –, Shrishti Impression, Coimbatore

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZYNA2 Title : ORNAMENTAL FISH CULTURE		Semester: VI
Hrs/Week :	1	Credit:2
Objectives	To study the various ornamental fishes and its culture	

Unit	Content	Hrs
Unit I	➢ Scope of ornamental fish ➢ General characteristic of fish ➢ General structure of fish o Digestive system o Reproductive system	(3Hrs)
Unit II	➢ Materials equipment required for aquaculture ➢ Construction of home aquarium ➢ Structure of location of home aquarium	(3Hrs)
Unit III	➢ Selection of fish for home aquarium ➢ Common fish aquarium fishes	(2Hrs)
Unit IV	➢ Fish feed ▪ Natural fish feed ▪ Artificial fish feed ➢ Maintenance of home aquarium	(2Hrs)
Unit V	➢ Common disease of normal fishes ➢ Fish parasites and control ➢ Bioremedies for fish disease ➢ Ornamental fish breeding- cum rearing unit for entrepreneurs	(3Hrs)
Total Contact Hrs		13

Reference Books:

1) Dhote. A.K, (1989) Publication Department – NCERT — 55 In land fishery – Instructural – curn – Practical -Manual Vol IV Aquaculture.
2) Agarwal, S.C (1994) A hand book of fish farming . B.H.Enterprises. New Delhi.
3) Biswas, K. P. (1996) A Text book of fish& Fisheries Technology - Calcutta(W.B) 2nd Edition, Published by Narendra Publishing house, Delhi
4) Jhingran, V. G. (1988) Fish and Fisheries of India - Hindustan Publishing Corporation (India) Delhi, Printed in India at Gopsons papers Pvt Ltd, Noida

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2011
Subject Code : 11UZYNB2 Title : BIOPHARMACEUTICALS		Semester: VI
Hrs/Week :	1	Credit:2
Objectives	To enable the students to know the actual path of metabolism of drugs and drug discovery.	

Unit	Content	Hrs
Unit I	**Biological systems and models**: Routes of administration- adsorption enhancement- bioavailability- site specific delivery; Pharmacodynamics of protein therapeutics- Inter species scaling	(3hrs)
Unit II	**Drug metabolism:** Oxidation- reduction- hydrolysis- conjugation. Need for developing new drugs: Procedure followed in drug design; Prodrug and soft drugs; Drug toxicity.	(3hrs)
Unit III	Drug discovery & cardiovascular drugs**:** Substances derived from bacteria- plants- insects- and animals; Sources of active principles; drugs used in atherosclerosis	(3hrs)
Unit IV	**Pharmaceutical products:** Microbial products - Antibiotics (penicillin- streptomycin- tetracycline)- vitamins- probiotics. Animal vaccines- Anti platelets drugs.	(2hrs)
Unit V	**Pharmaceutical products of DNA technology:** Therapeutic proteins – Insulin- human growth hormone- Diuretics- clotting factors-Vector usage strategies for gene therapy; Clinical trials.	(2hrs)
	Total Contact Hrs	13

Reference Books:

1. Heinrich Klefenz, (2002) "Industrial Pharmaceutical Biotechnology", WILEY-VCH Publication, Germany,
2. Daan Crommelin, & Robert D Sindelar, (2002) "Pharmaceutical Biotechnology", Tailor andFrancis Publications, New york,
3. Jay P Rho and Stan G Louie, (2003) "Hand book of Pharmaceutical Biotechnology", Pharmaceutical products press, New york,
4. Lachman L Lieberman, HA, and Kanig, J, (1986) "Theory and practice of industrial pharmacy", 3rd edition, Varghese publishing & Co, New Delhi,
5. Remington's Pharamaceutial sciences, (2000) 18th edtion, Mack publishing & Co., Easton, PA.

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