

DEPARTMENT OF ZOOLOGY

B.Sc. ZOOLOGY SYLLABUS

2015-2018 Batch

FACULTY

Dr. P. Badri Sriman Narayanan, M.A., M. Sc., M. Phil., Ph.D (Principal)

Dr. V. Dhanalakshmi, M. Sc., M. Phil., B. Ed., PGDCA., Ph.D (HOD)

Dr. P. R. Balasubramanian, M. Sc., M. Phil., M.A., B. Ed., PGDCA., Ph.D

Dr. M. Durairaju, M. Sc., M. Phil., B. Ed., PGDGC., Ph.D

Ms. S. Mariselvi, M.Sc., M.Phil., PGDCA

Ms.S.Jayalakshmi, M.Sc., M.Phil.,



NGM College

An Autonomous Institution Affiliated to Bharathiar University

Accredited with 'A' Grade by NAAC

An ISO 9001:2008 Certified Institution

Pollachi – 642 001

Coimbatore (Dt.) Tamil Nadu

DEPARTMENT OF ZOOLOGY
SCHEME OF EXAMINATION (FOR VI SEMESTERS)

(CBCS for under graduate programmes with language for 4 semesters) 2015-18 Batch

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	15UTL101	Tamil/Hindi Paper - I	6	3	25	75	100	3
II	15UEN101	English Paper – I	5	3	25	75	100	3
III	15UZY101	Core Major Paper –I Non-Chordata	6	3	25	75	100	4
		Practical – I (Non-Chordata & Chordata)	2	-	-	-	-	-
	15UZY1A1	Allied Zoology Paper–I: Non-Chordata & Chordata	6	3	25	75	100	4
		Allied Zoology Practical- (Paper–I &II)	2	-	-	-	-	-
IV	15UHR101	Human Rights	1	2	-	-	50	2
	15HEC101	HE – (Personal values & SKY Yoga practice -I)	2	2	25	25	50	1
V	15 UNC 401/15UNS 402/15 USG 403	Extension Activities (NSS, NCC, Sports & Games)						
(500)								17
Semester II								
I	15UTL202	Tamil/ Hindi Paper - II	6	3	25	75	100	3
II	15UEN202	English Paper – II	5	3	25	75	100	3
III	15UZY202	Core Major Paper –II Chordata	5	3	25	75	100	4
	15UZY203	Major Practical – I (Non-Chordata & Chordata)	2	3	40	60	100	4
	15UZY2A2	Allied Zoology Paper – II: Applied Zoology	6	3	25	75	100	4
	15UZY2A3	Allied Zoology Practical- (Paper I &II)	2	3	40	60	100	2
IV	15EVS201	Environmental Studies	2	2	-	50	50	2
	15HEC202	HE – Family values SKY Yoga practice -II	1	2	25	25	50	1
V	15 UNC 401/15UNS 402/15 USG 403	Extension Activities (NSS, NCC, Sports & Games)						

(700) 23								
Semester III								
I	15UTL303	Tamil/ Hindi Paper - III	5	3	25	75	100	3
II	15UEN303	English Paper – III	6	3	25	75	100	3
III	15UZY304	Core Major Paper –IV Cell Biology	7	3	25	75	100	4
		Major Practical – II (Cell biology & Genetics)	2	3	-	-	-	-
	15UCY3A1	Allied Chemistry Paper – I	6	3	25	75	100	4
		Allied Chemistry Practical	2	-	-	-	-	-
IV	15UZY3N1/ 15UZY3N2	Public health and hygiene (NME) / Ornamental fish culture (NME) /Basic Tamil paper/AD Tamil paper	1	2	-	50	50	2
	15HEC303	HE – (Professional values & SKY Yoga practice -III)	1	3	25	25	50	1
V	15 UNC 401/15UNS 402/15 USG 403	Extension Activities (NSS, NCC, Sports & Games)						
(500) 17								
Semester IV								
I	15UTL404	Tamil/ Hindi Paper - IV	5	3	25	75	100	3
II	15UEN404	English Paper – IV	6	3	25	75	100	3
III	15UZY405	Core Major Paper –V Genetics	7	3	25	75	100	4
	15UZY406	Major Practical – II (Cell biology & Genetics)	2	3	40	60	100	4
	15UCY4A2	Allied Chemistry Paper – II	6	3	25	75	100	4
	15UCY4A3	Allied Chemistry Practical	2	3	40	60	100	2
IV	15UZY4N3/ 15UZY4N4	Food and nutrition (NME) /Biopharmaceuticals (NME) /Basic Tamil paper/AD Tamil paper	1	2	-	50	50	2
	15HEC404	HE – (Social values & SKY Yoga practice -IV)	1	2	25	25	50	1
V	15 UNC 401/15UNS 402/15 USG 403	Extension Activities (NSS, NCC, Sports & Games)						
(750) 24								

Semester V								
III	15UZY507	Core Major Paper – VII Developmental Biology & Endocrinology	5	3	25	75	100	4
	15UZY508	Core Major Paper – VIII Biotechnology	5	3	25	75	100	4
	15UZY509	Core Major Paper – IX Biostatistics & Biophysics	5	3	25	75	100	4
		Major Practical - III	2	-	-	-	-	-
		Major Practical - IV	2	-	-	-	-	-
	15UZY510	Core Elective Paper I Medical Laboratory Technique	4	3	25	75	100	5
	15UZY511	Core Elective II Computer Applications in Biology & Bioinformatics	3	3	10	40	50	3
	15UZY512	Core Elective Practical Computer Practical	2	3	20	30	50	2
IV	15UZY5S1/ 15UZY5S2	Apiculture (SBE)	1	2	-	50	50	2
		Insect pest management (SBE)						
	15GKL501	General Knowledge & General Awareness (SBE)	SS	2	-	50	50	2
	15HEC505	HE – (National values & SKY Yoga practice -V)	1	2	25	25	50	1
650							25	
Semester VI								
III	15UZY613	Core Major Paper – XII Animal Physiology & Biochemistry	5	3	25	75	100	5
	15UZY614	Core Major Paper – XIII Ecology & Evolution	5	3	25	75	100	4
	15UZY615	Core Major Paper – XIV Microbiology & Immunology	5	3	25	75	100	4
	15UZY616	Core Elective - III: Aqua culture	5	3	25	75	100	5
	15UZY617	Sericulture	4	3	25	75	100	3
	15UZY618	Major Practical - III	2	3	40	60	100	4
	15UZY619	Major Practical - IV	2	3	40	60	100	4
IV	15UZY6S3/ 15UZY6S4	Vermiculture (SBE)	1	2	-	50	50	2
		Poultry science and management technology (SBE)						
	15HEC606	HE – (Global value s& SKY Yoga practice -VI)	1	3	25	25	50	1
							800	34
**Grand total							3900	140

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

**Grand total should be equal/below 3900 (For UG Programmes); 2550 (For PG Programmes)

SS – Self study, SBE – Skill Based Elective

**General Question Pattern
PART I,II & III**

Max. Marks:100	Internal : 25	External : 75	
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options (One question from each unit)	5X1	5
	6-10 Short answers (One question from each unit)	5X1	5
Part B	11-15 Either /Or type (One question from each unit)	5X5	25
Part C	16-20 Either /Or type (One question from each unit)	5X8	40
Total :			75

Question Pattern for PART -IV

Max. Marks:100	Internal : 25	External : 75	
Section	Pattern	Mark	Total
Part A	1-5 Multiple choice with 4 options	5X1	5
	6-10 Short answers (One question from each unit)	5X1	5
Part B	Answer any questions five out of eight	5X8	40
Total : 50			

Department	ZOOLOGY
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- Communicative English and General Awareness papers include 60% objective type of questions and 40% descriptive type of questions
- GK 100% objective type of questions (online exam)
The marks and credits for Extension activities are given by the concerned departments

Course	I B.SC	Effective from the Year:2015
Subject Code : 15UZY101 Title : NON -CHORDATA		Semester: I
Hrs/Week :	6	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ 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: <i>Taenia solium</i> – 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)

Text Book:

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) 3rdEdition 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.

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Department	ZOOLOGY	
Course	I B.SC	Effective from the Year:2015
Subject Code :	15UZY203	
Title	: MAJOR PRACTICAL –I NONCHORDATA AND CHORDATA	
Hrs/Week :	2	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To study the morphology and anatomy of invertebrates and vertebrates ➤ Understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance ➤ Impart awareness of the conservation of the biosphere. 	

Components –

1. Identifying the virtual specimen and comment on it with suitable diagram----- = 10
2. Spotters----- 4X5 = 20
3. Slide (maximum 5) ----- = 10
4. Field visit (Report submission)----- = 10
5. Record ----- = 10

Total ----- = 60

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CONTENT
<p>1. Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram</p>
<p>2. SPOTTERS</p> <p>A. Classify giving reasons:</p> <ol style="list-style-type: none"> 1) Plasmodium 2) Obelia 3) <i>Taenia solium</i> 4) Earth worm 5) Cockroach 6) Sea star 7) Tilapia 8) Frog 9) Calotes 10) Pigeon
<p>B. Draw labeled sketch:</p> <ol style="list-style-type: none"> 1) Obelia Medusa 2) T.S of <i>Taenia solium</i> 3) T.S of Earthworm 4) Cockroach- Mouth parts 5) Frog – Pectoral girdle 6) Frog – pelvic girdle 7) Poison apparatus - snake 8) Pigeon – Symsacrum 9) Pigeon – flight muscle 10) Human eye

<p>C. Biological significance:</p> <ol style="list-style-type: none"> 1) Sponge- Gemmule 2) Corals 3) Peripatus 4) Limulus 5) Bipinnaria Larva 6) Balanoglossus 7) Amphioxus 8) Axolotl larva 9) Hyla 10) Chamaeleon 	
<p>D. Write descriptive notes:</p> <ol style="list-style-type: none"> 1) <i>Taenia solium</i> – Scolex 2) Earth worm - setae 3) Pila – Radula 4) Mosquito - Culex 5) Rhacophorous 6) Draco – Flying fox 7) Cobra 8) Emu 9) Monotremes - Echidna 10) Marsupials – Kangaroo 	
<p>3. Permanent microscopic preparation of 5 animals in a neat glass slide with DPX mount.</p>	
<p>4. Field Visit/Project (Select A or B option)</p> <p>The student has to maintain a log book showing the progress of the field/project work, duly signed by the supervising teacher and may be shown to the external examiner at the time of end of semester practical examination.</p> <p>A. Individual activity</p> <p>Identification of invertebrate and vertebrate species available in campus/field without disturbing the natural habitat</p> <p>Field/project/tour report and photographs to be submitted</p> <p>B. Group Activity</p> <p>A maximum of three students can choose any one group of activity any matter of zoological interest and submit the report for external practical examination.</p> <p>Viva</p> <p>Experiences of field visit and report preparation should be present.</p>	
<p>5. Record</p>	
<p>Total Contact Hrs</p>	<p>52</p>

Mark Distribution:

Total Marks	Internal (CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Identifying the virtual specimen and comment on it with suitable diagram	10
			Spotters	20
	Model Practical Examination	20	Slides	10
	Record work	05	Field visit (Report submission)	10
	Attendance	05	Record	10
	Total Marks	40	Total Marks	

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
3. www.froguts.com
4. www.sciencelass.com
5. www.ento.vt.edu.
6. www.petaindia.com

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Department	ZOOLOGY	
Course	I B.SC (ANCILLARY ZOOLOGY PAPER – I)	Effective from the Year:2015
Subject Code :	15UZY1A1	Semester I
Title	: NON-CHORDATA AND CHORDATA	
Hrs/Week :	6	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ 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 : <i>Taenia solium</i> – 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

Text Books:

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

Reference Books:

1. Ekambaranatha Iyyer (1995) A Manual of Zoology Vol I & II, Ananda Book Depot,
2. “Acton Lodge”, Mc Nichols Road, Chetput, Madras – 600 031
3. Jordan E.L & Verma J.K. (1997) Invertebrate Zoology, S. Chand & Company Ltd, Ram Nagar, New Delhi 110055
4. Dhami P.S & Dhami J.K. (1995) Invertebrate Zoology, S. Chand & Company
5. Ganguly B.B Sinha.A &Adhikari.S. (1977) 3rd Edition Biology of Animals, Vol –I, Invertebrates, New Central Book Agencies.
6. Kotpal R.L. (1983) Modern Text Book of Zoology, Rastogi Publications.
7. 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 ANCILLARY ZOOLOGY	Effective from the Year:2015
Subject Code :	15UZY2A3	Semester I &II
Title	: ANCILLARY ZOOLOGY PRACTICAL – (PAPER I & II)	
Hrs/Week :	2	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To study the morphology and anatomy of invertebrate and vertebrate ➤ To study the morphology of invertebrate and vertebrate animals ➤ To study the anatomy of invertebrate and vertebrate animals 	

Components –

1. Identifying the virtual specimen and comment on it with suitable diagram----- = 20
 2. Spotters----- 4X5 = 20
 3. Identification of fauna and report submission ----- =10
 4. Record ----- = 10
- Total ----- = 60**
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CONTENT
1. Identifying the virtual specimen exposed in monitor /dissect the virtual specimen and label it and comment on it with suitable diagram
2. SPOTTERS
<p>A. Classify giving reasons:</p> <ol style="list-style-type: none"> 1) Paramecium 2) <i>Taenia solium</i> 3) Penaeus 4) Sea star 5) Amphioxus 6) Calotes 7) Pigeon 8) Rabbit
<p>B. Draw labeled sketch:</p> <ol style="list-style-type: none"> 1) Obelia colony 2) <i>Taenia solium</i> – Scolex 3) Frog – Pectoral girdle 4) Calotes – Brain 5) Snake - Poison apparatus 6) Pigeon – Quill feather 7) Rabbit – Dentition 8) Human – Digestive system
<p>C. Biological significance:</p> <ol style="list-style-type: none"> 1) Obelia Medusa 2) Balanoglossus 3) Honey bee 4) Culex mosquito 5) Earthworm 6) Salamander 7) Silkworm 8) Kangaroo

D. Write descriptive notes:	
1) Paramecium - conjugation	
2) Silkworm – silk gland	
3) Sea horse	
4) Cobra	
5) Draco	
6) Tortoise	
7) Owl	
8) Bat	
3. Identification of fauna and report submission	
4. Record	
Total Contact Hrs	52

Reference Books:

1. Arumugam .N. (2013) Practical Zoology Invertebrata Volume -I First edition. Satas publication, Nagarcoil, Kanyakunari
2. Arumugam .N. (2013) Practical Zoology Chordata Volume -II First edition. Satas publication, Nagarcoil, Kanyakunari

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Identifying the virtual specimen and comment on it with suitable diagram	20
			Spotters	20
	Model Practical Examination	20	Identification of fauna and report submission	10
	Record work	05		
	Attendance	05	Record	10
	Total Marks	40	Total Marks	60

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Department	ZOOLOGY	
Course	I B.SC	Effective from the Year:2015
Subject Code :	15UZY202	Semester: II
Title	: CHORDATA	
Hrs/Week :	5	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To acquire a basic knowledge on chordates ➤ To study the morphology and anatomy of vertebrates ➤ To study the biodiversity of chordates 	

Unit	Content	Hrs
Unit I	<p>General characters and outline classification of Phylum Chordata upto class level with suitable examples. (Ekambaranatha Iyer Text Book to be followed)</p> <p>General characters and affinities of</p> <ol style="list-style-type: none"> a) Amphioxus b) Balanoglossus c) Ascidian <p>Class: Pisces Type – Shark</p> <p>Systems: Externals - Digestive system - Respiratory and Urino- genital system.</p> <ul style="list-style-type: none"> ❖ Parental care in Fishes 	(13Hrs)
Unit II	<p>Class: Amphibia Type – Frog</p> <p>Systems: Externals - Girdles and Limbs - Respiratory system – Brain - Cranial nerves and Urino-genital system.</p> <ul style="list-style-type: none"> ❖ Origin of Amphibia. 	(13Hrs)
Unit III	<p>Class: Reptilia Type – Calotes</p> <p>Systems: Externals - Digestive system - Urino- genital system.</p> <ul style="list-style-type: none"> ❖ South Indian Poisonous and Non-Poisonous Snakes. ❖ Poison apparatus and Biting Mechanism in Snakes - First –Aid for Snake Bite. 	(13Hrs)
Unit IV	<p>Class: Aves Type: Pigeon</p> <p>Systems: Externals – Synsacrum - Flight muscles - Digestive system - Respiratory system- Brain- Eye and Urino – genital system.</p> <ul style="list-style-type: none"> ❖ Flightless Birds ❖ Migration in Birds 	(13Hrs)
Unit V	<p>Class: Mammalia Type – Homosapiens</p> <p>Systems: Digestive system - Respiratory system – Heart - Brain - Eye- Ear - Urinary and Reproductive system.</p> <ul style="list-style-type: none"> ❖ Salient features of Monotremes Marsupials ❖ Evolution of aortic arches 	(13Hrs)
Total Contact Hrs		(65Hrs)

❖ **General Essays**

Text Books:

1. Thangamani, A., Prasanna kumar, S., Narayanan, L.M., and Arumugam, N. (2014) (6th Edition) A text book of Chordata, Saras publications, 114/35 G, A.R.P Camp Road, Periyavillai, 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 ANCILLARY ZOOLOGY PAPER II	Effective from the Year:2015
Subject Code : 15UZY2A2 Title : APPLIED ZOOLOGY		Semester II
Hrs/Week :	6	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To understand the applications of Zoology for developing skills ➤ To study the ecological and economical aspects of bee keeping ➤ To ensure that the safety and quality of their raw milk will satisfy expectations of the food industry and consumers ➤ To uplift the economical and social status of the poultry co-operatives ➤ To ensures its sustainability, profitability of Aquaculture in an environmentally responsible manner 	

Unit	Content	Hrs
Unit I	AQUACULTURE <ul style="list-style-type: none"> • Scope of Aquaculture • Types of Fisheries <ol style="list-style-type: none"> 1. Inland fisheries 2. Marine fisheries • Culturable organisms <ol style="list-style-type: none"> 1. Fin fishes • Oyster culture <ol style="list-style-type: none"> 1. Biology and Need for Oyster culture 2. Essential conditions for Oyster culture • Pearl Industry <ol style="list-style-type: none"> 1. Types of Pearls 2. Pearl producing animals 3. Biology of Pearl Oyster 4. Pearl formation 	(16Hrs)
Unit II	APICULTURE <ul style="list-style-type: none"> • Scope of Apiculture • Brief account of <i>A.indica</i>, <i>A.mellifera</i> and <i>A.dorsata</i> • Structure of Bee Hive • Products of Bee Keeping <ol style="list-style-type: none"> 1. Royal jeely 2. Honey 3. Wax 4. Bee venom • Appliances used for modern method of Bee Keeping 	(16Hrs)
Unit III	SERICULTURE <ul style="list-style-type: none"> • Optimum conditions for mulberry growth • Mulberry cutting preparation • Structure of silkworm • Structure of silk gland 	(16Hrs)

	<ul style="list-style-type: none"> • Life cycle of <i>Bombyx mori</i> • Rearing appliances • Disinfection • Diseases of silkworm <ol style="list-style-type: none"> 1. Pebrine 2. Viral flacherie • Cocoon market 	
Unit IV	DAIRY FARMING <ul style="list-style-type: none"> • Scope of dairy farming • Live stock in india • A typical dairy farm(dairy house) • Dairy animals: cow • Live stock diseases <ol style="list-style-type: none"> 1. Mastitis 2. Foot and Mouth disease(FMD) • Nutritive value of milk • Dairy By-products 	(15Hrs)
Unit V	POULTRY KEEPING <ul style="list-style-type: none"> • Construction of poultry house • Rearing of Broilers • Rearing of Layers • Diseases of poultry <ol style="list-style-type: none"> 1. Fowl pox 2. Coccidiosis 3. Ranikhet disease • Nutritive value of Egg 	(15Hrs)
Total Contact Hrs		78

Text book:

1. Arumugam, N. (2010) Applied zoology Saras Publication, 114/35 G ARP Camp Road, Periavilai, Nagercoil, Kanyakumari – 629 002

Reference books:

1. Ganga and Sulochana Chetty (1999) An introduction to sericulture, 2nd Edition, Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi
2. Arumugam, N.(2013) Economic Zoology -, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periavilai, Nagercoil, Kanyakumari – 629 002
3. Shukla & Upadhyya,(2001) Economic Zoology - Rastroggi Publication, Shivaji Raod, Meerut 250 002
4. Arumugam, N. (2012) Aquaculture -, 1st edition, Saras Publication, 114/35 G ARP Camp Road, Periavilai, Nagercoil, Kanyakumari – 629 002

5. Ezhili, N. and Thirumathal, K. (2008) A hand book for sericulture –, Shrishti Impression, Coimbatore
6. Tripaty, S.N. (2004) Food biotechnology. Doarinant Publishing and distributions, New Helhi. 110 002.

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Ms.S.Mariselvi			

Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2015
Subject Code :15UZY304		Semester III
Title : CELL BIOLOGY		Credit:4
Hrs/Week :	7	
Objectives	<ul style="list-style-type: none"> ➤ To study the basic concepts of cell biology ➤ To understand the organelles present in the animal cell ➤ To acquire the basic knowledge about recent development in cell biology 	
Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Cell Theory: Salient features - Protoplasm theory - Germplasm theory and organismal theory. • Scope of Cell Biology: <ul style="list-style-type: none"> - Virus – HIV - Prokaryotic Cell (<i>E.coli</i> 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Nucleic acids DNA Structure (Watson & Crick model) <ul style="list-style-type: none"> - Replication of DNA (Semi-conservative model) - Types of RNA • Genetic Code – Salient features • Protein synthesis <ul style="list-style-type: none"> – Central dogma and Central dogma reverse - Mechanism of protein synthesis <ul style="list-style-type: none"> - Components - Transcription and Translation. 	(18Hrs)

Unit V	<ul style="list-style-type: none"> • 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

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, (2008). 9th revised edition Cell Biology –Rastogi Publications, Shivaji road, Meerut – 250 002, India.

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Dr.V.Dhanalakshmi			

Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2015
Subject Code : 15UZY406	Semester III	
Title : MAJOR PRACTICAL – II: CELL BIOLOGY AND GENETICS	III	
Hrs/Week :	2	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To know the measurements of microscopic objects. ➤ To identify the different stages of mitosis. ➤ To understand the concepts of genetics through experiments. 	

Components –

1. Experiment - I	= 20
2. Experiment - II	= 10
3. Spotters	4X5 = 20
4. Record	= 10
Total	= 60

=====

Content	Hrs
<p>EXPERIMENTS</p> <ul style="list-style-type: none"> • Measurements of cell using - Stage Micrometer and Ocular Micrometer • Squash preparation from Onion – Root tip – Mitosis • Identification of squamous epithelial cells in buccal smear. • 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. <p>SPOTTERS:</p> <p>CELL BIOLOGY</p> <ol style="list-style-type: none"> 1. Human Immuno Deficiency Virus. 2. E. Coli Bacterium 3. A typical animal cell 4. Interface Nucleus 5. Lamp brush chromosome 6. Mitosis – stages 7. Meiosis - stages 8. DNA – Watson & Crick Model <p>GENETICS</p> <ol style="list-style-type: none"> 1. Drosophilla – Male and Female 2. Gynandromorph 3. Hairy Pinna 4. Twins 5. Erythroblastosis Foetalis 6. Klinefelter’s Syndrome 7. Down Syndrome 	

8. Turner's Syndrome 9. Free – martin 10. Sickle cell anemia	
Record	
Total Contact Hrs	52

Reference Books:

1. Jaysura and Arumugam. N (2013) Practical Zoology Vol.3 Saras Publication, Nagarcoil, Tamil Nadu
2. Lal, S. S. (2008). A text book of Practical Zoology. Rastogi Publications, Shivaji Road, Meerut,

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Identifying the virtual specimen and comment on it with suitable diagram	30
			Spotters	20
	Model Practical Examination	20	Record	10
	Record work	05		
	Attendance	05		
Total Marks	40	Total Marks		60

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Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2015
Subject Code :	15UZY3N1	Semester III
Title	: PUBLIC HEALTH AND HYGIENE (NME)	
Hrs/Week :	1	Credit:2
Objectives	<ul style="list-style-type: none"> ➤ To study the importance of health and hygiene for the society ➤ To study the communicable and non-communicable diseases 	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Introduction to public health • Health indicators Personal hygiene, Public health, • Health Dynamics of disease transmission – host, vectors and environment 	(3Hrs)
Unit II	<ul style="list-style-type: none"> • Concepts of Health and diseases • Nutrition and Health Classification of food (Macro &Micro nutrients) • Nutritional deficiencies Vitamin and Mineral deficiencies • Balanced diet 	(3Hrs)
Unit III	<ul style="list-style-type: none"> • Environment and health Pollutants and their Effects • Types of Pollution Air, Water, Soil, Noise and Radiation Pollution 	(2Hrs)
Unit IV	<ul style="list-style-type: none"> • Communicable diseases Measles, Cholera, Amoebiasis, Malaria, Filariasis, AIDS • Non-Communicable Diseases Coronary heart Disease, Diabetes, Obesity, Stroke and Cancer 	(2Hrs)
Unit V	<ul style="list-style-type: none"> • Health Education: Health care services in India Health Planning in India Health Programmes in India Role of World Health Organization (WHO) in health education • First Aid and Nursing Methods, Dressing, Care & Duties. 	(3Hrs)
Total Contact Hrs		13

Reference Books:

- 1) Park and Park (1995) Text book of Preventive and Socio Medicine. M/S. Banarsidas Bhanot Publishers, Jabalpur
- 2) Verma S. (1998) Medical Zoology. Rastroggi Publications, New Delhi
- 3) Jordon, E.L. and Verma. P.S. (1995) Invertebrate Zoology. 12th edn. Sultan Chand & Co

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code : 15UZY3N2	Semester III	
Title : ORNAMENTAL FISH CULTURE (NME)		
Hrs/Week :	1	Credit:2
Objectives	➤ To study the various ornamental fishes and its culture	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Scope of ornamental fish • General characteristic of fish • General structure of fish <ul style="list-style-type: none"> ○ Digestive system ○ Reproductive system 	(3Hrs)
Unit II	<ul style="list-style-type: none"> • Materials, equipment required for aquarium • Construction of home aquarium • Structure and location of home aquarium 	(3Hrs)
Unit III	<ul style="list-style-type: none"> • Selection of fish for home aquarium • Common aquarium fishes 	(2Hrs)
Unit IV	<ul style="list-style-type: none"> • Fish feed <ul style="list-style-type: none"> ▪ Natural fish feed ▪ Artificial fish feed • Maintenance of home aquarium 	(2Hrs)
Unit V	<ul style="list-style-type: none"> • Common disease of ornamental 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. Arumugam, N. (2012) Aquaculture SARAS Publications, Nagercoil, Tamilnadu.
2. Dhote. A.K, (1989) Publication Department – NCERT — 55 Inland fishery – Instructional – cum – Practical -Manual Vol IV Aquaculture.
3. Agarwal, S.C (1994) A hand book of fish farming . B.H.Enterprises. New Delhi.
4. Biswas, K. P. (1996) A Text book of fish& Fisheries Technology - Calcutta(W.B) 2nd Edition, Published by Narendra Publishing house, Delhi
5. Jhingran, V. G. (1988) Fish and Fisheries of India - Hindustan Publishing Corporation (India) Delhi, Printed in India at Gopsons papers Pvt Ltd, Noida

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Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2015
Subject Code :	15UZY405	Semester IV
Title :	GENETICS	
Hrs/Week :	5	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To Study the basic concepts of hereditary and variations. ➤ To know about the genetic disorders in man. 	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> ○ Coat colour in Rabbit ○ ABO blood groups in man – Rh factor – problems 	(19Hrs)
Unit II	<ul style="list-style-type: none"> • Linkage Complete and incomplete linkage • Chromosome maps: Interference and Coincidence - chromosome map in Drosophila (Three Point Cross) • Sex determination: <ul style="list-style-type: none"> ○ XX – XY type – Man ○ ZZ –ZW type – Fowl ○ Bridge's genic balance theory ○ Hymenopteran type – Honey bee ○ Gynandromorph – Drosophila ○ Hormonal control – Free Martin Cattle. 	(18Hrs)
Unit III	<ul style="list-style-type: none"> • Sex linked inheritance <ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> • Pedigree analysis • Syndromes <ul style="list-style-type: none"> ○ Autosomal – Down syndrome and Patau's syndrome. ○ Allosomal – Klienfelter's syndrome and Turner's syndrome • Twins 	(18Hrs)

	<ul style="list-style-type: none"> • Inborn Errors of metabolism <ul style="list-style-type: none"> ○ Phenylketoneuria ○ Alcaptonuria ○ Albinism • Eugenics <ul style="list-style-type: none"> ○ Positive ○ Negative 	
Unit V	<ul style="list-style-type: none"> • Nucleic acids as genetic material DNA and RNA. • Mutation: <ul style="list-style-type: none"> ○ Detection of mutations – CIB method in Drosophila ○ Molecular basis of gene mutation – Substitution mutations and Frame shift mutations • Population Genetics <ul style="list-style-type: none"> ○ 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, Perivillai, 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. Hyderabad, 500029.

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Dr.M.Durairaju			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code : 15UZY4N3	Semester IV	
Title : FOOD AND NUTRITION (NME)	Credit:2	
Hrs/Week :	1	
Objectives	<ul style="list-style-type: none"> ➤ To understand the nutritive values of various foods. ➤ To know the importance of balanced diet. 	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • The scope of food and nutrition • Composition of food (Protein –Carbohydrate – Fat-Vitamins and Minerals) • Function and sources of food 	(3Hrs)
Unit II	<ul style="list-style-type: none"> • Measurement of energy and energy values of various food • Nutritional requirements – children, adolescence, old age • Balances diet • Digestion and absorption 	(3Hrs)
Unit III	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Food spoilage • Food poisoning- food borne diseases • Food adulteration • 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
2. Srilakshmi, B. (2012) 5th edition. Food Science, New age International Publishers, New Delhi

Reference Books:

1. Swaran Pasran Pasricvha, (2000) 1st edition. Count what you eat – NIN – Hyderabad
2. Tripathy, S. N. (2004) 1st edition. Food Biotechnology. Dominant Publishes and distributors, New Delhi. 110002
3. Srilakshmi, B. (2012) 6th edition. Dietetics, New age International Publishers, New Delhi

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code : 15UZY4N4 Title : BIOPHARMACEUTICALS (NME)		Semester IV
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", Taylor and Francis 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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Dr. K. M. Remia			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code : 15UZY507 Title : DEVELOPMENTAL BIOLOGY AND ENDOCRINOLOGY	Semester V	
Hrs/Week :	5	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • Definition-Ontogeny - Phylogeny Programme of developmental biology • Theroies Preformation Spemann's experiments on Organizer • Gametogenesis Spermatogenesis Oogenesis • Fertilization Mechanism In Vitro Fertilization(IVF) Parthenogenesis- Natural and Artificial • Significance of Parthenogenesis 	(13Hrs)
Unit II	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Organogenesis in Frog Ectodermal (Brain) Mesodermal (Heart) Endodermal (Alimentary canal) • Placentation in mammals Classification based on Foetal membranes Distribution of villi 	(13Hrs)

	<p style="text-align: center;">Histology</p> <ul style="list-style-type: none"> • Functions of placenta • Stem cells: embryonic & adult • Embryonic stem cell culture and applications 	
Unit IV	<ul style="list-style-type: none"> • Endocrinology-Definition • Endocrine glands (Structure & Functions) Thyroid Parathyroid Pancreas Testes & ovary • Hormonal interactions- Feedback control mechanisms 	(13Hrs)
Unit V	<ul style="list-style-type: none"> • Mechanism of hormone action: peptide ,steroid & thyroid. • Hormonal disorders: Pancreas (Diabetes mellitus) Thyroid (Goiter) Pituitary (Gigantism - Dwarfism) Sex hormones (Infertility) 	(13Hrs)
Total Contact Hrs		65

Text Books:

1. Arumugam .N. (2013) Developmental Zoology - Saras Publication, 114/35G, A.R.P Camp Road, Periyavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India, 2011
2. Verma P S & Agarwal V K (2012) Chordate embryology-S Chand & Company Ltd.

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. Sreekumar S. (2010) Edition. Basic Physiology –, PHI Learning Pvt. Ltd, New Delhi.
5. Sastry, K.V. (2009-2010) Endocrinology & Reproductive Biology –Rastogi Publications, Shivaji road, Meerut-250002, India.

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Dr.V.Dhanalakshmi			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY508	Semester V
Title	: BIOTECHNOLOGY	
Hrs/Week :	5	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To study the basics of biotechnology ➤ To understand the different application of biotechnology. 	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Introduction- scope and importance of biotechnology • Plasmids pBR 322 • Cosmids • Transposons • Gene map of λDNA • Construction of recombinant DNA 	(13Hrs)
Unit II	<ul style="list-style-type: none"> • Blotting Techniques: <ul style="list-style-type: none"> ➤ Southern Blotting ➤ Northern Blotting ➤ Western Blotting • Polymerase Chain Reaction (PCR) – Applications of PCR in Biotechnology • DNA Finger printing • Genomic library 	(13Hrs)
Unit III	<ul style="list-style-type: none"> • Establish cell lines • Kinetics of cell growth • Hybridoma technology • Monoclonal antibodies • Transgenic animals – Mice <ul style="list-style-type: none"> Retroviral method Microinjection method Embryonic stem cell method Applications of transgenic animals 	(13Hrs)
Unit IV	<ul style="list-style-type: none"> • Animal tissue culture <ul style="list-style-type: none"> ○ Explants ○ Culture media ○ Culture of animal tissues • Animal bioreactors <ul style="list-style-type: none"> ○ Selection and modification of micro-organisms ○ Preparation of animal ○ Product harvest ○ Application of animal bio-reactors ○ Nano- biotechnology 	(13Hrs)
Unit V	<ul style="list-style-type: none"> • Bacillus thuringensis as a pesticide • Biofertilizer • Biosensors- Biochips 	(13Hrs)

	<ul style="list-style-type: none"> • Biodegradable plastics • Biosafety <ul style="list-style-type: none"> ○ Possible dangers of GEO's ○ Implementation of biosafety guidelines • Bioethics <ul style="list-style-type: none"> ○ Monitoring the welfare of transgenic animals ○ Keeping of transgenic animals 	
Total Contact Hrs		65

Text Books:

1. Kumaresan V. and Arumugam N (2014) Animal Biotechnology –Saras publications, 114/35G, A.R.P Camp Road, Periyavilai, 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
5. Balasubramaniam. D. C.F. A. Bryce, Dharmalingam. K. J. Green, Kunthala Jayaraman (2005) Concepts in Biotechnology, University Press (India) Pvt. Ltd. Hydrabed
6. Jayanto Achrekar (2007) Fermentation biotechnology. Dominant Publishers. New Delhi
7. Sayyed and Patil (2009)Biotechnology-emerging trends Scientific publishers India
8. Kumaresan V. (2014) Biotechnology –Saras publications, 114/35G, A.R.P Camp Road, Periyavilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India

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Dr.P.R.Balasubramanian			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY509	Semester V
Title	: BIOSTATISTICS AND BIOPHYSICS	
Hrs/Week :	5	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • Collection of data <ul style="list-style-type: none"> ➤ Methods of collection – Random and Non-random sampling ➤ Primary and Secondary data • Tabulation <ul style="list-style-type: none"> ➤ Parts of table ➤ Simple and complex table • Diagrammatic presentation <ul style="list-style-type: none"> ➤ Line diagram ➤ Bar diagram ➤ Pie diagram • Measures of central tendency <ul style="list-style-type: none"> ➤ Arithmetic mean <ul style="list-style-type: none"> ✓ Individual - Discrete and Continuous series ➤ Median ➤ Mode 	(13Hrs)
Unit II	<ul style="list-style-type: none"> • Standard deviation <ul style="list-style-type: none"> ➤ Merits and demerits ➤ Individual - Discrete and Continues series • Correlation <ul style="list-style-type: none"> ➤ Positive and negative correlation ➤ Karl Pearson's coefficient of correlation • Regression analysis <ul style="list-style-type: none"> ➤ Types and methods 	(13Hrs)
Unit III	<ul style="list-style-type: none"> • Chi-square Test <ul style="list-style-type: none"> ➤ Degree of freedom ➤ Null hypothesis • Student's T- test – Properties and Applications • Analysis of Variance (ANOVA) - One-way analysis 	(13Hrs)
Unit IV	<ul style="list-style-type: none"> • Scope of biophysics • Thermodynamics principles <ul style="list-style-type: none"> ➤ First and second law • Bioluminescence <ul style="list-style-type: none"> ➤ Types ➤ Mechanisms 	(13Hrs)

	➤ Functions	
Unit V	<ul style="list-style-type: none"> • Instrumentation <ul style="list-style-type: none"> ➤ 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, Perivillai, 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, Perivillai, 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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Dr.M.Durairaju			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY510	Semester V
Title	: MEDICAL LABORATORY TECHNIQUES (MLT)	
Hrs/Week :	4	Credit:5
Objectives	➤ To understand the basic principles and applications of MLT.	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Introduction & instruments <ul style="list-style-type: none"> ○ Code of conduct for laboratory personnel ○ Structure of a laboratory • Laboratory instruments <ul style="list-style-type: none"> ○ Centrifuge ○ Autoclave ○ ECG ○ B. P. apparatus and stethoscope ○ General procedure – cleaning -Sterilization and disposal of infected materials ○ Safety measures and first aid 	(13Hrs)
Unit II	<ul style="list-style-type: none"> • Haematology <ul style="list-style-type: none"> ○ Blood collection ○ Anticoagulant <ul style="list-style-type: none"> - Ammonium & Potassium oxalate mixture ○ Bleeding time and clotting time ○ Staining of bold films ○ Estimation of haemoglobin ○ Blood cell total count - RBC and WBC ○ Erythrocyte Sedimentation Rate (ESR) ○ Glucose Tolerance Test (GTT) ○ Blood glucose ○ Anemia <ul style="list-style-type: none"> - Iron deficiency anaemia 	(13Hrs)
Unit III	<ul style="list-style-type: none"> • Urine analysis <ul style="list-style-type: none"> ○ Collection & preservation of urine ○ Physical examination ○ Chemical examination ○ Microscopic analysis • Faeces <ul style="list-style-type: none"> ○ Collection & preservation ○ Physical examination ○ Microscopic examination 	(13Hrs)

Unit IV	<ul style="list-style-type: none"> • Sputum collection <ul style="list-style-type: none"> ○ Collection & preservation ○ Naked eye inspection ○ Microscopic examination ○ Chemical examination • Semen analysis <ul style="list-style-type: none"> ○ Collection of semen ○ Physical examination ○ Microscopic analysis ○ Preparation of smear and staining 	(13Hrs)
Unit V	<ul style="list-style-type: none"> • Pregnancy test <ul style="list-style-type: none"> ○ Immunologic methods ○ Pregnancy card • Histopathology <ul style="list-style-type: none"> ○ Section cutting & fixation ○ Dehydration - Embedding and Sectioning ○ 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

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Dr. K. M. Remia			

Department	ZOOLOGY	
Course	III B.Sc.	Effective from the Year:2015
Subject Code :	15UZY511	Semester V
Title	: COMPUTER APPLICATION IN BIOLOGY AND BIOINFORMATICS	
Hrs/Week :	3	Credit:3
Objectives	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • Scope of Computer Technology • Components of Computer <ul style="list-style-type: none"> ○ Input devices ○ Output devices • Internet – LAN / WAN/WWW • Search engines • Types of modern computers 	(7Hrs)
Unit II	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Scope of Bioinformatics • Databases <ul style="list-style-type: none"> ➤ Biological database (Properties and classification) ➤ Specialized database • Protein sequence database – SWISS-PROT • Data mining • Virtual Library 	(8Hrs)
Unit IV	<ul style="list-style-type: none"> • Genomics - Definition and classification • Proteomics - Definition and classification • Drug designing • Human genome project <ul style="list-style-type: none"> ➤ Goals and techniques ➤ Potential benefits • Bioinformatics tools and its uses 	(8Hrs)
Unit V	<ul style="list-style-type: none"> • Similarity tool : BLAST • Visualizing tool : RasMol • Miscellaneous tool : Webcutter • Phylogenetic analysis - Definition and application • Construction of phylogenetic tree – structure of rooted tree 	(8Hrs)
Total Contact Hrs		39

Text Books:

1. Ron Mansfield, (2009) Working in Microsoft office- McGraw-Hill Book Co, New York
2. Sundaralingam R.& Kumaresan V. (2012) 2nd edition Bioinformatics , Saras Publication, 114/35G . A.R.P Camp road, Periaivillai, Kottar PO, Nagercoil, Kanyakumari,

Reference Books:

1. Rajaraman, V. (1986) Fundamentals of computer –Prentice Hall of India Pvt.Ltd, New Delhi -110001
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:2015
Subject Code :	15UZY512	Semester V
Title	: COMPUTER APPLICATION IN BIOLOGY AND BIOINFORMATICS	
Hrs/Week :	2	Credit:2
Objectives	<ul style="list-style-type: none"> ➤ To know the basic operations of M. S office programme ➤ To know the web browsing and e-mailing ➤ To study the sequence of proteins and nucleotides by using Bioinformatics tools ➤ To know the operations of Bioinformatics tools 	

Components –

1. Experiments	-----	= 25
2. Record	-----	= 05
	Total -----	= 30
		=====

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. Retrieving biological database (Demonstration)	
14. Sequence alignment using BLAST(Demonstration)	
Total Contact Hrs	26

Reference Books:

1. Attwood T.K. and Parrysmith D.J. (1999)1st Edition Introduction to Bioinformatics - Addison Wesley Longman, Harlow.
2. Sanjay Saxena. (2000 reprint) M S office 2000 for everyone. Vikas Publishing House, Pvt. Ltd, New Delhi
3. Sundaralingam, R. and Kumaresan, V. (2012) Bioinformatics. Saras Publication, 114/35G . A.R.P Camp road, Periavillai, Kottar PO, Nagercoil, Kanyakumari,

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	05	Experiments	25
	Model Practical Examination	10		
	Record work	2.5	Record work	5
	Attendance	2.5		
	Total Marks	20	Total Marks	

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY618	Semester V & VI
Title	: MAJOR PRACTICAL III (Developmental biology & Endocrinology, Biostatistics & Biophysics, Animal Physiology & Biochemistry and Medical Laboratory Technique)	
Hrs/Week :	2	Credit:4
Objectives	➤ To gain the practical knowledge about the general principles of Practical III (Developmental Biology & Endocrinology, Biostatistics & Biophysics, Biochemistry & Animal Physiology & MLT)	

Components –

1. Experiments	2X 10 = 20
2. Spotters	4X5 = 20
3. Field visit (Report submission)	= 10
4. Record	= 10
Total	= 60
	=====

Content
<p>EXPERIMENTS</p> <ul style="list-style-type: none"> • Qualitative detection of Excretory products • Total count of RBC • Total count of WBC • Estimation of haemoglobin • Preparation of Blood smear • Bleeding and clotting time • Preparation of haematin crystals • Find the mean and Standard deviation of the given samples <p>SPOTTERS</p> <p>Developmental Biology & Endocrinology (structure/developments)</p> <ul style="list-style-type: none"> • Frog- Egg • Frog- Cleavage • Frog- Yolk plug • Chick- Egg • Chick embryo - 24 hours • Chick embryo - 72 hours • Chick embryo - 96 hours • T. S. of Thyroid gland • T. S. of Ovary • T. S. of Testis <p>Biochemistry & Animal physiology (structure and function)</p> <ul style="list-style-type: none"> • Structure of haemoglobin • Structure of pentose

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

Biostatistics and Biophysics (statistical importance)

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

Medical Laboratory Technique (MLT) – (structure, principle and uses)

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

Total Contact Hrs

52

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Experiments	20
			Spotters	20
	Model Practical Examination	20	Field visit (Report submission)	10
	Record work	5	Record	10
	Attendance	5		
	Total Marks	40	Total Marks	

Reference Books:

1. Arumugam .N. (2013) Developmental Zoology - Saras Publication,114/35G, A.R.P Camp Road, Periaivilai, Kottar Post, Nagercoil - 629002 , Tamilnadu, India, 2011
2. H. R. Singh and Neerajkumar, 2014. Animal Physiology and biochemistry, Vishal Publishing Co. Jalandhar, Delhi
3. Ramnik Sood, Medical Laboratory Techniques (MLT). (1999) 5th edn. Jaypee Brothers Medical publishers (P) Ltd. Delhi
4. Mariakuttikan , A and Arumugam, N. 2014. Animal P|hysiology . Saras publication. Nagercoil, Kanyakumari Dist. Tamil Nadu

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Dr.V.Dhanalakshmi			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY619	Semester V &VI
Title	: MAJOR ZOOLOGY PRACTICAL – IV (Ecology, Evolution, Biotechnology, Microbiology Sericulture and Aquaculture)	
Hrs/Week :	2	Credit:4
Objectives	<ul style="list-style-type: none"> ➤ To obtain some practical knowledge in ecology and evolution, biotechnology and microbiology, sericulture and aquaculture ➤ To study the physico-chemical nature of environment 	

Components –

1. Experiments	2X 10 = 20
2. Spotters	4X5 = 20
3. Field visit/ Micro-environmental study/report preparation	= 10
4. Record	= 10
Total	= 60
	=====

Content
<p>EXPERIMENTS</p> <ul style="list-style-type: none"> • Estimation of dissolved oxygen in water samples. • Estimation of carbondioxide • Determination of primary productivity • Estimation of salinity in water samples • Determination of pH in water samples • Culture medium preparation (Demonstration only) • Milk Methylene Blue Test • Hanging drop preparation • Morphology and morphometric measurements of fish by using model <p>SPOTTERS</p> <p style="padding-left: 20px;">Ecology</p> <ul style="list-style-type: none"> • Sacculina on Crab • Leech • Taenia • Physalia • Albunea • Hippa • Anguilla <p style="padding-left: 20px;">Biotechnology/ Microbiology</p> <ul style="list-style-type: none"> • E-Coli • Plasmids • Bt – Bacillus thuringiensis • Biodiesel Plant – Jatropha • PCR • Micropipette • Magmatic stirrer

- Laminar Air Flow
- Gel Electrophoresis

Sericulture

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

Aquaculture

- Common Carp
- Gill net
- Hook
- Fish parasite – Argulus
- Chinese dip net

Evolution

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

Total Contact Hrs

52

Mark Distribution:

Total Marks	Internal(CIA)	Marks	End of semester Practical Examination (ESE)	Marks
100	Practical Skill/observation	10	Experiments	20
			Spotters	20
	Model Practical Examination	20	Field visit /Micro-environmental study/ report preparation	10
	Record work	5	Record	10
	Attendance	5		
	Total Marks	40	Total Marks	60

Reference Books:

1. Ganga , G and Sulochana chetty,(1999). An introduction to sericulture. Oxford and IBH Publishing company Pvt. Ltd. New Delhi
2. Jayasurya, (2013). Economic Zoology. Saras publication. Nagarcoil, Kanyakumari Dist. Tamil Nadu
3. Kumaresan. V (2012) Biotechnology. Saras publication. Nagarcoil, Kanyakumari Dist. Tamil Nadu
4. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
5. Arumugam, N. (2014) Aquaculture SARAS Publications, Nagercoil, Tamilnadu.
6. 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

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Dr.P.R.Balasubramanian			

Department	ZOOLOGY	
Course	II B.SC	Effective from the Year:2015
Subject Code :	15UZY5S1	Semester IV
Title	: APICULTURE (SBE)	
Hrs/Week :	1	Credit:2
Objectives	<ul style="list-style-type: none"> ➤ To examine the scope of beekeeping in India and other countries ➤ To identify major bee keeping challenges and opportunities. ➤ Purchase of honey, wax and byproducts from bee keeping industry 	

Unit	Content	Hrs
Unit I	History and Scope of Apiculture Classification of honey bee Types of honey bee – <i>Apis dorsata</i> - <i>Apis indica</i> - <i>Apis florea</i> - <i>Apis mellifera</i> Biology of honey bee – External Structure of worker bee 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	(3Hrs)
Unit III	Bee keeping equipments Extraction of honey Honey – Properties - Chemical composition - Value of honey (Nutritional, Medicinal values)	(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 - 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. Dharm 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,
6. Bee keeping basics. MAAREC: Delavane, Maryland, New Jersey, Pennsylvania, West Virginia & the USDA Co-operating PENNSTATE 1855- E-book

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Dr.V.Dhanalakshmi			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY5S2	Semester IV
Title	: INSECT PEST MANAGEMENT(SBE)	
Hrs/Week :	1	Credit:2
Objectives	➤ To study the insect available in the agricultural field	

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 Sugarcane – 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	III B.SC	Effective from the Year:2015
Subject Code :	15UZY5S2	Semester VI
Title	: ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	
Hrs/Week :	5	Credit:5
Objectives	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Water Balance: Osmatic and Ionic regulations in aquatic animal (Fish) • Receptors: Chemoreceptors - Gustatoreceptors & Olfactoreceptors Photoreceptor (Eye) Phonoreceptor (Ear) • Effectors: <ul style="list-style-type: none"> ➤ Types of muscles : Striped- unstriped and cardiac muscles Structure and properties of striped muscle Mechanism of muscular contraction- sliding filament theory. 	(13Hrs)
Unit III	<ul style="list-style-type: none"> • Nervous system: <ul style="list-style-type: none"> ➤ Structure of vertebrate neuron ➤ Conduction of nerve impulse through : Non-myelinated neuron Synapse ➤ Neuromuscular junction ➤ Reflex action and reflex arc • Reproductive system: <ul style="list-style-type: none"> ○ Sexual cycle in human: Puberty – Spermiation – Ovulation - Menstrual cycle - Pregnancy and Parturition. 	(13Hrs)

Unit IV	<ul style="list-style-type: none"> • Classification of Carbohydrates: <ul style="list-style-type: none"> ➤ Monosaccharides - Pentoses- Hexoses ➤ Disaccharides - Non-reducing sugar C1- C1 – Sucrose <li style="padding-left: 20px;">- Reducing Sugar C1 – C4 – Lactose ➤ Polysaccharides - Homopolysaccharide - Starch <li style="padding-left: 20px;">Heteropolysaccharide - Heparin • Classification of Lipids: <ul style="list-style-type: none"> ➤ Simple Lipids - Fats and Waxes ➤ Compound lipids -Phospholipids- Glycolipids ➤ Derived lipids -Glycerol - Fatty acids and Cholesterol • Classification of Proteins: <ul style="list-style-type: none"> ➤ Based on structure - Simple – Conjugated- Derived ➤ Based on solubility- Globular - Fibrous 	(13Hrs)
Unit V	<ul style="list-style-type: none"> • Metabolism: <ul style="list-style-type: none"> ➤ 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, Ananthkrishnan& 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:2015
Subject Code :	15UZY614	Semester VI
Title	: ECOLOGY AND EVOLUTION	
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	<ul style="list-style-type: none"> • Scope of ecology • Abiotic factors <ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • Biogeochemical cycle <ul style="list-style-type: none"> ➤ Gaseous cycle : Carbon cycle- Nitrogen cycle ➤ Sedimentary cycle: Sulphur cycle- Phosphorus cycle • Animal relationship <ul style="list-style-type: none"> ➤ Commensalism ➤ Mutualism ➤ Parasitism • Animal population <ul style="list-style-type: none"> ➤ Characteristics of population - Natality- mortality- growth- density • Animal Ethics <ul style="list-style-type: none"> ➤ Animal rights ➤ Animal law ➤ Wild life conservation 	(13Hrs)
Unit III	<ul style="list-style-type: none"> • Biochemical origin of life • Urey and Miller's experiment • Geological time scale • Fossils: Types and Dating of fossils 	(13Hrs)
Unit IV	<ul style="list-style-type: none"> • Evidences of evolution <ul style="list-style-type: none"> ➤ Morphological: Homologous structures – vestigial organs – connecting links ➤ Embryological: Recapitulation theory ➤ Palaeontological : Missing links 	(13Hrs)
Unit V	<ul style="list-style-type: none"> • Darwinism : Over production – variation – survival of the fittest – struggle for existence – origin of species • Isolating mechanism <ul style="list-style-type: none"> ➤ Geographic isolation ➤ Reproductive isolation 	(13Hrs)

	• Organic evolution of man	
	Total Contact Hrs	65

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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Dr. M. Durairaju			

Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY615	Semester VI
Title	: MICROBIOLOGY AND IMMUNOLOGY	
Hrs/Week :	5	Credit:4
Objectives	To acquire a basic knowledge of microbiology and immunology	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Introduction and scope of microbiology • Classification of microorganisms • Basic methods in Microbiology • Staining procedure and types of staining 	(13Hrs)
Unit II	<ul style="list-style-type: none"> • Bacteria: <ul style="list-style-type: none"> ○ Major features and structure of bacteria ○ Economic importance of bacteria ○ Bacterial growth and Growth curve ○ Bacterial culture – Culture of <i>E.Coli</i> • Viruses: <ul style="list-style-type: none"> ○ Characteristic and structure of viruses ○ classification of virus 	(13Hrs)
Unit III	<ul style="list-style-type: none"> • Applied microbiology <ul style="list-style-type: none"> ○ Agricultural microbiology: <ul style="list-style-type: none"> ▪ Role of microorganism in soil fertility ▪ Biofertilizers ▪ Harmful role of microorganism. ○ Food microbiology: <ul style="list-style-type: none"> ▪ Microorganisms of food ▪ Factors influence microbial growth- food spoilage- Food preservation ○ Medical microbiology <ul style="list-style-type: none"> ▪ Normal microflora of human body ▪ Diseases - Bacterial (any 2) ▪ Viral (any 2) 	(13Hrs)
Unit IV	<ul style="list-style-type: none"> • Immunology • Introduction and scope of immunology • Classification of Immunity – Innate and Acquired • Lymphoid Organs • Cells of the immune system – T and B Cells 	(13Hrs)
Unit V	<ul style="list-style-type: none"> • Structure and classes of immunoglobins • Classification of Major Histocompatibility Complex- (MHC) • Tumour immunology <ul style="list-style-type: none"> ○ Properties of tumour cells ○ Immune diagnosis and immunotherapy of tumour 	(13Hrs)
Total contact Hrs		65

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, Perivillai, Kottar PO, Nagercoil -629 002, Kanyakumari
2. Dulsy Fatima and N. Arumugam. Immunology, (2001) Saras Publications, 114/35 G, A.R.P Camp Road, Perivillai, 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

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :15UZY616 Title : AQUACULTURE		Semester VI
Hrs/Week :	5	Credit:5
Objectives	To study the nature and habitat of different aquatic animals	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • Scope of aquaculture • Aquaculture in India • General character and adaptations in fishes • General Organisation of fish <ul style="list-style-type: none"> ➤ Teleost – Mullet ➤ Morphology and anatomy <ul style="list-style-type: none"> ▪ Digestive system ▪ Circulatory system ▪ Reproductive system • Pond culture- different kinds of fish ponds in a model fish farm. 	(12hrs)
Unit II	<ul style="list-style-type: none"> • Culture methods <ul style="list-style-type: none"> ➤ mono culture ➤ poly culture ➤ integrated culture • Brackish water culture • Fresh water culture • Marine culture • Age and growth study • Induced spawning • Fish feed <ul style="list-style-type: none"> ➤ Classification of feed ➤ Composition of feed ➤ Live feed 	(10hrs)
Unit III	<ul style="list-style-type: none"> • Bionomics of some important aquatic animals <ul style="list-style-type: none"> ○ Fresh water fishes <ul style="list-style-type: none"> ▪ Indian major carps- Catla Mrigal Rohu ▪ Exotic fishes- Common carp Tilapia ○ Marine fish- Oil Sardine ○ Estuarine fish- Mullet ○ Prawn culture ○ Oyster culture ○ Pearl culture 	(10hrs)
Unit IV	<ul style="list-style-type: none"> • Fish crafts – different types of fishing boats. • Gears <ul style="list-style-type: none"> ➤ Hooks ➤ Simple dipnets ➤ Chinese dipnets ➤ Gill nets ➤ Purse seine 	(10hrs)

	<ul style="list-style-type: none"> ➤ Trawl nets • Fish processing <ul style="list-style-type: none"> ➤ Identification of good and spoiled fish ➤ Refrigeration ➤ Freeze drying ➤ Fumigation ➤ Canning ➤ Salting 	
Unit V	<ul style="list-style-type: none"> • Ornamental fish culture <ul style="list-style-type: none"> ➤ Requirements and setting of an aquarium ➤ Aquarium fishes • Fish pathology and major diseases <ul style="list-style-type: none"> ➤ 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:

1. Arumugam, N. (2014) Aquaculture SARAS Publications, Nagercoil, Tamilnadu.
2. Shanmugham, K. (1992) Fishery biology and aquaculture, LEO Pathippagam, Madras.

Reference Books:

1. Vadapalli and Satyanarayanan, (1996) Fish culture. Narendra publishing house, Delhi.
2. Datta Munshi and Srivastava, (1988) Natural history of fishes and systematic of Fresh-water fishes of India. Narendra Publishing House, New Delhi.
3. Jordan E. L. and Verma. P. S. (2000) Chordate Zoology. S. Chand and company LTD, New Delhi
4. Agarwal. S. C. (1994) A hand book on fish farming. Narendra publishing house. Delhi
5. Pandey and Shukla, (2010) Fish and fisheries. Rastogi publication
6. Charls L Cutting, (1999) Fish processing and preservation. Agrobotanical publishers (India)
7. ICAR Publication (2006) 1st edition. Hand book of fisheries and aquaculture, Directorate of information and publicatiios of agriculture. Indian Council of Agricultural Research, New Delhi
8. Jhingran, V.G. 1988. Fish and Fisheries of India – Hindustan Publishing Corporation India Delhi. Printed in India at Gopsons paper Pvt. Ltd. Noida

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Department	ZOOLOGY	
Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY617	Semester VI
Title :	SERICULTURE	
Hrs/Week :	4	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	<ul style="list-style-type: none"> • Definition and History of Sericulture • Varieties of silkworms: <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> • Methods of vegetative Propagation <ul style="list-style-type: none"> ○ 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	<ul style="list-style-type: none"> • Life cycle of Bombyx mori • Structure of silk worm • Structure of Silk gland • Grainages • Incubation and Brushing • Silkworm rearing appliances 	(10 Hrs)
Unit IV	<ul style="list-style-type: none"> • Disinfection • Rearing of mature larvae: Shelf- Floor and shoot rearing • Characteristics features of ripeworm • Mounting: Methods and precaution during mounting • Diseases of silk worms: <ul style="list-style-type: none"> ○ Pebrine ○ Viral Flacherie (IFV) ○ Grasserie :Nuclear Polyhedrosis (NPV) • Indian Uzi fly (Pest of silk worm) 	(11 Hrs)
Unit V	<ul style="list-style-type: none"> • Physical characteristics of cocoons • Defective cocoons • Reeling appliance - Country Charkha • Cocoon Markets • Raw silk testing 	(10 Hrs)

Total Contact Hrs	52
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Text Books:

1. Ganga G. and Sulochana Chetty. J. (1999) 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. (2008) A hand book for sericulture –, Shrishti Impression, Coimbatore

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Department	ZOOLOGY
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Course	III B.SC	Effective from the Year:2015
Subject Code :	15UZY6S3	Semester VI
Title :	VERMICULTURE (SBE)	
Hrs/Week :	1	Credit:2
Objectives	➤ To study the importance of vermiculture	

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: Megasclolex 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 Vermiwash Marketing of vermicompost	(3Hrs)
Total Contact Hrs		13

Reference Books:

1. Ekambaranatha Iyyer, (1990) A Manual of Zoology, Part I & II, Invertebrata, Revised edition. S. Viswanathan(Printers and Publishers)
2. Odum, E. P (1971) Fundamentals of ecology W.B. Sanders Company, London
3. Gupta. P. K. (2005) Vermicomposting for sustainable agriculture. Agrobios. Jothpur. India
4. Rana. S. V. S. (2010) Environmental biotechnology. Rastogi Publication. Meerut. India
5. Aravind Kumar. (2005) Verms and vermitechology APH Publishing co-operation

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Department	ZOOLOGY		

Course	III B.Sc.	Effective from the Year:2015
Subject Code :	15UZY6S4	Semester VI
Title	: POULTRY SCIENCE AND MANAGEMENT TECHNOLOGY (SBE)	VI
Hrs/Week :	1	Credit:2
Objectives	➤ To know the basic concept of poultry science	

Unit	Content	Hrs
Unit I	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Poultry house and equipment • Space requirements • Types of houses • Summer management - Winter management • Sterilization of room 	(3Hrs)
Unit III	<ul style="list-style-type: none"> • Classification of feed stuffs • Availability of raw materials and their cost • Feed formulation and Feeding programme • Equipment for feeding and drinking. 	(2Hrs)
Unit IV	<ul style="list-style-type: none"> • Management of Broilers • Management of layers • Management of Breeders • Common diseases – Bird flu disease • Antibiotics - Vaccination and deworming • Insecticide treatment and Bio-remedies 	(3Hrs)
Unit V	<ul style="list-style-type: none"> • Nutritive value of poultry meat and egg • Grading and Preservation of eggs • Packing and Transport and Marketing • Different uses of eggs • Poultry manure. 	(2Hrs)
Total Contact Hrs		13

Reference Books:

- 1) Rice . E.J 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.

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