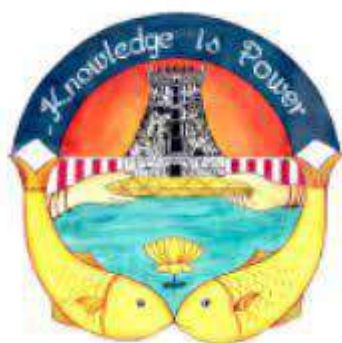


**SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN  
(AUTONOMOUS),  
MADURAI – 2**



**DEPARTMENT OF ZOOLOGY  
SYLLABUS**

**B. Sc. ZOOLOGY  
(CBCS & OBE)**

**For students who joined in the Academic year 2022-23**

## **Programme Outcomes**

**The successful completion of B. Sc. Program will enable the students to**

**PO1:** Inculcate a sustained interest to learn new concepts, techniques and acquire discipline based knowledge.

**PO2:** Relate their knowledge to design problem solving strategies addressing the demands in the society.

**PO3:** Involve themselves in capacity building and hone their skills for technical, conceptual and creative excellence.

**PO4:** Perceive a plan to take up Post Graduate programmes leading to research within and outside their disciplines.

**PO5:** Contribute to the ecological space and be sensitive to the multi - dimensional aspects of our country and strive for harmonious existence through environment – friendly academic involvement

## **Programme Specific Outcomes**

**Students completing the B. Sc. Zoology programme will be able to**

**PSO1:** Demonstrate a broad understanding of animal diversity including knowledge of the scientific classification and evolutionary relationship of major groups of animals.

**PSO2:** Recognize the relationship between structure and function at different levels of biological organisation (gene, genome, cell, organ and organ system) .

**PSO3:** Gain practical knowledge about the specimen observation and its classification depending on the observed characteristics, estimation and analysis of various immunological,

physiological and biochemical parameters and application of statistical techniques in Zoology.

**PSO4:** Identify and analyse various potential risk factors to the health of human in the realm of Microbiology, Biochemistry, Genetics and Nutrition.

**PSO5:** Demonstrate the practical knowledge in various avenues of Commercial Zoology with entrepreneurial skills.

**PSO6:** Progress to Postgraduate Education and Research and also for careers in different sectors of employment by using tools of information technology.

**PSO7:** Apply the acquired skills to various domains of Zoology in everyday life with critical thinking and problem solving.

**SRI MEENAKSHI GOVERNMENT ARTS COLLEGE FOR WOMEN (AUTONOMOUS), MADURAI-2**

**PROGRAMME : B. SC. ZOOLOGY**

**SEMESTER – I**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	LC	U221A1/ U221H1	Tamil/Hindi	6	3	3	25	75	100
II	ELC	U222A1	English	6	3	3	25	75	100
III	CC - I	U22CZ1	Biology of Invertebrates	6	5	3	25	75	100
III	CC - II	U22CZ2P	Biology of Invertebrates - Practical	3	3	3	40	60	100
III	AC - I	U22AZZ1	Economic Zoology I	4	3	3	25	75	100
III	AC - II	U22AZZ2P	Economic Zoology Practical	3	-	-	-	-	-
IV	AEC - I	U22AE1	Value Education	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>19</b>				<b>600</b>

**SEMESTER – II**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	LC	U221A2/ U221H1	Tamil/Hindi	6	3	3	25	75	100
II	ELC	U222A2	English	6	3	3	25	75	100
III	CC - III	U22CZ3	Biology of Chordates	6	5	3	25	75	100
III	CC - IV	U22CZ4P	Biology of Chordates- Practical	3	3	3	40	60	100
III	AC - II	U22AZZ2P	Economic Zoology Practical	3	3	3	40	60	100
1III	AC - III	U22AZZ3	Economic Zoology II	4	4	3	25	75	100
IV	AEC – II	U22AE2	Environmental Studies	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>23</b>				<b>700</b>

**SEMESTER – III**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	LC	U221A3/ U221H3	Tamil/Hindi	6	3	3	25	75	100
II	ELC	U222A3	English	6	3	3	25	75	100
III	CC - V	U22CZ5	Genetics And Biodiversity	6	5	3	25	75	100
III	CC - VI	U22CZ6P	Genetics and Biodiversity Practical	3	3	3	40	60	100
III	AC - IV	U22ACT1	Allied Chemistry Theory	4	3	3	25	75	100
III	AC - V	U22ACP	Allied Chemistry Practical	3	-	-	-	-	-
IV	NMEC-I	U22NMZ1	Human Reproductive Biology	2	2	3	25	75	100
V			NCC/NSS/Extension Activity		1		100	-	100
<b>Total</b>				<b>30</b>	<b>20</b>				<b>700</b>

**SEMESTER – IV**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	LC	U221A4/ U221H4	Tamil/Hindi	6	3	3	25	75	100
II	ELC	U222A4	English	6	3	3	25	75	100
III	CC - VII	U22CZ7	Cell and Molecular Biology	4	4	3	25	75	100
III	CC -VIII	U22CZ8P	Cell and Molecular Biology Practical	3	3	3	40	60	100
III	AC - V	U22ACP	Allied Chemistry Practical	3	3	3	40	60	100
III	AC - VI	U22ACT2	Allied Chemistry Theory	4	4	3	25	75	100
IV	NMEC II	U22NMZ2	Women and Child Care	2	2	3	25	75	100
IV	SEC-I	U22SEZ1	Bio-instrumentation and Bio-techniques	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>24</b>				<b>800</b>

**SEMESTER – V**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
III	CC - IX	U22CZ9	Developmental Biology and Evolution	5	5	3	25	75	100
III	CC - X	U22CZ10	Animal Physiology	5	4	3	25	75	100
III	CC - XI	U2CZ211	Biochemistry	5	5	3	25	75	100
III	CC - XII	U22CZ12P	Developmental Biology, Evolution, Animal Physiology and Biochemistry - Practical	6	5	3	40	60	100
III	DSEC - I	U22DSZ1A	Human Nutrition	5	5	3	25	72	100
		U22DSZ1B	Fishery Biology						
III	GEC - I	U22GEZ1A	Bioinformatics	2	2	3	25	75	100
		U22GEZ1B	Food Processing Technology						
IV	SEC– II	U22SEZ2	Entrepreneurial Zoology	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>28</b>				<b>700</b>

**SEMESTER – VI**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
III	CC - XIII	U22CZ13	Microbiology and Biotechnology	6	5	3	25	75	100
III	CC - XIV	U22CZ14	Immunology	6	5	3	25	75	100
III	CC - XV	U22CZ15P	Microbiology, Biotechnology and Immunology- Practical	6	4	3	40	60	100
III	DSEC-II	U22DSZ2A	Biophysics and Biostatistics	4	4	3	25	75	100
		U22DSZ2B	Biology and Human welfare						
III	DSEC-III	U22DSZ3A	Clinical Lab Technology	4	4	3	25	75	100
		U22DSZ3B	Endocrinology						
IV	SEC–III	U22SEZ3	Medical Biology	2	2	3	25	75	100
IV	AEC - III	U22AE3	General Knowledge	2	2	3	25	75	100
<b>Total</b>				<b>30</b>	<b>26</b>				<b>700</b>

**COURSES OFFERED BY  
DEPARTMENT OF ZOOLOGY FOR  
CHEMISTRY MAJOR STUDENTS DURING SEMESTER III**

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
III	AC - I	U22AZC1	<b>General Zoology I</b>	4	3	3	25	75	100
III	AC - II	U22AZP	<b>General Zoology I and II Practical</b>	3	3	3	40	60	100
III	AC - III	U22AZC2	<b>General Zoology II</b>	4	4	3	25	75	100

**COURSES OFFERED BY  
DEPARTMENT OF ZOOLOGY FOR  
VALUE ADDED COURSES**

Semester		Course Code	Title of the Course	Hrs/ Sem	Credits	Exam Hrs	Marks		
							Int	Ext	Total
Semester III	For Other Major Students	U22VAZ1	Public Health and Hygiene	30	2	2	20	30	50
Semester IV	Zoology Students	U22VAZ2	Reproductive Health for Women	30	2	2	20	30	50

**COURSE STRUCTURE ABSTRACT FOR**

**B. Sc. PROGRAMME**

<b>Part</b>	<b>Course</b>		<b>Total No of Papers</b>	<b>Hours</b>	<b>Credit</b>	<b>Marks</b>
I	Language Course (LC)		4	24	12	400
II	English Language Course (ELC)		4	24	12	400
III	Core Course (CC)		15	73	64	1500
III	Allied Course ( AC)		6	28	20	600
III	Discipline Specific Elective Course (DSEC)		3	13	13	300
III	Generic Elective Course (GEC)		1	2	2	100
IV	Non Major Elective Course (NMEC)		2	4	4	200
IV	Skill Enhancement Course (SEC)		3	6	6	300
IV	Ability Enhancement Course (AEC)	Value Education	1	2	2	100
IV		Environmental Studies	1	2	2	100
IV		General Knowledge	1	2	2	100
V	NCC/NSS/Extension Activity		1	-	1	100
<b>Total</b>			<b>42</b>	<b>180</b>	<b>140</b>	<b>4200</b>
<b>Value Added Courses</b>			<b>2</b>	<b>60</b>	<b>4</b>	<b>100</b>
<b>Total</b>			<b>44</b>		<b>144</b>	<b>4300</b>



Programme : B. Sc. ZOOLOGY

Part III : CC - I

Semester : I

Hours : 6/W 90/S

Subject Code: U22CZ1

Credits : 5

**TITLE OF THE PAPER: BIOLOGY OF INVERTEBRATES**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	6	4	1	1

**PREAMBLE:**

The course is designed to gain knowledge and understanding of classification of Animal Kingdom and various physiological systems of Invertebrates.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Classify animal kingdom. Describe the structure and functions of different systems in Paramecium and canal system of Porifera.	1	18	K1
<b>CO2:</b> List out general characters of phylum Helminthes and Annelida. Describe the structure and functions of different systems in Nereis. Analyse the parasitic adaptations of helminthes and adaptive radiation in Annelida.	2	18	K3
<b>CO3:</b> Describe the excretory, reproductive system and life cycle of <i>Pleurochaeta monodon</i> and compare and contrast the mouth parts of insects.	3	18	K3
<b>CO4:</b> Gain knowledge about the general characters of phylum Mollusca. Describe the structure and functions of different systems of <i>Pila globosa</i> and analyse the torsion in Gastropoda and advanced features in Cephalopods.	4	18	K3
<b>CO5:</b> Classify the phylum Echinodermata depending on the observed characteristics and describe the water vascular system, reproductive system of starfish and larval forms of Echinodermata and types of Pedicellaria.	5	18	K2

**SYLLABUS**

**UNIT I:**

Classification of animal kingdom - binomial nomenclature, general characters of phylum Protozoa - classification up to class level with examples. Type study - Paramecium - structure, Nutrition and Reproduction. Porifera - General characters, canal system in sponges. General characters of phylum Coelenterata.

**UNIT II:**

General characters of phylum Helminthes - classification up to class level with examples - type study - *Fasciola hepatica* - external character and life history, Parasitic adaptations in Helminthes. General characters of phylum Annelida - classification up to class level with examples - type study - Neris - external characters, digestive system, excretory system and reproductive system. Adaptive radiation in Annelida.

**UNIT III:**

General characters of phylum Arthropoda - classification up to class level with examples - type study - *Pleurochaeta monodon*- external characters, appendages, excretory system, reproductive system and life cycle. Mouth parts of insects – Cockroach, Mosquito, Butterfly and House fly.

**UNIT IV:**

General characters of phylum Mollusca - classification up to class level with examples. Type study - *Pila globosa* - external characters, digestive system, respiratory system and nervous system. Torsion in Gastropoda, Cephalopods as advanced Molluscs.

**UNIT V:**

General characters of phylum Echinodermata - classification up to class level with examples. Type study - Star fish - external characters, water vascular system and reproductive system. Larval forms of Echinoderms, types of Pedicellaria.

**TEXTBOOK:**

1. Ekambaranatha Iyyar and Ananathakrishnan T N. A Manual of Zoology. Vol I Invertebrata, Part I and II. S.Vishwanathan Pub. and Pvt. Ltd., 1992

**REFERENCE BOOKS:**

1. Jordan EL and Verma PS. Invertebrate Zoology. S. Chand and Company Ltd., 2012
2. Kotpal RL, Agarwal SK and Khetarpal RP. Modern Text book of Zoology -Invertebrates. Rastogi Pub., 1985.

**Course Designer: MRS. A. SHEELA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Classification of animal kingdom – binomial	2	Lecture - 2

	nomenclature		
1.2	general characters of phylum Protozoa - classification up to class level with examples	4	Lecture - 4
1.3	Type study - <i>Plasmodium vivax</i> - life cycle	4	Lecture - 4
	Type study - Paramecium	4	Lecture - 4
1.4	Porifera - canal system in sponges	2	Peer teaching - 2
1.5	General characters of phylum Colenterata	2	Tutorial - 2
<b>UNIT II</b>			
2.1	General characters of phylum Helminthes - classification up to class level with examples	3	Discussion - 3
2.2	Type study - <i>Fasciola hepatica</i> - life cycle. Parasitic adaptations in Helminthes.	6	Lecture - 6
2.3	General characters of phylum Annelida - classification up to class level with examples	3	Lecture - 3
	type study - Neries - external characters, digestive system, excretory system and reproductive system	4	Lecture - 4
2.4			
2.5	Adaptive radiation in Annelida	2	Lecture - 2
<b>UNIT III</b>			
3.1	General characters of phylum Arthropoda - classification up to class level with examples	5	Lecture - 5
3.2	type study - <i>Piенаeusmonodon</i> - external characters, appendages, excretory system, reproductive system and life cycle	7	Lecture - 7
3.3	Mouth parts of insects – Cockroach, Mosquito, Butterfly and House fly	6	Peer teaching - 6
<b>UNIT IV</b>			
4.1	General characters of phylum Mollusca - classification up to class level with examples	4	Lecture - 4
4.2	Type study – <i>Pila globosa</i> - external characters, digestive system, respiratory system and nervous system.	7	Lecture - 7
4.3	Torsion in Gastropoda	3	Lecture - 3

4.4	Cephalopods are advanced Molluscs	4	Tutorial - 4
<b>UNIT V</b>			
5.1	General characters of phylum Echinodermata - classification up to class level with examples	6	Discussion - 6
5.2	System Type study - Star fish - external characters and water vascular	7	Lecture - 7
5.3	Larval forms of Echinoderms	5	Discussion - 5

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7		
CO1	4	-	-	4	3	4	4	4	4	4	4	4	4	3.1
CO2	4	-	-	3	4	4	4	4	4	4	4	4	4	3.1
CO3	3	-	-	4	4	4	4	4	4	4	4	4	4	3.1
CO4	4	-	-	3	4	4	4	4	4	4	4	4	4	3.1
CO5	4	-	-	4	3	4	4	4	4	4	4	4	4	3.1
<b>Mean Overall Score</b>													<b>3.1</b>	

**Result: The Score for this Course is 3.1 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	40%	40%
UNDERSTANDING	30%	30%
APPLY	30%	30%

Programme : B. Sc. ZOOLOGY

PART III : CC - II

Semester : I

Hours : 3/W 45/S

Subject Code : U22CZ2P

Credits : 3

**TITLE OF THE PAPER : BIOLOGY OF INVERTEBRATES - PRACTICAL**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/ TUTORIAL
	3	1	-	2

**PREAMBLE :**

This Course will provide Practical skills of the students in identifying the animal species and to show how the form, function and behavior of animals become adapted to the environment.

COURSE OUTCOME	Unit	Hrs P/S	Knowledge level
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Understand the morphological characters of the selected animal species.	1	10	K1
<b>CO2:</b> Gain knowledge about various organ system of the selected invertebrate species.	2	10	K1
<b>CO3:</b> Exhibit practical skills in mounting and correlate structural features.	3	10	K2
<b>CO4:</b> Identify and locate given organ system of an invertebrates by virtual or visual aids.	4	8	K2
<b>CO5:</b> Identify draw and elucidate various structural features of animals of various phyla.	5	7	K3

**SYLLABUS:**

**UNIT I:**

**Virtual dissection:** Cockroach - Nervous system and digestive system. Earthworm -Nervous system (or by model/chart/CD. Students draw diagram and write a detailed account about the system).

**UNIT II:**

**Mounting:** Earthworm – body setae. Prawn appendages.

Mouth parts of housefly, mosquito and cockroach.

**UNIT III:**

**Spotters:**

Protozoa - *Amoeba*, *Paramecium*, and *Plasmodium*.

Porifera - *Leucosolenia* and *Sycon*.

Coelenterata - *Obelia* colony and Medusa.

Platyhelminthes - Larval forms of *Fasciola hepatica* - Sporocyst, Miracidium, Redia, Cercaria and Metacercaria.

#### UNIT IV:

##### Spotters:

Aschelminthes - *Ascaris* male and female.

Annelida - Neries, Heteroneries, Arenicola and Cheatopterus

Arthropoda - Prawn entire, Nauplius, Mysis and Zoea larva.

#### UNIT V:

##### Spotters:

Mollusca - Pila, Fresh water mussel, Chiton and Sepia.

Echinodermata - Star fish - Oral and aboral view, Bipinnaria and Ophiopluteus larva.

Survilence of invertebrate specimens from college campus and report submission. Insect box preparation.

**Course Designer : Dr. E. EMIMAL VICTORIA**

### COURSE CONTENT AND LECTURE SHEDULE

UNITS	TOPIC	PRACTICAL HOURS	MODE OF TEACHING
<b>UNIT 1</b>			
1.1	Virtual dissection: Cockroach- Nervous system and digestive system. Earthworm- Nervous system(or by model/chart/CD. Students draw diagram and write a detailed account about the system).	5	Demo - 3 Tutorial - 2
1.2	Earthworm- Nervous system(or by model/chart/CD. Students draw diagram and write a detailed account about the system).	5	Demo - 3 Tutorial - 2
<b>UNIT II</b>			
2.1	Mounting: Earthworm – body setae. Prawn appendages.	5	Demo - 3 Tutorial - 2
2.2	Mouth parts of housefly, mosquito and cockroach.	5	Demo - 3

			Tutorial - 2
<b>UNIT III</b>			
3.1	Protozoa - Plasmodium, Paramecium and Amoeba. Porifera - Leucosolenia and Sycon.	5	Demo - 3 Tutorial 2
3.2	Coelenterata - Obelia colony and Medusa. Platyhelminthes - Fasciola hepatica - Larval forms of Fasciola hepatica - Sporocyst, Miracidium, Redia, Cercaria and Metacercaria.	5	Demo - 3 Tutorial - 2
<b>UNIT IV</b>			
4.1	Aschelminthes - Ascaris male and female. Annelida - Neries, Heteroneries, Arenicola, Cheatopterus. Arthropoda - Prawn entire, Nauplius, Mysis and Zoea larva.	4	Demo 2 Tutorial 2
4.2	Mollusca - Pila, Fresh water mussel, Chiton and Sepia. Echinodermata - Star fish-Oral and aboral view, Bipinnaria and Ophiopluteus larva.	4	Demo - 2 Tutorial - 2
<b>UNIT V</b>			
5.1	Survilence of invertebrate specimens from college campus and report submission.	4	Demo - 2 Tutorial - 2
5.2	Insect box preparation.	3	Demo - 3

Course outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	-	4	3	4	4	3	3	3	3	3	4	3.2
<b>CO2</b>	4	-	4	-	-	4	4	4	3	-	4	4	2.5
<b>CO3</b>	4	-	4	3	4	4	4	3	3	3	3	4	3.2
<b>CO4</b>	4	4	3	3	3	3	4	4	4	3	-	4	3.2
<b>CO5</b>	3	4	4	4	3	4	3	4	-	3	4	4	3.6
	<b>Mean Overall Score</b>												<b>3.1</b>

**Result : The Score for the Course is 3.1 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	40%	40%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	30%	30%



Programme : B. Sc. ZOOLOGY

Part III : AC - I

Semester : I

Hours : 4/W 60 P/S

Subject Code : U22AZZ1

Credits : 3

**TITLE OF THE PAPER : ECONOMIC ZOOLOGY - I**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS / TUTORIAL
	4	2	-	2

**PREAMBLE :**

The Course offers platform to gain the knowledge on industrial application of silk reeling and marketing and to acquire entrepreneurial skill regarding vermicompost production.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Describe the history of sericulture in India and basic concepts of silkworm rearing.	1	12	K1
<b>CO2:</b> Explain processing of cocoon and apply knowledge of diseases of silkworm to develop entrepreneurship.	2	10	K2
<b>CO3:</b> Acquire knowledge and skills in the establishment and production of vermicompost.	3	15	K3
<b>CO4:</b> Understand the concepts and techniques of vermicomposting.	4	15	K3
<b>CO5:</b> Gain knowledge about lac cultivation and its benefits.	5	8	K2

**SYLLABUS**

**UNIT . I :**

Introduction to Sericulture – SSB, CSB, CSRTI. Types of silkworm – mulberry and non - mulberry. Life cycle of *Bombyx mori*, structure and functions of silk gland. Diseases of silkworm: Protozoan – pebrine, Bacteria - flacherie, Virus - NPV, CPV, Fungal – Muscardine. Pest of silkworm – Uzifly.

**UNIT II :**

Silkworm rearing, Rearing appliances. Mounting, spinning and harvesting of cocoons. Types of cocoons, marketing of cocoons. Cocoon processing and Reeling.

**UNIT III :**

Apiculture - social organizations - types of Honey bees, Significance of honey bees in Agriculture. types of bee hives. Products - honey, bee wax and beevenom.

**UNIT IV :**

Biology of Lac insect – Lac culture. Natural enemies of lac insect - control measures. Significance of lac. Uses of Shellac.

**UNIT V :**

Earthworms – Characteristics. Classification of Earthworm based on habitat – Epigeic species, Endogeic species and Anecic species. Vermiculture and vermi composting – definition, scope, importance and Environmental requirements in vermicomposting. Culture methods - small scale and large scale – pit method, heap method and windrow method. Applications of vermiculture – agricultural and horticultural practices. Vermicast, vermiwash.

**TEXT BOOK:**

1. Johnson M and Kesary M. Sericulture. 4<sup>th</sup> Edn., CSI Press., 2008
2. Seethalakshmi M and Santhi R. Text Book of Vermi technology. Saras Pub., 2012
3. Arumugam N. Applied Zoology. Saras Pub., 2016

**REFERENCE BOOKS:**

1. Ganga G and Sulochana Chetty J. An Introduction to Sericulture. 2<sup>nd</sup> Edn., Oxford and IBH Pub., New Delhi, 2004.
2. Christy AM. Text Book of Vermitechnology. MJP Pub., 2008.
3. Vasantharaj David B and Kumaraswami T. Elements of Economic Entomology.

**Course Designer : DR. E. EMIMAL VICTORIA**

**COURSE CONTENT AND LECTURE SHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT 1</b>			
1.1	Introduction to sericulture Sericulture industry in India.	3	Lecture - 3
1.2	Varieties of Mulberry Types of Silk worm – Mulberry and Non mulberry.	3	Lecture - 2 Video - 1
1.3	Life cycle of <i>Bombyx mori</i> . Struture and functions of silk gland.	3	Lecture - 2 Video - 1

1.4	Silkworm rearing and rearing appliances.	3	Lecture - 2 Group discussion - 1
<b>UNIT II</b>			
2.1	Mounting, spinning and harvesting of cocoons.	2	Lecture - 1 Video - 1
2.2	Types of cocoons, marketing of cocoons.	2	Lecture - 2
2.3	Cocoon processing and Reeling.	2	Lecture - 1 Group discussion - 1
2.4	Diseases of silkworm: Protozoan – pebrine, Fungal – muscardine.	2	Lecture - 2
2.5	Pest of silkworm – Uzifly.	2	Lecture - 2
<b>UNIT III</b>			
3.1	Earthworms – Taxonomic position and diversity, Characteristics .	4	Lecture - 3 Group discussion - 1
3.2	Classification of earthworm based on habitat – Epigeic species, Endogeic species and Anecic species.	4	Lecture - 3 Video - 1
3.3	Vermiculture and vermi composting – definition, scope, importance	4	Lecture - 2 Group discussion - 2
3.4	Environmental requirements in vermi composting	3	Lecture - 2 Group discussion - 1
<b>UNIT IV</b>			
4.1	Culture methods - small scale and large scale – pit method, heap method and windrow method.	4	Lecture - 2 Video - 2
4.2	Factors affecting vermin composting.	3	Lecture - 3
4.3	Applications of vermin culture – agricultural and horticultural practices.	4	Lecture - 2 Group discussion - 2
4.4	Vermicast, vermiwash	4	Lecture - 2 Video - 2
<b>UNIT V</b>			

5.1	Biology of Lac insect – Loc culture	2	Lecture - 2
5.2	Benefits of Lac insect	2	Lecture - 1 Video - 1
5.3	Natural enemies of Lac insect	2	Lecture - 1 Group discussion - 1
5.4	Control measures and uses of Shelloc	2	Lecture - 2

Course outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3.5	4.5	3.5	3	3.5	-	3	4	3	4	4	4	3.3
CO2	3.5	3	4	-	4	-	4.5	4	4	4	2	4	3.0
CO3	4	4	3.5	4	4	3	4	4	4	4	3	3	3.3
CO4	4	4	4	3	3.5	3	-	3	4	4	3	3	3.2
CO5	3	4	4	3	4	3	3	4	4	3	3	4	3.5
<b>Mean Overall Score</b>													<b>3.2</b>

**Result : The Score for the Course is 3.20 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	40%	40%
UNDERSTANDING	30%	30%
APPLY	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : AC - II

Semester : I & II

Hours : 3/W 45/S

Subject Code : U22AZZ2P

Credits : 3

**TITLE OF THE PAPER: ECONOMIC ZOOLOGY - PRACTICAL**

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial
	3	1	-	2

**PREAMBLE:**

- This course will enhance knowledge and practical understanding about Sericulture, Apiculture, Lac culture, Vermicompost, Fishery Biology, Poultry, and Dairy Farming and
- to develop entrepreneurial skills.

COURSE OUTCOME	Unit	Hrs P/S	Knowledge Levels
At the end of the Semester, the Students will be able to			
<b>CO1:</b> gain knowledge on various characteristics of silkworm larvae and pupae rearing practices and diseases of silkworm.	1	11	K1
<b>CO2:</b> infer social organization in honeybee , bee keeping practices and to understand lifecycle of lac insect.	2	9	K2
<b>CO3:</b> comprehend the principles of vermicompost technology, and apply them to exhibit entrepreneurial skills	3	15	K3
<b>CO4:</b> gain knowledge about freshwater and marine fishes and interpret various physico-chemical parameters essential for fishery industry	4	5	K1
<b>CO5:</b> demonstrate knowledge about various chick breeds and their characteristics and also about various cattle diseases and byproducts of dairy industry	5	5	K2

**SYLLABUS**

**UNIT I:**

**Sericulture**

Life Cycle of *Bombyx mori*

Identification of male and female larvae of *Bombyx mori*

Identification of male and female pupae of *Bombyx mori*

Dissection of Silk gland (Demo)

**Spotters:** Rearing appliances

Layout of Model rearing house

Reeling appliance – Country charka

Identification of defective mulberry cocoon

Diseases of silkworm – Pebrine, Muscardine, Uzifly

## **UNIT II:**

### **Apiculture and Lac Culture**

**Spotters:** Species of Honey Bees-*Apis indica*, *Apis mellifera*

Types of Honey bee- Queen bee, worker bee, drone bee

Bee keeping equipments - Newton's Bee hive, Honey Extractor,

Smoker

Life cycle of Lac insect

## **UNIT III:**

### **Vermiculture**

Identification of Species of Earthworm (*Epigeic*, *Endogeic*, *Anecic*)

Collection of vermicast

Collection of cocoon

Collection of hatchlings

### **Fishery Biology**

Freshwater fishes –*Tilapia*, *Labeo*

Marine fishes- *Sardine*, *Shark*

Estimation of pH

Estimation of Dissolved Oxygen of pond water

Estimation of  $CO_2$

## **UNIT IV:**

### **Poultry**

Indigenous breeds of chick-*Aseel*, *Chittagong*

Exotic breed: *Leghorn*, *Rhode Island*

Egg incubator

## **UNIT V:**

### **Dairy Farming**

Identification of diseases in cattle (*Anthrax*, *Mastitis*)

Identification of milk products

\* Filed visit to any Sericulture farm/Vermicompost unit/Fish farm/Poultry farm.

**REFERENCE BOOKS:**

1. Ganga G and Sulochana Chetty J. An Introduction to Sericulture. 2<sup>nd</sup> Edn., Oxford and IBH Pub., New Delhi , 2004
2. Christy AM. Text book of Vermi technology. MJP Pub., 2008
3. Seethalakshmi M and Santhi R. Text book of Vermitechnology. Saras Pub., 2012
4. JawaidAhsan and Sinha SP.A Handbook on Economic Zoology. 5<sup>th</sup>Edn., S. Chand Pub., 2010
5. Sinha RK. Hand book of Fish and Fisheries. Agrotech Press, 2014
6. Gupta SM. Text book of Fishery. Anne Books Pvt. Ltd., 2010
7. Ganamani K. . Modern aspects of Poultry keeping. Hytone Publishers 1997

**Course Designer: DR. V. KABILA**

**COURSE CONTENT AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Life Cycle of <i>Bombyx mori</i> Identification of male and female larvae of <i>Bombyx mori</i> Identification of male and female pupae of <i>Bombyx mori</i>	4	Tutorial-2 Demonstration-2
1.2	Dissection of Silk gland (Demo) Farm implements and their uses	3	Tutorial-1 Demo -2
1.3	Rearing appliances Layout of Model rearing house Reeling appliance – Country charka	2	Tutorial -1 Discussion -2
1.4	Identification of defective mulberry cocoon; Diseases of silkworm – Pebrine, Septicemia, NPV, Muscardine, Uzifly	2	Tutorial-1 Lecture-1

<b>UNIT II</b>			
2.1	Species of Honey Bees- <i>Apis indica</i> , <i>Apis mellifera</i> . Types of Honey bee- Queen bee, worker bee, drone bee	3	Tutorial-1 Demo -2
2.2	Bee keeping equipments - Newton's Bee hive, Honey Extractor, Smoker	3	Tutorial-1 Demonstration-2
2.3	Life cycle of Lac insect	3	Tutorial-1 Demo -2
<b>UNIT III</b>			
3.1	Vermiculture : Identification of Species of Earthworm (Epigeic, Endogeic, Anecic)	2	Tutorial-1 Demo -1
3.2	Collection of vermicast, cocoon and Hatchlings	2	Tutorial-1 Discussion-1
3.3	Identification of Freshwater and marine fishes	2	Lecture-1 Demo -1
3.4	Estimation of pH of water samples	3	Tutorial-1 Demo -2
3.5	Estimation of Dissolved Oxygen of watersamples	3	Tutorial-1 Demo -2
3.6	Estimation of Co <sub>2</sub> of given water samples	3	Tutorial-1 Demo -2
<b>UNIT IV</b>			
4.1	Identification of Indigenous breeds of chick-Aseel, Chittagong and Exotic breed: Leghorn, Rhode Island	5	Lecture-2 Tutorial-3
<b>UNIT V</b>			
5.1	Identification of diseases in cattle (Anthrax, Mastitis) and Identification of milk products	5	Lecture-2 Tutorial-3



Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	3	4	4	4	4	4	4	4	4	--	3.41
CO2	3	3	4	4	4	4	4	4	3	4	4	--	3.41
CO3	4	4	4	3	4	4	4	4	4	4	4	--	3.58
CO4	4	4	4	3	3	4	4	4	3	4	4	--	3.41
CO5	3	3	3	3	3	3	3	4	3	4	3	--	2.91
	<b>Mean Overall Score</b>												<b>3.34</b>

**The Score for this Course is 3.34 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	40%	40%
UNDERSTANDING	30%	30%
APPLY	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : CC - III

Semester : II

Hours : 6/W 90/S

Subject Code: U22CZ3

Credits : 5

**TITLE OF THE PAPER: BIOLOGY OF CHORDATES**

Pedagogy	Hours	Lecture	Peer teaching	GD/Videos/Tutorial	Charts/ Models
	6	4	-	1	1

**PREAMBLE:**

The course helps to understand the basic concepts of general characters and classification of chordates and to understand the structure and physiological system of chordates.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Levels</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Impart basic knowledge about the general characters and classification of Chordates	1	20	K1
<b>CO2:</b> Provide adequate explanation to the students about animal diversity in Pisces through classification and organ systems	2	16	K2
<b>CO3:</b> Understand the unique characters, classification of Amphibians and Reptiles	3	18	K2
<b>CO4:</b> Develop knowledge about the classification and evolutionary significance of Aves	4	16	K2
<b>CO5:</b> Understand analytical thinking about classification and organ systems in Mammals	5	20	K2

**SYLLABUS**

**UNIT I:**

General characters of Chordata and its outline classification. Prochordata - general characters and its outline classification up to class level with example - type study - Amphioxus External Morphology - feeding mechanism and excretory system- Balanoglossus. External Morphology - Tornaria Larva - Affinities of Balanoglossus, Retrogressive metamorphism in Ascidian.

**UNIT II:**

Vertebrata - Pisces - general characters and its classification up to class level with example -

type study - Scoliodon - Placoid Scales - Digestive System, circulatory system, urinogenital system and lateral line system. Migration in Fishes. Affinities of Petromyzon. Accessory Respiratory Organs in Fishes.

### **UNIT III:**

Amphibia - general characters and its classification up to class level with example - type study - Frog - digestive and respiratory system. Parental care in Amphibia. Reptilia - general characters and its classification up to class level with example. Identification of poisonous and non-poisonous snakes of south India. Poison apparatus, biting mechanism, First aid and treatment.

### **UNIT IV:**

Aves – General characters and its classification up to class level with example. Type study - Pigeon – External Morphology - Digestive System, Respiratory system structure of Eye. Flight adaptation in birds. Migration of Birds.

### **UNIT V:**

Mammalia - general characters and its classification up to class level with example. Type study - Rabbit - External morphology, Digestive System, Circulatory System and Urinogenital system. Dentition and Adaptive radiation in Mammals. Adaptations of Aquatic Mammals.

### **TEXTBOOK:**

1. Ekambaranatha Ayyar and Ananathakrishnan TN. A Manual of Zoology. Vol II Chordata, Vishwanathan and Company., 1992

### **REFERENCE BOOKS:**

1. Dhama DS and Dhama JK. Chordate Zoology. R. Chand and Company, 1978.
2. Jordon EL and Verma PS. Chordate Zoology, 14<sup>th</sup> Edn., S. Chand and Company, 2013.
3. Thangamani T and Arumugam N. A Text book of Chordates. Saras Pub., 1992.
4. Thangamani A, Prasannakumar S, Narayanan LM and Arumugam N. A. Text Book of Chordates. 6<sup>th</sup> Edn., Saras Pub., 2014.
5. Thiyagarajan Saba. Zoology Thunai padanool Vol. I & II. Tee Jay Pub., 1998.
6. Vajrapoorani and Sathyaprema. Mudhal Muthukuth Thandudaiyavai. Tamil Nadu Text Book Corporation., 1973.
7. R. L. Kotpal. Modern Text Book of Zoology Vertebrates. 4<sup>th</sup> Edition. Rastogi Publications.

**Course Designer – DR. KALAIARASI ROSELIND**

## COURSE CONTENT AND LECTURE SCHEDULE

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	General characters of Chordata	3	Lecture - 2 Video demo - 1
1.2	Outline classification	4	Lecture - 4
1.3	Prochordata - general characters and its outline classification up to class level with example	3	Lecture - 3
1.4	Type study Amphioxus - External Morphology - Feeding mechanism and excretory system..	5	Lecture - 3 Charts -2
1.5	Balanoglossus External Morphology - Tornaria Larva - Affinities of Balanoglossus, Retrogressive Metamorphism in Ascidian.	5	Lecture - 4 Charts - 1
<b>UNIT II</b>			
2.1	Vertebrata - Pisces - general characters and its classification up to class level with example	3	Lecture - 2 Video Demo- 1
2.2	Type study - Scoliodon - Placoid Scales-Digestive System and circulatory system	4	Lecture - 4
2.3	Urinogenital system and lateral line system.	4	Lecture - 2, Models – 2
2.4	Migration in Fishes. Affinities of Petromyzon. Accessory Respiratory Organs in Fishes	5	Lecture - 4 Video Demo - 1
<b>UNIT III</b>			
3.1	Amphibia - general characters and its classification up to class level with example	4	Lecture - 2 Charts - 2
3.2	Type study - Frog - digestive and respiratory system. Parental care in Amphibia	4	Lecture - 2 Charts - 2
3.3	Reptilia - General characters and its classification up to class level with example.	4	Lecture - 3 Charts - 1

3.4	Identification of poisonous and non-poisonous snakes of south India. Poison apparatus, biting mechanism, First aid and treatment.	6	Lecture - 4 Charts - 2
<b>UNIT IV</b>			
4.1	Aves - General characters and its classification up to class level with example	3	Lecture - 2 Video Demo - 1
4.2	Type study - Pigeon External Morphology	3	Lecture - 3
4.3	Digestive System, Circulatory System, Structure of Eye	5	Lecture - 3 Charts - 2
4.4	Flight Adaptation in Birds and Migration of Birds	5	Lecture - 3 Charts - 2
<b>UNIT V</b>			
5.1	Mammalia - general characters	3	Lecture - 2 Video Demo - 1
5.2	Classification up to class level with example	4	Lecture - 2 Charts - 2
5.3	Type study - Rabbit - External morphology	3	Lecture - 2 Charts - 1
5.4	Digestive System, Circulatory System and Urinogenital system	5	Lecture - 3 Charts - 2
5.5	Dentition, Adaptations of Aquatic Mammals	3	Lecture - 2 Video Demo - 1
5.6	Adaptive radiation in Mammals.	2	Lecture - 2

Course Outcomes (COs)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO 1	3	3	2	4	4	3	4	3	4	4	4	3	3.4
CO 2	4	4	3	3	4	4	2	3	4	4	3	4	3.5
CO 3	4	4	3	2	4	3	4	3	4	2	4	4	3.4
CO 4	4	4	3	4	4	4	3	4	4	3	4	4	3.8
CO 5	4	3	3	4	4	4	4	4	4	3	4	3	3.7
<b>Mean overall score</b>													<b>3.6</b>

**Result: The score for this course is 3.6 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	40%	40%
UNDERSTANDING	30%	30%
APPLY	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : CC - IV

Semester : II

Hours : 3/W 45/S

Subject Code : U22CZ4P

Credits : 3

**TITLE OF THE PAPER: BIOLOGY OF CHORDATES - PRACTICAL**

Pedagogy	Hours	Demonstration	Peer Teaching	GD/VIDEOS/TUTORIAL
	3	2	-	1

**PREAMBLE:**

This course will develop practical skills of the students in identifying the animal species and to show how the form, function and behaviour of animals become adapted to the environment.

COURSE OUTCOME	Unit	Hrs P/S	Knowledge Level
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Understand the morphological characters of the selected animal species.	1	9	K2
<b>CO2:</b> Gain knowledge about the various organ systems of the selected chordate species.	2	9	K2
<b>CO3:</b> Illustrate the anatomical features of the organ systems of the selected species of chordates.	3	9	K2
<b>CO4:</b> Exhibit the practical skill on mounting and correlate the structural features	4	9	K3
<b>CO5:</b> Identify, draw and elucidate various structural features of chordates	5	9	K3

**SYLLABUS**

**UNIT I**

**External Morphology** – Shark, Frog, Calotes, Pigeon and Rat

**UNIT II**

**Dissection:** Virtual dissection by Model/Chart/ CD:

Shark - Cranial Nerves.

Frog - Digestive system, Arterial and Venous systems

**UNIT III: Virtual Dissection** - V and VII Cranial nerves - Frog

Calotes - Urinogenital system

(Students have to draw diagram and write a detailed account about the system)

**UNIT IV:**

**Preparation of Temporary Slides:**

- (a). Placoid Scales
- (b). Cycloid Scales
- (c). Ctenoid Scales
- (d). Mounting of human RBC

**UNIT V:**

**Spotters: (museum specimen, slides, models and charts)**

Prochordata – *Amphioxus*, *Balanoglossus* and *Acidian*

Pisces – *Narcine*, *Anabus*, *Echeneis*, *Eel*, *Clarius* and *Hippocampus*

Amphibia – *Rhacophorus*, Salamander and *Alytes*

Annelida - *Nereis*, *Heteronereis*, *Arenicola*, *Cheatopterus*

Reptilia – Cobra, Viper, Chameleon and *Draco*

Poison apparatus of Snake

Aves – Ostrich and Pelicon

Mammalia – Ant eater and Bat

**Reference Books:**

Poddar T, Mokhopadhyay B and Das SK. An advanced Laboratory Manual of Zoology.

Macmillan Pub., 2010

Verma PS. A Manual of Practical Zoology. S. Chand and Company Ltd., 2007

**Course Designer: DR. G. SASIREKA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	PRACTICAL HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1	<b>External Morphology</b> – Shark, Frog, Calotes, Pigeon and Rat	9	Demo - 6 Tutorial - 6



<b>UNIT II</b>			
2	<b>Dissection:</b> Virtual dissection (or by Model/Chart/CD): Shark - Cranial Nerve Frog-Digestive system, Arterial and Venous systems	9	Demo - 7 Tutorial - 7
<b>UNIT III</b>			
3	Frog-V and VII Cranial nerves  Calotes - Urinogenital system (Students have to draw diagram and write a detailed account about the system)	9	Demo - 6 Tutorial - 6
<b>UNIT IV</b>			
4	<b>Preparation of Temporary Slides:</b> (a) Placoid Scales (b) Cycloid Scales (c) Ctenoid Scales (d) Mounting of human RBC	9	Demo - 7 Tutorial - 7
<b>UNIT V</b>			
5	<b>Spotters: (museum specimen, slides, models and charts)</b>  Prochordata– <i>Amphioxus</i> , <i>Balanoglossus</i> and <i>Acidian</i>  Pisces – <i>Narcine</i> , <i>Anabus</i> , <i>Echeneis</i> , <i>Eel</i> , <i>Clarius</i> and <i>Hippocampus</i>  Amphibia– <i>Rhacophorus</i> , Salamander and <i>Alytes</i>  Annelida - <i>Nereis</i> , <i>Heteronereis</i> , <i>Arenicola</i> , <i>Cheatopterus</i>  Reptilia – <i>Cobra</i> , <i>Viper</i> , <i>Chameleon</i> and <i>Draco</i>  Aves– <i>Ostrich</i> and <i>Pelicon</i>  Mammalia– <i>Ant eater</i> and <i>Bat</i>	9	Demo - 4  Tutorial - 4

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	-	2	4	3	4	4	4	3	4	4	4	3.3
<b>CO2</b>	3	3	3	3	3	4	3	4	3	4	4	3	3.3
<b>CO3</b>	3	3	3	3	3	4	3	4	3	4	4	3	3.3
<b>CO4</b>	4	2	4	4	3	4	3	4	3	4	4	3	4
<b>CO5</b>	4	3	4	4	4	4	4	4	3	4	4	3	4
<b>Mean Overall Score</b>													<b>3.6</b>

**Result: The Score for this Course is 3.6 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
<b>KNOWLEDGE</b>	40%	40%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	30%	30%

**Programme : B. Sc. ZOOLOGY**

**Part III : AC - III**

**Semester : II**

**Hours : 4/W 60/S**

**Subject Code : U22AZZ3**

**Credits : 4**

**TITLE OF THE PAPER: ECONOMIC ZOOLOGY - II**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>TUTORIAL</b>
	4	2	-	2

**PREAMBLE:**

The students will understand the nutritional ,medicinal and economical values of Fishes,Chicks and Honey bees and to gain knowledge about these towards Entrepreneurship

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Learn the importance of Government organizations and Indian economy related to fishery and acquire the knowledge about the classification of fisheries.	1	12	K2
<b>CO2:</b> Understand the various methods of fish culture	2	12	K3
<b>CO3:</b> Learn the basic techniques involved in ornamental fish culture.	3	12	K2
<b>CO4:</b> Understand the Poultry farming and practice to rear them in their fields	4	12	K3
<b>CO5:</b> Understand the Dairy farming and management	5	12	K3

**SYLLABUS**

**UNIT I:**

Scope of Fisheries - Central and State Government organizations related to fisheries - CMFRI, CIFRI, CIFA, CIBA, MPEDA, Classification of fisheries.

**UNIT II:**

Culture Fisheries - site selection - construction of ponds - Monoculture, Polyculture, paddy cum fish culture, sewage fed fish culture.

Hypophysation technique - Ecological factors influencing spawning in carps. –

Temperature, pH and DO (Dissolved Oxygen). Fish processing and preservation. Economic importance of fishes - fish marketing.

**UNIT III:**

Ornamental fish culture - Gold fish, Angel fish, fighter fish, Molly, Guppy - Maintenance of Home Aquarium. Crustacean fisheries - shrimp, lobster and crab. Artificial pearl culture.

**UNIT IV:**

Poultry industry - indigenous breeds - Aseel, Chittagong. Exotic breeds - Leghorn, Rhode island red. Rearing - Cage and deep litter system. Management - winter and summer. Poultry diseases - Ranikhet and Fowl cholera. Poultry products - egg, meat and manure. Indian economy.

**UNIT V:**

Introduction to dairy farming - Dairy animals - Goat - Jamunapari and Malabari, Cow - Sindhi, Jersey, Buffaloes - Murrah, Jaffrabadi. Cattle management - new born, heifer and milking cow. Milk and milk products. Cattle diseases - mastitis, anthrax.

**TEXT BOOK:**

1. Zade S. B, Khune. C. J .Principles of Aquaculture.Himalaya publishing House.2011
2. Manjuyadav. Economic Zoology. Discovery publishing House, 2003

**REFERENCE BOOKS:**

- 1.Gupta S M. Text book of Fishery. Anne Books Pvt. Ltd., 2010
2. Gnanamani M R. Modern Aspects of Poultry Keeping. Deepam. Pub., 2010
3. Malhotra P. Economic Zoology. Adhyayan Pub. 2008
4. Sinha R K. Hand book of Fish and Fisheries. Agrotech Press. 2014

**Course Designer: MRS. N. AMUTHA**

## COURSE CONTENTS AND LECTURE SCHEDULE

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1. 1	Government organizations - CMFRI, CIFRI, CIBA, MPEDA	6	Lecture - 5 Chart-1
1. 2	Classification of fisheries	6	Charts - 1 Lecture - 5
<b>UNIT II</b>			
1. 1	Fish culture methods	3	Lecture - 2 Video-1
2.2	Construction of ponds	2	Charts - 1 Lecture - 1
2.3	Hypophysation technique	3	Lecture - 2 Video - 1
2.4	Culture practices	4	Lecture - 4
<b>UNIT III</b>			
3.1	Ornamental fishes	6	Lecture - 6
3.2	Maintenance of home aquarium and marketing	6	Lecture - 5 Video - 1
<b>UNIT IV</b>			
4.1	Poultry industry	3	Charts with Lecture - 3
4.2	Poultry breeds	3	Charts with Lecture - 3
4.3	Rearing, management and poultry products	4	Lecture - 1 Field visit - 3
	Poultry diseases	2	Lecture and Video - 2
<b>UNIT V</b>			
5.1	Dairy farming	4	Lecture - 4

5.2	Dairy breeds	2	Charts with Lecture - 2
5.3	Farming and management	3	Lecture - 3
5.4	Dairy products and diseases	3	Visual aids and Lecture - 3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	3	4	2	4	3	4	-	3	4	4	4	3	3.2
<b>CO2</b>	4	4	-	3	4	3	-	4	3	4	4	4	3.1
<b>CO3</b>	3	4	-	4	4	3	-	3	4	3	4	4	3.0
<b>CO4</b>	4	4	-	4	3	3	-	4	3	4	4	4	3.1
<b>CO5</b>	4	4	-	4	3	3	-	3	4	4	4	4	3.1
<b>Mean Overall Score</b>													<b>3.1</b>

**Result: The Score for this Course is 3.1 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos\& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	40%	40%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : CC - V

Semester : III

Hours : 6/W 90/S

Subject Code : U22CZ5

Credits : 5

**TITLE OF THE PAPER : GENETICS AND BIODIVERSITY**

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial
	5	3	1	1

**PREAMBLE:**

This course enables to acquire knowledge on basic principles of Genetics and Biodiversity, understand the concepts of gene interaction and the laws and needs to conserve Biodiversity and apply the gained knowledge in genetic counseling and conservation of biodiversity.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowl edge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Acquire knowledge on Mendelian principles, understanding gene interaction and apply the knowledge practically in donating blood to the needy.	1	18	K2
<b>CO2:</b> Recognize and correlate the relationship between linkage and crossing over of genes and analyse gene frequency.	2	18	K3
<b>CO3:</b> Identify and analyse the risk factors causing anomalies of chromosomes and apply the knowledge practically in human genetic counseling for the welfare of the society.	3	18	K3
<b>CO4:</b> Enrich knowledge on biodiversity and to understand the causes of extinction of animals, apply the skills to conserve biodiversity.	4	18	K3
<b>CO5:</b> Involve themselves in practicing the policies on biodiversity and strive for harmonious existence of the environment.	5	18	K3

**SYLLABUS**

**UNIT I:**

Introduction - Mendelian principles - monohybrid cross- back cross - test cross - dihybrid cross- Mendel's laws. Gene Interaction – Non allelic - complementary, supplementary and epistatic interaction. Allelic - complete and incomplete dominance, co-dominance. Multiple allelism - ABO blood grouping.

**UNIT II:**

Linkage - types of linkage, arrangement of linked genes. Crossing over- mechanism and types. Chromosome mapping-construction of chromosome map in *Drosophila*. Population genetics - gene pool, gene frequency and genotype frequency, genetic equilibrium, Hardy - Weinberg law, Factors affecting Hardy Weinberg Law.

**UNIT III:**

Human genetics - Sex determination in man - sex-linked genes- haemophilia, colour blindness. Karyotyping - karyotype and idiogram. Anomalies in sex chromosomes - Klinefelter's, Turner's syndrome. Anomalies in autosomes - aneuploidy and polyploidy in man, Down's syndrome, twins - types and origin. Genetic counselling - Eugenics, Euthenics and Euphenics..

**UNIT IV:**

Biodiversity - Earth summit, definition, types - genetic, species and ecosystem, hotspots. IUCN categories of threat, Red Data Book - causes for extinction.

Biodiversity Measurement and Conservation - Biodiversity indices –  $\alpha$ ,  $\beta$  and  $\gamma$  diversity. *In-situ* conservation - Wild life sanctuaries and National parks, *Ex-situ* conservation – cryopreservation and gene bank.

**UNIT V:**

Biodiversity Policy and Management - National Biodiversity Register - policy and management implications. Organizations involved in Biodiversity - National and International. Recent policies on Biodiversity - Kyoto Protocol - Recent conservative measures taken by the Government of India to preserve biodiversity, Ramsar Convention. NBPGR, BSI, ZSI, WWF, IUCN.

**TEXT BOOK:**

1. Study Material
2. Verma VK and Agarwal SK. Genetics. S. Chand and Company, 2000
3. Introduction to Biodiversity. Krishnamoorthy K Oxford and IBH, 2003

**REFERENCE BOOKS:**

1. Gardner EJ, Simmons MJ and Snustad DP. Principles of Genetics. John Wiley and Smith Inc., 2010
2. Russel PJ. Genetics - A Molecular Approach. 3<sup>rd</sup> Edn., Pearson Edn. Inc., 2010
3. Strickberger MW. Genetics. 3<sup>rd</sup>Edn., PHI Learning Pvt. Ltd ., 2013
4. Bharucha E. The Biodiversity of India. Mapin Pub. Pvt. Ltd., 2000

**Course Designer: DR. M. KALAIARASI**



## COURSE CONTENTS AND LECTURE SCHEDULE

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Introduction- Mendelian principles - monohybrid cross- back cross - test cross -dihybrid cross	4	Lecture - 3 Video - 1
1.2	Mendel's laws	3	Lecture - 3
1.3	Gene interaction – Non allelic - complementary, supplementary and epistatic interaction.	5	Lecture - 3 Video - 1 Peer teaching - 1
1.4	Allelic - complete and incomplete dominance, co-dominance	4	Lecture - 3 Video - 1
1.5	Multiple allelism- ABO blood grouping	2	Lecture - 2
<b>UNIT II</b>			
2.1	Linkage - types of linkage, arrangement of linked genes	4	Lecture - 3 Video - 1
2.2	Crossing over- mechanism, types	4	Lecture - 4
2.3	Chromosome mapping-construction of chromosome map in Drosophila.	4	Lecture - 3s Group Discussion - 1
2.4	Population genetics - gene pool, gene frequency and genotype frequency, genetic equilibrium	4	Lecture - 3 Tutorial - 1
2.5	Hardy - Weinberg law - Factors affecting Hardy Weinberg Law	2	Lecture - 2hrs
<b>UNIT III</b>			
3.1	Human genetics -Sex determination in man sex-linked genes- haemophilia, colour blindness	4	Lecture - 3 Video - 1
3.2	Karyotyping - karyotype and idiogram	2	Lecture - 1 Video - 1
3.3	Anomalies in sex chromosomes -	3	Lecture - 2

	Klinefelter's and Turner's syndrome - Down's syndrome		Video - 1
3.4	Anomalies in autosomes- aneuploidy and polyploidy in man	4	Lecture - 2 Video - 1 Discussion - 1
3.5	Heredity of twins – types and origin	2	Lecture - 1 video - 1
3.6	Genetic counseling - Eugenics, Euthenics and Euphenics	3	Lecture - 2 Discussion - 1
<b>UNIT IV</b>			
4.1	Biodiversity - definition, types and components,	3	Lecture - 3
4.2	Species categories – rare, endangered and threatened species	3	Lecture - 2 video - 1
4.3	Red data Book – Causes for extinction	2	Lecture - 2
4.4	Biodiversity measurement and conservation - Biodiversity indices – $\alpha$ , $\beta$ and $\gamma$ diversity	5	Lecture - 3 GD - 1 Video - 1
4.5	<i>In-situ</i> conservation - Wild life sanctuaries, National parks. <i>Ex-situ</i> conservation – cryopreservation and gene bank.	5	Lecture - 3 Video - 2
<b>UNIT V</b>			
5.1	Animal Biodiversity policy and management – National Biodiversity Register – policy and management implications	5	Lecture - 3 Video - 1 Discussion - 1
5.2	Organizations involved in Biodiversity.	4	Lecture - 3 Video - 1
5.3	Recent Policies on Biodiversity – Kyoto Protocol.	4	Lecture - 2 Video - 1 Discussion - 1
5.4	Recent conservative measures taken by the Government of India to preserve Biodiversity. Role	5	Lecture - 3 Video - 1

	of NBPGR, BSI, ZSI, WWF, IUCN – Ramsar Convention		Discussion - 1
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Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	3	3	2	4	2	2	2	4	3	4	3.08
CO2	4	4	4	3	4	4	4	2	2	3	4	3	3.41
CO3	4	4	4	3	4	4	4	4	4	4	4	4	3.91
CO4	4	4	4	3	4	3	2	3	4	4	4	4	3.58
CO5	4	3	4	3	4	2	3	4	4	3	3	4	3.41
<b>Mean Overall Score</b>													<b>3.50</b>

**Result: The Score for this Course is 3.50 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	40%	40%
APPLY	30%	30%

**Programme : B. Sc. ZOOLOGY**

**Part III : CC - VI**

**Semester : III**

**Hours : 3/W 45/S**

**Subject Code : U22CZ6P**

**Credits : 3**

**TITLE OF THE PAPER : GENETICS AND BIODIVERSITY - PRACTICAL**

<b>Pedagogy</b>	<b>Hours</b>	<b>Demonstration</b>	<b>Peer Teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>
	3	1	-	2

**PREAMBLE:**

The course will enable the students to gain practical knowledge about the principles and techniques involved in genetics and gain knowledge about Biodiversity.

<b>COURSE OUTCOME</b>	<b>Units</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the semester, the student will be able to		<b>P/S</b>	
<b>CO1:</b> Understand the principles of Mendelian inheritance and significance of Barr body in human.	1	9	K2
<b>CO2:</b> Enrich their knowledge and understand the genetic Crossing.	2	9	K3
<b>CO3:</b> Understand the application of Blood Grouping in man.	3	9	K3
<b>CO4:</b> Appreciate the diversity of flora and fauna.	4	9	K1
<b>CO5:</b> Understand the Ecological Significance of Land/Marine/ Fores	5	9	K2

**SYLLABUS**

**UNIT I:**

**Experiments:**

A Survey of Mendelian traits in man (in Class Population)

Identification of Barr body from human buccal smear

**UNIT II:**

Verification of Monohybrid cross

Verification of Dihybrid cross.

**UNIT III:**

Determination of Blood Grouping in man

**Spotters:**

Identification of male and female drosophila

Test Cross

Klinefelter's syndrome  
 Turner 's syndrome,  
 Down Syndrome ,  
 Human Karyotype - male and female,  
 Pedigree analysis – Preparation of Pedigree chart

**UNIT IV:**

Survey of flora and fauna in the campus study and submission of report.  
 Calculation of Shannon Index  
 Calculation of Simson's Index

**UNIT V:**

**Spotters:**

Endangered Species: Giant Panda, Tiger, Rhinoceros  
 Corridor Species : Wild life – Deer, Lizard, Tortoise  
 Marking Biodiversity Hotspot in India in a map

- A field visit to any one Ecosystem (Land/Marine/Forest)

**REFERENCE BOOKS**

1. Rajan S and Selvi Christy; Experimental Procedures in Life Sciences, Anjaana Book house., 2012
2. Poddar T. Mukhopadhyays, Das S.K; An Advanced Laboratory manual of Zoology, Rajiv Beri for Mac millan.

**Course Designer : MRS. P. YUVARANI**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPICS</b>	<b>PRACTICAL HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	A survey of Mendelian traits in man (in class population).	3	Demo - 1 Tutorial - 2
1.2	Identification of Barr body from human buccal Smear.	6	Demo -1 Tutorial - 2
<b>UNIT II</b>			

2.1	Verification of Monohybrid Cross	3	Demo -1 Tutorial - 2
2.2	Verification of Dihybrid cross	6	Demo -1 Tutorial - 2
3.1	Determination of Blood Grouping in man	3	Demo -1 Tutorial - 2
3.2	Spotters: Identification of male and female drosophila Test Cross Klinefelter's syndrome Turner 's syndrome, Down Syndrome , Human Karyotype - male and female, Pedigree analysis – Preparation of Pedigree chart	6	Tutorial - 9
4.1	Survey of flora and fauna in the campus study and submission of report	3	Tutorial - 3
4.2	Calculation of Shannon Index Calculation of Simson's Index	6	Tutorial - 6
5.1	Spotters: Endangered Species: Giant Panda, Tiger, Rhinoceros Corridor Species : Wild life – deer, Lizard, tortoise , Marking Biodiversity Hotspot in India in a map.  A field visit to any one Ecosystem (Land/Marine/Forest)	9	Tutorial - 9

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	4	-	4	4	4	4	4	-	4	3	3	3.16
<b>CO2</b>	4	4	-	4	4	4	4	4	-	4	3	3	3.16
<b>CO3</b>	4	4	-	4	4	4	4	4	-	4	3	3	3.16
<b>CO4</b>	4	4	-	4	4	4	4	4	-	4	3	3	3.16
<b>CO5</b>	4	4	-	4	3	4	4	4	-	4	3	3	3.08
<b>Mean overall Score</b>												<b>3.14</b>	

**Result : The Score for this Course is 3.14 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	40%	40%
<b>APPLY</b>	30%	30%

**Programme : B.Sc. ZOOLOGY**

**Semester : III**

**Subject Code : U22NMZ1**

**Part IV : NMEC - I**

**Hours : 2/W 30/S**

**Credits : 2**

**TITLE OF THE PAPER: HUMAN REPRODUCTIVE BIOLOGY**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>
	2	1	-	1

**PREAMBLE:**

The course will provide basic knowledge on reproductive physiology for non-major students, make the students to learn the scientific facts about foetal growth and population control measures.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> To understand the structure of human Reproductive biology for non major students.	1	6	K1
<b>CO2:</b> To gain the basic knowledge on reproductive biology for non major students.	2	6	K2
<b>CO3:</b> To explain the different developmental stages of foetus, Immunization schedule and nutritional requirements.	3	6	K2
<b>CO4:</b> To demonstrate the parturition lactation and abortion during delivery.	4	6	K2
<b>CO5:</b> To describe the male and female infertility , birth control measures , Sexually transmitted diseases.	5	6	K3

**SYLLABUS**

**UNIT I:** Reproductive system - Female reproductive organ – structure, oogenesis. menstrual cycle – hormones. Male reproductive organ – structure – spermatogenesis - hormones.

**UNIT II:** Fertilization – beginning of life – blastula, implantation, gestation period – pregnancy – signs and symptoms –pregnancy test – hormonal changes.

**UNIT III:** Stages of foetal development – trimester stages – placenta – functions – care during pregnancy – immunization for mother – nutritional requirements.



**UNIT IV:** Parturition – lactation – abortion and still born during delivery – causes.

**UNIT V:** Infertility in male and female – causes. Birth control measures – reproductive tract infections – sexually transmitted diseases.

**REFERENCES:**

1. Handouts prepared by Family Planning Association of India
2. Kemper D. Health wise Handbook
3. Townsend L. Obstetrics for students, 3<sup>rd</sup>Edn. Macmillan Company, 2003

**Course Designer: MRS. P. YUVARANI**

**COURSE CONTENT AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Reproductive system-female reproductive organ	2	Lecture - 1 Charts - 1
1.2	Structure, oogenesis. menstrual cycle	2	Lecture - 1 Charts - 1
1.3	Male reproductive organ – structure – spermatogenesis – hormones	2	Lecture - 1 Charts - 1
<b>UNIT II</b>			
2.1	Fertilization – beginning of life	2	Lecture - 1 Charts- 1
2.2	Blastula, implantation, gestation period	2	Lecture - 1, Visual aids - 1
2.3	Pregnancy – signs and symptoms –pregnancy test-hormonal changes	2	Lecture -1 , Chart -1
<b>UNIT III</b>			
3.1	Stages of foetal development – trimester stages –	3	Visual aids -1

	placenta – functions		Charts- 1, Lecture - 1
3.2	Care during pregnancy – immunization for mother – nutritional requirements.	3	Visual aids- 1, Charts -1, Lecture - 1
<b>UNIT IV</b>			
4.1	Parturition – lactation	3	Visual aids - 1 Charts -1 Lecture - 1
4.2	Abortion and delivery – causes.	3	Visual aids - 1 Charts - 1 Lecture - 1
<b>UNIT V</b>			
5.1	Infertility in male and female – causes	2	Lecture - 1 Charts – 1
5.2	Birth control measures	2	Lecture -1 Visual aids - 1
5.3	Reproductive tract infections – sexually transmitted diseases	2	Lecture - 1 Visual aids – 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	3	4	3	4	4	-	4	4	4	-	4	4	3.16
<b>CO2</b>	3	3	4	4	4	-	4	4	4	-	4	4	3.16
<b>CO3</b>	4	-	4	4	4	-	4	4	4	-	4	4	3.00
<b>CO4</b>	4	4	4	4	4	-	3	3	4	-	4	4	3.16
<b>CO5</b>	4	3	4	4	4	-	4	4	4	-	4	4	3.25
<b>Mean Overall Score</b>												<b>3.14</b>	

**Result: The Score for this Course is 3.14 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	40%	40%
<b>APPLY</b>	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : CC - VII

Semester : IV

Hours : 4/W 60/S

Subject Code : U22CZ7

Credits : 4

**TITLE OF THE PAPER: CELL AND MOLECULAR BIOLOGY**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	4	2	-	2

**PREAMBLE:**

This course helps to gain a better picture of the cellular environment with greater understanding of how cellular processes are regulated at the molecular level.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Understand and appreciate the diversity of life and illustrate that fundamental structural units define the function of all living things.	1	12	K2
<b>CO2:</b> Describe, relate and summarize the structure and functions of cell organelles in the cell. Knowing the components of cells and how they work is fundamental to all biological sciences.	2	12	K2
<b>CO3:</b> Understand and familiarize the structure and functions of nuclear components. Discuss the cyclic events, types of cell division and distinguish between mitosis and meiosis.	3	12	K3
<b>CO4:</b> Analyze the structure and functions of DNA and RNA and their types in the cell. Discuss the mechanism associated with Gene expression and its regulation. Explain that the growth, development, and behavior of organisms are activated through the expression of genetic information in context.	4	12	K3
<b>CO5:</b> Summarize that biological systems grow and change by processes based upon chemical transformation pathways and identify social and historical dimensions of biological investigation. Define and identify different types of mutations and explain the causes of mutation.	5	12	K3

## **SYLLABUS**

### **UNIT I:**

Cell Theory, structure of Prokaryotic and Eukaryotic cell, difference between Prokaryotic and Eukaryotic cell. Ultra structure and chemical composition of plasma membrane (Lamellar - model, micellar model and fluid mosaic model). Functions of plasma membrane.

### **UNIT II:**

Mitochondria - structure of mitochondria, biogenesis and functions of mitochondria (Respiratory chain complex and Electron transport mechanism). Endoplasmic Reticulum, Ribosome, Golgi Bodies and Lysosomes - structure, functions and importance.

### **UNIT III:**

Nucleus - structure, functions and importance. Chromosomes - types. Giant chromosomes, Polytene chromosome and Lampbrush chromosome. Cell Division - Mitosis (cell cycle stages, cytokinesis) Meiosis (reproductive cycle stages, synaptonemal complex, recombination nodules). Comparison between meiosis and mitosis.

### **UNIT IV:**

DNA - Chemical composition and structure of DNA (Watson And Crick). Types of DNA - A, B and Z, replication of DNA . Structure, types and function of RNA.

### **UNIT V:**

Genetic Code - Types and Properties. Protein Synthesis - Transcription - initiation, elongation and termination; Translation - initiation, elongation and termination. Gene regulation - Operon hypothesis. Mutation - mutagens and its types.

### **TEXT BOOKS:**

Power CB. Cell Biology. 3<sup>rd</sup> Edn., Himalaya Pub., 1983.

### **REFERENCE BOOKS:**

1. Benjamin Lewi. Genes VII. Oxford University Press, New York., 2000
2. David Ferifelder. Essentials of Molecular Biology. Narosa Pub., 2001
3. Twyman R. M. Advanced Molecular Biology. Viva Books Pvt., 2002
4. Verma P. S and Agarwal V. K. A Text Book of Cytology. S. Chand and Company, 1979.

**Course Designer: DR. JOTHI SAM**

## **COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Prokaryotic and Eukaryotic cell. Difference between Prokaryotic and Eukaryotic cell	6	Lecture - 3 Tutorial - 3
1.2	Plasma membrane - ultra structure, biochemistry, model and functions	6	Lecture - 3 Tutorial - 2 Video - 1
<b>UNIT II</b>			
2.1	Cytoplasmic organelles - structure and functions of mitochondria, golgi apparatus	6	Lecture - 3 Tutorial - 2 Video - 1
2.2	Endoplasmic reticulum, ribosomes and lysosomes - structure, functions and Importance	6	Lecture - 3 Tutorial - 2
<b>UNIT III</b>			
3.1	Nuclear components - nucleus, nucleolus and nucleosomes	4	Lecture - 4
3.2	Chromosomes - structure and types. Special types - giant - lamp brush chromosome and polytene chromosomes	4	Lecture - 3 Video - 1
3.3	Cell cycle and cell division - mitosis and meiosis	4	Lecture - 3 Video - 1
<b>UNIT IV</b>			
4.1	DNA as a genetic material – experimental proof. DNA - structure and types	4	Lecture - 5
4.2	DNA replication - mechanism	4	Lecture - 3 Tutorial - 1
4.3	RNA – types and functions - tRNA, mRNA and rRNA	4	Lecture - 3 Tutorial - 2
<b>UNIT V</b>			
5.1	Genetic code - properties. Protein synthesis - mechanism - inhibitors of protein synthesis	4	Lecture - 4
5.2	Regulation of gene expression - Lac operon	4	Lecture - 4
5.3	Mutation - molecular basis of mutation. Mutagens -	4	Lecture - 3

	physical and chemical		Tutorial - 2
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Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	3.5	3.5	3.5	3	4	4	3	3	1	2	1	3.0
CO2	4	3.5	3	3.5	3	4	4	3	2	1	2	1	2.8
CO3	4	3.5	3.5	3.5	3	4	4	3	3	1	3	1	3.3
CO4	4	3.5	3.5	4	3	4	4	4	3	1	3	2	3.3
CO5	4	4	3.5	4	3	4	4	4	4	1	3.5	2	3.4
<b>Mean Overall Score</b>													<b>3.16</b>

**Result: The Score for this Course is 3.16 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	40%	40%
APPLY	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : CC - VIII

Semester : IV

Hours : 3/W 45/S

Subject Code : U22CZ8P

Credits : 3

**TITLE OF THE PAPER: CELL AND MOLECULAR BIOLOGY -  
PRACTICAL**

Pedagogy	Hours	Demonstration	Peer Teaching	GD/VIDEOS/TUTORIAL
	3	1	-	2

**PREAMBLE:**

This practical course will facilitate the students to demonstrate various techniques to learn and understand the morphology, identification, functions and propagation of cells, cellular organelles and biomolecules.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> To understand the basic techniques to work with cells. To demonstrate working principles of Microscopy. To understand and perform cell staining techniques. Demonstrate practical skills in different laboratory equipment's and their handling.	1	9	K2
<b>CO2:</b> Demonstrate the different types of blood cells. Understand, analyse and appreciate the different cellular organelles of the eukaryotic and prokaryotic cells.	2	9	K2
<b>CO3:</b> Understand and familiarize the structure and functions of nuclear components. To identify the various stages of mitosis.	3	9	K3
<b>CO4:</b> Provide the students practical skills in basic molecular biology and microbial bioresources.	4	9	K3
<b>CO5:</b> Execute qualitative and quantitative analysis to interpret biological data.	5	9	K3

**SYLLABUS**

**UNIT I:**

1. Principles of microscopy - Compound microscope, phase contrast and fluorescent microscope.
2. Identification of given animal and bacterial cells and their components by microscopy.



3. Leishman Staining
4. Giemsa Staining
5. Study of Animal cell types basic structure using micrographs or models.
6. Study of bacterial cell structure, shape and arrangement using micrographs or model.

**UNIT II:**

1. Blood as liquid tissue - demonstrating the different types of blood cells.
2. Studying the different cellular organelles of the eukaryotic and prokaryotic cells with animation and micrographs or models -
  - A. Mitochondria
  - B. Endoplasmic Reticulum
  - C. Ribosome
  - D. Golgi Bodies
  - E. Lysosomes
  - F. Nucleus

**UNIT III:**

1. Preparation and identification of Salivary gland polytene chromosomes from chironomous sp. Larva.
2. Staining for different stages of mitosis in *Allium cepa* (Onion)
3. Preparation and identification of Squamous epithelium.

**UNIT IV:**

1. Genomic DNA Isolation
2. Quantitative estimation of DNA
3. Demonstration of Bacterial Transformation

**UNIT V:**

1. Structure of DNA
2. Structure of tRNA

3. Structure of mRNA
4. Structure of rRNA
5. Proteins - Structure - Primary, Secondary, Tertiary and Quaternary

**REFERENCES:**

1. Poddar T, Mokhopadhyay B and Das SK. An advanced Laboratory Manual of Zoology. Macmillan Pub., 2010.
2. K. V. Chaitanya. Cell And Molecular Biology : A Lab Manual. Kindle Edition. PHI Publishers., 2013.
3. Verma PS. A Manual of Practical Zoology. S. Chand and Company Ltd., 2007.

**Course Designer: DR. JOTHI SAM**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	PRACTICAL HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Principles of microscopy, phase contrast and fluorescent microscopy. Identification of given animal and bacterial cells and their components by microscopy.	3	Demo - 1 Tutorial - 2
1.2	Leishman Staining Giemsa Staining	3	Demo - 1 Tutorial - 2
1.3	Study of Animal cell types basic structure using micrographs or models.  Study of bacterial cell structure, shape and arrangement using micrographs or model.	3	Demo - 1 Tutorial - 2
<b>UNIT II</b>			
2.1	Blood as liquid tissue - demonstrating the different types of blood cells.	3	Demo - 1 Tutorial - 2
2.2	Studying the different cellular organelles of the	6	Charts and Models - 6



<b>CO1</b>	4	4	3	3	1	4	4	4	2	2	4	3	3.2
<b>CO2</b>	4	3	3	3	1	4	4	4	2	3	4	2	3.1
<b>CO3</b>	4	4	4	3	2	4	4	4	3	3	3	3	3.4
<b>CO4</b>	4	4	3	4	3	4	3	4	3	3	2	2	3.3
<b>CO5</b>	4	4	3	4	3	4	4	3	3	3	3	3	3.4
<b>Mean Overall Score</b>													<b>3.3</b>

**Result: The Score for this Course is 3.3 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	40%	40%
<b>APPLY</b>	30%	30%

**Programme : B. Sc. ZOOLOGY**

**Part IV : NMEC - II**

**Semester : IV**

**Hours : 2/W 30/S**

**Sub.Code : U22NMZ2**

**Credits : 2**

**TITLE OF THE PAPER: WOMEN AND CHILD CARE**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>
	2	1		1

**PREAMBLE:**

The course will provide basic knowledge and importance of mother and child health care and to create awareness on the significance of nutrition and preventing deficiency diseases.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Demonstrate the awareness of prevention of common diseases to avoid child health problems	1	6	K2
<b>CO2:</b> Take into account the values and management of personnel hygiene	2	6	K1
<b>CO3:</b> Interpret and perform child care.	3	6	K3
<b>CO4:</b> Access the nutritional requirement of women	4	6	K2
<b>CO5:</b> Recognize, analyze and treat Nutritional deficiency diseases	5	6	K3

**SYLLABUS**

**UNIT I :**

Care of nursing / lactating mother – post natal care. Neonatal care – infant feeding formula, immunization schedule for children.

**UNIT II:**

Minor ailments in children – common fever, cold, diarrhea, vomiting, behavioral problems – causes and prevention – habit formation.

**UNIT III:**

General and personal hygiene – menopause – psychological and physical needs.

**UNIT IV:**

Nutritional requirement for women – puberty and adult stage – aging process.

**UNIT V:**

Nutritional deficiency diseases – iron deficiency anemia – zinc and folic acid deficiency, osteoporosis, hypertension.

**TEXT BOOK:**

Srilakshmi.B. Dietetics. 6<sup>th</sup> Edn. New age international publishers.

**REFERENCE BOOKS:**

1. Handouts prepared by Family Planning Association of India
2. Palanikumar P. Healthy diet. New Horizon Printers, 2007
3. Rajaraman. Child development - A psychological approach. Manora Pub., 2006

**Course Designer: DR. C. RANI VIJAYA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Care of nursing / lactating mother	2	Lecture - 1, Video demo - 1
1.2	Post natal care. Neonatal care	2	Lecture - 1, Video demo - 1
1.3	Infant feeding formula, immunization schedule for children.	2	Lecture - 1, Video demo - 1
<b>UNIT II</b>			
2.1	Infant feeding formula, immunization schedule for children.	2	Lecture - 1, Video demo - 1
2.2	Common fever, cold, diarrhea, vomiting, behavioral problems	2	Lecture - 1, Video demo - 1
2.3	causes and prevention – habit formation	2	Lecture - 2
<b>UNIT III</b>			
3.1	General and personal hygiene	2	Lecture - 2
3.2	Menopause	2	Lecture - 2
3.3	Psychological and physical needs	2	Lecture - 2

<b>UNIT IV</b>			
4.1	Nutritional requirement for women	2	Lecture - 2
4.2	Puberty and adult stage	2	Lecture -2
4.3	Aging process	2	Lecture -2
<b>UNIT V</b>			
5.1	Nutritional deficiency diseases	2	Lecture -2
5.2	Iron deficiency anemia – zinc and folic acid deficiency,	2	Lecture -2
5.3	Osteoporosis, hypertension	2	Lecture -1, video demonstration-1

Course Outcomes (COs)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	4	3	4	-		4	4	3	4	4	3.16
CO2	4	4	4	4	4	-	4	3	4	2	4	4	3.41
CO3	4	3	4	4	4	-		4	4		4	4	2.75
CO4	4	4	4	4	4	-	3	4	4	2	4	4	3.41
CO5	4	4	4	4	4	-		4	4		4	4	3.0
<b>Mean overall score</b>												<b>3.14</b>	

**Result: The score for this course is 3.14 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	40%	40%
<b>APPLY</b>	30%	30%



Programme : B. Sc. ZOOLOGY

Part IV : SEC - I

Semester : IV

Hours : 2/W 30/S

Subject Code : U22SEZ1

Credits : 2

**TITLE OF THE PAPER: BIOINSTRUMENTATION AND BIOTECHNIQUES**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	2	1	--	1

**PREAMBLE:**

To gain knowledge about the principles and applications of basic scientific instruments and to find Placement in scientific companies

<b>COURSE OUTCOME</b> At the end of the Semester, the Students will be able to	<b>Unit</b>	<b>Hrs</b> <b>P/S</b>	<b>Knowledge</b> <b>Level</b>
<b>CO1:</b> Describe the general principles and uses of different kinds of microscope.	1	6	K1
<b>CO2:</b> Analyse the mechanism of chromatography and pH meter based on solvents.	2	6	K2
<b>CO3:</b> Interpret the applications of biomedical instruments such as ECG, EEG, CT and MRI.	3	5	K2
<b>CO4:</b> Apply the theoretical aspects of Colorimeter and Spectrophotometer based on collection of samples.	4	6	K3
<b>CO5:</b> Understand the principles of DNA sequences and blotting techniques.	5	7	K2

**SYLLABUS**

**UNIT I:**

Microscopy - Principles and applications of compound and phase contrast microscope. Types of electron microscope – scanning and transmission

**UNIT II:**

Chromatography - Principles and applications of paper, thin layer and ion exchange Chromatography. Principles and applications of pH meter

**UNIT III:**

Biomedical Instruments - Principles and applications of centrifuge - Clinical and ultra Centrifuge. Principles and applications of ECG , EEG, CT, MRI

**UNIT IV:**

Principles and applications of Colori meter and spectro photo meter. Principles and applications of Nuclear Magnetic Resonance Spectroscopy and Atomic Absorption Spectroscopy.

**UNIT V:**

Blotting Techniques - Principles and applications of Northern, Southern and Western. DNA Sequencing Techniques – Sanger and Gilbert method

**TEXT BOOKS:**

1. Kumaresan V . Principles and Techniques of Biophysics. Saras Pub ., 2012

**REFERENCE BOOKS:**

1. Jayaraman J . Laboratory Manual in Biochemistry . Wiley Pub., 2005
2. Subramanian MA . Biophysics – Principles and Techniques . MJP Pub., 2008

**Course Designer : DR. E. EMIMAL VICTORIA**

**COURSE CONTENT AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1. 1	Principles and applications of compound and phase contrast microscope	3	Lecture - 2 Demo - 1
1. 2	Types of electron microscope – scanning and transmission	3	Lecture - 2 Video - 1
<b>UNIT II</b>			
2. 1	Principles and applications of paper, thin layer and ion exchange chromatography	4	Lecture – 3 Demo - 1
2.2	Principles and applications of pH meter	2	Lecture - 2
<b>UNIT III</b>			
3. 1	Principles and applications of centrifuge	2	Lecture - 2

3.2	Clinical and ultra centrifuge	1	Tutorial - 1
3.3	Principles and applications of ECG , EEG, CT, MRI	3	Lecture - 2 Video - 1
<b>UNIT IV</b>			
4. 1	Principles and applications of Colorimeter and Spectro photo meter	3	Lecture - 2 Demo - 1
4.2	Principles and applications of Nuclear Magnetic Resonance Spectroscopy and Atomic Absorption Spectroscopy	3	Lecture - 2 Video - 1
<b>UNIT V</b>			
5. 1	Principles and applications of Northern, Southern and Western Blotting techniques	3	Lecture - 2 Video - 1
5.2	DNA Sequencing Techniques – Sanger and Gilbert method	3	Lecture - 2 Video - 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	3.5	2	4	4	2.5	2	3.5	4	3.5	4	4	2	3.3
<b>CO2</b>	2	3	4	4	4	2	2	3.5	2	4	4	2.5	3.1
<b>CO3</b>	3.5	2	4	4	4.5	2	3	4	2	3	4	3	3.3
<b>CO4</b>	4	2	4	3	3	2	2	4	3	4	4	2	3.1
<b>CO5</b>	4	2.5	4	4	3.5	2	3	4	4	4	4	3	3.6
	<b>Mean Overall Score</b>												<b>3.28</b>

**Result: The Score for this Course is 3.28 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	40%	40%
<b>APPLY</b>	30%	30%

**Programme : B. Sc. ZOOLOGY**

**Part III : CC - IX**

**Semester : V**

**Hours : 5/W 75/S**

**Subject Code : U22CZ9**

**Credit : 5**

**TITLE OF THE PAPER: DEVELOPMENTAL BIOLOGY AND  
EVOLUTION**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>GD/VIDEO/TUTORIAL</b>
	5	2	1	2

**PREAMBLE**

The course provides knowledge to understand the events of Gametogenesis and Organ formation and also to gain knowledge about the principle behind the process of evolution.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the semester students will be able to			
<b>CO1:</b> Understand the definition and basic concepts of Developmental Biology	1	15	K1
<b>CO2:</b> Develop detailed understanding of Gastrulation and Placenta	2	15	K2
<b>CO3:</b> Explaining the basic concepts of regeneration and metamorphosis	3	15	K2
<b>CO4:</b> Elucidate various theories of Evolution and principles involved in them	4	15	K2
<b>CO5:</b> Gain knowledge about the evolutionary significance of speciation, Isolation and evolution of man	5	15	K3

## **SYLLABUS**

### **UNIT I:**

Gametogenesis – Definition - Spermatogenesis, Oogenesis – Structure of Sperm and Egg in frog - Fertilization – capacitation, fertilizin- anti fertilizin reaction, monospermy, polyspermy, acrosomal reaction, cortical reaction, amplexus. Cleavage - definition and patterns of cleavage in frog, Blastula – types.

### **UNIT II:**

Gastrulation - definition, gastrulation in frog, fate map, germ layers and its derivatives. Organogenesis - definition, development of brain in frog, foetal membranes in chick. Placenta - types and functions.

### **UNIT III:**

Organizer – Spemann and Manford experiment, Regeneration – types and mechanism - Regeneration in Planaria. Metamorphosis - metamorphosis in frog, Neoteny.

### **UNIT IV:**

Origin of life, Theories of Evolution - Lamarckism, Darwinism, De Vries theory of mutation – Modern synthetic theory of Evolution

### **UNIT V:**

Isolating Mechanism, types of speciation, Mimicry and Colouration, Evolution of man.

### **TEXT BOOKS:**

1. Verma PS and Agarwal V. K. Chordate Embryology 9<sup>th</sup> Edn, S. Chand and Company Ltd. New Delhi
2. Arumugam N, Organic Evolution. 10<sup>th</sup> Edn. Saras Publication

**REFERENCE BOOKS:**

1. Ballinsky BI An introduction to Embryology 5<sup>th</sup> Edn Saunders College Pub Philadelphia
2. Berrill N. Developmental Biology 2<sup>nd</sup> Edn. Tata Mchraw Hill Pub. Ltd., New Delhi
3. Pattern BM and Carison BM. Foundations of Embryology 3<sup>rd</sup> Edn, Tata McGraw Hill Publication Ltd New Delhi
4. Stick Berger Mw. Evolution Jone sand Bartlett publication
5. Moody PA. Introduction to Evolution 1<sup>st</sup> Edn., 1978.

**Course Designer: DR. C. RANI VIJAYA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPICS</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Process of Gametogenesis, Spermatogenesis, Oogenesis	5	Lecture - 5
1.2	Process of cleavage and Fertilization	5	Lecture - 5
1.3	Blastula, Blastoderm, Fate map	5	Lecture - 5
<b>UNIT II</b>			
2.1	Gastrulation, Archenteron, Organogenesis	6	Lecture and Videos - 6
2.2	Derivatives of Germ layers, Development of brain in frog and chick	3	Lecture - 3
2.3	Types and functions of Placenta, Foetal membranes in chick	6	Lecture and Videos - 6
<b>UNIT III</b>			
3.1	Types of Organizer and Embryonic induction	5	Lecture - 5

3.2	Types Regeneration, Regeneration in Planaria	5	Lecture and Videos - 5
3.3	Hormonal control of Metamorphosis in frog and Neoteny	5	Lecture - 5
<b>UNIT IV</b>			
4.1	Theories – Origin of life - Lamarckism, Darwinism	8	GD - 9
4.2	Devries theory of Mutation, Modern synthetic theory of evolution	7	Lecture - 8
<b>UNIT V</b>			
5.1	Speciation and Isolating Mechanisms	6	Lecture - 8
5.2	Orthogenesis	3	Lecture - 2
5.3	Mimicry,Coloration and Evolution of man	6	Lecture - 7

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4.5	3.3	3.4	3.2	3.3	3.5	3.5	3.1	-	3.1	3.6	3.8	3.19
CO2	4.3	3.1	3.5	3.3	3.1	3.4	3.5	3.0	-	3.3	3.7	3.7	3.15
CO3	4.5	3.5	3.5	3.3	3.2	3.4	3.4	3.2	-	3.2	3.8	3.7	3.22
CO4	4.4	3.4	3.4	3.2	3.1	3.5	3.5	3.1	-	3.4	3.5	3.8	3.19
CO5	4.3	3.4	3.5	3.3	3.1	3.5	3.5	3.0	-	3.2	3.5	3.6	3.15
<b>Mean Overall Score</b>													<b>3.18</b>

**Result: The Score for this Course is 3.18 (High Relationship)**



<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : CC - X

Semester : V

Hours : 5/W 75/S

Subject Code : U22CZ10

Credits : 4

**TITLE OF THE PAPER: ANIMAL PHYSIOLOGY**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	5	3	-	2

**PREAMBLE:**

The students gain basic knowledge on physiology, understand the structure and functions of the human organs.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> To understand metabolic activities , and respiratory system of animals.	1	15	K1
<b>CO2:</b> To gain the knowledge of circulatory system and excretory system of animals.	2	15	K2
<b>CO3:</b> To learn osmoregulation structure and types and function of Nervous system.	3	15	K3
<b>CO4:</b> To know the structure and functions of the muscular system and understand the mechanism and physicochemical changes in muscle system.	4	15	K3
<b>CO5:</b> To demonstrate the human reproductive organs and know the role of hormones and abnormalities and learn the chronobiology of animals	5	15	K2

**SYLLABUS**

**UNIT I:**

Digestion and absorption of carbohydrate, protein and lipid. Respiration - respiratory pigments - transport of respiratory gases - anaerobiosis - Respiratory Quotient.

**UNIT II:**

Circulation - structure of heart, origin and conduction of heart beat. Mechanism of Blood coagulation. Excretion - types of nitrogenous wastes - ammonotelism, urotelism and uricotelism. Structure of the human nephron and mechanism of urine formation.

**UNIT III:**

Osmoregulation – osmoregulators - osmoconformers - Stenohaline and Euryhaline - osmoregulation in fresh water and marine teleosts. Nervous system - structure and types of neurons - conduction of nerve impulse through and across neurons - synapse - Myoneural conduction - Reflex action - conditioned reflexes.

**UNIT IV:**

Muscular system - types of muscle fibers - ultra structure of the skeletal muscle - contractile proteins - mechanism of muscle contraction - physicochemical changes during muscle contraction.

**UNIT V:**

Receptors - structure and functioning of phonoreceptor (Human ear) and photoreceptor (Human eye). Human reproductive cycle, role of hormones and abnormalities. Chronobiology - biological clock- circadian and circannual rhythms.

**TEXT BOOKS:**

1. Arumugam A and Mariankuttikan A. Text Book of Animal Physiology. 9<sup>th</sup> Edn., 2014

**REFERENCE BOOKS:**

1. Delela RC and Verma PS. Animal Physiology and related Biochemistry. 3<sup>rd</sup> Edn. S. Chand and Company, New Delhi, 1986
2. Hoar WS. General and Comparative Physiology. 2<sup>nd</sup> Edn., Prentice Hall of India Ltd., New Delhi, 1975
3. Verma PS and Agarwal VK. Animal Physiology. 6<sup>th</sup> Edn. S.Chand and Company., New Delhi, 1997.

**Course Designer: MRS. P. YUVARANI**

**COURSE CONTENT AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Digestion and absorption of carbohydrate	3	Charts -1 Lecture – 1
1.2	Digestion and absorption of protein	3	Visual aids - 1 Lecture – 1
1.3	Digestion and absorption of lipid	3	Charts - 1 Lecture – 1
1.4	Respiration -respiratory pigments - transport of respiratory gases	3	Charts - 1 Lecture – 1
1.5	Anaerobiosis - Respiratory Quotient	3	Charts - 1

			Lecture – 1
<b>UNIT II</b>			
2.1	Circulation - structure of heart, origin and conduction of heart beat	3	Visual aids - 1 Lecture – 2
2.2	Mechanism of Blood coagulation.	2	Charts - 1 Lecture – 1
2.3	Excretion - types of nitrogenous wastes - ammonotelism, urotelism and uricotelism.	4	Visual aids - 2 Lecture – 2
2.4	Structure of the human nephron	3	Charts - 2 Lecture - 1
2.5	Mechanism of urine formation	3	Charts - 1 ,Lecture - 2
<b>UNIT III</b>			
3.1	Osmoregulation - osmoregulators- osmoconformers - Stenohaline and Euryhaline	3	Lecture - 2 Charts- 1
3.2	Osmoregulation - fresh water and marine teleosts	3	Charts - 1 Lecture - 2
3.3	Nervous system - structure and types of neurons	3	Visual aids - 1 Lecture - 2
3.4	Conduction of nerve impulse- synapse	3	Charts - 1 Lecture - 2
3.5	Myoneural conduction - Reflex action - conditioned reflexes	3	Visual aids - 1 Lecture - 2
<b>UNIT IV</b>			
4.1	Muscular system-types and structure	4	Charts - 1 Lecture - 2
4.2	Contractile proteins	3	Lecture -1 Charts-1
4.3	Mechanism Of Muscle Contraction	4	Visual aids -1 Lecture -1
4.4	Physicochemical Changes- During Muscle Contraction.	4	ICT - 1, Lecture - 1, Charts -1
<b>UNIT V</b>			
5.1	Receptors - structure and function - phonoreceptor	3	Chart - 1 Lecture -1
5.2	Photoreceptor	3	Chart - 1 Lecture - 1
5.3	Human reproductive cycle	3	Chart - 1 Lecture - 1

5.4	Role of hormones and abnormalities	3	Chart - 1 Lecture - 1
5.5	Chronobiology - biological clock- circadian and circannual rhythms.	3	Chart - 1 Lecture - 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	3	-	3	4	-	4	4	4	4	4	3	3.08
<b>CO2</b>	4	4	-	4	4	-	4	3	3	4	4	3	3.08
<b>CO3</b>	4	4	-	4	4	-	4	4	4	4	4	3	3.25
<b>CO4</b>	3	4	-	4	4	-	4	3	4	4	4	4	3.16
<b>CO5</b>	4	4	-	4	4	-	4	4	4	4	4	3	3.25
<b>Mean Overall Score</b>													<b>3.16</b>

**Result: The Score for this Course is 3.16 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

**Programme : B. Sc. ZOOLOGY**

**Part III : CC - XI**

**Semester : V**

**Hours : 5/W 75/S**

**Subject Code : U2C2Z11**

**Credits : 5**

**TITLE OF THE PAPER: BIOCHEMISTRY**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>
	5	3	1	1

**PREAMBLE:**

The course encourage the students to gain basic knowledge on molecular basis , and to know the functions and significance of biomolecules.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge levels</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Give ideas to understand fundamental biochemical structure of Carbohydrate.	1	15	K1
<b>CO2:</b> Demonstrate an understanding of the chemistry, structure and function of biological molecule - protein.	2	15	K2
<b>CO3:</b> Provide knowledge regarding the biologically significant fat.	3	10	K2
<b>CO4:</b> Provide knowledge regarding the regulation of various processes through Enzymes and Vitamins.	4	15	K3
<b>CO5:</b> Describe the metabolic pathways and its biochemical significance.	5	20	K3

**SYLLABUS**

**UNIT I**

Classification and structure of Carbohydrates - Monosaccharides - glucose; Dissacharides - sucrose; Polysaccharides - Homopolysaccharides - starch; heteropolysaccharides - glycoprotein; . Biological importance of carbohydrates.

**UNIT II:**

Proteins: Classification of amino acids based on structure, solubility, size and shape. Structure of proteins - primary, secondary, tertiary and quaternary. Proteins of biological

importance: Haemoglobin, Collagen.

### **UNIT III:**

Lipids - Classification and functions of lipids. Simple lipids - tripalmitin, Compound lipids – lecithin, Derived lipid - cholesterol; fatty acids - classification, nomenclature, structure and properties of unsaturated fatty acids. Essential fatty acids, biological significance of fats. Complex lipids: glycerophospholipids,

### **UNIT IV:**

Enzymes: Properties, classification, kinetics – Michaelis Menton hypothesis; Factors affecting enzyme activity - pH, temperature, substrate concentration and enzyme concentration. Coenzymes - NADH, FAM.

Vitamins : Dietary sources, deficiency manifestation and biological functions of fat soluble and water soluble vitamins.

### **UNIT V:**

Carbohydrate metabolism– Glycolysis, Citric acid cycle. Protein metabolism - deamination, transamination and Ornithine cycle. Lipid metabolism –  $\beta$  oxidation of fatty acids.

### **TEXT BOOKS:**

1. Dr. Ambika Shanmugam, Biochemistry Published by Author

### **REFERENCE BOOKS:**

1. Lehninger: Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.

2. Rober K. Murray, Daryl K. Grammer, Harper's Biochemistry McGraw Hill, Lange Medical Books.25th edition.

3. J.L. Jain, Sunjay Jain, Nitin Jain, S..Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand &Company.

4. Dr. Amit Krishna De, Biochemistry- S. Chand & Co., Ltd.

5. Rober K. Murray, Daryl K. Grammer, Harper's Biochemistry McGraw Hill, Lange Medical

Books.25th edition.

6. C. Kannan. Biomolecules MJP Publishers, Chennai-5

7. E.S. West, W.R. Todd, H.S. Mason and J.T. Van Bruggen, A Text Book of Biochemistry, Oxford and IBH Publishing Co., New Delhi, 1974.

8. Donald Voet, Judith G. Voet8. Biochemistry [with CD rom] (2004) by Publisher: John Wiley & Sons

9. Lubert Stryer, Biochemistry by 4th Edition, W.H Freeman and Company.

**Course Designer: DR. S. MALA**

### **COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT 1</b>			
1.1	Carbohydrates	3	Lecture - 3
1.2	Classification, properties and biological importance.	3	Charts - 1 Lecture - 2
1.3	Monosaccharides - glucose,	2	Charts - 1 Lecture - 1
1.4	Disaccharides - sucrose,	2	Models - 1 Lecture - 1
1.5	Polysaccharides – starch. Cellulose, glycoprotein	5	Charts - 2 Lecture -1GD -2
<b>UNIT II</b>			
2.1	Amino acids	3	Lecture - 3
2.2	General structure and classification.	3	Charts -1 Lecture - 2
2.3	Protein classification	3	Lecture - 3
2.4	Structure of protein- primary secondary, tertiary and quaternary structure	3	Models - 1 Lecture - 2



2.5	Structure and functions of hemoglobin and collagen.	3	Models - 1 Lecture - 2
<b>UNIT III</b>			
3.1	Lipids - Structure,	2	Charts - 1 Lecture - 1
3.2	Lipid Classification with examples	1	Lecture - 1
3.3	Simple lipids - tripalmitin,	2	Models with Lecture - 2
3.4	Compound lipids - lecithin,	2	Visual aids-1 Lecture-1
3.5	Derived lipid – cholesterol. Biological significance.	3	Charts - 1 Lecture - 2
<b>UNIT IV</b>			
4.1	Enzymes - properties	3	Charts with Lecture - 3
4.2	Enzyme Classification.	3	Charts with Lecture - 3
4.3	Enzyme kinetics –Michaelis Menton hypothesis.	2	Lecture - 2
4.4	Factors affecting enzyme activity - pH, temperature, substrate concentration and enzyme concentration.	2	Charts - 1 Lecture - 1
4.5	Coenzymes: Vitamins	5	Charts - 2 Lecture - 3
<b>UNIT V</b>			
5.1	Carbohydrate metabolism glycolysis	4	Charts-1 Lecture - 3
5.2	Citric acid cycle.	4	Charts with Lecture - 4
5.3	Protein metabolism - deamination, transamination	4	Lecture - 3 Charts - 1
5.4	Ornithine cycle.	3	Visual aids with explanations - 3
5.5	Lipid metabolism – $\beta$ oxidation of fatty acids.	5	Charts - 2 Lecture - 3

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	4	1	4	1	2	4	4	4	4	4	4	3.3
<b>CO2</b>	4	4	2	4	-	1	4	4	4	4	4	4	3.3
<b>CO3</b>	4	4	2	4	1	1	4	4	4	4	4	4	3.3
<b>CO4</b>	4	4	1	4	2	1	4	4	4	4	4	4	3.0
<b>CO5</b>	4	4	2	4	1	1	4	4	4	4	4	4	3.3
<b>Mean Overall Score</b>													<b>3.2</b>

**Result: The Score for this Course is 3.2 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30 %	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : CC - XII

Semester : V

Hours : 6/W 90/S

Subject Code : U22CZ12P

Credits : 5

**TITLE OF THE PAPER: DEVELOPMENTAL BIOLOGY, EVOLUTION,  
ANIMAL PHYSIOLOGY AND BIOCHEMISTRY - PRACTICAL**

Pedagogy	Hours	Demonstration	Peer Teaching	Tutorial	GD/VIDEOS
	6	2	-	4	-

**PREAMBLE:**

This course will develop practical skills of the students in identifying the animal species and to show how the form, function and behavior of animals become adapted to the environment.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Gain practical knowledge on various embryonic stages of chick	1	18	K2
<b>CO2:</b> Enrich their knowledge about physiological parameters analyze and apply in experiments.	2	18	K3
<b>CO3:</b> Demonstrate and apply the Knowledge on biomolecule and analyze in the form of various experiments	3	18	K3
<b>CO4:</b> Understand and apply the of significance of genetic drift .Appreciate the process of variation in fingerprints of Human.	4	18	K3
<b>CO5:</b> Understand the evolutionary concepts and appreciate the functions of evolution in Homologous and Analogous organs, Mimicry, coloration etc.	5	18	K3

**SYLLABUS**

**UNIT I: Developmental Biology**

Mounting: Temporary mounting of Chick Blastoderm

Chick Embryo – 24 hours, 48 hours and 72 hours (whole mount)

## **UNIT II: Animal Physiology**

Preparation of Blood Smear

Differential count of Leucocytes

Identification of Haemin Crystals

Qualitative test for excretory products of fish, bird and mammal

## **UNIT III: Biochemistry**

Qualitative test for Carbohydrate, Protein and Lipid.

Separation of amino acids by Circular Paper Chromatography.

Qualitative estimation of Protein – Lowry et al., method.

Measurement of pH in various water sample using digital pH meter.

## **UNIT IV: Evolution**

Study of Genetic Drift using beads

Demonstration of variations in human using fingerprints of students

Homologous and Analogous organs

Spotters: (museum specimen, slides, models and charts)

## **UNIT V: Developmental Biology: Frog – Blastula, Gastrula Yolk plug and Placenta of Pig and Sheep**

Animal Physiology: Haemoglobinometer, sphygmomanometer and menstrual cycle

Biochemistry: pH meter, colorimeter, centrifuge

Evolution: Connecting link: Peripatus, Archeopteryx, Colouration – Mimicry – Lycodon, Krait, Mutation – Peppered moth, Ancon Sheep and Fossils.

Collection and submission of homologous and analogous organs in available animal

species.

**REFERENCE BOOKS:**

4. Poddar T, Mokhopadhyay B and Das SK. An advanced Laboratory Manual of Zoology. Macmillan Pub., 2010
5. Verma PS. A Manual of Practical Zoology. S. Chand and Company Ltd., 2007

**Course Designer: DR. G. SASIREKA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>PRACTICAL HRS.</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1	<b><u>Developmental Biology</u></b> Mounting: Temporary mounting of Chick Blastoderm Chick Embryo – 24 hours, 48 hours and 72 hours (whole mount) Spotters: (museum specimen, slides, models and charts) Frog – Blastula, Gastrula Yolk plug and Placenta of Pig and Sheep	18	Demo - 9 Tutorial - 9
<b>UNIT II</b>			
2	<b><u>Animal Physiology</u></b> Preparation of Blood Smear Differential count of Leucocytes Identification of Haemin Crystals Qualitative test for excretory products of fish, bird and mammal Spotters: (museum specimen, slides, models and charts) Haemoglobinometer, sphygmomanometer and	18	Demo - 9 Tutorial - 9

	menstrual cycle		
<b>UNIT III</b>			
3	<p><b><u>Biochemistry</u></b></p> <p>Qualitative test for Carbohydrate, Protein and Lipid.</p> <p>Separation of amino acids by Circular Paper Chromatography.</p> <p>Qualitative estimation of Protein – Lowry et al., method.</p> <p>Measurement of pH in various water sample using digital pH meter.</p> <p>Spotters: (museum specimen, slides, models and charts)</p> <p>Biochemistry: pH meter, colorimeter, centrifuge</p>	18	Demo - 9 Tutorial - 9
<b>UNIT IV</b>			
4	<p><b><u>Evolution</u></b></p> <p>Study of Genetic Drift using beads</p> <p>Demonstration of variations in human using fingerprints of students</p> <p>Homologous and Analogous organs</p> <p><b>Spotters: (museum specimen, slides, models and charts)</b></p> <p>Evolution: Connecting link: Peripatus, Archeopteryx, Colouration – Mimicry – Lycodon, Krait, Mutation – Peppered moth, Ancon Sheep and Fossils.</p> <p>Collection and submission of homologous and analogous organs in available animal species.</p>	18	Demo - 9 Tutorial - 9
<b>UNIT V</b>			
5	Collection and submission of homologous and analogous organs in available animal species.	18	Tutorial - 18

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	-	4	3	2	4	4	4	-	4	4	2	3
CO2	4	-	4	3	2	-	3	4	4	4	4	4	3
CO3	4	-	4	4	2	-	2	4	4	4	4	3	3
CO4	4	4	3	4	4	4	4	4	3	4	4	3	4
CO5	4	-	3	4	3	4	4	3	3	4	4	4	3.3
<b>Mean Overall Score</b>													<b>3.3</b>

**Result: The Score for this Course is 3.3 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : DSEC - I

Semester :V

Hours : 5/W 75/S

Subject Code : U22DSZ1A

Credits : 5

**TITLE OF THE PAPER: HUMAN NUTRITION**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	5	3	-	2

**PREAMBLE:**

The Course will provide self equip on health care and health education and find placement in health care sector.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> To understand the food requirements of human.	1	15	K1
<b>CO2:</b> To explain the knowledge of Vitamins and minerals and to know the value of water nutrients	2	15	K2
<b>CO3:</b> To analyses the calorific value of food, Energy requirements different aged persons, nutritional requirements different aged persons, to understand health education, malnutrition.	3	20	K3
<b>CO4:</b> To know the nutritional value of foods, balanced diet.	4	15	K2
<b>CO5:</b> To describe the deficiency diseases.	5	10	K3

**SYLLABUS**

**UNIT I:**

Introduction and scope. Carbohydrates, proteins and lipids - sources - daily requirements - essential amino acids- essential fatty acids.

**UNIT II:**

Vitamins and minerals – types - sources and functions-deficiency symptoms and treatment. Prevention and treatment. Water as a nutrient- regulation of water balance.

**UNIT III:**

Calorific values of food - Basal Metabolic Rate - BMI-Energy requirements of man, pregnant women, infants and children. Nutritional requirements-infants, school children, pregnant and lactating mothers and the aged- health education- malnutrition.



**UNIT IV:**

Nutritional value of foods, cereals, fruits, milk, egg, meat, and fish. Balanced diet.

**UNIT V:**

Deficiency diseases - anemia, osteoporosis, kwashiorkor and marasmus.

**TEXT BOOKS:**

1. Sri Lakshmi B. Human Nutrition. New age International Pub., 2009

**REFERENCE BOOKS:**

1. Gopalan CB, Ramasastri S and Balasubramanian SC. Nutritive Value of Indian Foods. National Institute of Nutrition, Hyderabad, 1971
2. Pandey MD and Kulkurni N. Food and Nutrition. Himalaya Pub., 2010
3. Sri Lakshmi B. Food science. New age International Pub., 2012

**Course Designer: MRS. P. YUVARANI**

**COURSE CONTENT AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Introduction and scope Carbohydrates, protein and lipids	5	Lecture – 3 Chart – 2
1.2	Sources - Daily requirements	5	Lecture - 3 Charts - 2
1.3	Essential amino acids	3	Models - 1 Charts - 1 Lecture – 1
1.4	Essential fatty acids.	2	Models- 1 Charts - 1
<b>UNIT II</b>			
2.1	Vitamins	4	Charts – 2 Lecture – 2
2.2	Minerals	4	Charts – 2 Lecture – 2
2.3	Water as a nutrient	4	Charts – 2 Lecture – 2
2.4	Regulation of water balance.	3	Charts – 1 Lecture – 2
<b>UNIT III</b>			
3.1	Calorific values of food	3	Chart – 1

			Lecture – 2
3.2	Basal Metabolic Rate,BMI	4	Chart – 2 Lecture – 2
3.3	Energy requirements	4	Chart – 2 Lecture – 2
3.4	Nutritional requirements	4	Chart – 2 Lecture – 2
3.5	Health education	3	Chart – 1 Lecture – 2
3.6	Malnutrition.	2	Visual aids -1 Lecture – 1
<b>UNIT IV</b>			
4.1	Nutritional value of foods	10	Chart - 2 Lecture – 6 Visual aids 2
4.2	Balanced diet.	5	Chart - 2 Lecture – 3
<b>UNIT V</b>			
5.1	Deficiency diseases - Anemia	3	Chart - 1 Lecture - 2
5.2	Osteoporosis	3	Chart - 1 Lecture - 2
5.3	Kwashiorkor	2	Chart -1 Lecture -1
5.4	Marasmus	2	Visual aids -1 , Lecture – 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	-	4	4	-	4	4	3	3	4	4	3.16
CO2	3	4	-	4	4	-	4	4	4	3	4	4	3.16
CO3	3	4	3	4	3	-	3	4	3	3	4	4	3.16
CO4	3	4	-	4	4	-	4	4	3	3	4	4	3.08
CO5	4	4	-	4	3	-	3	4	4	3	4	3	3.00
<b>Mean Overall Score</b>													<b>3.11</b>

**Result: The Score for this Course is 3.11 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : DSEC - I

Semester : V

Hours : 5/W 75/S

Subject Code : U22DSZ1B

Credits : 5

### TITLE OF THE PAPER: FISHERY BIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial
	5	3	-	2

#### PREAMBLE:

This course will enhance knowledge and practical understanding about Fishery Biology.

COURSE OUTCOME	Unit	Hrs P/S	Knowledge Levels
At the end of the Semester, the Students will be able to			
<b>CO1:</b> gain knowledge about the classification of fishes and marine environment	1	15	K1
<b>CO2:</b> comprehend feeding habits and spawning in fishes and factors influencing them	2	15	K2
<b>CO3:</b> understand the principles of culture fisheries , and apply them to exhibit entrepreneurial skills	3	15	K3
<b>CO4:</b> gain knowledge about culture fisheries, nutritional values of fishes and exhibit entrepreneurial skills essential for keeping home aquarium	4	15	K3
<b>CO5:</b> demonstrate knowledge about various fish processing and preservation techniques and also interprets the role of fisheries in public health	5	15	K2

#### SYLLABUS

##### UNIT I:

Scope of Fishery-classification of fisheries- capture fisheries-Exclusive Economic Zone (EEZ) - Marine, coastal, offshore and deep sea- crustacean- shrimp, lobster, crab.

##### UNIT II:

Feeding biology of fish – food and feeding habits of fishes – air bladder in fishes- reproduction in fishes-induced spawning in carps- ecological factors influencing spawning in carps.

**UNIT III:**

Culture fisheries- site selection- construction of ponds- kinds of fish culture-monoculture, paddy cum fish culture, sewage fed fish culture-Integrated fish farming.

**UNIT IV:**

Shellfish culture – culture of prawn, crab, edible oyster. Natural pearl formation, artificial pearl culture – maintenance of home aquarium – pen culture - edible fishes – nutritional value - Fish marketing.

**UNIT V:**

Fishing craft and gears in India – Parasites and diseases of fishes – Fish processing and preservation. Canning of fishes – fish in relation to public health.

**TEXT BOOK:**

1. Santhana Kumar G and Selva Raj A. Concepts of Aqua Culture. Meenam Pub., 2005

**REFERENCE BOOKS:**

1. Gupta SM. Text book of Fishery. Anne Books Pvt. Ltd., 2010
2. Jhingran V G. Fish and Fisheries of India, Hindustan Pub., 1982
3. Sinha R K. Hand book of Fish and Fisheries. Agrotech Press, 2014

Course Designer : DR.V. KABILA

**COURSE CONTENT AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Classification of fisheries	5	Chart – 2 Lecture-3
1.2	Exclusive Economic Zone (EEZ) - Marine, coastal, offshore and deep sea	5	Lecture -3 Chart/Map-2 Tutorial-1
1.3	Crustacean fishery- shrimp, lobster, crab.	5	Lecture -3 Video demonstration -2

<b>UNIT II</b>			
	Feeding biology of fish	5	Lecture -3 Video -2
	Air bladder in fishes – reproduction in fishes	5	Lecture -3 Video -2
	Induced spawning in carps	5	Lecture -3 Video -2
<b>UNIT III</b>			
	Culture fisheries- site selection- construction of ponds	5	Lecture-2 Video-2 Tutorial-1
	Kinds of fish culture	5	Lecture-2 Video-2 Tutorial-1
	Integrated fish farming.	5	Lecture-2 Video-2 Tutorial-1
<b>UNIT IV</b>			
	Shellfish culture	5	Lecture-2 Video-2 Tutorial-1
	Pearl culture	5	Lecture-2 Video-2 Tutorial-1
	Edible fishes and fish marketing	5	Lecture-2 Video-2 Tutorial-1
<b>UNIT V</b>			
	Fishing craft and gears	5	Lecture -3 video -2
	Diseases of fishes	5	Lecture-3 Video/Charts-2
	Fish processing and preservation	5	Lecture-2 Video-2 Tutorial-1

Course Outcomes (COs)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO 1	4	3	3	3	2	4	3	3	3	3	3	3	3.08
CO 2	3	4	2	3	4	4	3	3	3	3	3	3	3.16
CO 3	4	3	3	3	3	3	3	3	3	3	3	3	3.08
CO 4	4	4	4	4	4	4	3	3	2	3	4	4	3.33
CO 5	2	3	3	3	4	3	2	3	4	3	2	4	3.0
<b>Mean overall score</b>													<b>3.13</b>

**Result: The score for this course is 3.13 (High relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of Cos = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of Cos = $\frac{\text{Total of Mean Score}}{\text{Total No. of Cos}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : GEC - I

Semester : V

Hours : 2/W 30/S

Subject Code : U22GEZ1A

Credits : 2

**TITLE OF THE PAPER: BIOINFORMATICS**

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial
	2	1	-	1

**PREAMBLE:**

The course will introduce basic principles of Bioinformatics and its applications in various disciplines of Biology.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Expose themselves to the emerging field of Bioinformatics	1	3	K1
<b>CO2:</b> Acquire knowledge about types of biological databases	2	7	K2
<b>CO3:</b> Use data retrieval techniques and analyse database similarity search tools and phylogenetic studies	3	8	K3
<b>CO4:</b> Understand prediction of structure and function of proteins and visualization	4	6	K3
<b>CO5:</b> Apply principles of Bioinformatics in the field of computational drug designing methods	5	6	K2

**SYLLABUS**

**UNIT I:**

History and scope of bioinformatics. Bioinformatics and internet. Useful bioinformatics sites., Applications of Bioinformatics.

**UNIT II:**

Biological databases- classification- Nucleotide sequence databases - protein sequence



databases- organism specific databases.-miscellaneous databases.

### **UNIT III:**

Data retrieval- retrieving tools –Entrez and SRS., Sequence Analysis tools – BLAST and FASTA. Sequence alignment- simple and multiple sequence alignment – local and global alignment- CLUSTAL.W . Phylogenetic studies-phylogenetic trees - PHYLIP.

### **UNIT IV:**

Prediction of structure and function of proteins-Structure prediction tools and softwares- homology modelling - Visualisation tools-RASWIN, Swiss PDB viewer.

### **UNIT V:**

Computer Aided Drug Designing- target-lead-Structure based and ligand based designing- - Application of Bioinformatics in drug discovery Docking (definition only).

### **TEXT BOOK:**

1. Mani K and Vijayraj N. Bioinformatics for beginners. Kalaikathir Achagam, 2004

### **REFERENCE BOOKS:**

1. Bergeron B. Bioinformatics Computing. Prentice Hall India, EE Edn., 2006

2. Bosu Oand Thukral SK. Bioinformatics-Databases, Tools and Algorithms.

Oxford University Press, 2009.

2. Westhed and Twyman K. Bioinformatics. Viva books Ltd., 2006.

**Course Designer: DR. V. KABILA**

## **COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HRS.</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	History and scope of bioinformatics. Bioinformatics as interdisciplinary science.	1	Lecture - 1
1.2	Bioinformatics and internet-.Useful bioinformatics sites.	2	Lecture - 1



<b>CO1</b>	4	4	4	3	4	3	4	4	4	4	3	-	3.4
<b>CO2</b>	4	4	3	4	4	4	4	4	4	4	4	-	3.5
<b>CO3</b>	4	4	4	3	4	3	4	3	4	4	4	-	3.4
<b>CO4</b>	3	4	4	4	3	4	3	4	4	3	4	-	3.3
<b>CO5</b>	4	4	4	4	3	4	3	3	3	3	4	-	3.2
<b>Mean Overall Score</b>													<b>3.36</b>

**Result: The Score for this Course is 3.36 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

**Programme : B. Sc. ZOOLOGY**

**Part III : GEC - I**

**Semester : V**

**Hours : 2/W 30/S**

**Sub. Code : U22GEZ1**

**Credits : 2**

**TITLE OF THE PAPER: FOOD PROCESSING**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>
	30	21	3	6

**PREAMBLE:**

To make the students understand, evaluate and apply the concepts of cooking methods, processing of pulses, cereals and meat products.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Define and identify the characteristics of food, enumerate cooking methods	I	6	K1
<b>CO2:</b> Explain and interpret processing of pulses, methods and cite toxic constituents	II	6	K2
<b>CO3:</b> Discuss and illustrate processing of cereals, trace the difference between fermented and unfermented products	III	6	K2
<b>CO4:</b> Assess the nutritive value and properties of milk and include milk products under diet pattern	IV	6	K3
<b>CO5:</b> Determine meat and Poultry processing and implement storage methods.	V	6	K3

**SYLLABUS**

**UNIT I:**

Functions of Food- Food Groups- Food Science, objectives of cooking- Preliminary preparation- cooking methods.

**UNIT II:**

Processing of pulses, composition and nutritive value, processing methods, toxic

constituents.

**UNIT III:**

Processing of cereals- structure, composition and nutritive value, Processing methods- fermented and non - fermented products.

**UNIT IV:**

Processing of milk, composition, physical properties, nutritive value and effect of salt, enzymes, acid and heat, Fermented and Non -fermented milk products.

**UNIT V:**

Processing of meat and poultry- processing, composition, nutritive value, preservation and storage.

**TEXT BOOK:**

1. Avantina Sharma, Text Book of Food Science and Technology, International Book Distributing Co, Lucknow, UP, 2006.

**REFERENCES:**

1. NIIR Board of Food and Technologist, Modern Technology of Food Processing and Agro based industries, National Institute of Industrial Research, Delhi, 2005.

**Course Designer: DR. D. HELEN CHRISTINA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Functions of Food- Food Groups	2	Lecture – 2
1.2	Food Science, objectives of cooking- Preliminary preparation	2	Lecture -1, Peer teaching 1
1.3	cooking methods	2	Lecture – 1, GD -1

<b>UNIT II</b>			
2.1	Processing of pulses, composition and nutritive value	3	Lecture -2, GD -1
2.2	Processing methods	2	Lecture -2
2.3	Toxic constituents.	1	Lecture 1
<b>UNIT III</b>			
3.1	Processing of cereals- structure, composition and nutritive value	3	Lecture -2, GD -1
3.2	Processing methods- fermented and unfermented products.	3	Lecture -2, GD -1
<b>UNIT IV</b>			
4.1	Processing of milk, composition, physical properties,	2	Lecture -1, Peer teaching -1
4.2	Nutritive value and effect of salt, enzymes, acid and heat	3	Lecture -2, Peer teaching -1
4.3	Fermented and Non -fermented milk products	1	Lecture -1
<b>UNIT V</b>			
5.1	Processing of meat and poultry	2	Lecture -1, GD -1
5.2	composition, nutritive value	2	Lecture -1, GD -1
5.3	Preservation and storage	2	Lecture -2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	5	2	5	4	-	-	-	5	2	2	-	4	2.4
CO2	5	3	5	-	3	-	-	5	5	5	3	4	3.2
CO3	5	4	5	-	3	-	-	5	5	5	3	4	3.3
CO4	5	4	-	-	5	-	-	5	5	5	4	5	3.2
CO5	5	3	-	3	5	2	-	5	5	5	4	5	3.5
	<b>Mean Overall Score</b>												<b>3.12</b>

**Result: The Score for this Course is 3.12 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part IV : SEC -- II

Semester : V

Hours : 2/W 30/S

Subject Code : U22SEZ2

Credits : 2

**TITLE OF THE PAPER: ENTREPRENEURIAL ZOOLOGY**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	2	1	-	1

**PREAMBLE:**

To sensitize and motivate students to become Women entrepreneurs and Agripreneurs.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Define, describe and identify the characteristics of entrepreneurs and entrepreneurship	I	6	K1
<b>CO2:</b> Explain and comprehend the functional roles of governmental and non-governmental agencies promoting entrepreneurship	II	6	K2
<b>CO3:</b> Discuss and interpret the challenges of women entrepreneurs and also learn marketing and promotional strategies	III	6	K2
<b>CO4:</b> Prepare & Establish themselves as Agripreneurs utilizing the opportunities	IV	6	K3
<b>CO5:</b> Correlate & apply the business ideas, utilize opportunities to transform into an entrepreneur	V	6	K3

**SYLLABUS**

**UNIT I:**

Entrepreneur- Definition, Characteristics of Entrepreneurship, Classification of Entrepreneur, Factors influencing Entrepreneurship.

**UNIT II:**

Agencies promoting entrepreneurship - EDP, KVIC, NIESBUD, SISI, SIPCOT, IDBI,



NABARD, ICICI

**UNIT III:**

Womenpreneur - Problems of Women entrepreneurs- Rural Entrepreneurship – Self Help Groups - Marketing Feasibility - Product Strategies.

**UNIT IV:**

Agripreneurship – Definition. Characteristics of Agripreneur. Scope and Opportunity – Brief account on beekeeping, fisheries, sericulture, poultry, dairy farming, horticulture, medicinal plant cultivation, Food processing, honey agribusiness, Plant clinics, Landscaping and Nursery, Animal feed unit - Promotional Strategies.

**UNIT V:**

Business idea and opportunities- Starting a Small Scale Industry - Bank Loan - Benefits of SSI - Incentives and Subsidies.

**TEXT BOOKS:**

Jayashree Suresh : Entrepreneurial Development. 2<sup>nd</sup> Edn; Margham pub; 2008

**REFERENCE BOOKS:**

1. Rengarajan L. Entrepreneurial Development; Sree Renga Pub; 2008
2. <https://openeducationonline.com/magazine/what-does-agripreneurship-mean/>

**Course Designer: DR. D. HELEN CHRISTINA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Entrepreneur- Definition, Characteristics of Entrepreneurship,	2	Lecture – 2
1.2	Classification of Entrepreneurs	2	Lecture -1
1.3	Factors influencing Entrepreneurship.	2	Lecture- 1,GD -1

<b>UNIT II</b>			
2.1	Agencies promoting entrepreneurship - EDP, KVIC, NIESBUD, SISI	3	Lecture -2,GD -1
2.2	Agencies promoting entrepreneurship - SIPCOT, IDBI, NABARD, ICICI	3	Lecture -2,GD -1
<b>UNIT III</b>			
3.1	Womenpreneur - Problems of Women Entrepreneurs	2	Lecture -1,GD -1
3.2	Rural Entrepreneurship – Self Help Groups	2	Lecture -1,GD -1
3.3	Marketing Feasibility - Product Strategies	2	Lecture -1,GD -1
<b>UNIT IV</b>			
4.1	Agripreneurship – Definition. Characteristics of agripreneur.	2	Lecture -1 Peer teaching -1
4.2	Scope and Opportunity – Brief account on beekeeping, fisheries, sericulture, poultry, dairy farming, fisheries, horticulture, medicinal plant cultivation, Food processing, honey agribusiness, Plant clinics, Landscaping and Nursery, Animal feed unit	3	Lecture -1 Peer teaching -2
4.3	Promotional Strategies	1	Lecture -1, GD-1
<b>UNIT V</b>			
5.1	Business ideas and opportunities	2	Lecture -1, GD-1
5.2	Starting a Small Scale Industry- Bank Loan	2	Lecture -1,GD -1
5.3	Benefits of SSI- Incentives and Subsidies.	2	Lecture - 2

Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	5	3	4	-	-	-	-	-	-	5	4	4	2.08
CO2	4	5	-	-	4	-	-	-	-	5	4	4	2.2
CO3	3	5	-	-	4	-	-	-	-	5	5	4	2.2
CO4	3	5	5	-	-	-	-	-	-	5	5	4	2.3
CO5	-	4	5	-	3	-	-	-	-	5	4	4	2.08
<b>Mean Overall Score</b>												<b>2.2</b>	

**Result: The Score for this Course is (Medium Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : CC - XIII

Semester : VI

Hours : 6/W 90/S

Subject Code : U22CZ13

Credits : 5

**TITLE OF THE PAPER: MICROBIOLOGY AND BIOTECHNOLOGY**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL/ CHARTS
	6	3	1	2

**PREAMBLE:**

Impart knowledge on basic concepts of microbes, microbial techniques, rDNA techniques and to understand their practical significance.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	<b>Level</b>
<b>CO1:</b> Gain knowledge on basic concepts and scope of microbiology and to Elucidate the practical knowledge on sterilization techniques	1	18	K1
<b>CO2:</b> Acquire knowledge on classification and the structure of bacteria and to develop the skills in microbial techniques	2	18	K2
<b>CO3:</b> Recognize and correlate the relationship between the general characteristics and the structure of virus, fungi and algae	3	18	K2
<b>CO4:</b> Inculcate knowledge on basic concepts of biotechnology and acquire skills on techniques of rDNA technology,	4	18	K2
<b>CO5:</b> Application of acquired skills on the production of enzymes, insulin, vaccines cell culture system and transgenic animals and to gain knowledge on the values, ethics and the patent of the products.	5	18	K3

**SYLLABUS**

**UNIT I:**

History and scope of Microbiology. Classification of Microorganism - Whittaker's Five kingdom concept. Control of microbes - Sterilization, disinfection, antiseptic, tyndallisation and pasteurization. Physical sterilization - dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Chemical sterilization - phenol and phenolic compounds, anionic and cationic detergents.

**UNIT II:**

Bacteria – classification, fine structure of bacterial cell. Cultivation of bacteria – Types of culture media - natural, synthetic, complex, enriched, selective and anaerobic Growth media (definition with

example). Pure culture methods - streak plate, spread plate, pour plate, stab culture, slant culture, anaerobic culture. Observation of microorganism – Staining techniques – Principles of staining, simple staining, negative staining, Gram staining and Acid-fast staining.

### **UNIT III:**

Fungi - general characteristics, morphology (*Penicillium*, *Saccharomyces*) and classification. Virus - general characteristics and morphology (Corona virus and Hepatitis). Algae - general characteristics and morphology (Nostac).

### **UNIT IV:**

Biotechnology - history and scope. Recombinant DNA technology - cloning vectors – plasmids, bacteriophages, cosmids – Enzymes used in rDNA technology – *in vitro* construction of rDNA - Construction of genomic and cDNA libraries. Principles involved in blotting techniques- southern, northern and western. Principles and application of PCR Technology.

### **UNIT V:**

Microbial production of amylase, insulin as recombinant vaccine (HBV). Cell culture - types of culture. Transgenic animals - Development and application of transgenic mice - ethics - patent - IPR.

### **TEXT BOOKS:**

1. Dubey RC and Maheswari DK. A Text Book of Microbiology. S. Chand and Company, New Delhi, 2013.
2. Kumaresan V. Biotechnology. Saras Pub., 2016.

### **REFERENCE BOOKS:**

1. Ananathanarayan R and Paniker CKJ. Text Book of Microbiology. 6<sup>th</sup>Edn., Orient Longman Ltd. 2001.
2. Pelczar Jr. MJ, Chan ECS and Kreig NR. Microbiology. 5<sup>th</sup>Edn., Tata McGraw Hill Pub. Ltd., New Delhi, 2013.
3. Prescott IM, Harley JP and Klein DK. Microbiology. 2<sup>nd</sup>Edn., WMC Brown Pub., 1993.
4. Brown T A. Gene Cloning: An Introduction. 4<sup>th</sup>Edn., Black Bell Science Ltd., New Delhi, 2001.
5. Dubey RC. A text book of Biotechnology. Multicolor illustrative Edn., S. Chand and

Company, New Delhi, 2006.

6. Primrose SB. Principles of Gene manipulation. 6<sup>th</sup> Edn., Black Bell Science Ltd., New Delhi, 2003.
7. Satyanarayana U. Biotechnology 1<sup>st</sup> Edn., Books and Allied (P) Ltd., Kolkata, 2009.  
Singh BD. Biotechnology 2<sup>nd</sup> Edn., Kalyani Pub., Chennai, 2005.

**Course Designer: Dr. H. VIJAYARANI**

### **COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	History and scope of Microbiology	2	Lecture - 2
1.2	Classification of Microorganism - Whittaker's Five kingdom concept.	2	Lecture - 2
1.3	Control of microbes - Sterilization, disinfection, antiseptic, tyndallisation and pasteurization.	6	Lecture - 3 Video - 3
1.4	Physical sterilization - dry heat, moist heat, UV light, ionizing radiation, filtration, HEPA filter, Chemical sterilization - phenol and phenolic compounds, anionic and cationic detergents	8	Lecture - 3 Video - 3 Tutorial - 2
<b>UNIT II</b>			
2.1	Bacteria – classification, fine structure of bacterial cell	2	Lecture – 1 Chart - 1
2.2	Cultivation of bacteria – Types of culture media - natural, synthetic, complex, enriched, selective and anaerobic Growth media (definition with example).	4	Lecture - 2 Peer teaching - 2
2.3	Pure culture methods - streak plate, spread plate, pour plate, stab culture, slant culture, anaerobic culture.	6	Lecture - 3 Video - 3
2.4	Observation of microorganisms – Staining techniques – principles of staining, simple staining, negative staining, Gram's staining, Acid-Fast staining	6	Lecture - 3 Tutorial - 3
<b>UNIT III</b>			

3.1	Fungi - general characteristics, morphology ( <i>Penicillium, Saccharomyces</i> ) and classification	7	Lecture - 4, Peer Teaching - 1 Group discussion - 2
3.2	Virus - general characteristics and morphology (Corona virus and Hepatitis).	7	Lecture - 4 Video - 3
3.3	Algae - general characteristics and morphology (Nostac)	4	Lecture - 2 Peer Teaching - 2
<b>UNIT IV</b>			
4.1	Biotechnology - history and scope	2	Lecture - 1, chart - 1
4.2	Recombinant DNA technology - cloning vectors – plasmids, bacteriophages, cosmids – Enzymes used in rDNA technology	8	Lecture - 4 Videos - 2 Peer Teaching - 2
4.3	<i>Invitro</i> construction of rDNA - Construction of genomic and cDNA libraries. Principles involved in blotting techniques- southern, northern and western. Principles and application of PCR Technology	8	Lecture - 2 Peer Teaching - 4 Video - 2
<b>UNIT V</b>			
5.1	Enzyme production from microbes - production of insulin, recombinant vaccines – HBV	5	Lecture – 2 Peer Teaching - 2 Tutorial - 1
5.2	Cell culture - types of culture	5	Lecture - 3, Video - 2
5.3	Transgenic animals - Development and application of transgenic mice - ethics - patent - IPR	8	Lecture - 4 Peer Teaching - 2 Group Discussion - 2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	3	4	4	4	2	4	4	4	3	3	3.58
CO2	4	4	4	4	4	4	-	4	4	4	4	3	3.58
CO3	4	4	1	4	4	4	4	1	4	-	4	3	3.08
CO4	4	4	4	4	4	-	-	4	3	4	4	4	3.25
CO5	4	4	4	3	4	-	-	3	4	4	4	4	3.17
<b>Mean Overall Score</b>												<b>3.33</b>	

**Result: The Score for this Course is 3.33 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%



**Programme : B. Sc. ZOOLOGY**

**Part III : CC - XIV**

**Semester : VI**

**Hours : 6/W 90/S**

**Subject Code : U22CZ14**

**Credits : 5**

**TITLE OF THE PAPER: IMMUNOLOGY**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>
	6	4	-	2

**PREAMBLE:**

This course helps to understand the basic concept of immune system and immune response and gain knowledge in the immunodiagnosis of diseases.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Define, discuss and explain the types of immunity. Compare and summarize the organs and cells of immune system.	1	17	K2
<b>CO2:</b> Describe and compare antigenicity and immunogenicity. List and compare types of immunoglobulin and antigen antibody interactions. And summarize the compliment pathway.	2	22	K3
<b>CO3:</b> Define and analyze types of immune responses and tumor immunity.	3	24	K3
<b>CO4:</b> Define and compare types of hypersensitivity. Summarize and describe autoimmune disorder and immunodeficiency using examples.	4	13	K3
<b>CO5:</b> Classify, explain and recommend types of vaccines. Understand and demonstrate a few of the important immunological techniques.	5	14	K3

**SYLLABUS**

**UNIT I:**

Introduction - History and scope of Immunology. Immunity - types of immunity - innate and acquired immunity - humoral and cell mediated immunity - active and passive immunity. Organs and cells of immune system- primary and secondary lymphoid organs. T cell, B cell, NK cell, dendritic cell, macrophage and granulocytes.

**UNIT II:**

Antigens - antigenicity, immunogenicity, haptens and types of antigens. Immunoglobulin- structure, types, biological properties and functions. Antigen and Antibody interactions - primary interactions - affinity and avidity - secondary interactions - applications of agglutination and precipitation reaction.

Complement - classical and alternative pathways.

**UNIT III:**

Immune response - basic concepts of humoral immune response - primary and secondary immune response - cell mediated immune response - mechanism - cytokines MHC - a note on HLA and tissue transplantation. A brief account of tumour immunity - types, immune response.

**UNIT IV:**

Hypersensitivity-type I, type II, III, IV and V. Auto immune diseases -Rheumatoid Arthritis. Immunodeficiency - AIDS.

**UNIT V:**

Immunoprophylaxis - types of vaccines - live attenuated, killed. Recommended immunization schedule for children. Immunoassays - ELISA, RIA, Western blotting technique.

**TEXT BOOKS:**

Eli Benjamin. Immunology - A short course. A. John Wiley & Sons Pub., New York, 1996.

**REFERENCE BOOKS:**

1. GolKindt T J, Goldsby RA and Osborne BA. Kuby. Immunology. W. H. Freeman and Company, New York, 2007.
2. Roitt I. Essential Immunology. Blackwell Science Pub., Oxford, 1997.

**Course Designer: DR. JOTHI SAM**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Introduction - History and scope of Immunology. Immunity - types of immunity - innate and acquired immunity - humoral and cell mediated immunity - active and passive immunity.	6	Lecture - 4 Tutorial - 2
1.2	Organs of immune system- primary and secondary lymphoid organs.	5	Lecture - 3 Tutorial - 2
1.3	Cells of immune system - T cell, B cell, NK cell, dendritic cell, macrophage and granulocytes.	6	Lecture - 4 Tutorial - 1

			ICT - 1
<b>UNIT II</b>			
2.1	Antigens - antigenicity, immunogenicity, haptens and types of antigens.	6	Lecture - 5 Tutorial - 1
2.2	Immunoglobulin- structure, types, biological properties and functions.	5	Lecture - 3 Tutorial - 1 Video - 1
2.3	Antigen and Antibody interactions - primary interactions - affinity and avidity - secondary interactions - applications of agglutination and precipitation reaction.	7	Lecture - 5 Tutorial - 1 ICT - 1
2.4	Complement - classical and alternative pathways.	4	Lecture - 4
<b>UNIT III</b>			
3.1	Immune response - basic concepts of humoral immune response - primary and secondary immune response.	7	Lecture - 5 Tutorial - 1 Video - 1
3.2	Cell mediated immune response - mechanism - cytokines	7	Lecture - 5 Tutorial - 2
3.3	MHC - a note on HLA and tissue transplantation.	5	Lecture - 4 Tutorial - 1
3.4	A brief account of tumour immunity - types, immune response.	5	Lecture - 4 Tutorial - 1
<b>UNIT IV</b>			
4.1	Hypersensitivity-type I, type II, III, IV and V.	5	Lecture - 3 Tutorial - 2
4.2	Auto immune diseases - Rheumatoid Arthritis.	3	Lecture - 3
4.3	Immunodeficiency - AIDS.	5	Lecture - 4 Tutorial - 1
<b>UNIT V</b>			
5.1	Immunoprophylaxis - types of vaccines - live attenuated, killed.	4	Lecture - 3 Tutorial - 1
5.2	Recommended immunization schedule for children.	2	Lecture - 2
5.3	Immunoassays - ELISA, RIA, Western blotting technique.	8	Lecture - 6 Tutorial - 2

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4.5	3.5	3.0	3.5	2	4	4	3.5	3.5	3.5	3.5	3	3.45
<b>CO2</b>	4	3.5	4	4.5	2	4	4	3.5	3.5	3.5	3.5	3	3.58
<b>CO3</b>	4	4	3.5	4	3	4	3.5	3.5	3.5	3.5	3.5	3.5	3.62
<b>CO4</b>	4	4	3.5	3.5	3	4	3.5	3.5	4	3.5	3.5	3.5	3.62
<b>CO5</b>	4	3.5	3.5	3.5	3.5	3.5	3.0	3.5	3.5	3.5	3.5	3.5	3.50
<b>Mean Overall Score</b>													<b>3.55</b>

**Result: The Score for this Course is 3.55 (High Relationship)**

<b>Mapping</b>	1-20%	21- 40%	41- 60%	61- 80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1- 4.0	4.1- 5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : CC - XV

Semester : VI

Hours : 6 P/W 90 P/S

Subject Code : U22CZ15P

Credits : 4

**TITLE OF THE PAPER: MICROBIOLOGY, BIOTECHNOLOGY AND  
IMMUNOLOGY - PRACTICAL**

Pedagogy	Hours	Lecture	Tutorial	Demonstration
	6	1	2	3

**PREAMBLE**

The students will enrich their practical knowledge on microbiology, biotechnology and immunology and apply these techniques in various fields of Zoology.

COURSE OUTCOME	Unit	Hrs P/S	Knowledge level
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Acquire practical knowledge and develop skills on microbiological techniques	1	18	K3
<b>CO2:</b> Gain knowledge on basic sterilization procedures and develop skills on staining techniques	2	15	K3
<b>CO3:</b> Learn the techniques for the isolation of DNA	3	16	K3
<b>CO4:</b> Acquire practical knowledge on the techniques of biotechnology and develop skills on electrophoresis techniques	4	15	K3
<b>CO5:</b> Inculcate practical knowledge and develop skills on basic and immunodiagnostic techniques	5	26	K3

**SYLLABUS**

**UNIT I:**

Culture media preparation - Liquid (Nutrient broth), solid, agar slant

Inoculation techniques - Streak plate, pour plate and spread plate

Isolation of pure culture by streak plate method

**UNIT II:**

Staining Technique - simple staining and Gram's staining

Spotters - Compound microscope, Laminar Air Flow, Autoclave, Incubator, Hot Air Oven

**UNIT III:**

Isolation of DNA from animal/bacterial cells

Isolation of plasmid DNA

**UNIT IV:**

Analysis of DNA by agarose gel electrophoresis

Spotters : pBR 322, Cosmid, Microinjection, PCR

**UNIT V:**

Isolation of amylase producers

Rapid Plasma Reagin Test (RPR)

Ouchterlony's Double Immuno Diffusion test (ODD)

Rocket Immuno Electrophoresis (RIE)

Blood grouping test– ABO & Rh

WIDAL – Slide test

Spotters: ELISA, Hybridoma Technology

**REFERENCE BOOKS:**

1. Dubey RC and Maheswari DK. Practical Microbiology. S. Chand and Company, New Delhi, 2008.
2. Gunasekaran P. Laboratory Manual in Microbiology. New Age International Ltd. Pub., 2009.

**Course Designer: Dr. H. VIJAYARANI**

**COURSE CONTENT AND LECTURE SCHEDULE**

UNITS	TOPIC	PRACTICAL HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Culture media preparation – Liquid (Nutrient broth), solid, agar slant	6	Demo - 3 Tutorial - 2 Lecture - 1
1.2	Inoculation techniques - Streak plate, pour plate and spread plate	6	Demo - 3 Tutorial - 2 Lecture - 1
1.3	Isolation of pure culture by streak plate method	6	Demo - 3

			Tutorial - 2 Lecture - 1
<b>UNIT II</b>			
2.1	Staining Technique – simple staining and Gram’s staining	8	Demo - 4 Tutorial - 3 Lecture - 1
2.2	Spotters - Compound microscope, Laminar Air Flow, Autoclave, Incubator, Hot Air Oven	7	Demo - 2 Tutorial - 2 Lecture - 3
<b>UNIT III</b>			
3.1	Isolation of DNA from animal/bacterial cells	8	Demo - 4 Tutorial - 3 Lecture - 1
3.2	Isolation of plasmid DNA	8	Demo - 4 Tutorial - 3 Lecture - 1
<b>UNIT IV</b>			
4.1	Analysis of DNA by agarose gel electrophoresis	8	Demo - 4 Tutorial - 3 Lecture - 1
4.2	Spotters : pBR 322, Cosmid, Microinjection, PCR	7	Demo - 3 Tutorial - 2 Lecture - 2
<b>UNIT V</b>			
5.1	Rapid Plasma Reagin Test (RPR) Ouchterlony’s Double Immuno Diffusion test (ODD) Rocket Immuno Electrophoresis (RIE)	12	Demo - 8 Tutorial - 3 Lecture - 1
5.2	Blood grouping test– ABO & Rh WIDAL – Slide test RA Test	9	Demo - 5 Tutorial - 3 Lecture - 1
5.3	Spotters: ELISA, Hybridoma Technology	5	Demo - 2 Tutorial - 2 Lecture - 1

Course Outcomes (COs)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO 1	4	4	4	4	4	-	-	4	4	4	4	4	3.33
CO 2	4	4	4	4	4	-	-	4	4	4	4	4	3.33
CO 3	4	4	4	4	4	-	-	4	4	4	4	4	3.33
CO 4	4	4	4	4	4	-	-	4	4	4	4	4	3.33
CO 5	4	4	4	4	4	-	-	4	4	4	4	4	3.33
<b>Mean overall score</b>												<b>3.33</b>	

**Result: The score for this course is 3.33 (High relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%



Programme : B. Sc. ZOOLOGY

Part III : DSEC - II

Semester : VI

Hours : 4/W 60/S

Subject Code : U22DSZ2A

Credits : 4

**TITLE OF THE PAPER: BIOPHYSICS AND BIostatISTICS**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	4	3	--	1

**PREAMBLE:**

Provide an advanced understanding of the core principles in biophysics, understand the concepts in biostatistics and apply the statistical techniques in analyzing the biological data.

<b>COURSE OUTCOME</b> At the end of the Semester, the Students will be able to	<b>Unit</b>	<b>Hrs</b> <b>P/S</b>	<b>Knowledge</b> <b>Level</b>
<b>CO1:</b> Describe the concepts of electro kinetic properties of biomolecules.	1	7	K1
<b>CO2:</b> Analyse biophysical principles in neuromuscular conduction.	2	8	K2
<b>CO3:</b> Understand the theoretical aspects of data collection and processing.	3	15	K2
<b>CO4:</b> Apply the formula for calculating central measures of tendency and dispersion.	4	15	K3
<b>CO5:</b> Analyse and calculate Pearson's correlation coefficient, interpret regression equations and evaluate chi square test	5	15	K3

**SYLLABUS**

**UNIT I:**

Colloids - types, properties, electro kinetic properties, Donnan equilibrium, Tyndal effect, surface tension, Brownian movement, filtration, osmosis, dialysis, adsorption.

**UNIT II:**

Laws of thermodynamics - Biophysical principles in neuromuscular conduction – membrane transport mechanism - Bioluminescence.

**UNIT III:**

Collection of data - primary and secondary data - types of sampling: random and stratified Sampling. Processing of data - classification and tabulation. Representation of data - diagrammatic and graphic.

**UNIT IV:**

Measures of central tendency - mean, median and mode. Measures of dispersion – standard deviation, standard error, variance and coefficient of variation.

**UNIT V:**

Chi square analysis, types of correlation and regression, Karl Pearsons correlation coefficient.

**TEXT BOOKS:**

1. Ramakrishnan P . Biostatistics. Saras Pub ., 2015

**REFERENCE BOOKS:**

1. Daniel WW. Biostatistics – A foundation for analysis in health sciences. Wiley Student Edn., 2005
2. Gurumani N . An introduction to Biostatistics. MJP Pub., 2004
3. Palanisamy S. and Manoharan M . Statistical methods for Biologists. Palani paramount Pub., 1990
4. Subramanian M.A., Biophysics – Principles & Techniques, MJP Publishers, 2005

**Course Designer : DR. E. EMIMAL VICTORIA**

### COURSE CONTENT AND LECTURE SCHEDULE

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
	1.1: Colloids – types, properties	2	Lecture - 2
	1.2 : Electro Kinetic properties, Donnan equilibrium	2	Lecture - 2
	1.3 : Tyndal effect, Surface tension	2	Lecture - 2
	1.4 : Brownian movement, filtration	3	Lecture - 3
	1.5 : Osmosis, dialysis, adsorption	3	Lecture - 3
<b>UNIT II</b>			
	2..1 : Laws of thermodynamics	2	Lecture - 2
	2.2 : Biophysical principles in nerve impulse conduction	2	Lecture
	2.3 : Biophysical principles in muscular conduction	2	Tutorial
	2.4 : Membrane transport mechanism	3	Lecture -2

		Tutorial - 1
2.5 : Bioluminescence	2	Tutorial
<b>UNIT III</b>		
3.1 : Primary and secondary collection of data	2	Lecture
3.2 : Types of sampling – random and stratified	2	Lecture
3.3 : Processing of data – classification and tabulation	3	Lecture -2 Tutorial - 1
3.4 : Diagramatic representation of data	4	Lecture -3 Tutorial - 1
3.5 : Graphic representation of data	2	Tutorial - 2
<b>UNIT IV</b>		
4.1 : Measures of central tendency	3	Lecture - 2 Tutorial - 1
4.2 : Calculation of mean, median and mode	3	Lecture - 2 Tutorial - 1
4.3 : Measures of dispersion	2	Lecture -1 Tutorial -1
4.4 : Standard deviation, standard error	2	Lecture -1 Tutorial -1
4.5 : Variance and coefficient of variation	2	Lecture - 1 Tutorial - 1
<b>UNIT V</b>		
5.1 : Chi square analysis	2	Tutorial - 2
5.2 : Types of correlation	2	Lecture – 2
5.3 : Types of regression	2	Lecture - 2
5.4 : Correlation coefficient	3	Lecture - 2 Tutorial -1
5.5 : Karl Pearsons coefficient	3	Lecture -2 Tutorial -1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	2.5	3	4	4	2.5	3	3.7	4	2	2.3	4	4	3.3
CO2	3.5	2.5	4	2	4	3	4	4	3	3	4	2	3.3
CO3	3	2	4	4	3	3.7	3.3	4	2.5	4	3	3.5	3.4
CO4	3	2	3.5	4	4.5	2	3.3	4	3	4	3.7	2	3.3
CO5	2	2.5	3.5	4	3	2	3	4.5	2.5	4.5	3.5	2	3.3
<b>Mean Overall Score</b>													<b>3.32</b>

**Result: The Score for this Course is 3.32 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : DSEC - II

Semester : VI

Hours : 4/W 60/S

Subject Code : U22DSZ2B

Credits : 4

**TITLE OF THE PAPER: BIOLOGY AND HUMAN WELFARE**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	Charts/Models
	4	2	-	1	1

**PREAMBLE:**

The course encourage the students to gain basic knowledge on molecular basis , and to know the functions and significance of biomolecules

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge levels</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Give ideas to understand fundamental Microbial pathogens and immunity .	1	12	K1
<b>CO2:</b> Demonstrate an understanding of the Protozoan and Helminth parasites, the life cycle ,disease transmission and control measures	2	12	K2
<b>CO3:</b> Provide knowledge regarding the Bio – resources regarding Pisciculture , Pearl culture and Poultry farming	3	12	K3
<b>CO4:</b> Provide knowledge regarding the–principles, Health status and problems – Health care services, Health programmes in India. Birth control and family planning.	4	12	K3
<b>CO5:</b> Describe the First Aid for heart attacks, fire accident – drowning, road accident	5	12	K3

## **SYLLABUS**

### **UNIT I:**

Microbial pathogens and immunity . Bacterial diseases - Tuberculosis, cholera, Viral diseases – Hepatitis, AIDS.

### **UNIT II:**

Protozoan and Helminth parasites – Life cycle, mode of transmission , disease , caused and control measures of *Entamoeba histolytica* and *Taenia solium*.

### **UNIT III:**

Bio – resources – pisciculture, pearl culture and poultry farming

### **UNIT IV:**

Health and Hygiene - concept of health care – levels of health primary health care – principles, Health status and problems – Health care services , Health programmes in India. Birth control and family planning.

### **UNIT V:**

First Aid – objectives – for heart attacks, fire accident – drowning, road accident – CPR (Cardio Pulmonary Resuscitation) , Electric shock, Dog bite, poisoning and bleeding.

## **TEXTBOOK**

Sachin Yadav, Biology in Human Welfare, 1<sup>st</sup> Edition, Notion Press

## **REFERENCE BOOKS:**

1. Kotpal Agarwal and Khetarp, Invertebrate Zoology , 6<sup>th</sup> edn. Rastogi Publishers, Meerut. 2020
2. Park and Park, Textbook of social and Preventive Medicine. 13<sup>th</sup> edn. Banarasides publishers , Jabalpur.2014.
3. Viswaprem, K.K.C , Economic Zoology, Akashdeep Publishing House. New Delhi. 2003.

**Course Designer: DR. V. KABILA**

## **COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Microbial pathogens and immunity	3	Lecture - 3
1.2	Bacterial diseases	3	Charts - 1 Lecture - 2

1.3	Tuberculosis, cholera	2	Charts-1 Lecture - 1
1.4	Viral diseases	2	Models-1 Lecture - 1
1.5	Hepatitis, AIDS	5	Charts -1 Lecture - 1 GD -3
<b>UNIT II</b>			
2.1	Protozoan and Helminth parasites	3	Lecture - 3
2.2	Life cycle of <i>Entamoeba histolytica</i>	3	Charts - 1 Lecture - 1 Video - 1
2.3	Life cycle Of <i>Taenia solium</i> .	3	Lecture - 1 Video - 2
2.4	Transmission of disease ,Causative agents ,control measures of <i>Entamoeba histolytica</i>	3	Models 1 Lecture - 2
2.5	Transmission of disease, Causative agents , control measures of <i>Taenia solium</i>	3	Models - 1 Lecture - 1 Video - 1
<b>UNIT III</b>			
3.1	Bio – resources	2	Charts-1 Lecture-1
3.2	Pisciculture	1	Lecture-1
3.3	Pearl culture	2	Lecture-2
3.4	Poultry farming	2	Visual aids-1 Lecture-1
3.5	Importance of various farming	3	Charts - 1 Lecture - 1 Video - 1
<b>UNIT IV</b>			
4.1	Health and Hygiene	3	Charts - 1 Lecture - 2
4.2	Concept of health care – levels of health primary health care	3	Chart - 1 Lecture - 2
4.3	Principles, Health status and problems	2	Lecture - 2
4.4	Health care services , Health programmes in India	2	Charts - 1 Lecture - 1
4.5	Birth control and family planning.	5	Video - 2 Lecture - 3
<b>UNIT V</b>			
5.1	First Aid – objectives	4	Charts - 1 Lecture - 3
5.2	First Aid for heart attacks, fire accident	4	Video - 2 Lecture - 2

5.3	First Aid for Drowning, road accident	4	Lecture - 3 Charts - 1
5.4	First Aid for CPR (Cardio Pulmonary Resuscitation), Electric shock	3	Visual aids with explanations -1, Lecture - 2
5.5	First Aid for Dog bite, poisoning and bleeding	5	Charts - 1 Lecture - 3 Video - 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	1	4	-	3	4	4	5	4	4	4	3.4
CO2	4	4	-	4	1	3	4	4	4	4	4	4	3.3
CO3	4	4	4	4	-	3	4	3	4	4	4	4	3.5
CO4	4	4	1	4	1	3	4	4	4	4	4	4	3.3
CO5	4	4	2	3	1	3	4	3	4	3	3	4	3.2
<b>Mean Overall Score</b>												<b>3.3</b>	

**Result: The Score for this Course is 3.3 (High)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30 %	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%



**Programme : B. Sc. ZOOLOGY**

**Part III : DSEC - III**

**Semester : VI**

**Hours : 4/W 60P/S**

**Subject Code : U22DSZ3A**

**Credits : 4**

**TITLE OF THE PAPER: CLINICAL LAB TECHNOLOGY**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Teaching</b>	<b>GD/VIDEOS/TUTORIAL</b>	<b>Charts/ Models</b>
	4	2	-	1	1

**PREAMBLE:**

The course will provide basic knowledge on first aid and safety measures, understand the principle and methodology of clinical lab techniques, find placement in Medical Laboratory

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge levels</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> To understand the laboratory designing and safety methods of First Aid in laboratory.	1	10	K2
<b>CO2:</b> To analyses the human blood regarding types of blood groups (A, B, AB, O)	2	10	K3
<b>CO3:</b> To understand theoretical knowledge about the specimen collection and Transportation of urine	3	10	K3
<b>CO4:</b> To describe the chemical and microscopic examination of stool	4	15	K3
<b>CO5:</b> To Explain the chemical, microscopic examination of sputum and analysis the semen.	5	15	K3

**SYLLABUS**

**UNIT I:**

Laboratory designing and safety methods - laboratory designing, code of conduct for clinical laboratory, personal hygiene for laboratory technologists. Laboratory accidents - types, safety measures - First Aid in laboratory and precautions

**UNIT II:**

Hematology - Phlebotomy (Peripheral and venous). Composition of blood plasma and

corpuscles (self study). ABO Blood group system - Rh typing - blood components separation. Blood transfusion - compatibility testing. Chemical Examination - blood glucose, GTT, diabetes mellitus - types, urea, cholesterol, bilirubin.

### **UNIT III:**

Urine - collection, storage and transport of urine sample. Physical properties - colour, volume, specific gravity, odour, turbidity. Chemical examination of urine - sugar, albumin, bile salts, bile pigments, urobilinogen, Bence-Jones proteins, ketones. Microscopic examination of urine deposits - cast, crystals and cells.

### **UNIT IV:**

Stool - collection and transport of specimen – macroscopic examination – colour, odour, consistency. Chemical examination - Occult blood and pH. Microscopic examination - ova and cyst.

### **UNIT V:**

Sputum - collection and transport of specimen - macroscopic examination - consistency and appearance - microscopic examination - AFB staining. Semen - Semen analysis - collection, gross examination of specimen - microscopic examination - motility, total count and abnormality.

### **TEXT BOOK:**

1. Mukherjee LK. Medical Laboratory Technology. Vol 3, 2<sup>nd</sup>Edn. Hill Pub. Ltd., New Delhi, 1988.
2. Richard A. Mcpherson, and Matthew R. Pincus .Henry's Clinical Diagnosis and Management by Laboratory Methods .Publisher: Elsevier
3. Dr. William Clarke and Dr. Mark Marzinke , Contemporary Practice in Clinical Chemistry, Publisher : Academic Press Inc
4. Nader Rifai, Carl T. Wittwer Andrea Rita Horvath , Tietz Fundamentals Of Clinical Chemistry And Molecular Diagnostics , Publisher: Saunders

### **REFERENCE BOOKS:**

1. Sood R. Medical Laboratory Technology - Methods and Interpretations. 5<sup>th</sup>Edn., Jaypee Pub., New Delhi
2. Barbara Estridge, Anna Reynolds, Basic Clinical Laboratory Techniques , Publisher: Delmar Cengage Learning.

**Course Designer: MRS. P. YUVARANI**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Laboratory designing and safety methods	2	Charts – 1 Lecture – 1
1.2	Laboratory designing, code of conduct for clinical laboratory,	2	Charts – 1 Visual aids- 1
1.3	Personal hygiene for laboratory technologists	2	Lecture - 1 Video-1
1.4	Laboratory accidents-types, safety measures	2	Charts – 1 Visual aids-1
1.5	First Aid in laboratory and precautions.	2	Charts – 1, visual aids-1
<b>UNIT II</b>			
2.1	Composition of blood plasma, corpuscles	2	Charts – 1 Lecture- 1
2.2	Blood group system - Rh typing	2	Lecture – 1 Chart – 1
2.3	Blood components separation	2	Visual aids1 Lecture – 1
2.4	Blood transfusion	2	Visual aids 1 Lecture – 1
2.5	Chemical Examination	2	Lecture – 1 Chart – 1
<b>UNIT III</b>			
3.1	Urine-collection, storage and transport of urine sample	3	Lecture -2 Video - 1
3.2	Physical properties	2	Lecture - 1

			Chart – 1
3.3	Chemical examination	3	Visual aids 1 Lecture – 2
3.4	Microscopic examination	2	Charts- 1 Lecture – 1
<b>UNIT IV</b>			
4.1	Stool - collection and transport of specimen	4	Lecture - 2 Chart - 1, Video - 1
4.2	Macroscopic examination	5	Visual aids - 1, Lecture - 3, Charts - 1
4.3	Chemical examination	3	Visual aids - 1, Lecture - 2
4.4	Microscopic examination	3	Charts - 1, Lecture - 2
<b>UNIT V</b>			
5.1	Sputum -collection and transport	3	Lecture - 2, Video - 1
5.2	Macroscopic examination	3	Visual aids - 1, Lecture – 2
5.3	Microscopic examination	3	Charts - 1, Lecture – 2
5.4	Semen analysis	3	Visual aids - 1, Lecture – 2
5.5	Microscopic examination	3	Visual aids - 1, Lecture – 1, Charts - 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	-	4	4	1	-	4	4	4	4	4	4	3.0
CO2	4	1	4	4	-	2	4	4	4	4	4	4	3.3
CO3	4	1	4	4	1	-	4	4	4	4	4	4	3.2
CO4	4	-	4	4	1	2	4	3	4	4	4	4	3.2
CO5	4	-	4	4	1	2	4	3	4	4	4	4	3.2
<b>Mean Overall Score</b>												<b>3.18</b>	

**Result: The Score for this Course is 3.18 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : DSEC - III

Semester : VI

Hours : 4/W 60/S

Subject Code : U22DSZ3B

Credits : 4

**TITLE OF THE PAPER: ENDOCRINOLOGY**

Pedagogy	Hours	Lecture	Peer Teaching	Tutorial/video/demo	
	4	2	-	2	
<b>PREAMBLE:</b> The students will be able to understand the structure and functions of various Endocrine organs and the related disorders.					
<b>COURSE OUTCOMES</b> At the end of the Semester, the Students will be able to			<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
<b>CO1:</b> Acquire the knowledge about the endocrine system and Hormones			1	9	K2
<b>CO2:</b> understand the structure and functions of hypothalamus and biological rhythms			2	9	K3
<b>CO3:</b> analyse the structure of pituitary with reference to hypothalamo- hypophysial portal system and its functions			3	12	K2
<b>CO4:</b> apply the structure of various endocrine glands and their structure with reference to regulatory mechanisms			4	18	K3
<b>CO5:</b> understand the structure of hormone receptors and apply the concept to various regulatory mechanisms of hormones			5	12	K3
<b>SYLLABUS</b>					
<b>UNIT I:</b> Definition and classification of hormones. Endocrine, paracrine and autocrine modes of hormone delivery,					
<b>UNIT II:</b> Structure of pineal gland, Secretions and their functions in biological rhythms and reproduction; Structure of hypothalamus, Hypothalamic nuclei and their functions.					

**UNIT III:**

Structure of pituitary gland, Its hormones and their functions; Hypothalamo - hypophysial portal system; Disorders of pituitary gland.

**UNIT IV:**

Structure, Hormones, Functions and Regulation of Thyroid gland; Parathyroid & Adrenal glands; Pancreas; Ovary and Testis; Hormones in homeostasis; Disorders of endocrine glands. Regulation of neuroendocrine glands, Feedback mechanisms.

**UNIT V:**

Hormone action at Cellular level: Hormone receptors; Transduction and regulation of Hormone action at Molecular level; Molecular mediators; Genetic control of hormone action.

**TEXT BOOK:**

1. Turner, C. D. (1971) General Endocrinology, Pub- Saunders Toppan.

**REFERENCE BOOKS:**

1. Nussey, S.S.; and Whitehead, S.A. (2001) Endocrinology: An Integrated Approach, Oxford: BIOS Scientific Publishers.
2. Hadley, M.E. and Levine J.E. (2007) Endocrinology (6th edition) Pearson Prentice-Hall, New Jersey.
3. David, O.N. (2013) Vertebrate Endocrinology

**Course Designer: DR. V. KABILA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HRS.</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Classification of hormones and Endocrine Glands	4	Lecture-2 Tutorial-2

1.2	Mechanism of endocrine, autocrine and paracrine delivery of hormones	5	Lecture-3 Video-2
<b>UNIT II</b>			
2.1	Structure of pineal gland, Secretions and their functions	4	Lecture-2 Tutorial-2
2.2	Structure of hypothalamus, Hypothalamic nuclei and their functions.	5	Lecture-3 Tutorial-2
<b>UNIT- III</b>			
3.1	Structure of pituitary gland, Its hormones and their functions; Hypothalamo - hypophysial portal system	6	Lecture-3 Video-3
3.2	Disorders of pituitary gland	6	Lecture-3 Video-3
<b>UNIT IV</b>			
4.1	Structure, Hormones, Functions and Regulation of Thyroid gland; Parathyroid gland	6	Lecture-2 video-2 Demo-2
4.2	Structure, Hormones, Functions and Regulation of Adrenal glands; Pancreas; Ovary and Testis	6	Lecture-2 Tutorial-2 Demo-2
4.3	Regulation of neuroendocrine glands, Feedback mechanisms	6	Lecture-3 Lecture-2 Demo-1
<b>UNIT V</b>			
5.1	Hormone action at Cellular level: Hormone receptors	4	Lecture-4
5.2	regulation of Hormone action at Molecular level and Molecular mediators	4	Lecture-3 Demo-1
5.3	Genetic control of hormone action	4	Lecture-3 Tutorial-1



Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	3	4	3	2	3	4	4	4	4	3	3	3.4
CO2	4	4	3	4	3	4	4	4	4	4	4	3	3.7
CO3	4	4	4	3	4	3	4	3	4	4	4	2	3.5
CO4	4	4	4	4	3	4	3	4	4	3	4	3	3.6
CO5	4	4	4	3	2	3	3	3	3	3	4	3	3.2
<b>Mean Overall Score</b>												<b>3.48</b>	

**Result: The Score for this Course is 3.48 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	30%	30%
APPLY	40%	40%

Programme : B. Sc. ZOOLOGY

Part IV : SEC - III

Semester : VI

Hours : 2/W 30/S

Subject Code : U22SEZ3

Credits : 2

**TITLE OF THE PAPER: MEDICAL BIOLOGY**

Pedagogy	Hours	Lecture	Peer teaching	GD/VIDEOS/TUTORIAL
	2	1	-	1
<b>PREAMBLE:</b>				
The students will be introduced to basic laboratory diagnostic techniques with a view to gain job opportunities in hospitals, clinical labs and healthcare centers and also for self employment				
<b>SYLLABUS</b>	<b>COURSE OUTCOME</b>			<b>Unit</b>
<b>UNIT I:</b>	End of the Semester, the Students will be able to			<b>Hrs</b>
<b>CO1:</b> Understand the bacterial and viral diseases	Bacterial diseases – Tuberculosis, Leptospirosis. Viral diseases - Hepatitis, AIDS.			<b>P/S</b>
<b>UNIT II:</b>	Learn parasitic and fungal diseases			<b>Knowledge Level</b>
<b>CO2:</b> Understand the parasitic and fungal diseases	Parasitic diseases – Malaria, Taeniasis, Filaria. Fungal diseases – Candidiasis, Aflatoxicosis.			
<b>UNIT III:</b>	Understand the Nosocomial and occupational pathogens			
<b>CO3:</b> Understand the Nosocomial and occupational pathogens	Nosocomial and occupational pathogens – <i>Pseudomonas</i> , <i>Streptococcus</i> and <i>Staphylococcus</i> .			
<b>UNIT IV:</b>	Learn blood cell counting, blood sugar and haemoglobin estimation			
<b>CO4:</b> Learn blood cell counting, blood sugar and haemoglobin estimation	Safety and control measures.			
<b>UNIT V:</b>	Learn creatinine and urea estimation in blood and urine			
<b>CO5:</b> Learn creatinine and urea estimation in blood and urine	Total count - RBC, WBC, differential count, haemoglobin estimation, ESR, BT and CT, blood sugar - random, PP and GTT.			

**UNIT V:**

Blood urea, blood creatinine. Urine – urea and creatinine. Presence of pus cells and albumin.

**TEXT BOOKS:**

1. Dubey RC and Maheswari DK. A Text Book of Microbiology. S. Chand and Company Ltd., New Delhi, 2005
2. Jayaraman J. Laboratory Manual in Biochemistry. New Age International Pub., 2006

**REFERENCE BOOKS:**

1. Dubey RC and Maheswari DK. Practical Microbiology. S. Chand and Company, New Delhi, 2008
2. Kannan N. Laboratory Manual in General Microbiology. Palani Paramount Pub., 1995
3. Wilson K and Walker J. Practical Biochemistry. Cambridge University Press, 1995

**Course Designer : MRS. N. AMUTHA**

**COURSE CONTENT AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Bacterial diseases - Tuberculosis, Leptospirosis.	2	Lecture -1 video demonstration - 1
1.2	Viral diseases - Hepatitis	3	Lecture - 2 video demonstration - 1
1.3	AIDS	2	Lecture - 1 video demonstration - 1
<b>UNIT II</b>			
2.1	Malaria	3	Lecture - 3
2.2	Taeniasis, Filaria.	2	Lecture -1 chart - 1
2.3	Candidiasis, Aflatoxicosis.	2	Lecture -1 chart - 1

<b>UNIT III</b>			
3.1	Pseudomonas	1	Lecture - 1
3.2	Streptococcus	1	Lecture - 1
3.3	Staphylococcus	1	Lecture - 1
<b>UNIT IV</b>			
4.1	Total count - RBC, WBC, differential count	2	Lecture - 1 video - 1
4.2	Haemoglobin estimation, ESR, BT and CT	2	Lecture - 1 video - 1
4.3	Blood sugar - random, PP and GTT	3	Lecture - 3
<b>UNIT V</b>			
5.1	Blood urea, blood creatine	2	Lecture - 2
5.2	Urine – urea and creatine	2	Lecture - 2
5.3	Presence of pus cells and albumin	2	Lecture - 2

Course Outcomes (COs)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	3	4	3	4	3	-	3	3	4	4	4	3.25
<b>CO2</b>	4	3	-	4	4	3	-	3	3	4	4	4	3.0
<b>CO3</b>	4	3	-	3	4	3	-	3	4	4	4	4	3.0
<b>CO4</b>	4	3	3	3	4	3	-	3	4	3	4	4	3.16
<b>CO5</b>	4	3	-	3	4	3	-	4	4	4	4	4	3.08
<b>Mean overall score</b>												<b>3.098</b>	

**Result: The score for this course is 3.098 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	40%	40%

Programme : B. Sc. ZOOLOGY

Part III : AC - I

Semester : III

Hours : 4/W 60/S

Subject Code : U22AZC1

Credits : 3

**TITLE OF THE PAPER: GENERAL ZOOLOGY - I**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	Models and Charts
	4	2	-	1	1

**PREAMBLE:**

To impart knowledge and understanding on the classical and advanced topics of Zoology

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	<b>Level</b>
<b>CO1:</b> Learn classification of Invertebrates and disease causing parasites	1	13	K1
<b>CO2:</b> Gain knowledge and Understand Chordate classification, behavioural pattern and adaptations in animals	2	13	K2
<b>CO3:</b> Characterize genetic basis of sex determination and related chromosomal abnormalities	3	11	K3
<b>CO4:</b> Describe basic principles of evolution and adaptive characters	4	11	K2
<b>CO5:</b> Explain and associate biological rhythm patterns and learning process in animals	5	12	K3

**SYLLABUS**

**UNIT I:**

**Invertebrata:**

Classification of Invertebrates. Life History of Plasmodium vivax, Wuchereria bancroftii, Ascaris lumbricoides, Taenia solium.

**UNIT II:**

**Chordata:**

Classification of Chordates, Migration of fishes – Anadromous & Catadromous. Parental care in Amphibia. Identification of South Indian Poisonous Snakes – Poison apparatus – Biting mechanism. Flight adaptation in birds. Adaptive Radiation in Mammals.

**UNIT III:****Genetics:**

Definition of Gene and Karyotype. Sex determination in man; Sex linked inheritance – Colour blindness. Chromosomal abnormalities - Aneuploidy, Polyploidy, Down's syndrome, Turner's syndrome

**UNIT IV:****Evolution:**

Basic Principles of Lamarkism and Darwinism. Isolation – Mimicry – Batesian & Mullerian. Colouration

**UNIT V:****Animal Behaviour:**

Biological Rhythm – Circadian, Circannual and Lunar rhythms. Classical Conditioning. Social Behaviour – Flocking in Birds, Herding in Mammals

**REFERENCE BOOKS:**

1. Jordan EL and Verma PS. Invertebrate zoology. S. Chand and Company Ltd., 2012
2. Thangamani T and Arumugam N. A Text book of Chordates. Saras Pub., 1992
3. Meyyan R P., Genetics. Saras Publications , 2019
4. Krishnamoorthy K. Introduction to Biodiversity. Oxford and IBH, 2003
5. Agarwal VK. Animal Behaviour (Ethology). S. Chand Pub., New Delhi, 2013

**Course Designer: DR. KALAIARASI ROSALIND**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Classification of Invertebrates	3	Lecture- 3
1.2	Life History of <i>Plasmodium vivax</i>	4	Lecture -1 Video -3
1.3	Life History of <i>Wuchereria bancroftii</i>	2	Lecture -2
1.4	Life History of <i>Ascaris lumbricoides</i>	2	Lecture -2

1.5	Life History of <i>Taenia solium</i>	2	Lecture -1 Charts-1
<b>UNIT II</b>			
2.1	Classification of Chordates,	2	Lecture -2
2.2	Migration of fishes – Anadromous & Catadromous. Parental care in Amphibia.	4	Lecture -2 Video- 1 Charts -1
2.3	Identification of South Indian Poisonous Snakes – Poison apparatus – Biting mechanism.	3	Lecture -1, Video -2
2.4	Flight adaptation in birds. Adaptive Radiation in Mammals	4	Lecture -1, Video- 1 Charts-2
<b>UNIT III</b>			
3.1	Definition of Gene and Karyotype. Sex determination in man	3	Lecture -2 GD- 1
3.2	Sex linked inheritance – Colour blindness.	3	Lecture- 2, GD -1
3.3	Chromosomal abnormalities - Aneuploidy, Polyploidy, Down's syndrome, Turner's syndrome	5	Lecture -1 GD- 2 Video- 1 Chart-1
<b>UNIT IV</b>			
4.1	Basic Principles of Lamarkism and Darwinism	4	Lecture 2 Charts-2
4.2	Isolation – Mimicry – Batesian & Mullerian.	4	Lecture -3 Charts 1
4.3	Colouration	3	Lecture -1 Charts-2
<b>UNIT V</b>			
5.1	Biological Rhythm – Circadian, Circannual and Lunar rhythms	5	Lecture -1, Video- 2, Charts-2
5.2	Classical Conditioning	2	Lecture- 2
5.3	Social Behaviour - Flocking in Birds, Herding in Mammals	4	Lecture -1, video- 2 Charts-1



Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	4	3	4	3	3	4	3	4	-	4	4	3.3
<b>CO2</b>	3	4	3	3	4	4	3	3	3	1	4	3	3.2
<b>CO3</b>	4	4	3	3	3	4	4	4	3	-	3	3	3.2
<b>CO4</b>	4	4	4	3	3	3	3	4	4	-	4	3	3.25
<b>CO5</b>	3	3	4	3	3	4	3	3	4	1	3	3	3.1
<b>Mean Overall Score</b>												<b>3.2</b>	

**Result: The Score for this Course is 3.2 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	30%	30%
<b>UNDERSTANDING</b>	40%	40%
<b>APPLY</b>	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : AC - II

Semester : IV

Hours : 3/W 45/S

Subject Code : U22AZP

Credits : 3

**TITLE OF THE PAPER: GENERAL ZOOLOGY - PRACTICAL**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL
	3	1	--	2

**PREAMBLE:**

This course will develop practical skills of the students by doing various experiments and to show how the form, function and behavior of animals become adapted to their position in animal kingdom and also the functions performed.

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Levels</b>
At the end of the Semester, the Students will be able to		<b>P/S</b>	
<b>CO1:</b> Identify various invertebrate and chordate slides/specimens/charts and relate their function	1	8	K2
<b>CO2:</b> Identify and comment on important patterns of inheritance and evolutionary mechanisms	2	7	K2
<b>CO3:</b> Enhance their skill towards preparation of onion root tip squash and also gain practical skill towards preparation of blood smear and staining	3	12	K3
<b>CO4:</b> Gain hands on experience on bacterial and fungal staining and mounting techniques	4	12	K3
<b>CO5:</b> Identify, draw and comment on the given spotters/charts	5	6	K2

**SYLLABUS**

**UNIT I:**

Spotters: Malarial Parasite, Ascaris, Tape worm, Poisonous snakes, Poison Apparatus

**UNIT II:** Spotters: Colour Blindness , Down's Syndrome, Turner's Syndrome, Mimicry- Batesian and Mullerian mimicry

**UNIT III:** Squash Preparation of Onion root tip

Blood Smear staining – identification of WBC

Spotters – Cell Organelles – Endoplasmic Reticulum, Golgi complex, Mitochondria,

DNA Structure,

**UNIT IV:** Simple staining of Bacteria

Fungal spore Mounting

Spotters: Immune organs – Bone marrow, Thymus, Spleen and Lymph node

**UNIT V:** Spotters: Structure of Virus, PBr 322, PCR, Biodiversity hotspots of India

**REFERENCE BOOKS:**

1. Lal, Text Book of Practical Zoology, Rastogi Publishers, 2015
2. Rajan and Selvi Christy. Experimental Procedures in Life Sciences, CBS Publishers, 2015

**Course Designer: DR. V. KABILA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Malarial Parasite, Ascaris, Tape worm,	4	Lecture - 2 Video - 2
1.2	Poisonous snakes, Poison Apparatus	4	Lecture - 3 Drawing practice - 1
<b>UNIT II</b>			
2.1	Colour Blindness Down's Syndrome, Turner's Syndrome,	4	Lecture -2 GD - 2
2.2	Mimicry - Batesian and Mullerian mimicry	3	Lecture-1 Tutorial-1 Video-1
<b>UNIT III</b>			
3.1	Squash Preparation of Onion root tip	4	Demo-2, practice-2
3.2	Blood Smear staining – identification of WBC	4	Demo-2, practice-2
3.3	Spotters – Cell Organelles – Endoplasmic Reticulum, Golgi complex, Mitochondria, DNA Structure,	4	Lecture-2 Tutorial-1 Drawing practice-1
<b>UNIT IV</b>			
4.1	Simple staining of Bacteria	4	Demo-2, practice-2

4.2	Mounting of fungi	4	Demo-2, practice-2
4.3	Spotters: Immune organs – Bone marrow, Thymus, Spleen and Lymph node	4	Lecture-1 Drawing practice-1
<b>UNIT V</b>			
5.1	Spotters: Structure of Virus, PBr 322, PCR,	3	Lecture1 Tutorial-2
5.2	Biodiversity hotspots of India	3	Lecture-1 Tutorial-2

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	4	4	3	4	--	4	4	4	4	3	4	--	3.1
CO2	4	4	4	4	--	4	4	4	4	3	4	--	3.2
CO3	4	4	4	4	--	4	4	4	4	4	4	3	3.5
CO4	4	4	4	4	--	4	4	4	4	4	4	4	3.6
CO5	4	3	3	4	2	4	4	4	4	3	4	4	3.5
<b>Mean Overall Score</b>													<b>3.38</b>

**Result: The Score for this Course is 3.38 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	40%	40%
APPLY	30%	30%

Programme : B. Sc. ZOOLOGY

Part III : AC - III

Semester : IV

Hours : 4/W 60/S

Subject Code : U22AZC2

Credits : 4

**TITLE OF THE PAPER: GENERAL ZOOLOGY - II**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	Charts /Models
	4	2	-	1	1

**PREAMBLE:**

Enrich knowledge on the advanced level Zoology and its application in the fields of medicine and research

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Levels</b>
At the end of the Semester, the Students will be able to			
<b>CO1:</b> Describe and appreciate cellular structure and functions	1	14	K1
<b>CO2:</b> Understand the significance of immune system and immune responses	2	14	K2
<b>CO3:</b> Gain knowledge and discuss on the structure of Bacteria , Fungi and Virus	3	12	K2
<b>CO4:</b> Apply molecular basis of enzymes and vectors in research	4	10	K3
<b>CO5:</b> Understand the ecological importance of Biodiversity and animal conservation	5	10	K2

**SYLLABUS**

**UNIT I: Cell and Molecular Biology:**

Ultra Structure of Cell, Types and Functions of Cytoplasmic organelles – Endoplasmic Reticulum, Golgi Complex and Mitochondria. Nuclear Components – nucleus, Nucleolus, Chromosome – Structure of DNA, Properties of Genetic Code – DNA Replication.

**UNIT II: Immunology:**

Types of Immunity – Innate and Acquired – Primary and Secondary immune response. Immune cells and Organs – Types and functions.

**UNIT III: Microbiology:**

Bacteria – Structure of E. coli, Characteristics of Gram positive and Gram negative bacteria.

Fungi – Morphology – Eg: Penicillium. Virus – Structure of T4.

**UNIT IV: Biotechnology:**

Enzymes as Molecular Tools - . Cloning Vector – Plasmid – PBr 322. PCR – Methods & Application

**UNIT V: Biodiversity & Conservation:**

Biodiversity Hotspots of India – Endemic and Endangered species – IUCN, Red Data Book, - Impact of Climate change.

**REFERENCE BOOKS:**

1. Powar CB. Cell Biology. 3<sup>rd</sup> Edn., Himalaya Pub., 1983
2. Eli Benjamin. Immunology - A short course. A. John Wiley & Sons Pub., New York, 1996
3. Dubey RC and Maheswari DK. A Text Book of Microbiology. S. Chand and Company, New Delhi, 2013
4. Kumaresan V. Biotechnology. Saras Pub., 2016
5. Joshi PC and Namita J. Biodiversity and Conservation. APH Pub., New Delhi, 2004

**Course Designer : DR. D. HELEN CHRISTINA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
<b>UNIT I</b>			
1.1	Ultra Structure of Cell	2	Lecture 2
1.2	Types and Functions of Cytoplasmic organelles – Endoplasmic Reticulum, Golgi Complex and Mitochondria	5	Lecture -1 Video -2 Charts-2
1.3	Nuclear Components – nucleus, Nucleolus, Chromosome	2	Lecture -1 Chart-1
1.4	Structure of DNA, Properties of Genetic Code – DNA Replication	5	Lecture -3 Charts-2
<b>UNIT II</b>			
2.1	Types of Immunity – Innate and Acquired	3	Lecture 2

			Charts 1
2.2	Primary and Secondary immune response	2	Lecture- 1 Charts-1
2.3	Immune cells– Types and functions	4	Lecture 2 Video 2
2.4	Immune Organs – Types and functions	5	Lecture -3 Chart-1
<b>UNIT III</b>			
3.1	Bacteria – Structure of E. coli,	3	Lecture- 2 GD- 1
3.2	Characteristics of Gram positive and Gram negative bacteria.	4	Lecture -1 Charts - 3
3.3	Fungi – Morphology – Eg: Penicillium	3	Lecture- 1, GD -1 Charts-1
3.4	Virus – Structure of T4	2	Lecture- 2
<b>UNIT IV</b>			
4.1	Enzymes as Molecular Tools	3	Lecture- 2 GD -1
4.2	Cloning Vector – Plasmid – PBr 322	3	Lecture- 2, Models-1
4.3	PCR – Methods & Application	4	Lecture -3 Video- 1
<b>UNIT V</b>			
5.1	Biodiversity Hotspots of India	3	Lecture -2 Video -1
5.2	Endemic and Endangered species – IUCN, Red Data Book,	4	Lecture- 2 Video- 1 Charts-1
5.3	Impact of Climate change	3	Lecture -2 Video-1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	3	4	3	3	4	-	4	4	3	-	4	4	3.0
<b>CO2</b>	4	3	4	3	4	1	4	4	4	4	4	4	3.6
<b>CO3</b>	3	3	3	3	3	-	3	4	4	3	3	4	3.0
<b>CO4</b>	4	4	4	4	3	1	4	4	4	3	4	4	3.6
<b>CO5</b>	3	3	4	4	3	-	3	3	4	3	3	4	3.1
<b>Mean Overall Score</b>													<b>3.26</b>

**Result: The Score for this Course is 3.26 (High Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	30%	30%
UNDERSTANDING	40%	40%
APPLY	30%	30%



Programme : B. A/B. Sc./B.Com./B.B.A./B.C.A

Value Added Course

Semester :III

Hours : 30/ S 2/W

Subject Code: U22VAZ1

Credits: 2

**TITLE OF THE PAPER: PUBLIC HEALTH AND HYGIENE**

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial
	2	1	-	1

**PREAMBLE:**

To impart knowledge on health and hygiene

To create awareness on health and impact of health hazards

<b>COURSE OUTCOME</b>	<b>Unit</b>	<b>Hrs</b>	<b>Knowledge Level</b>
At the end of the semester, the students will be able to		<b>P/S</b>	
<b>CO1:</b> Learn the merits of nutrition and health	1	5	K1
<b>CO2:</b> Develop knowledge on environment and health hazards	2	5	K2
<b>CO3 :</b> Understand the types, causes and prevention of communicable diseases	3	7	K2
<b>CO4:</b> Understand the types, causes and prevention of non-communicable diseases and impact of modern life style	4	7	K2
<b>CO5:</b> Assess the advantages of being hygienic and acquire knowledge on health education	5	6	K3

**SYLLABUS**

**UNIT I**

Scope of Public health and Hygiene – Nutrition and Health – Classification of foods – Balanced diet and Malnutrition - Nutrition deficiency diseases- Vitamin deficiency diseases.

**UNIT II**

Environment and Health hazards – Bio waste management and disposal – Pollution - Air, water, land and noise - Associated health hazards.

**UNIT III**

Communicable diseases and their prevention and control - Tuberculosis, Typhoid, Measles,

Dengue, Malaria, Filariasis, Rabies and AIDS.

#### **UNIT IV**

Non-Communicable diseases and their preventive measures - Hypertension, Coronary Heart diseases, Stroke, Diabetes, Obesity and Cancer. Mental Health – Causes and preventive measures.

#### **UNIT V**

Hygiene: Personal hygiene - Social hygiene. Health Education – Principles and methods - First Aid

#### **TEXT BOOK:**

**Park JE and Park K.** Text book of Preventive and Social Medicine. Banarsidas Bhanot Publ. Jabalpur, India, 1995

#### **REFERENCE BOOKS:**

1. **Verma S.** Medical Zoology. Rastogi Publ. Meerut, India, 1998
2. **Dubey RC and Maheswari DK.** Text Book of Microbiology. S. Chand & Co. Publ. New Delhi, India, 2007
3. **Singh HS and Rastogi P.** Parasitology. Rastogi Publ. India, 2009

**Course Designer: Dr. H. VIJAYARANI**

#### **COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Scope of Public health and Hygiene	1	Lecture
1.2	Nutrition and Health - Classification of food - Balanced diet and Malnutrition	2	Lecture (1), ICT (1)
1.3	Nutrition deficiency diseases	1	Peer teaching
1.4	Vitamin deficiency diseases	1	Group discussion
<b>UNIT II</b>			
2.1	Environment and Health hazards – Bio waste management and disposal	1	Lecture

2.2	Pollution –Air, water and land	2	Lecture (1), Video(1)
2.3	Pollution associated health hazards	2	Peer teaching (1), Video (1)
<b>UNIT III</b>			
3.1	Communicable diseases and their prevention and control - Tuberculosis	2	Lecture (1), Video (1)
3.2	Malaria	2	Video (1), ICT (1)
3.3	Dengue, AIDS	3	Video (1), ICT (1), Peer teaching (1)
<b>UNIT IV</b>			
4.1	Non-Communicable diseases and their preventive measures – Hypertension and Stroke	2	Lecture (1), Peer teaching (1)
4.2	Diabetes, Obesity and Cancer	2	Lecture (1), ICT(2)
4.3	Mental Health – Causes and preventive measures	3	Lecture (1), Video (1), Tutorial (1)
<b>UNIT V</b>			
5.1	Hygiene: Personal hygiene - Social hygiene	2	ICT(1), Peer Teaching (1)
5.2	Health Education – Principles and methods	3	Lecture (2) ), ICT (1)
5.3	First Aid	1	Peer Teaching

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	5	3	3	4	3	5	2	4	3	3	3	-	3.45
<b>CO2</b>	5	5	5	5	4	4	5	5	5	3	3	-	4.45
<b>CO3</b>	5	5	4	5	3	5	2	4	4	2	3	-	3.81
<b>CO4</b>	3	5	3	5	2	5	2	2	3	2	3		3.18
<b>CO5</b>	5	5	3	4	2	5	2	2	3	2	4		3.36
<b>Mean Overall Score</b>													<b>3.65</b>

**Result: The Score for this Course is 3.65 (High Relationship)**

<b>Mapping</b>	1-20%	21-40%	41-60%	61-80%	81-100%
<b>Scale</b>	1	2	3	4	5
<b>Relation</b>	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
<b>Quality</b>	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
<b>KNOWLEDGE</b>	50%	50%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	20%	20%

**Programme :B. Sc. ZOOLOGY**

**Semester : III**

**Subject Code : U22VAZ2**

**Value Added Course**

**Hours : 30/ S 2/W**

**Credits : 2**

**TITLE OF THE PAPER: REPRODUCTIVE HEALTH FOR WOMEN**

<b>Pedagogy</b>	<b>Hours</b>	<b>Lecture</b>	<b>Peer Learning</b>	<b>GD/VIDEOS</b>		
	2	1	-	1		
<b>PREAMBLE:</b> Impart knowledge on reproductive health and extend practical understanding about the diseases related to reproductive functioning.						
<b>COURSE OUTCOME</b>				<b>Unit</b>	<b>Hrs P/S</b>	<b>Knowledge Level</b>
At the end of the Semester, the Students will be able to						
<b>CO1:</b> Gain knowledge on the structure and functions of reproductive system				1	6	K1
<b>CO2:</b> Classify and Understand the uterine and ovarian cycles in relevance to hormones; following healthy practices				2	6	K2
<b>CO3:</b> Understand common reproductive health issues prevalent among young women				3	6	K2
<b>CO4:</b> Characterize the role of environment and nutrition in enhancing health				4	6	K2
<b>CO5:</b> Understand and Self assess mental health status and frame personal coping strategies				5	6	K3
<b>SYLLABUS</b>						
<b>UNIT I:</b>						
Female Reproductive system – Overview; Process of Ovulation – Sex hormones – Estrogen, Progesterone and Androgen						
<b>UNIT II:</b>						
Ovarian and Menstrual cycles – Follicular and Luteal phase; Hormones – FSH and LH. Menstrual health – Personal hygiene						

**UNIT III:**

Common reproductive health issues – Endometriosis, Uterine fibroids, Poly Cystic Ovarian disease, Cervix and breast cancer, Obesity & underweight, Anemia

**UNIT IV:**

Improvement of reproductive health – Nutritive requirements. Environmental issues contributing to health – Health consequences – Preventive strategies

**UNIT V:**

Mental Health – Stress, Anxiety, Depression – Coping Strategies

**TEXT BOOKS:** Handout Prepared by the course teacher

**Course Designer: DR. D. HELEN CHRISTINA**

**COURSE CONTENTS AND LECTURE SCHEDULE**

<b>UNITS</b>	<b>TOPIC</b>	<b>LECTURE HOURS</b>	<b>MODE OF TEACHING</b>
<b>UNIT I</b>			
1.1	Female reproductive system - overview	3	Lecture-2 Video-1
1.2	Process of Ovulation and sex hormones	3	Lecture-2, Video-1
<b>UNIT II</b>			
2.1	Ovarian and Menstrual cycles - Follicular and Luteal phase; Hormones – FSH and LH.	3	Lecture-2, Video-1
2.2	Menstrual health – Personal hygiene and food practices	3	Lecture-2, ICT-1
<b>UNIT III</b>			
3.1	Endometriosis, Uterine fibroids Poly Cystic Ovarian disease	3	Lecture-2, Peer learning-1
3.2	Cervix and breast cancer	1	Lecture- 1
3.3	Obesity & underweight, Anemia	2	Lecture-2

<b>UNIT IV</b>			
4.1	Improvement of reproductive health – Nutritive requirements	3	Lecture-2, GD-1
4.2	Environmental issues contributing to health – Health consequences – Preventive strategies	3	Lecture-2, ICT-1
<b>UNIT V</b>			
5.1	Mental Health – Stress, Anxiety,	3	Lecture-1, Peer learning 2, GD - 1
5.2	Depression – Coping Strategies	3	Lecture-2, Peer learning 1

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
<b>CO1</b>	4	4	3	3	2	4	4	4	4	2	3	3	3.3
<b>CO2</b>	4	4	4	4	2	4	4	4	3	2	3.5	3.5	3.5
<b>CO3</b>	4	4	4	3	3	4	4	4	3	2	3.5	3.5	3.5
<b>CO4</b>	4	4	3	3	3	4	4	4	4	3	3	3	3.5
<b>CO5</b>	4	4	4	3	3	4	4	4	4	2	3	3	3.5
	Mean Overall Score												3.46

**Result: The Score for this Course is 3.46 (Medium Relationship)**

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of POs\& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

<b>BLOOM'S TAXANOMY</b>	<b>INTERNAL</b>	<b>EXTERNAL</b>
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<b>KNOWLEDGE</b>	50%	50%
<b>UNDERSTANDING</b>	30%	30%
<b>APPLY</b>	20%	20%



**QUESTION PATTERN FOR B.Sc. ZOOLOGY**

**FOR MAJOR AND ALLIED PAPERS**

**SECTION A : 5 X 2 = 10 (1 Question from Each Unit)**

**SECTION B: 5 x 5 = 25 (Either Or Pattern)**

**SECTION C: 5 x 8 = 40 (Either Or Pattern)**

<b>UNIT</b>	<b>SEC. A</b> <b>(5 X 2 = 10)</b>	<b>SEC. B</b> <b>(5 x 5 = 25)</b>	<b>SEC. C</b> <b>(5 x 8 = 40)</b>
<b>I</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>II</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>III</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>IV</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>V</b>	<b>1</b>	<b>2</b>	<b>2</b>

## **QUESTION PATTERN FOR VALUE ADDED COURSES**

### **INTERNAL:**

- QUIZ/ASSIGNMENT/DEMO/SEMINAR/PRESENTATION/  
PRACTICALS - **10 MARKS**
- TEST - **10 MARKS**
- TOTAL - **20 MARKS**

### **EXTERNAL:**

- THEORY/PRACTICAL - **5 X 6 = 30 MARKS (EITHER OR PATTERN)**