

**SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN
(AUTONOMOUS),**

MADURAI – 2



DEPARTMENT OF ZOOLOGY

M.Sc. Syllabus – New Pattern – CBCS

Outcome Based Syllabi

For those who are admitted in the academic year 2021 - 2022

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

DEPARTMENT OF ZOOLOGY

(For those who are admitted in the year 2021 - 2022)

Sem	Core/ Elective	Code	Subject	Hrs/ Week	Exam Hours	Credit	Int. Mark	Ext. Mark	Total
I	Core 1	ZA1	Animal Physiology	6	3	5	25	75	100
	Core 2	ZA2	Environmental Biology	6	3	5	25	75	100
	Core3	ZA3	Molecular Biology	5	3	4	25	75	100
	Core 4	ZL1	Practical Zoology 1	8	3	4	40	60	100
	Elective 1	EZA	Clinical Lab Technology	5	3	5	25	75	100
			Total	30		23			
II	Core 5	ZB1	Applied Microbiology	6	3	5	25	75	100
	Core 6	ZB2	Biochemistry	6	3	5	25	75	100
	Core7	ZB3	Human Genetics	5	3	4	25	75	100
	Core 8	ZL2	Practical Zoology 2	8	3	4	40	60	100
	Elective 2	EZB	Forensic Biology	5	3	4	25	75	100
			Total	30		22			
III	Core 9	ZC1	Immunology	5	3	5	25	75	100
	Core 10	ZC2	Developmental Biology	5	3	4	25	75	100
	Core11	ZC3	Biophysics and Biostatistics	5	3	4	25	75	100
	Core 12	ZL3	Practical Zoology 3	8	3	4	40	60	100
	Elective 3	EZC	Genomics and Proteomics	5	3	4	25	75	100
	NME	NMPZ	Brain and Human Behaviour	2	3	2	25	75	100
			Total	30		23			
IV	Core 13	ZD1	Animal Biotechnology	6	3	4	25	75	100
	Core 14	ZD2	Entomology	6	3	4	25	75	100
	Core 15	ZD3	Biodiversity and Conservation Strategies	5	3	4	25	75	100
	Elective 4	EZD	Animal Behaviour	5	3	5	25	75	100
	Core 16	ZPW	Project	8		5	80	20	100
			Total	30		22			

CREDITS

SEMESTER	CREDITS
I	23
II	22
III	23
IV	22
Total	90

ASSESSMENT

	INTERNAL	EXTERNAL	TOTAL
Theory	25	75	100
Practical	40	60	100

Programme : M. Sc. ZOOLOGY
 Semester : I
 Sub. Code : ZA1

Core I
 Hours : 6 P/W 90Hrs P/S
 Credits: 5

TITLE OF THE PAPER: ANIMAL PHYSIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT	
	6	4	-	-	2	
PREAMBLE:						
This course provides knowledge and understanding of structure and functions of human organ systems and awareness to prevent human diseases						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 - CO1: Distinguish the heterotrophic mode of nutritional types such as Saprotrophic, Parasitic, Holozoic nutrition and heterotrophs such as decomposer, omnivore, Herbivore and Detrivore and describe process of digestion.					1	12
UNIT - CO2: Explain breathing, ventilation, process of gaseous exchange, respiratory pigments. Hemoglobin as oxygen carrier, respiratory quotient.					2	18
UNIT 3 - CO3: Gain knowledge on the structure and fuctions of heart, understanding of composition of blood and role of blood and blood cells and applying this with reference to cardiac diseases.					3	20
UNIT 4 - CO4: Associate the structure and functions of Muscular system , compare and contrast CNS, PNS and ANS and discover the role of photo and phono receptors					4	20
UNIT 5 - CO5: List the excretory organs in animals and summarise the structure and functions of kidney , understanding the mechanism of urine formation and analyse hypertension with Kidney disorders.					5	20
SYLLABUS						
UNIT I:						
Feeding and digestion - an overview of nutritional types and feeding mechanisms – Mode of digestion - intracellular and extracellular, mechanism of absorption of carbohydrates, fats, and proteins, defecation.						
UNIT II:						
Respiration – structure of Lung, external respiration - respiratory movements, breathing, ventilation, process of gaseous exchange, respiratory pigments. Hemoglobin as oxygen carrier, respiratory quotient.						

UNIT III:

Circulation – structure and functioning of Heart - composition and functions of blood, mechanism of blood clotting, functioning of heart, cardiac cycle, heart beat – origin and regulation, blood pressure, ECG, diseases of heart.

UNIT IV:

Muscular system - ultra structure of skeletal muscle, mechanism of muscle contraction, theories and biochemical changes during contraction. Nervous system - CNS, PNS, ANS. Neuron - structure and types, conduction of nerve impulses. Mechanism of photo and phonoreceptors.

UNIT V:

Excretion - products of excretion, excretory organs in animals, structure and functions of human kidney, mechanism of urine formation. Hypertension vs kidney disorders. Osmoregulation - osmoregulators, conformers, stenohaline and euryhaline, osmoregulation in fishes. Thermoregulation - hibernation, aestivation, diapause.

TEXT BOOK:

1. Hoar WS. General and Comparative Physiology. Prentice Hall of India, ND, 2004

REFERENCE BOOKS:

1. Eckert and Randal. Animal Physiology. CBS Pub., New Delhi, 2005
2. Nagabhushanam, Kodarkar and Sarojini. Text Book of Animal Physiology. Oxford and IBH Pub., New Delhi, 1983
3. Verma PS and Agarwal VK. Animal Physiology. 6th Edn. S. Chand and Company, 1997

Course Designer: Dr. M. Kalaiarasi

Course Contents and Lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	An overview of nutritional types and feeding mechanisms	3	Lecture 2 Discussion 1
1.2	Digestion - intracellular and extracellular	3	Lecture 2 ICT 1
1.3	mechanism of absorption of carbohydrates, fats, and proteins, defecation	6	Lecture 4 ICT 2
UNIT 11			

2.1	Structure of Lung	3	ICT
2.2	External respiration - respiratory movements, breathing, ventilation	4	Lecture 2 ICT 2
2.3	Process of gaseous exchange	5	Lecture 3 ICT 2
2.4	Respiratory pigments. Hemoglobin as oxygen carrier	4	ICT
2.5	Respiratory quotient	2	Lecture
UNIT III			
3.1	structure and functioning of Heart	3	ICT
3.2	composition and functions of blood, mechanism of blood clotting	4	Lecture 2 ICT 2
3.3	functioning of heart, cardiac cycle	5	ICT 3 Lecture 2
3.4	heart beat – origin and regulation	5	ICT 2 Lecture 3
3.5	Blood pressure, ECG, diseases of heart.	3	Seminar 1 ICT 1 Lecture 1
UNIT IV			
4.1	Muscular system - ultra structure of skeletal muscle, mechanism of muscle contraction, theories and biochemical changes during contraction.	7	Lecture 4 ICT 3
4.2	Nervous system - CNS, PNS, ANS. Neuron - structure and types, conduction of nerve impulses	7	ICT 4 Lecture 3
4.3	Mechanism of photo and phonoreceptors.	6	ICT 2 Lecture 4
UNIT V			
5.1	products of excretion, excretory organs in animals structure and functions of human kidney, mechanism of urine formation. Hypertension vs kidney disorders.	3	Discussion 1 Lecture 2
5.2	Osmoregulation - osmoregulators, conformers, stenohaline and euryhaline, osmoregulation in fishes.	6	Seminar 1 Lecture 3 ICT 2
5.3	Thermoregulation - hibernation, aestivation, diapause	4	Lecture 4 ICT 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	3	5	4	3	3	3	4	4	3	4	3	3.58
CO2	3	4	3	4	4	3	4	4	3	3	3	4	3.50
CO3	4	4	3	4	3	3	4	3	4	3	3	3	3.41
CO4	4	3	3	4	3	4	3	4	3	4	4	4	3.50
CO5	4	4	3	4	4	3	4	3	4	3	4	4	3.66
Mean Overall Score												3.53	

Result: The Score for this Course is 3.53 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme: M. Sc ZOOLOGY
 Semester : III
 Sub. Code : ZA2

Part III: Core 2
 Hours: 6 P / W 90 Hrs P / S
 Credits: 5

TITLE OF THE PAPER: ENVIRONMENTAL BIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial	ICT
	6	2	-	2	2

PREAMBLE:

This course helps to understand the basic concepts of ecosystem and community

COURSE OUTCOME	Unit	Hrs P/S
At the end of the semester, the students will be able to		
UNIT I - CO1 : acquire knowledge in basic ecosystem	1	14
UNIT II - CO2: understand the principles of community ecology	2	17
UNIT III -CO3: analyse the significance of natural resources	3	23
UNIT IV- CO4: understand effect of pollution	4	18
UNIT V- CO5: create awareness about environmental laws and disasters	5	15

SYLLABUS

UNIT I: Abiotic factors – light and temperature.. Biogeochemical cycles - Nitrgen, Phosphorous and Sulphur.

UNIT II: Community ecology - community structure - ecological succession - types, causes and process - Trends in succession - concept of climax and significance of ecological succession. Population structure and distribution - growth curves, regulation of population – density dependent and independent. -

UNIT III: Ecosystem - concept, types, structure and functions - food chains, food webs, productivity and ecological pyramids. Habitat ecology – Fresh water, Marine water and Terrestrial. Minerals - Energy from conventional and non-conventional resources - solar, natural gases, oil, petroleum and biogas. Forest – types

UNIT IV: Pollution - types - land, water, air, noise, radioactive and thermal pollution - sources, effects, control measures. Ecosystem - concept, types, structure and functions - food chains, food webs, productivity and ecological pyramids. Ecological energetics and energy flow in ecosystem

UNIT V: EIA - objectives, benefits and process - methods of EIA - Environmental law and policy - social issues. Natural and Man-made disasters - types and management.

TEXT BOOK:

1. Sharma PD. Environmental Biology. Rastogi Pub., Meerut, 2009

REFERENCES:

1. Chary SN and Vyasulu V. Environmental Management. MacMillan India Ltd., New Delhi, 2009
2. Joshi PC and Joshi N. A Text Book of Ecology and Environment. 1stEdn., Himalaya Pub., Mumbai, 2005
3. Odum EP. Fundamentals of Ecology. Akash Press, New Delhi, 2007
4. Singh JS, Singh SP and Gupta SR. Ecology, Environment and Resource Conservation. Anama;ya Pub., New Delhi, 2008

Course Designer: Dr. D. Helen Christina

Course contents and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Abiotic factors – light and temperature	4	Lecture
1.2	Biogeochemical cycles - Nitrogen, Phosphorous and Sulphur.	10	Lecture 1 ICT (2 hrs) Tutorial (3 hrs)
UNIT II			
2.1	Community ecology - community structure	4	Lecture
2.2	Ecological succession - types, causes and process	4	video
2.3	Trends in succession - concept of climax and significance of ecological succession	3	Tutorial
2.4	Population structure and distribution - growth curves, regulation of population – density dependent and independent.	6	ICT (3 hrs) Tutorial (3 hrs)
UNIT III			
3.1	Ecosystem - concept, types, structure and functions	5	Lecture
3.2	food chains, food webs, productivity and ecological pyramids.	5	Lecture Video
3.3	Habitat ecology -- Fresh water, Marine water and Terrestrial	5	Lecture Video
3.4	Minerals - Energy from conventional and non-conventional resources - solar, natural gases, oil, petroleum and biogas	5	Lecture Video
3.5	Forest – types	3	
UNIT IV			
4.1	Pollution - types - land, water, air, noise - sources, effects, control measures	6	Tutorial (3 hrs) Group Discussion (3 hrs)
4.2	Radioactive and thermal pollution - Sources, effects, control measures	6	ICT (3 hrs) Tutorial (3hrs)
4.3	Ecological energetics and energy flow in ecosystem	6	Video (3hrs) Lecture (3 hrs)

UNIT V			
5.1	EIA - objectives, benefits and process	5	Video (2 hrs) Lecture (3 hrs)
5.2	Methods of EIA - Environmental law and policy, social issues.	5	Lecture 3 Tutorial 2
5.3	Natural and Man-made disasters - types and management.	5	Lecture 3 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	5	3	3	4	3	5	2	4	3	3	3	3	3.42
CO2	5	5	5	5	4	4	5	5	5	3	3	3	4.33
CO3	5	5	4	5	3	5	2	4	4	2	3	3	3.75
CO4	3	5	3	5	2	5	2	2	3	2	3	3	3.17
CO5	5	5	3	4	2	5	2	2	3	2	4	3	3.33
Mean Overall Score													3.60

Result: The Score for this Course is 3.60 (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 = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

Programme : M. Sc. Zoology

Part III: Core

Semester : I

Hours : 5 P/W 75Hrs P/S

Sub. Code : ZA3

Credits: 4

TITLE OF THE PAPER: MOLECULAR BIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT	
	5	2	-	2	1	
PREAMBLE: This course helps to gain knowledge on the molecular aspects of the living system and understand the gene functions and its disorders.						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 - CO1: Explain concepts such as gene structure and function and obtain an understanding of genetics and molecular biology principles.					1	15
UNIT 2 - CO2: Define, Analyze and explain the characteristics of codon and gene expression at the level of Transcription.					2	15
UNIT 3 - CO3: Describe the mechanism of gene expression at the translation level and compare between Prokaryotes and Eukaryotes					3	15
UNIT 4 - CO4: Explain and demonstrate the gene regulation using examples.					4	14
UNIT 5 - CO5: Define, explain and generalize the mutation and oncogenes.					5	16
SYLLABUS						
UNIT I: DNA - structure, forms and properties - replication of DNA, Messelsan & Stahl, Hershey- Chase experiment - enzymes in replication - mechanism of replication in prokaryotes and eukaryotes. RNA – types.						
UNIT II: Genetic code - codon characteristics and deciphering. Transcription - mechanism of transcription in prokaryotes and eukaryotes - initiation, elongation and termination - post transcriptional modification - RNA splicing.						
UNIT III:						

Translation - mechanism of translation in prokaryotes and eukaryotes - post translational modifications.

UNIT IV:

Regulation of gene expression in prokaryotes - Operon concept - Lac, Trp and Ara operons – gene regulation in eukaryotes.

UNIT V:

Mutation - types - mutagenesis. Types of mutagenic agents - DNA repair – photo reactivation, excision, recombination and SOS - mechanisms. Oncogenes.

TEXT BOOKS:

Rastogi SC. - Cell and Molecular Biology. 2nd Edn., Taj Press, New Delhi, 2004.

REFERENCES:

1. David Friefelder. Molecular Biology. Nanosa Pub., New Delhi, 1995.
2. Latchman DS. Basic Molecular and Cell Biology. 3rd Edn., Replika Press Pvt. Ltd., India, 2006.
3. Power C B. Cell Biology. 3rd Edn., Himalaya Pub., Bombay, 1990.
4. Turner P C, Chennan A G M, Bates A D and White M R H. Molecular Biology. 2nd Edn., Vinod Vasishta, New Delhi, 2010.
5. Twyman RM. Advanced Molecular Biology 1st Edn., Vinod Vasishta Press, New Delhi, 1999.

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	DNA - structure, forms and properties.	4	Lecture - 2 Tutorial – 1 Video - 1
1.2	Replication of DNA, Messelsan & Stahl, Hershey - Chase experiment - enzymes in replication - mechanism of replication in prokaryotes and eukaryotes.	6	Lecture - 4 Tutorial – 1 Video - 1
1.3	RNA – types – tRNA, mRNA and rRNA.	5	Lecture - 3 Tutorial – 1 ICT - 1
UNIT 11			
2.1	Genetic code - Codon characteristics and deciphering.	3	Lecture - 3
2.2	Transcription - mechanism of transcription in prokaryotes.	5	Lecture - 3 Tutorial - 1 Video - 1
2.3	Transcription in eukaryotes -initiation, elongation and	4	Lecture - 4

	termination.		
2.4	Post transcriptional modification - RNA splicing.	3	Lecture - 3
UNIT III			
3.1	Translation - mechanism of translation in prokaryotes.	5	Lecture - 3 Tutorial – 1 Video - 1
3.2	Translation in eukaryotes.	5	Lecture - 5
3.3	Post translational modifications.	5	Lecture - 3 Tutorial – 1 Video - 1
UNIT IV			
4.1	Regulation of gene expression in prokaryotes - Operon concept – Lac operon.	6	Lecture - 4 Tutorial - 1 Video - 1
4.2	Trp and Ara operons.	4	Lecture - 4
4.3	Gene regulation in eukaryotes.	4	Lecture - 3 Tutorial - 1
UNIT V			
5.1	Mutation - types - mutagenesis.	5	Lecture - 3 Tutorial – 1 Video - 1
5.2	Types of mutagenic agents.	4	Lecture - 4
5.3	DNA repair - photo reactivation, excision, recombination and SOS - mechanisms.	5	Lecture - 3 Tutorial – 1 Video - 1
5.4	Oncogenes.	2	Lecture - 2

Course designer: Dr. Jothi Sam

Course contents and lecture schedule

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	4.0	3.6	3.8	3.8	2.8	4.0	3.8	3.5	3.2	3.6	3.0	3.5	3.55
CO2	3.4	2.8	3.4	3.6	2.8	4.0	3.6	3.6	3.2	3.5	2.8	3.5	3.35
CO3	3.5	2.8	3.4	3.6	3.0	4.0	3.6	3.7	3.2	3.5	2.8	3.5	3.38
CO4	3.5	2.8	3.4	3.6	3.0	4.0	3.6	3.6	3.4	3.6	2.8	3.5	3.40
CO5	3.5	3.6	3.3	3.5	3.0	3.5	3.5	3.5	3.4	3.2	2.8	3.4	3.35
Mean Overall Score													3.41

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 = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

Result: The Score for this Course is 3.41 (High Relationship)

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc
Semester : I
Sub.Code : ZLI

Part III: Core 4
Hours :8P/W 120Hrs P
Credits:4

TITLE OF THE PAPER:

ANIMAL PHYSIOLOGY, MOLECULAR BIOLOGY AND ENVIRONMENTAL BIOLOGY -PRACTICAL

Pedagogy	Hours	Lecture	Peer teaching	GD/VIDEOS/TUTORIAL	ICT
	8			4	4
PREAMBLE					
<p align="center">The techniques in Haematology, blood cell analysis, estimation of O₂, CO₂, salinity and exposure to practicals related to environmental impact</p>					

COURSE OUTCOME	Unit	Hrs P/S
At the end of the Semester, the Students will be able to		
UNIT 1- CO1:Enumerate the RBC,WBC,observeHaemoglobin content	1	30
UNIT2 -CO2:Learn clinical procedures for blood , urine and semen analysis;	2	20
UNIT3 -CO3:Isolate DNA from the sample,Paper and Thin layer	3	35

chromatography		
UNIT4 -CO4:EstimateCOD,BOD, alkalinity,salinity and polluting factors	4	35

SYLLABUS

UNIT I:

Total count of RBC and WBC Differential count of Leucocytes Bleeding time and Clotting time Estimation of Hemoglobin Analysis of Haemin crystals

UNIT II:

**Determination of Blood Pressure
Analysis of excretory products – urea, uric acid and ammonia
Estimation of oxygen consumption in Fish
Semen analysis – Motility and Total count
Spotters: Structure of muscle fibers, reflex arc, ECG**

UNIT III:

**Isolation of DNA from tissue sample
Quantitative estimation of Nucleic Acid – DNA/RNA
Spotters: Types of DNA, tRNA, Okazaki fragment**

UNIT IV:

**Estimation of dissolved oxygen in water samples
Estimation of carbon dioxide in water samples
Estimation of alkalinity
Estimation of salinity
Biological water quality analysis - pollution indicators
Estimation of Primary Productivity (Light and dark bottle method)
Spotters: Food web, Ecological Pyramids, Secchic disc**

Reference Books:

- 1.Sinha J and Chatterjee AK. Advanced Practical Zoology. ArunabhaSen Pub., Kolkata, 2014.**
- 2.Poddor T, Mukhopadhaya S and Das SK. An Advanced Laboratory Manual of Zoology. MacMillan Pub., New Delhi, 2010**
- 3.Ghose KC and Manna B. Practical Zoology. New Clinical Book Agency, Kolkata, 2007**

Course designer: Mrs .A.Sheela

Course contents and lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Total count of RBC and WBC	8	TUTORIAL – 6, ICT - 2
1.2	Differential count of Leucocytes	8	TUTORIAL – 6, ICT -2
1.3	Bleeding time and Clotting time Estimation of Hemoglobin Analysis of Haemin crystals	8	TUTORIAL – 6, ICT -2
UNIT 2			
2.1	Analysis of Haemin crystals Determination of Blood Pressure Estimation of oxygen consumption in Fish	8	TUTORIAL – 6, ICT -2
2.2	Analysis of excretory products – urea, uric acid and ammonia Spotters: Structure of muscle fibers, reflex arc, ECG	10	TUTORIAL – 6, ICT -4
2.3	Semen analysis – Motility and Total count Spotters: Structure of muscle fibers, reflex arc, ECG	10	TUTORIAL – 6, ICT -4
UNIT 3			
3.1	Isolation of DNA from tissue sample	8	TUTORIAL – 6, ICT -2
3.2	Quantitative estimation of Nucleic Acid – DNA/RNA	10	TUTORIAL – 6, ICT -4
3.3	Paper and Thin layer Chromatography Spotters: Types of DNA, tRNA, Okazaki fragment.	10	TUTORIAL – 6, ICT -4
UNIT 4			
4.1	Estimation of dissolved oxygen in water samples Estimation of carbon dioxide in water samples Estimation of alkalinity Estimation of salinity	12	TUTORIAL – 8, ICT -4
4.2	Biological water quality analysis - pollution indicators	12	TUTORIAL – 8, ICT -4

Course Outcomes (Cos)	Programme outcomes (POs)	Programme specific outcomes (PSOs)	Mean Scores Of Cos

	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO 1	4	4	2	3	4	4	4	2	3	3	3	3	3.25
CO 2	3	4	3	3	4	4	3	3	4	3	3	3	3.33
CO 3	3	3	3	3	4	4	4	3	3	3	3	3	3.25
CO 4	3	3	4	3	3	4	4	3	3	3	3	2	3.16
Mean overall score													3.24

Result: The score for this course is 3.24 (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 = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSO s}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc ZOOLOGY
 Semester : V
 Sub. Code : EZA

Part III: Elective1
 Hours : 5P/W 75Hrs P/S
 Credits : 5

TITLE OF THE PAPER: CLINICAL LAB TECHNOLOGY

Pedagogy	Hours	Lecture	Peer teaching	GD/VIDEO/TUTORIAL	ICT	
	5	2	-	2	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.						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 - CO1: To understand the laboratory designing and safety methods of First Aid in laboratory.					1	15
UNIT 2 - CO2: To analyses the human blood regarding types of blood groups (A,B, AB,O)					2	15
UNIT 3 - CO3: To understand theoretical knowledge about the specimen collection and Transportation of urine					3	15
UNIT 4 - CO4: To describe the chemical and microscopic examination of stool					4	15
UNIT 5 - CO5: To Explain the chemical, microscopic examination of sputum And analysis the semen.					5	15

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 BOOKS

1. Mukherjee LK. Medical Laboratory Technology. Vol 3, 2ndEdn. Hill Pub. Ltd., New Delhi, 1988

REFERENCES:

1. Sood R. Medical Laboratory Technology - Methods and Interpretations. 5thEdn., Jaypee Pub., New Delhi

Course designer: P. Yuvarani

Course Content and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Laboratory designing and safety methods	3	Charts – 1, Visual aids – 1 Lecture – 1

1.2	Laboratory designing, code of conduct for clinical laboratory,	3	Charts – 1, Visual aids- 2
1.3	Personal hygiene for laboratory technologists	3	Lecture - 3
1.4	Laboratory accidents-types, safety measures	3	Charts – 2, Visual aids-1
1.5	First Aid in laboratory and precautions.	3	Charts – 2, visual aids-1
UNIT 11			
2.1	Composition of blood plasma, corpuscles	3	Charts – 1 , Lecture- 2
2.2	Blood group system - Rh typing	3	Lecture – 1 , Chart – 2
2.3	Blood components separation	3	Visual aids -1, Lecture – 2
2.4	Blood transfusion	3	Visual aids-1. Lecture – 2
2.5	Chemical Examination	3	Lecture – 2.Chart – 1
UNIT III			
3.1	Urine-collection, storage and transport of urine sample	4	Lecture - 3,Chart – 1
3.2	Physical properties	3	Lecture- 2,.Chart – 1
3.3	Chemical examination	4	Visual aids – 2,Lecture – 2
3.4	Microscopic examination	4	Visual aids- 2, Lecture – 2
UNIT IV			
4.1	Stool - collection and transport of specimen	3	Lecture -2, Chart -1
4.2	Macroscopic examination	4	Visual aids-2, Lecture -2
4.3	Chemical examination	4	Visual aids-2, Lecture -2
4.4	Microscopic examination	4	Visual aids-2, Lecture -2
UNIT V			
5.1	Sputum -collection and transport	3	Lecture-2,Chart- 1
5.2	Macroscopicexamination	3	Visual aids-1, Lecture – 2
5.3	Microscopic examination	3	Visual aids-1, Lecture – 2
5.4	Semen analysis	3	Visual aids-1, Lecture – 2
5.5	Microscopic examination	3	Visual aids-1, Lecture – 2

Course Outcomes (Cos)	Programme Outcomes (Pos)							Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	3	4	3	3	5	3	3	2	4	4	3	3	3	3	3.24
CO2	3	3	3	4	4	4	3	4	4	4	4	3	3	3	3.50
CO3	3	4	4	4	4	4	3	3	3	3	4	4	4	4	3.64
CO4	3	3	3	3	4	4	4	4	4	3	3	3	3	4	3.42
CO5	4	4	3	3	3	3	4	4	4	3	4	3	4	4	3.57
Mean Overall Score														3.47	

Result: The Score for this Course is 3.47 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M. Sc ZOOLOGY
 Semester : II
 Sub. Code : ZB1

Core 5
 Hours : 6 P/W 90Hrs P/S
 Credits : 5

TITLE OF THE PAPER: APPLIED MICROBIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT	
	6	4			2	
PREAMBLE:						
Study of this course aims to gain fundamental knowledge in various branches of microbiology and to get exposure to the techniques applied in various fields of microbiology						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 - CO1: perform microbial analysis of water ,presumptive test, confirmed test and complete test and gain the knowledge of water born pathogens and prevent the diseases					1	15
UNIT 2 - CO2: Treat sewage water for microbes and gain knowledge on biodegradation and bioremediation					2	15
UNIT 3 - CO3: explain role of microbes in soil fertility , Nif genes nitrogen fixation and apply the knowledge of biofertilizers VAm fungi					3	20
UNIT 4 - CO4: apply the knowledge of food and dairy microbiology in day today life					4	15
UNIT 5 - CO5:analyse the role of microbes in industrial microbiology , fermentors and its types and knowing the process of production of wine and citric acid					5	25
SYLLABUS						
UNIT I:						
Microbiology of water - Microbial analysis of water - sanitary tests for coli forms - MPN - Presumptive test, confirmed test, completed test - the membrane filter technique. Water borne pathogens - water purification.						
UNIT II:						
Environmental Microbiology - sewage treatment - physical, chemical and biological treatment - trickling filter, activated sludge & oxidation pond. Microbial leaching - copper. Biodegradation - petroleum, pesticides, xenobiotics. Bioremediation - types and its applications.						
UNIT III:						

Soil and Agricultural Microbiology - types of soil microbes - Role of microbes in soil fertility. Biological Nitrogen Fixation - Nitrogen fixing bacteria - biochemistry of N₂ fixation - nitrogenase – Nif genes. Biofertilizers - Azolla. Mycorrhizal biofertilizer - VAM fungi. UNIT IV: Food and Dairy Microbiology - types and sources of microorganisms in food. (mould, yeast, bacteria) - Microbial contamination and spoilage of food. Food preservation - physical and chemical methods. Food - borne infections - bacterial and fungal. Fermented dairy products - cheese, butter.

UNIT IV:

Food and Dairy Microbiology - types and sources of microorganisms in food. (mould, yeast, bacteria) - Microbial contamination and spoilage of food. Food preservation - physical and chemical methods. Food - borne infections - bacterial and fungal. Fermented dairy products - cheese, butter.

UNIT V:

Industrial Microbiology - Bioreactor –basic design and types. Screening of industrially important microorganisms, strain improvement by gene manipulation techniques- media for fermentation. types of fermentation - submerged and solid state fermentation – downstream processing - microbial production of wine, citric acid and antibiotics (streptomycin).

TEXT BOOK:

1. Dubey R C and Maheswari D K. A Text Book of Microbiology. S. Chand and Company Ltd., New Delhi, 2005

REFERENCE BOOKS:

1. Daniel JC. Environmental Aspects of Microbiology, Bright Sun Pub., Chennai, 1999
2. Fraier WC and Westhoff DC. Food Microbiology. 4thEdn., McGraw Hill, New York, 1988
3. Patel AH. Industrial Microbiology. Macmillan India Ltd. Pub. Chennai, 2005
4. Prescott LM, Harley JP and Klein DA. Microbiology. 2ndEdn., WMC Brown Pub., 1993
5. SubbaRao NS. Soil Microbiology. 4thEdn. Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi, 2004
6. VijayaRamesh K. Environmental Microbiology. MJP Pub., Chennai, 2004

Course Designer: Dr. M. Kalaiarasi

Course Contents and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Microbial analysis of water - sanitary tests for coli forms	3	Lecture 2 ICT 1

1.2	MPN - Presumptive test, confirmed test, completed test	5	Lecture 3 ICT 2
1.3	Membrane filter technique	3	Lecture 2 ICT 1
1.4	Water borne pathogens - water purification	4	ICT 1 Lecture 3
UNIT 11			
2.1	Sewage treatment - physical, chemical and biological treatment - trickling filter, activated sludge & oxidation pond.	6	Lecture 3 ICT 3
2.2	Microbial leaching - copper.	2	ICT 1 Lecture 1
2.3	Biodegradation - petroleum, pesticides, xenobiotics	3	Lecture 2 ICT 1
2.4	Bioremediation - types and its applications	4	Seminar 1 Lecture 3
UNIT III			
3.1	Types of soil microbes - Role of microbes in soil fertility	4	Lecture 2 ICT 2
3.2	Biological Nitrogen Fixation - Nitrogen fixing bacteria - biochemistry of N ₂ fixation - nitrogenase Nif genes	10	Lecture 6 Seminar 1 ICT 3
3.3	Biofertilizers - Azolla. Mycorrhizal biofertilizer - VAM fungi.	6	ICT 2 Lecture 4
UNIT IV			
4.1	Types and sources of microorganisms in food. (mould, yeast, bacteria)	2	Discussion 1 Lecture 1
4.2	Microbial contamination and spoilage of food	3	Lecture 1 ICT 2
4.3	Food preservation - physical and chemical methods.	3	Lecture 2 ICT 1
4.4	Food - borne infections – bacterial and fungal	4	Seminar 2 Lecture 2
4.5	Fermented dairy products - cheese, butter.	3	Lecture 2
UNIT V			
5.1	Bioreactor –basic design and types.	5	ICT 3 Lecture 2
5.2	Screening of industrially important	6	ICT 2

	microorganisms, strain improvement by gene manipulation techniques		Lecture 3 Seminar 1
5.3	Media for fermentation. Types of fermentation - submerged and solid state fermentation – downstream processing	8	Lecture 5 ICT 3
5.4	Microbial production of wine, citric acid and antibiotics (streptomycin).	6	ICT 2 Lecture 2 Seminar 1 Discussion 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	3	4	4	4	4	3	3	3	4	3	3.90
CO2	3	4	4	4	3	3	3	3	4	4	3	4	3.50
CO3	3	4	3	3	3	4	4	3	3	4	3	4	3.41
CO4	3	3	3	5	4	3	3	3	4	3	4	3	3.41
CO5	4	3	3	3	3	4	3	4	4	3	3	3	3.33
Mean Overall Score													3.51

Result: The Score for this Course is 3.51 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc Zoology
 Semester : II
 Sub. Code : ZB2

Part III: Core
 Hours : 6 P/W 90Hrs P/S
 Credits :5

TITLE OF THE PAPER: BIOCHEMISTRY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDEOS/TUTORIAL	ICT	
	6	2	1	1	2	
PREAMBLE:						
The course enhance the students to develop an understanding about various biomolecules and to impart a comprehensive knowledge of the principles of biochemistry						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1- CO1: Understand basic biochemical systems in the biological systems					1	15
UNIT 2 -CO2: To learn the fundamental biochemical principles such as structure of bio molecules					2	15
UNIT 3 -CO3: To gain ideas regarding metabolic pathways					3	20
UNIT 4 -CO4: To understand the regulations of biological and biochemical processes					4	20
UNIT 5 -CO5: Analyze the mechanism and involvement of the key factor of metabolism, the enzymes					5	20
SYLLABUS						
UNIT I:						
Water - structure, physical properties, Polarity - interaction of water - weak and non-covalent interaction, Ionization and dissociation of water, pH - buffers - Henderson-Hasselbach equation Biological buffer systems.						
UNIT II:						
Carbohydrates-classification, Structure and biological importance of glucose, lactose, starch,						

Carbohydrate metabolism - metabolic cycles and regulation of glycolysis, Glycogenolysis, gluconeogenesis, glycogenesis, HMP shunt, TCA cycle and Electron transport system.

UNIT III:

Proteins - aminoacids - structure, Classifications - physical and chemical properties of aminoacids.

Configuration of proteins - primary, secondary, tertiary and quarternary structures - Ramachandran plot, Metabolism of proteins - deamination, transamination, Transmethylation and Ornithine cycle.

UNIT IV:

Lipids - fatty acids –structure, types, classification, Structure of triglycerides-phospholipids – cholesterol, Biosynthesis of cholesterol, Degradation of fatty acids, β - Oxidation - formation of Ketone bodies.

UNIT V:

Enzymes - characteristics – classification, Enzyme action - enzyme kinetics, Activation and inhibition of enzyme action, Coenzymes - allosteric enzymes - abzymes and ribozymes, Enzymes of cell cycle regulation - CAKs and cDKs. Factors affecting enzyme action.

TEXT BOOKS:

1. Jain JL, Jain S and Jain N. Fundamentals of Biochemistry. S. Chand and Company, New Delhi, 2009

REFERENCE BOOKS:

2. Conn EE, Stumpf PK, Bruening G and Doi RH. Outlines of Biochemistry. John Wiley and Sons Inc., New York, 199

3. Lehninger L. Principles of Biochemistry. Mac Millan 6th Edn., Global Pub., 2013

4. Stryer L. Biochemistry. W.H. Freeman Company, 2010

Course designer : Dr.S.Mala

Course Contents and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Water - structure, physical properties	3	Lecture -3
1.2	Polarity - interaction of water -weak and non-covalent interaction	3	Lecture-3
1.3	Ionization and dissociation of water	2	Charts-1, lecture-1
1.4	pH - buffers - Handerson-Hasselbach equation	4	Lecture-4
1.5	Biological buffer systems.	3	ICT-1, lecture 2
UNIT 11			

2.1	Carbohydrates- classification	3	Charts -1,lecture-2
2.2	Structure and biological importance of glucose, lactose, starch,	4	ICT-1,lecture-3
2.3	Carbohydrate metabolism - metabolic cycles and regulation of glycolysis,	3	Charts-1,Lecture-2
2.4	Glycogenolysis, gluconeogenesis, glycogenesis, HMP shunt.	3	Lecture -2,Charts -1
2.5	TCA cycle and Electron transport system.	2	Charts-1,lecture -2
UNIT III			
3.1	Proteins - aminoacids - structure,	4	Lecture-3,ICT-1
3.2	Classifications - physical and chemical properties of aminoacids.	5	Lecture-5
3.3	Configuration of proteins - primary, secondary, tertiary and quaternary structures - Ramachandran plot.	6	ICT-2, lecture -4
3.4	Metabolism of proteins - deamination , transamination.	3	Lecture -3
3.5	Transmethylation and Ornithine cycle.	2	Lecture -2
UNIT IV			
4.1	Lipids - fatty acids – structure, types, classification	4	Charts-1,Lecture-3
4.2	Structure of triglycerides- phospholipids - cholesterol.	4	Models-1Lecture-3
4.3	Biosynthesis of cholesterol.	6	ICT-2,Lecture-4
4.4	Degradation of fatty	3	Lecture -3

	acids		
4.5	β - Oxidation - formation of Ketone bodies.	3	Charts-1lecture-2
UNIT V			
5.1	Enzymes - characteristics – classification	5	Lecture -5
5.2	Enzyme action - enzyme kinetics	4	ICT-1,Lecture-3
5.3	Activation and inhibition of enzyme action	4	Charts -1, Lecture-3
5.4	Coenzymes - allosteric enzymes - abzymes and ribozymes	3	Lecture -3
5.5	Enzymes of cell cycle regulation - CAKs and CDKs. Factors affecting enzyme action.	4	Charts -1,ICT-3

Course Outcomes (Cos)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO 1	PO2	PO3	PO 4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	4	3	4	4	3	3	3	3	4	4	4	3	3.5
CO2	4	4	3	4	4	4	5	4	3	3	3	4	3.75
CO3	3	3	3	3	4	3	3	5	4	4	3	4	3.5
CO4	3	3	3	4	4	4	3	4	4	3	3	4	3.5
CO5	3	4	3	3	5	3	4	4	3	3	3	3	3.4
	Mean overall score												3.53

Result: The Score for this Course is 3.53 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc., ZOOLOGY
Semester : II
Sub. Code : ZB3

Part III: Core 7
Hours : 5 P/W 75 Hrs P/S
Credits : 4

TITLE OF THE PAPER: _HUMAN GENETICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT	
	5	2	1	1	1	
PREAMBLE: To understand the genetic principles based on karyotype, to update the knowledge on application oriented genetics.						
COURSE OUTCOME At the end of the Semester, the Students will be able to					Unit	Hrs P / S
UNIT 1 CO1: Gain basic knowledge on mendelian principles, Analyse and interpret the characteristics of autosomal dominant and recessive inheritance with examples.					1	15
UNIT 2 CO2: Describe the preparation of karyotype and chromosomal aberrations.					2	15
UNIT 3 CO3: Incorporate the fundamentals of cancer especially in leukemia and bone marrow transplantation.					3	15

UNIT 4 CO4: Interpret and evaluate the prenatal and post natal diagnosis.	4	15
UNIT 5 CO5: Understand and apply the principles of genetics in crime and law.	5	15

SYLLABUS

UNIT I: Mendel's laws – application of Mendel's laws to human genetics. Principles and methods of pedigree analysis . Mendelian inheritance patterns - Autosomal dominant inheritance – Huntington disease. Autosomal recessive inheritance – phenyl ketoneuria. Sex linked inheritance – haemophilia, colour blindness.

UNIT II: Sex determination in man. Human karyotype - preparation of karyotype. Abnormal karyotyping – Down's syndrome, Klinefelter's syndrome, Turner's syndrome. Sex related phenotypic effects – sex influenced traits, sex limited traits. Twin studies – monozygotic and dizygotic.

UNIT III: Oncogenes – functions of proto – oncogenes, effects of oncogenes. Tumor suppressor genes – knudson's two hit hypothesis - Loss of heterozygosity – neuro oncology. Apoptosis - Role of P53 – PTCH as a tumor suppressor. Genetic basis of leukemia – bone marrow transplantation. Epigenetics.

UNIT IV: Methods of prenatal diagnosis – Prenatal screening in pregnancy - neural tube defects, amniocentesis, chorionic villus sampling . Post natal diagnosis – fetal blood sampling, new born blood spot screening. Congenital hypothyroidism, sickle cell disease, Cystic fibrosis and medium chain acyl – CoA dehydrogenase deficiency.

UNIT V: Application of genetics – DNA finger printing. Gene therapy. Pharmacogenetics and personalized medicine. Eugenics, eugenics and eugenics. Genetics of social behavior – Tourette syndrome and Alzheimer disease.

TEXT BOOKS: 1. Cummings M R . Human Genetics . Cengage Learning India Pvt. Ltd., New Delhi, 2009

REFERENCES:

- 1. Gardner A and Davies T. Human genetics . Scion Pub . Ltd., UK, 2010**
- 2. Lewin B . Genes VI. Oxford university press, New York, 2000**

3. Verma PS and Agarwal VK . Genetics . S . Chand and company, New Delhi, 2008

Course Designer : Dr.E. Emimal Victoria

Course Content and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Mendel's laws – application of Mendel's laws to human genetics	4	Lecture-2 ICT-1
1.2	Principles and methods of pedigree analysis	3	Lecture-2 ICT-1
1.1	Autosomal dominant inheritance – Huntington disease	2	ICT-2
1.2	Autosomal recessive inheritance – phenyl ketoneuria	3	L-2 Tutorial-1
1.3	Sex linked inheritance – haemophilia, colour blindness	3	Lecture
UNIT II			
1.1	Sex determination in man	3	Lecture-2 ICT-1
1.2	Human karyotype - preparation of karyotype	4	Lecture-2 ICT-2
1.1	Abnormal karyotyping – Down's syndrome, Klinefelter's syndrome, Turner's syndrome	3	Lecture
1.2	Sex related phenotypic effects – sex influenced traits, sex limited traits	2	Lecture
1.5	Twin studies – monozygotic and dizygotic	3	L-2 Tutorial-1
UNIT III			
1.1	Oncogenes – functions of proto – oncogenes, effects of oncogenes	3	Lecture-2 ICT-2
1.2	Tumor suppressor genes – Knudson's two hit hypothesis	3	Lecture-2 ICT-1
1.3	Loss of heterozygosity – neuro oncology	2	Tutorial
1.4	Apoptosis role of P53 – PTCH as a tumor suppressor	4	Lecture-3 ICT-1
1.5	Genetic basis of leukemia – bone marrow transplantation – epigenetics.	3	Lecture
UNIT IV			
1.1	Methods of prenatal diagnosis – neural tube defects, amniocentesis, chorionic villus sampling .	4	Lecture-2 ICT-2
1.2	Post natal diagnosis – fetal blood sampling, newborn blood spot screening	3	Lecture
1.3	Congenital hypothyroidism, sickle cell disease	4	Lecture-3 Tutorial-1
1.4	Cystic fibrosis, medium chain acyl – CoA dehydrogenase	4	ICT

deficiency.		
UNIT V		
1.1 : Application of genetics – DNA finger printing, Gene therapy	5	Lecture-3 ICT-2
1.2 : Pharmacogenetics and personalized medicine	3	Lecture-2 ICT-1
1.3 : Eugeneics, euthenics and euphenics	4	Lecture-3 ICT-1
1.4 : Genetics of social behavior – Tourette syndrome and Alzheimer disease.	3	Lecture-2 Tutorial-1

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	3	2	4	4	2	2	3	3.5	3	4	4.5	2	3.1
CO2	4	3	4.5	4	3.5	2	3	4	2	3	2	3	3.2
CO3	3	2	4	4	3	2	2	4	3	2	4	4	3.1
CO4	4	2	3	4	3	2	2	4	3.5	4.5	4	2	3.2
CO5	3.5	2	4	4	2.5	2	2.3	3	3.7	4.5	4	4.5	3.4
Mean Overall Score												3.24	

Result: The Score for this Course is 3.24 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc., Zoology
Semester : II
Sub. Code : ZL2

Part III: Core Practical
Hours : 8 hrs P/W ; 120 Hrs P/S
Credits : 4

**TITLE OF THE PAPER: APPLIED MICROBIOLOGY, BIOCHEMISTRY
AND HUMAN GENETICS**

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	8				

PREAMBLE: To gain basic knowledge on biochemical investigation in clinical practices, Assess and evaluate microbial interaction in in-vivo condition and analyze distribution of genetic characters

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 CO1: Analyse and interpret the quantity of protein, carbohydrate and lipid. Evaluate the quality of protein, carbohydrate and lipid from biological samples	1	32
UNIT 2 CO2: Understand the concepts of bacterial enumeration and apply the concepts to test water quality or potability and milk quality. Demonstrate and interpret the bactericidal action of antibiotics by Kirby-Bauer method.	2	40
UNIT 3 CO3: Calculate and prepare buffer, Molar and Normal solutions; describe the structure of amino acids and gain knowledge on Microbiology instruments	3	20
UNIT 4 CO4: Demonstrate gene frequency pattern. Apply Pedigree chart to evaluate human traits and syndromes	4	28

SYLLABUS

UNIT I: Qualitative Estimation of carbohydrates, proteins and fats
Quantitative estimation of carbohydrates
Quantitative estimation of proteins
Quantitative estimation of lipids

UNIT II: Serial Dilution Technique
Enumeration of microbial population from soil
Bacterial examination of water – MPN method
Bacterial examination of water- Standard Plate Count (quantitative test)
Reductase test for milk – Methylene Blue/Resazurin
Antibiotic sensitivity test- Kirby-Bauer method

UNIT III: Preparation of Buffer Solution
Preparation of solution based on Normality and Molarity
Spotters: Amino acids - types, structure of collagen, primary, secondary and tertiary structure, Ramachandran plot, Autoclave, Hot air oven, pH meter, Fermentors

UNIT IV: Calculation of gene frequency using beads
Spotters: Pedigree analysis of human traits – autosomal dominant, autosomal recessive, X-linked dominant, X- linked recessive and Y- linked inheritance
Karyotypes-normal, Turner’s syndrome, Klinefelters syndrome, Edwards’s syndrome
DNA fingerprinting, Twins - identical, fraternal and Siamese twins

REFERENCES:

- 1. Gangene SD, Human Genetics, 4th edn., Elsevier, 2012**
- 2. Guna Sekaran P. Laboratory Manual in Microbiology. New age International Pvt. Ltd., 2009**

3. Jayaraman J. Laboratory Manual in Biochemistry. New Age International Pub., 2006
4. Kannan N. Laboratory Manual in General Microbiology. Palani Paramount Pub., 1995
5. Wilson K and Walker J. Practical Biochemistry. Cambridge University Press, 1995

Course designer: Dr.D. Helen Christina

Course contents and lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Qualitative Estimation of carbohydrates, proteins and fats	8	Demonstration -4, Practical -4
1.2	Quantitative estimation of carbohydrates	8	Demonstration -4 Practical -4
1.3	Quantitative estimation of proteins	8	Demonstration -4 Practical -4
1.4	Quantitative estimation of lipids	8	Demonstration -4 Practical -4
UNIT II			
2.1	Serial Dilution Technique	4	Practical
2.2	Enumeration of microbial population from soil	8	Demonstration -4 Practical -4
2.3	Bacterial examination of water – MPN method	8	Demonstration -4 Practical -4
2.4	Bacterial examination of water- Standard Plate Count (quantitative test)	8	Demonstration -4 Practical -4
2.5	Reductase test for milk – Methylene Blue/Resazurin	4	Practical
2.6	Antibiotic sensitivity test- Kirby-Bauer method	8	Demonstration -4 Practical -4
UNIT III			
3.1	Preparation of Buffer Solution	4	Demonstration, Peer teaching
3.2	Preparation of solution based on Normality and Molarity	4	Demonstration, Peer teaching
3.3	Amino acids - types	4	Tutorial-4
3.4	structure of collagen, primary, secondary and tertiary structure,	4	Tutorial-4
3.5	Ramachandran plot, Autoclave, Hot air oven, pH meter, Fermentors	4	Tutorial-4
UNIT IV			
4.1	Calculation of gene frequency using beads	8	Demonstration -4 Practical -4
4.2	Pedigree analysis of human traits – autosomal dominant, autosomal recessive, X-linked dominant	8	Demonstration -4 Tutorial-4
4.3	X- linked recessive and Y- linked inheritance, Twins - identical, fraternal and Siamese twins	4	Tutorial-4
4.4	Karyotypes-normal, Turner's syndrome, Klinefelters syndrome, Edwards's	8	Demonstration -4 Tutorial-4

	syndrome; DNA fingerprinting
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Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	4	4	4	3	3	4	4	4	4	3.5	4	3	3.7
CO2	4	4	4	3	3	4	4	4	4	3.5	4	3	3.7
CO3	4	4	3	3	2	4	4	4	4	3	3	2	3.3
CO4	4	4	3	3	2	4	4	4	4	3	3	3	3.4
Mean Overall Score												3.52	

Result: The Score for this Course is 3.52 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc., Zoology
Semester : II
Sub. Code : EZB

Part III: Core
Hours : 5 P/W 75 Hrs P/S
Credits : 4

TITLE OF THE PAPER: FORENSIC BIOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT	
	5	2	1	1	1	
PREAMBLE: To introduce the students the basic concepts of forensics and crime related applications and to create awareness about the legal aspects of forensic law and cyber crime						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 CO1: List and categorize forensic evidences and crime scene identity; analyze and relate socio economic offences to the present societal scenario					1	14
UNIT 2 CO2: Classify finger prints, describe post mortem changes, understand and interpret blood group and DNA paternity test					2	15
UNIT 3 CO3: Generalize and explain about insects of forensics, venoms and poisons. Discuss and summarize related medico-legal issues					3	16
UNIT 4 CO4: Classify narcotic drugs and cosmetics; Associate the symptoms and explain its effects on humans					4	15
UNIT 5 CO5: Understand and apply information technology and legal aspects related to forensics; gain knowledge about Enforcement agencies					5	15
SYLLABUS						
UNIT I: Scope of forensics - history - evidences and their classification - specific socio economic offences against human body, property, terrorism, pollution, adulteration - crime scene - establishment of identity.						
UNIT II: Finger printing - primary classification and computerized prints - Types of injuries - wounds - signs and symptoms of death time - post mortem changes- Blood stains, grouping, and identification- disputed paternity and DNA tests.						
UNIT III: Forensic entomology and forensic medicine - biology of insects of forensic importance - study of maggots – sarcophagi - venoms and poisons - Medico legal issues of organ transplantation - organ racketing - euthanasia- sexual offences- rape, semen analysis.						
UNIT IV: Food poisons and narcoanalysis - classification and sources of drugs, narcotics, cosmetics and abortifacients- physiological and psychological effects - toxic nature of poisoning - sources of poisons - Narco analysis.						
UNIT V: Information technology and legal aspects - cyber crime - law of robotics - super imposing techniques - e-com and intelligent systems - laws of copyrights and patents. Forensic sourcing - Enforcement agencies - public and private - police, CBI - National						

Institute of criminology and forensic science - Interpol, prisons and rehabilitation.

TEXT BOOKS:

1. Forensic Biology, Lesson notes prepared by DDE, Madurai Kamaraj University, 2014

REFERENCES:

1. Ignatius, P.C, Forensic Medicine and Toxicology, 2nd edn, Letterwave Books, 2016

Course designer: Dr.D. Helen Christina

Course contents and lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Scope of forensics - history - evidences and their classification	4	Lecture - 3 ICT -1
1.2	Specific socio economic offences against human body, property, terrorism, pollution, adulteration	5	Lecture -3, Peer teaching -1, GD -1
1.3	Crime scene - establishment of identity.	5	Lecture - 4 , ICT -1
UNIT II			
2.1	Finger printing - primary classification and computerized prints	2	Lecture -1, Video -1
2.2	Types of injuries - wounds - signs and symptoms of death time	5	Lecture -4, ICT -1
2.3	Post mortem changes, Blood stains, grouping, and identification	4	Lecture -3, Peer teaching -1
2.4	Disputed paternity and DNA tests	4	Lecture -2, ICT -1
UNIT III			
3.1	Forensic entomology and forensic medicine - biology of insects of forensic importance - study of maggots	3	Lecture-3
3.2	Sarcophagi - venoms and poisons	5	Lecture -3, Video -2
3.3	Medico legal issues of organ transplantation - organ racketing	4	Lecture 3, ICT -1
3.4	Euthanasia, Sexual offences- rape, semen analysis	4	Lecture-4
UNIT IV			
4.1	Food poisons and narcoanalysis - classification and sources of drugs, narcotics, cosmetics and abortifacients	5	Lecture -3, GD -2
4.2	Physiological and psychological effects	3	Lecture -2, Peer teaching -1
4.3	Toxic nature of poisoning - sources of poisons	4	Lecture -3, ICT -1
4.4	Narco analysis	3	Lecture -3
UNIT V			

5.1	Information technology and legal aspects - cyber crime - law of robotics	5	Lecture -4, ICT -1
5.2	Super imposing techniques - e-com and intelligent systems	4	Lecture -2, ICT -2
5.3	Laws of copyrights and Patents	3	Lecture -3,
5.4	Forensic sourcing - Enforcement agencies - public and private - police, CBI - National Institute of criminology and forensic science - Interpol, prisons and rehabilitation.	3	Lecture -2, GD -1

Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	4	3.5	4	4	4	4	4	3.5	3.2	3.5	3.8	2.5	3.6
CO2	4	4	3.7	3.8	3.7	4	4	4	3.5	3.5	3.5	3	3.7
CO3	4	4	3.5	3.5	3.5	3.5	4	4	4	4	3.5	3	3.7
CO4	3	3.5	4	4	3.5	3.5	4	4	3.5	3.8	4	3.5	3.6
CO5	3	4	4	3.5	3.5	4	4	3.5	3	3.5	2.5	2.5	3.3
	Mean Overall Score												3.58

Result: The Score for this Course is 3.58 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Semester : III
 Sub. Code : ZC1

Hours: 5 P / W 75Hrs P / S
 Credits: 5

TITLE OF THE PAPER: IMMUNOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial	ICT	
	5	2	-	2	1	
PREAMBLE:						
This course helps to understand the basic concepts of immune system and immune response and apply the knowledge in basic research in Immunology						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the semester, the students will be able to						
UNIT I - CO1 : acquire knowledge in basic immune system					1	12
UNIT II - CO2: understand the principles of various immunological techniques and apply them in immunodiagnosis of diseases					2	15
UNIT III -CO3: develop in depth knowledge on activation of immune system					3	12
UNIT IV- CO4: understand the immune response in major health issues such as transplantation and cancer					4	18
UNIT V- CO5: analyse the immune reactions against various pathogens, allergens, self antigens and vaccines					5	18
SYLLABUS						
UNIT I:						
Historical perspectives of Immunology. Types of immunity - Innate Immunity, acquired immunity - active and passive immunity. Cells and organs of immune system -structure and functions						
UNIT II:						
Humoral immune response – antigens. Antibodies - structure, functions and isotypes of immunoglobulin. Mechanism of humoral immune response - production of antibodies. Antigen and antibody interactions. Cell mediated immune response - types of T cells - Mechanism of CMI						
UNIT III:						
Cytokines - T cell activation and differentiation - B cell activation and differentiation. Complement - activation - classical, alternative and lectin pathways. Regulation of complement activation - Biological consequences of complement						
UNIT IV:						
Major Histo-compatibility Complex - Structure and functions of MHC class I and class II						
Molecules. Transplantation Immunology - Graft rejection - Graft versus Host reaction - HLA Tissue typing. Tumor immunology - types of Tumor - Tumor antigens - Immune response to tumors - Immunodiagnosis of tumor.						
UNIT V:						
Hyper sensitive reactions – types. Auto immunity - Organ specific and systemic auto						

immune diseases. Host immune response to bacteria (*Mycobacterium tuberculosis*), virus (HIV) and parasite (*Plasmodium vivax*). Vaccines - types

TEXT BOOK:

1. GolKindt TJ, Goldsby RA and Osborne BA. Kuby Immunology. W.H. Freeman and Company, New York, 2007

REFERENCES:

1. Riot I M. Essentials of Immunology. ELBS Blackwell Scientific Pub., London, 2007
2. Tizard K. Immunology - An Introduction. Saunders College Pub., Philadelphia, 1983

Course Designer: Dr. H. Vijaya Rani

Course contents and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Historical perspectives of Immunology	1	Lecture
1.2	Types of immunity - Innate Immunity, acquired immunity - active and passive immunity	5	ICT (2 hrs) Tutorial (2 hrs)
1.3	Cells and organs of immune system -structure and functions	6	Lecture –(3 hrs) Tutorial (3 hrs)
UNIT II			
2.1	Humoral immune response - antigens	2	Lecture
2.2	Antibodies - structure, functions and isotypes of immunoglobulin	3	video
2.3	Mechanism of humoral immune response - production of antibodies	1	Tutorial
2.4	Antigen and antibody interactions	6	ICT (3 hrs) Tutorial (3 hrs)
2.5	Cell mediated immune response - types of T cells - Mechanism of CMI	3	ICT
UNIT III			
3.1	Cytokines	2	Lecture
3.2	T cell activation and differentiation	2	video
3.3	B cell activation and differentiation	2	Video
3.4	Complement - activation - classical, alternative and lectin pathways	4	video
3.5	Regulation of complement activation - Biological consequences of complement	2	Peer teaching
UNIT IV			
4.1	Major Histo-compatibility Complex - Structure	6	Tutorial (3 hrs)

	and functions of MHC class I and class II molecules		Group Discussion (3 hrs)
4.2	Transplantation Immunology - Graft rejection - Graft versus Host reaction – HLA- Tissue typing	6	ICT (3 hrs) Tutorial (3hrs)
4.3	Tumor immunology - types of Tumor - Tumor antigens - Immune response to tumors Immunodiagnosis of tumor.	6	Video (3hrs) Lecture (3 hrs)
UNIT V			
5.1	Hyper sensitive reactions - types	5	Video (3 hrs) Lecture (3 hrs)
5.2	Auto immunity - Organ specific and systemic auto immune diseases	5	Tutorial
5.3	Host immune response to bacteria (<i>Mycobacterium tuberculosis</i>), virus (HIV) and parasite (<i>Plasmodium vivax</i>)	4	Group Discussion
5.4	Vaccines - types	4	Tutorial

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	3	4	3	5	2	4	3	3	3	3	3.42
CO2	5	5	5	5	4	4	5	5	5	3	3	3	4.33
CO3	5	5	4	5	3	5	2	4	4	2	3	3	3.75
CO4	3	5	3	5	2	5	2	2	3	2	3	3	3.17
CO5	5	5	3	4	2	5	2	2	3	2	4	3	3.33
Mean Overall Score												3.60	

Result: The Score for this Course is 3.60 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme :M.Sc. ZOOLOGY

Semester :III

Sub.Code :ZC2

Part III: Core 10

Hours : 5 P/W75Hrs P/S

Credits: 4

TITLE OF THE PAPER: CORE 10: DEVELOPMENTAL BIOLOGY

Pedagogy	Hours	Lecture	Peer teaching	GD/VIDEOS/TUTORIAL	ICT
	5	2	1	-	2

PREAMBLE

The students gets familiarized with the basic facts and problems of biology of development.

COURSE OUTCOME	Unit	Hrs P/S
At the end of the Semester, the Students will be able to		
UNIT 1 CO1: Demonstrate knowledge of the fundamental concepts in development of an organism.	1	15
UNIT 2 CO2: Describe the mechanism of fertilization and its significance .	2	15
UNIT 3 CO3: Demonstrate an understanding of cleavage and blastulation	3	15
UNIT 4 CO4: Acquire knowledge in morphogenetic movements during gastrulation	4	15
UNIT 5 CO5: To understand theoretical aspects of organogenesis and the techniques in IVF and birth control measures.	5	15

SYLLABUS

UNIT I: Gametogenesis - spermatogenesis - origin of primordial germ cells - differentiation of spermatozoa - structure and motility of sperm. Oogenesis - Development of oocytes - types of eggs - biochemical changes during oogenesis.

UNIT II: Mechanism of fertilization - activation of sperm and ovum – interaction of sperm and ovum - sperm entry - egg surface changes - biochemical, physiological - significance of fertilization - post fertilization changes.

UNIT III: Cleavage and Blastulation – types of cleavage –patterns of cleavage - influence of yolk in cleavage - products of cleavage - blastula and morula. Biochemical changes during cleavage. Fate map and cell lineage.

UNIT IV: Gastrulation - morphogenetic movements - epiboly, emboly - invagination, involution, polyinvagination, concrescence, cell proliferation, divergence and extension. Sea urchin gastrulation. Biochemical changes during gastrulation, - nuclear activation and gene activities during gastrulation.

UNIT V: Organogenesis – development of Brain and Eye. Cellular interaction - differentiation and organogamy. Organizer - Spemann’s primary organizer - mechanism of induction. Metamorphosis in amphibia. Regeneration in amphibia. Cryopreservation of gametes and embryos – *invitro* fertilization and embryo transfer - sperm banking - birth control measures.

Text Book:

1. Balinsky BI and Fabian BC. **An Introduction to Embryology. 5thEdn., CBS college Pub., 2012**

Reference books:

1. Berril NJ. **Developmental Biology. Tata McGraw Hill Pub., New Delhi, 1974**
2. Bradley M, Patten M and Carlson BM. **Foundations of Embryology. Tata McGraw Hill Book Company, 1974**
3. Verma PS and Agarwal VK. **Chordate Embryology. S. Chand and Company Ltd., New Delhi, 2011**

Course Designer : Mrs. N. AMUTHA

Course Content and Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Gametogenesis-spermatogenesis and oogenesis.	5	Lecture -3 ICT - 2
1.2	Differentiation of spermatozoa and motility of sperm.	5	Lecture -3 ICT - 2
1.3	Biochemical changes in oogenesis	5	Lecture
UNIT 2			
2.1	Mechanism of fertilization	5	Lecture -3 video demonstration - 2

2.2	Biochemical, physiological - significance of fertilization	5	Lecture -3 video demonstration - 2
2.3	Post fertilization changes.	5	Lecture -3 video demonstration - 2
UNIT 3			
3.1	Cleavage and Blastulation - patterns of cleavage	5	Lecture -3 video demonstration - 2
3.2	Biochemical changes during cleavage.	5	Lecture -3 video demonstration - 2
3.3	Fate map and cell lineage.	5	Lecture -3 video demonstration - 2
UNIT 4			
4.1	Gastrulation - morphogenetic movements	5	Lecture-3 ICT - 2
4.2	Gastrulation in Sea urchin	5	Lecture-3 ICT - 2
4.3	Biochemical changes during gastrulation	5	Lecture-3 ICT - 2
UNIT 5			
5.1	Organogenesis – development of Brain and Eye	5	Lecture-3 ICT - 2
5.2	Organizer - Spemann's primary organizer - mechanism of induction.	5	Lecture-3 ICT - 2
5.3	<i>invitro</i> fertilization and embryo transfer - birth control measures.	5	Lecture-3 ICT - 2

Course Outcomes (Cos)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores Of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO 1	4	3	3	3	2	4	2	3	4	3	3	4	3.16
CO 2	4	4	3	3	3	4	4	3	3	3	3	3	3.33
CO 3	4	3	3	3	3	4	3	3	2	3	3	4	3.16
CO 4	4	4	3	3	3	4	3	3	3	3	3	3	3.25
CO 5	3	4	3	3	3	3	4	4	3	3	3	4	3.33

Mean overall score	3.24
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Result: The score for this course is 3.24 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc
Semester : III
Sub.Code : ZC3

Part III: Core 11
Hours :5 P/W 75Hrs P/S
Credits: 4

TITLE OF THE PAPER: CORE 11: BIOPHYSICS AND BIOSTATISTICS

Pedagogy	Hours	Lecture	Peer teaching	GD/VIDEOS/TUTORIAL	ICT
	5	2	1	-	2

PREAMBLE

This paper will enlighten the principles of biophysics and biostatistics and how to apply the biophysical knowledge in working of biological systems and statistics in biological research .

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 - CO1: Demonstrate knowledge of the fundamental concepts in Physics and Biology.	1	10
UNIT 2 - CO2: Describe the principles that govern bio molecular interactions and understand the application of Radio isotopes in Biology.	2	12
UNIT 3 - CO3: Demonstrate an understanding of the central concepts of modern statistical theory.	3	17
UNIT 4 - CO4: Acquire knowledge in data collection and its presentation.	4	18
UNIT 5 CO5: Communicate the results of statistical analysis accurately and effectively; Make appropriate use of statistical software.	5	18

SYLLABUS

UNIT 1:

Intra and intermolecular interactions in biological systems - ionic and covalent bonds-
hydrogen bonds - peptide bonds - Vander Waal's forces. Transport across membranes - types of transport - active and passive transport. Osmosis -

exosmosis and endosmosis, exocytosis and endocytosis.

UNIT II:

Bioenergetics - ATP structure, formation and breakdown in living systems. Redox couples.

Impulse conduction in nerve and muscle. Electro encephalogram and Cathode Ray

Oscilloscope. Radio isotopes - applications of radioisotopes in biology.

UNIT III:

Introduction to Biostatistics. Sampling - Representative sample, sample size, sampling bias and sampling techniques. Types of data, methods of collection of primary and secondary data, classification, tabulation. Graphical representation of data – graphical and diagrammatic.

UNIT IV:

Measures of central tendency - Mean, median, mode. Measures of dispersion - standard deviation, standard error, variance, range, mean deviation, quartile deviation and coefficient of variation. Correlation - positive and negative correlation, calculation of Karl - Pearsons co-efficient of correlation.

UNIT V:

Regression - Linear regression and regression equation. Calculation of an unknown variable using regression equation. ANOVA - one way classification. Tests of significance - Chi-square test (Theory & problem), Student's t test.

Text Books:

- 1.Arora MP. Biophysics. Himalaya Pub., 2007
- 2.Palanichamy S and Manoharan M. Statistical Methods for Biologists. Paramount Pub., 2008

Reference Books:

- 1.Lehninger L. Biochemistry. Kalyani Pub., New Delhi, 2012
- 2.Subramanian MA. Biophysics - Principles and Techniques. MJP Pub., Chennai, 2005
- 3.Palanichamy S and Shanmugavelu M. Principles of Biophysics. PalaniPramount Pub., 2002
- 4.Pagano M and Gauvreau. K. Principles of Biostatistics. Duxbury Press, USA, 2000

Course designer: Mrs .A.Sheela

Course Contents And Lecture Schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
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UNIT 1			
1.1	Intra and intermolecular interactions in biological systems - ionic and covalent bonds-hydrogen bonds - peptide bonds - Vander Waal's forces.	5	Lecture - 3 video demonstration - 2
1.2	Transport across membranes - types of transport - active and passive transport.	5	Lecture - 3 video demonstration - 2
1.3	Osmosis - exosmosis and endosmosis, exocytosis and endocytosis.	5	Experimental demonstration -5
UNIT 2			
2.1	ATP structure, formation and breakdown in living systems. Redox couples.	5	Lecture -3 video demonstration -2
2.2	Impulse conduction in nerve and muscle.	5	Lecture -3 video demonstration -2
2.3	Electro encephalogram and Cathode Ray Oscilloscope. Radio isotopes - applications of radioisotopes in biology.	5	Lecture -3 video demonstration-2
UNIT 3			
3.1	Sampling - Representative sample, sample size, sampling bias and sampling techniques.	5	Experiment -3 Group activity-2
3.2	Types of data, methods of collection of primary and secondary data, classification, tabulation.	5	Experiment -3 Group activity-2
3.3	Classification, tabulation., representation of data – graphical and diagrammatic.	5	Experiment -3 Group activity-2
UNIT 4			
4.1	Measures of central tendency - Mean, median, mode	5	Lecture -3 Assignment -2
4.2	Measures of dispersion - standard deviation, standard error, variance, range, mean deviation, quartile deviation and coefficient of variation.	5	Lecture -3 Assignment -2
4.3	Correlation - positive and negative correlation, calculation of Karl - Pearsons co-efficient of correlation.	5	Lecture -3 Assignment -2
UNIT 5			
5.1	Linear regression and regression equation. Calculation of an unknown variable using regression equation.	5	Lecture -3 Assignment -2
5.2	ANOVA - one way classification.	5	Lecture -3 Assignment -2
5.3	Tests of significance - Chi-square test (Theory & problem), Student's t test.	5	Lecture -3 Assignment -2

Course Outcomes (Cos)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores Of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO 1	4	3	3	3	2	4	2	3	4	3	3	4	3.16
CO 2	4	4	3	3	3	4	4	3	3	3	3	3	3.33
CO 3	4	3	3	3	3	4	3	3	2	3	3	4	3.16
CO 4	4	4	3	3	3	4	3	3	3	3	3	3	3.25
CO 5	3	4	3	3	3	3	4	4	3	3	3	4	3.33
Mean overall score												3.24	

Result: The score for this course is 3.24 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme: M.Sc

Semester : III

Sub. Code : ZL3

**Title of the paper: LAB 3: IMMUNOLOGY, DEVELOPMENTAL BIOLOGY AND
BIostatistics AND BIOPHYSICS**

Part III: Core12 PRACTICAL

Hours: 8 P/W, 120 Hrs P/S

Credits: 4

Pedagogy	Hours	Lecture	Peer Teaching	Demonstration	Tutorial	Visual aids
	8	1	-	4	2	1
PREAMBLE: This course helps to acquire practical knowledge on various immunological techniques, mounting of chick embryo and to apply statistical techniques in Zoology						
COURSE OUTCOME At the end of the Semester, the Students will be able to					Unit	Hrs P/S
UNIT 1 - CO1: carry out immunodiagnostic techniques					1	30
UNIT 2 - CO2: demonstrate immunological techniques used in research					2	30
UNIT 3 - CO3: carry out mounting of chick embryo					3	20
UNIT 4 - CO4: apply statistical techniques in research					4	30
UNIT 5 - CO5: interpret the outcome of the experiments					5	10
SYLLABUS						
Unit I: Preparation of antigen Separation of lymphocytes Agglutination tests - WIDAL – Slide and tube test RA test						

	ASO test
Unit II:	Precipitation tests - Ouchterlony's Double Immuno Diffusion test (ODD) Counter Current Immuno Electrophoresis (CIE) Rocket Immuno Electrophoresis (RIE) Rapid Plasma Region Test (RPR) Demonstration of ELISA
Unit III:	Serial sections of Chick embryo Mounting of Chick Blastoderm
Unit IV:	Data collection – Primary and Secondary data Calculation of Mean, Median, Mode and SD Representation of Data -Tabulation, Histogram and Pie diagram
Unit IV:	Spotters: Oogenesis and Spermatogenesis Chick - Four cell stage, 48 hrs stage, 56 hrs stage, 72 hrs and 96 hrs stage Membrane transport mechanism - active and passive transport
REFERENCES:	
<ol style="list-style-type: none"> 1. Dubey RC and Maheswari DK. Practical Microbiology. S. Chand and Company Ltd., New Delhi, 2008 2. Gunasekaran P. Laboratory Manual in Microbiology. New Age International Ltd. Pub., 2009 3. Palanichamy S and Manoharan M. Statistical Methods for Biologists. Paramount Pub., 2008 4. Subramanian MA. Biophysics - Principles & Techniques. MJP Pub., Chennai, 2005 	

Course Designer: Dr. H. Vijayarani

Course contents and Lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
UNIT 1.1	Preparation of antigen	6	Demonstration (4 hrs) Lecture (2 hrs)
UNIT 1.2	Separation of lymphocytes	8	Demonstration (6 hrs) Lecture (2 hrs)
UNIT 1.3	Agglutination tests - WIDAL – Slide and tube test	8	Demonstration (6 hrs) Tutorial (2 hrs)
UNIT 1.4	RA test, ASO test	8	Demonstration (6 hrs) Tutorial (2 hrs)
UNIT 2			
UNIT 2.1	Precipitation tests - Ouchterlony's	8	Demonstration (6 hrs)

	Double Immuno Diffusion test (ODD)		Lecture (4 hrs)
UNIT 2.2	Counter Current Immuno Electrophoresis (CIE)	8	Demonstration (6 hrs) Lecture (2 hrs)
UNIT 2.3	Rocket Immuno Electrophoresis (RIE)	8	Demonstration (6 hrs) Lecture (2 hrs)
UNIT 2.4	Rapid Plasma Region Test (RPR)	2	Demonstration
UNIT 2.5	Demonstration of ELISA	4	Demonstration
UNIT 3			
UNIT 3.1	Serial sections of Chick embryo	10	Demonstration (5 hrs) Tutorial (5 hrs)
UNIT 3.2	Mounting of Chick Blastoderm	10	Demonstration (5 hrs) Tutorial (5 hrs)
UNIT 4			
UNIT 4.1	Data collection – Primary and Secondary data	5	Demonstration (2 hrs) Peer Teaching (3 hrs)
UNIT 4.2	Calculation of Mean, Median, Mode and SD	10	Tutorial (6 hrs) Lecture (4 hrs)
UNIT 4.3	Representation of Data -Tabulation, Histogram and Pie diagram	15	Tutorial (7 hrs) Lecture (8 hrs)
UNIT 5			
UNIT 5.1	Spotters: Oogenesis and Spermatogenesis	3	Lecture (2 hrs) Visual aid (1 hr)
UNIT 5.2	Spotters: Four cell stage, 48 hrs stage, 56 hrs stage, 72 hrs and 96 hrs stage	3	Lecture (2 hrs) Visual aid (1 hr)
UNIT 5.3	Spotter: Membrane transport mechanism - active and passive transport	4	Lecture (2 hrs) Visual aid (2 hrs)

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO 1	PO2	PO3	PO4	PO5	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	4	5	5	4	5	4	5	2	4	4	5	3	4.16
CO2	4	5	5	4	5	4	5	2	4	4	5	4	4.25
CO3	4	3	4	3	4	2	5	3	3	2	2	3	3.17
CO4	4	5	5	5	5	4	5	5	4	5	4	4	4.58
CO5	4	4	2	2	4	4	3	3	3	2	3	3	3.08
Mean Overall Score												3.85	

Result: The Score for this Course is 3.85 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc
Semester : III
Course Code : EZC

Part III : Elective3
Hours : 5 P/W 75 Hrs P/S
Credits :4

TITLE OF THE PAPER: GENOMICS AND PROTEOMICS

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT	
	5	2	-	1	2	
PREAMBLE:						
The course will provide knowledge about the basic principles of Genomics and Proteomics and its applications.						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 - CO1: equip themselves with the recent developments in 'OMICS' technology					1	10
UNIT 2 - CO2: update their knowledge in genomics and gene expression techniques					2	18
UNIT 3 - CO3: get acquainted with proteomics , protein expression analysis and application					3	17

UNIT 4 - CO4: enrich their ideas on gene prediction and protein structure prediction methods	4	15
UNIT 5 - CO5: apply computational methods in drug designing by virtual screening and docking	5	15

SYLLABUS

UNIT I: Biological databases - types – classification with examples- SRS, ENTREZ similarity search - FASTA and BLAST - sequence alignment types - applications of Bioinformatics.

UNIT II: Genomics - types - Prokaryotic and Eukaryotic genome structure - Genomes of *E.coli* and human. Human Genome Project - an overview. Gene expression analysis-cDNAs and ESTs-SAGE - DNA Microarray - Applications of Microarray.

UNIT III: Proteomics - Types-Separation of protein by Gel Electrophoresis. Identification of protein by peptide mass fingerprinting, Mass Spectrometry-MALDI –MALDI - TOF. Protein expression analysis - applications of Proteomics

UNIT IV :Gene prediction Methods - Lab based, Feature based, Homology based and HMM based approaches - Protein structure prediction - computational tools for primary and secondary structure of proteins - comparative modeling.

UNIT V: Application of genomics and proteomics - drug development – pharmacogenomics - target-lead – hits - Lipinski's rule – CADD - - Ligand and -Structure based drug designing-docking - types. Tools for docking. -

TEXT BOOKS:

1. Ignacimuthu S. Basic Bioinformatics. Narosa Pub. House, New Delhi, 2008
2. Singh J. Discovering Genomics and proteomics. Manglam Pub., New Delhi, 2009
3. Solomon KA. Molecular Modeling and Drug Design. MJP Pub., Chennai, 2008

REFERENCE BOOKS:

1. Higgs PG and Attwood TK. Bioinformatics and Molecular Evolution. Blackwell Pub., 2005
2. Krawetz SA and Womble DD. Introduction to Bioinformatics - A Theoretical and Practical Approach. Humana Press, New Jersey, 2009
3. Larson RS. Bioinformatics and Drug Discovery. Humana Press, New Jersey, 2008

Course Designer: Dr. V.Kabila

Course contents and lecture schedule

UNITS	TOPIC	LECTUR E HRS.	MODE OF TEACHIG
UNIT I			
1.1	Biological databases - types – classification with examples	4	Lecture -2 ICT-2
1.2	SRS, ENTREZ similarity search - FASTA and BLAST - sequence alignment types	4	Lecture-3 ICT-1
1.3	Applications of Bioinformatics.	2	Lecture-2
UNIT II			
2.1	Genomics - types - Prokaryotic and Eukaryotic genome structure	5	Lecture-2
2.2	Genomes of <i>E.coli</i> and human. Human Genome Project - an overview.	4	Lecture-3 ICT-1
2.3	Gene expression analysis-cDNAs and ESTs-SAGE	5	Lecture-5
2.4	DNA Microarray - Applications of Microarray	4	Lecture-2 ICT-2
UNIT- III			
3.1	Proteomics - Types-Separation of protein by Gel Elelectrophoresis	5	Lecture-4 ICT-1
3.2	Identification of protein by peptide mass fingerprinting	4	Lecture-2 ICT-2
3.3	Mass Spectrometry-MALDI –MALDI – TOF	3	Lecture-2 ICT-1
3.4	Protein expression analysis	4	Lecture-2 ICT-2
3.5	Applications of Proteomics	1	Lecture-1
UNIT IV			
4.1	Gene prediction Methods - Lab based, Feature based, Homology based and HMM based approaches	5	Lecture-3 ICT-2
4.2	Protein structure prediction - computational tools for primary and secondary structure of proteins	6	Lecture-3 ICT—3
4.3	comparative modeling	4	Lecture-1 ICT-3
UNIT V			
5.1	Application of genomics and proteomics	3	Lecturer-3
5.2	drug development – pharmacogenomics - target-lead – hits - Lipinski's rule –	5	Lecture-2 ICT-3
5.3	CADD – Ligand and-Structure based drug designing	4	Lecture-2 ICT-2
5.4	Docking - types. Tools for docking.	3	Lecture-2 ICT-2

Course Outco	Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)	Mean scores
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mes (COs)													of Cos
	PO 1	PO2	PO3	PO4	PO5	PS O1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PS O7	
CO1	3.6	3.4	3.6	3.0	3,3	3.3	3.6	3.5	3.1	3.0	3.5	3.6	3.37
CO2	3.5	3.6	3.5	3.0	3.5	3.1	3.3	3.4	3.3	3.3	2.2	3.6	3.27
CO3	3.4	3.5	3.6	3.1	3.4	3,0	3.4	3.4	3.3	3.3	2.1	3.4	3.24
CO4	3.4	3.5	3.5	3.0	3.5	3.1	3.4	3.5	3.4	3.5	2.5	3.5	3.31
CO5	3.5	3.6	3.6	3.1	3.6	3.3	3.3	3.7	3.8	3.2	3.1	3.4	3.43
Mean Overall Score													3.32

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 = PSOs	$\frac{\text{Total of Value}}{\text{Total No. of Pos \&}}$		$\frac{\text{Mean Overall Score of COs} = \text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc., Zoology
 Semester : II
 Sub. Code : NMPZ

Part III: Non-Major Elective
 Hours : 2 P/W 30 Hrs P/S
 Credits : 2

TITLE OF THE PAPER: BRAIN AND HUMAN BEHAVIOUR

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT	
	2	1		1		
<p>PREAMBLE: To introduce the amazing brain facts and its functions for non-biology students; And to make them learn, understand and associate the behavior pattern with brain activity.</p>						
<p>COURSE OUTCOME At the end of the Semester, the Students will be able to</p>					Unit	Hrs P/S
<p>UNIT 1 CO1: Acquire knowledge about the structure and functions of brain and describe it with basic understanding</p>					1	6
<p>UNIT 2 CO2: Distinguish and explain the types of neurons, neurotransmitters and its functions</p>					2	6
<p>UNIT 3 CO3: Understand the process of learning and associate with individuals' behavior patterns</p>					3	6
<p>UNIT 4 CO4: Integrate the concepts of thought process and motivation through self-understanding</p>					4	6

UNIT 5 CO5: Interpret emotions and relate it with behavior changes, understand stress and its effect on human body and mind; Practice Stress management	5	6
SYLLABUS		
UNIT I: Architecture of Brain - Cerebrum - Frontal, Parietal, Occipital and Temporal lobes. Cerebellum, Brain stem - Mid brain, Pons, Medulla oblongata. Limbic system – Thalamus, hypothalamus, amygdala and hippocampus. Functions of different parts of brain.		
UNIT II: Nervous system - Functional description of Central, Peripheral and Autonomic nervous system in brief. Neurons - Motor and Sensory. Neurotransmitters - acetylcholine, adrenalin, endorphins, serotonin, dopamine - functional significance.		
UNIT III: Learning - Classical conditioning, Instrumental or Operant conditioning, reinforcement, reward and punishment learning.		
UNIT IV: Thought process- Problem solving and Decision making. Motivation - needs and drives – Biological motives.		
UNIT V: Emotion and Stress - Biological basis of emotion - types of emotion - influence of emotions on behavior. Types and Sources of Stress - physical, psychological and biological symptoms. Stress management.		
TEXT BOOK:		
1. Fundamentals of Psychology, Published by School of Social Sciences, TNOU, 2012		
REFERENCES:		
1. Garrett B. Brain and Behaviour. 4 th Edn., SAGE Pub., 2007		
2. Pfaff DW and Joels M. Hormones, Brain and Behaviour. 3 rd Edn., Elsevier Pub., 2016		

Course designer: Dr.D. Helen Christina

Course contents and lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Architecture of Brain - Cerebrum - Frontal, Parietal, Occipital and Temporal lobes.	2	Lecture -1, Video-1
1.2	Cerebellum, Brain stem - Mid brain, Pons, Medulla oblongata	1	Lecture
1.3	Limbic system – Thalamus, hypothalamus, amygdala and hippocampus.	1	Lecture
1.4	Functions of different parts of brain.	2	Lecture -1, GD-1

UNIT II			
2.1	Nervous system - Functional description of Central, Peripheral nervous system in brief.	2	Lecture
2.2	Autonomic nervous system in brief. Neurons - Motor and Sensory. Neurotransmitters - acetylcholine, adrenalin,	2	Lecture -1, Video-1
2.3	Endorphins, serotonin, dopamine - functional significance	2	Lecture
UNIT III			
3.1	Learning - Classical conditioning	2	Lecture-1, peer learning -1
3.2	Instrumental or Operant conditioning, reinforcement	2	Lecture
3.3	reward and punishment learning	2	Lecture-1, peer learning -1
UNIT IV			
4.1	Thought process	1	Lecture
4.2	Problem solving and Decision making.	2	Lecture-1, Interaction-1
4.3	Motivation - needs and drives	2	Lecture
4.4	Biological motives.	1	Lecture
UNIT V			
5.1	Emotion and Stress - Biological basis of emotion	2	Lecture-1, Interaction-1
5.2	Types of emotion - influence of emotions on behavior	1	Lecture
5.3	Types and Sources of Stress - physical, psychological and biological symptoms.	2	Lecture-1, GD-1
5.4	Stress management.	1	Lecture

Course Outcomes (COs)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO1	4	3	2	2	3	4	4	2	2	2	3.5	1	3.2
CO2	4	4	2	2	3	4	4	3	2	3	4	1	3
CO3	4	4	3	3	3	4	4	4	3.5	3	3.5	3	3.8
CO4	4	4	3	2.5	2.5	4	4	3	3	3	3.5	2.5	3.3
CO5	4	4	2	2	4	4	4	4	3	3	3.5	4	3.5
	Mean Overall Score											3.36	

Result: The Score for this Course is 3.36 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme: M. Sc ZOOLOGY
Semester : IV
Sub. Code : ZD1

Part III: Core 13
Hours: 5 Hrs. P/W 90 Hrs. P/S
Credits: 4

TITLE OF THE PAPER: ANIMAL BIOTECHNOLOGY

Pedagogy	Hours	Lecture	Peer Teaching	GD/Videos/Tutorial	ICT	
	6	4	-	1	1	
PREAMBLE:						
<p style="text-align: center;">This course helps to gain knowledge on basic techniques and tools of biotechnology and understand the application of biotechnology in various fields.</p>						
COURSE OUTCOME					Unit	Hrs P/S
At the end of the Semester, the Students will be able to						
UNIT 1 CO1: acquire knowledge on the tools of genetic engineering					1	12
UNIT 2 CO2: understand the principle and methodology of basic Techniques in genetic Engineering					2	22
UNIT 3 CO3: learn advanced techniques in genetic Engineering					3	20

UNIT 4 CO4: apply skills to develop genetically modified organisms	4	18
UNIT 5 CO5: assess the biosafety and other regulations of biotechnology	5	18

SYLLABUS

Unit I: Tools of Genetic Engineering - Vectors - plasmids, bacteriophage, cosmids, shuttle vectors, yeast vectors. Enzymes - exonucleases, endonucleases, restriction endonucleases, ligases, reverse transcriptases, polymerases, terminal transferases, isozymes. Probes and molecular markers - RFLP, RAPD.

Unit II: Techniques in Genetic Engineering - selection and isolation of desired genes, gene splicing, introduction of rDNA into host, selection of clone containing DNA insert, PCR, DNA finger printing, blotting techniques, DNA sequencing, genomic library, cDNA library.

Unit III: Gene cloning - Gene transfer in animals - gene transfer technology, expression of induced genes. Animal cell culture- cell culture, culture media, monolayer and suspension culture, cell lines, somatic cell fusion and Hybridoma technology. Organ culture - techniques, advantages and applications.

Unit IV: Transgenic Animal Technology - production of transgenic animals, Genetically Modified Organisms - Gene knockouts, Gene silencing, Transgenic Mice, Sheep and Fishes, uses of transgenic animals.

Unit V: Medical Biotechnology - production of recombinant vaccines. Problems related to biotechnology - social, cultural, economic and legal problems, safety in biotechnology, Bioethics, Intellectual Property Rights, and Patenting.

Text Book:

- 1. Dubey RC. A Text Book of Biotechnology. Multicolor Illustrative Edn., S. Chand Pub., New Delhi, 2006**

Reference Books:

- 1. Brown TA. Gene Cloning - An Introduction. 4thEdn., Black Bell Science Ltd., New Delhi, 2001**
- 2. Primrose SB. Principles of Gene manipulation. Old R.N. and 6thEdn., Black Bell Science Ltd., New Delhi, 2003**
- 3. U. Biotechnology. 1stEdn., Books and Allied (P) Ltd., 2005**

Course Designer: Dr. H. Vijayarani

Course contents and Lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			

1.1	Tools of Genetic Engineering - Vectors - plasmids, bacteriophage, cosmids, shuttle vectors, yeast vectors	8	Lecture (4 hrs) Video (4 hrs)
1.2	Enzymes - exonucleases, endonucleases, restriction endonucleases, ligases, reverse transcriptases, polymerases, terminal transferases, isozymes	4	Lecture
UNIT II			
2.1	Techniques in Genetic Engineering - selection and isolation of desired genes, gene splicing, introduction of rDNA into host, selection of clone containing DNA insert	6	Lecture (4 hrs) ICT (2hrs)
2.2	PCR, DNA finger printing	4	Lecture (3 hrs) Video (1 hr)
2.3	Blotting techniques, DNA sequencing	8	Lecture (6 hrs) ICT (2 hrs)
2.4	Genomic library, cDNA library	4	Lecture (3 hrs) Video (1hr)
UNIT III			
3.1	Gene cloning - Gene transfer in animals - gene transfer technology, expression of induced genes	8	Video (4 hrs) Tutorial (4 hrs)
3.2	Animal cell culture- cell culture, culture media, monolayer and suspension culture, cell lines, somatic cell fusion and Hybridoma technology	8	Peer teaching (4 hrs) Group discussion (4 hrs)
3.3	Organ culture - techniques, advantages and applications	4	Lecture
UNIT IV			
4.1	Transgenic Animal Technology - production of transgenic animals	6	Lecture (4 hrs) Video (2 hrs)
4.2	Genetically Modified Organisms - Gene knockouts, Gene silencing	6	Lecture (4 hrs) ICT (2 hrs)
4.3	Transgenic Mice, Sheep and Fishes, uses of transgenic animals.	6	Lecture (4 hrs) ICT (2 hrs)
UNIT V			
5.1	Medical Biotechnology - production of recombinant vaccines	6	Lecture (4 hrs) Video (2 hrs)
5.2	Problems related to biotechnology - social, cultural, economic and legal problems	6	Lecture (4 hrs) Group discussion (2 hrs)
5.3	Safety in biotechnology, Bioethics, Intellectual Property Rights, and Patenting.	6	Lecture

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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	5	3	3	4	3	5	2	4	3	3	4	3	3.50
CO2	4	5	5	5	4	4	5	5	5	3	3	3	4.25
CO3	3	5	4	5	4	4	5	4	3	2	3	3	3.75
CO4	3	3	4	4	4	5	4	4	3	3	3	3	3.58
CO5	3	2	4	5	5	3	3	3	4	5	3	3	3.58
Mean Overall Score													3.73

Result: The Score for this Course is 3.73 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc

Semester :IV

Sub.Code :ZD2

Part III: Core14

Hours :6P/W 90Hrs P/S

Credits: 4

TITLE OF THE PAPER: ENTOMOLOGY

Pedagogy	Hours	Lecture	Peer teaching	GD/VIDEOS/TUTORIAL	ICT
	6	3		2	1

PREAMBLE

This will enable the students to understand the basic concept of insect biology and evolutionary relationships of insect orders and families and to have a deeper understanding of several aspects of insect biology .

COURSE OUTCOME At the end of the Semester, the Students will be able to	Unit	Hrs P/S
UNIT 1 - CO1:Acquire the knowledge about insect classification with examples.	1	18
UNIT2- CO2:Understand the comparative morphology of insect organ systems.	2	18
UNIT3 - CO3:Understand the physiology of insects in a comparative manner.	3	18
UNIT4 - CO4:Identify the insect pests, their control methods and pesticide applications and to develop the skills in rearing beneficial insects.	4	18
UNIT 5 CO5:Enhance the productivity of agricultural crops through insect pest management.	5	18

SYLLABUS

UNIT I:

Classification - Insect classification up to order level. General characters and classification up to family level - Hemiptera, Lepidoptera and Coleoptera.

UNIT II:

Insect Morphology - morphology of head, thorax and abdomen. Appendages - antennae, legs and genitalia. Wing structure and mechanism of flight. Mouth parts - types, morphology and feeding mechanism.

UNIT III:

Insect Physiology - respiratory system - tracheal, aquatic and plastron respiratory mechanism. Excretory system. Reproduction - male and female reproductive system, structure of testis and ovary, mechanism of spermatogenesis and oogenesis with special reference to vitellogenesis. Metamorphosis - types of larvae and pupae.

UNIT IV:

Life Cycle, rearing and economic importance of honey bee, lac insect and silk worm. Damages caused, life cycle and control measures of *Schistocera gregaria*, *Leptocoryza acuta*, *Tribolium castaneum*.

UNIT V:

Vector borne diseases - Malarial and Dengue vectors – life cycle and control measures. Methods of insect control - Principles and methods of pest control - physical, mechanical, chemical and biological control - *Bacillus thuringiensis*, *Beauveria bassiana*, Nuclear Polyhedrosis virus, Cytoplasmic polyhedrosis virus,

Parasitoids. Integrated Pest Management.

Text Book:

1. **Tembhare DB. Modern Entomology. Himalaya Pub., 2012**

Reference Books:

1. **Vasantharaj David B and Ananthakrishnan TN. General and Applied Entomology. TaTa McGraw Hill, New Delhi, 2010**
2. **Chapman.RF. The Insect Structure and Function. Cambridge University Press London, 2008**
3. **WiggleWorth VB. The Principles of Insect Physiology. English Language Book Society and Methuen and Co. Ltd., 2007**
4. **Vasantharaj David B and Kumaraswami T. Elements of Economic Entomology. Popular Book Depot, Chennai, 2000**

Course designer: Mrs .A.Sheela

Course contents and lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Insect classification up to order level.	6	Chart – 1, Lecture - 5
1.2	General characters and classification up to family level - Hemiptera, Lepidoptera	8	Lecture -6, video demonstration – 2
1.3	General characters and classification up to family level - Coleoptera,	4	Lecture -6, video demonstration – 2
UNIT 2			
2.1	Insect Morphology - morphology of head, thorax and abdomen. Appendages - antennae, legs and genitalia.	8	Demonstration with specimen-5, Lecture -3
2.2	Wing structure and mechanism of flight.	4	Demonstration with specimen-5, Lecture -3
2.3	.Mouth parts - types, morphology and feeding mechanism.	6	Demonstration with specimen-5, Lecture -3
UNIT 3			
3.1	Insect Physiology - respiratory system - tracheal, aquatic and plastron	6	Lecture -3, video demonstration-3

	respiratory mechanism. Excretory system.		
3.2	Reproduction - male and female reproductive system, structure of testis and ovary, mechanism of spermatogenesis and oogenesis with special reference to vitellogenesis.	6	Lecture -3, ICT-3
3.3	Metamorphosis - types of larvae and pupae.	6	Lecture -3, video demonstration-3
UNIT 4			
4.1	Life Cycle, rearing and economic importance of honey bee, lac insect	8	Lecture-5, video/Field visit-3
4.2	Life Cycle, rearing and economic importance of silk worm	4	Lecture-2, video/Field visit-2
4.3	Life cycle and control measures of <i>Schistocera gregaria</i> , <i>Leptocoryza acuta</i> , <i>Tribolium castaneum</i> .	6	Lecture-3, ICT-3
UNIT 5			
5.1	Vector borne diseases - Malarial and Dengue vectors	6	Lecture-4, ICT-2
5.2	Methods of insect control - Principles and methods of pest control - physical, mechanical, chemical and biological control	6	Seminar -4, Group activity - 2
5.3	Integrated Pest Management.	6	Lecture-5, video demonstration-1

Course Outcomes (Cos)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores Of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
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
Mean overall score												3.13	

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

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
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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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc. ZOOLOGY
Semester : IV
Sub. Code : ZD3

Part III: Core 15
Hours : 5 Hrs P/W 75 Hrs P/S
Credits : 4

TITLE OF THE PAPER: BIODIVERSITY AND CONSERVATION STRATEGIES

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	2	-	2	1

PREAMBLE:

This course helps to understand the benefits and values associated with biodiversity and gain knowledge on the scientific and technical concepts and skills relating to biodiversity.

COURSE OUTCOME	Unit	Hrs P/S
At the end of the Semester, the Students will be able to		
UNIT 1 CO1: Understand, describe the concepts of biodiversity	1	17
UNIT 2 CO2: Outline the sources and values of biodiversity and list down the benefits.	2	16
UNIT 3 CO3: Explain and analyze the megadiversity zone in India and discuss the threats.	3	14
UNIT 4 CO4: Discuss the methods and types of biodiversity conservation	4	15
UNIT 5 CO5: Understand and describe the Biodiversity Act - organizations involved	5	13

SYLLABUS

UNIT I:

Biodiversity - types - Genetic, species and ecosystem. Regional, national and global patterns of biodiversity - α , β and γ . Evenness, abundance, richness and biodiversity indices. Ecosystem diversity.

UNIT II:

Sources and values of biodiversity - food, drugs, medicines, industry. Ecotourism – aesthetic, cultural and scientific benefits of biodiversity – ecosystem services – ecosystem functioning.

UNIT III:

India - A mega biodiversity zone – Hotspots in India. Endemic species, endangered species, Vavilovian centres of origin. Key stone species, IUCN, Red Data Book - Threats to biodiversity - species extinction.

UNIT IV:

Conservation of biodiversity - types of conservation management - *In-situ* - Wild life sanctuaries, national parks, sacred grooves, botanical and zoological gardens. *Ex-situ* - Tissue culture and gene Bank - challenges in conservation of biodiversity - Land and water

UNIT V:

Biodiversity conservation - Biodiversity Act - organizations involved - India -global - Future Conservation strategies for India – carrying capacity of the system. Enhancement of the protected areas – Stress on Integrated Development Research impetus - types - strategies opportunities and options.

- ❖ Field Trip to Wild life and Biodiversity Conservation Centres.

TEXT BOOK:

Joshi PC and Namita J. Biodiversity and Conservation. APH Pub., New Delhi, 2004

REFERENCE BOOKS:

1. Biswas S. Indian biodiversity for the present millennium - Global prospect and perspectives. Satish Serial Pub., New Delhi, 2006
2. Krishnamoorthy KV. Introduction to Biodiversity. Oxford and IBH, 2003
3. Dadhich LK and Sharma AP. Biodiversity strategies for conservation. APH PUB., New Delhi, 2002

Course designer: Dr. M. Rajee

Course contents and lecture schedule

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT I			
1.1	Biodiversity - types - Genetic, species and ecosystem. Regional, national and global patterns of biodiversity - α , β and γ . Evenness, abundance, richness and biodiversity indices. Ecosystem diversity.	6	Lecture - 6
1.2	Regional, national and global patterns of biodiversity - α , β and γ . Evenness, abundance, richness and biodiversity indices. Ecosystem diversity.	7	Lecture - 5 ICT - 2
1.3	Ecosystem diversity.	4	Lecture - 4
UNIT II			
2.1	Sources and values of biodiversity - food, drugs, medicines, industry.	3	Lecture - 3
2.2	Ecotourism – aesthetic, cultural and scientific benefits of biodiversity – ecosystem services – ecosystem functioning	5	Lecture - 2 Tutorial - 2 Video - 1
2.3	Ecosystem services	4	Lecture - 3 ICT - 1
2.4	Ecosystem functioning.	4	Lecture - 2 Tutorial - 2
UNIT III			
3.1	India - A mega biodiversity zone	4	Lecture - 2 Tutorial - 2
3.2	Hotspots in India. Endemic species, endangered species, Vavilovian centres of origin.	4	Lecture - 2 Tutorial - 2
3.3	Key stone species, IUCN, Red Data Book	4	Lecture - 2 Tutorial - 2
3.4	Threats to biodiversity - species extinction	2	Lecture - 2
UNIT IV			
4.1	Conservation of biodiversity - types of conservation management - <i>In-situ</i> - Wild life sanctuaries, national	7	Lecture - 5 Tutorial - 2

	parks, sacred grooves, botanical and zoological gardens.		
4.2	<i>Ex-situ</i> - Tissue culture and gene Bank	4	Lecture - 2 Tutorial - 2
4.3	Challenges in conservation of biodiversity - Land and water	4	Lecture - 2 Tutorial - 2
UNIT V			
5.1	Biodiversity conservation - Biodiversity Act - organizations involved - India -global	5	Lecture - 2 Tutorial - 2 ICT - 1
5.2	Future Conservation strategies for India – carrying capacity of the system.	4	Lecture - 3 ICT - 1
5.3	Enhancement of the protected areas – Stress on Integrated Development Research impetus - types - strategies opportunities and options.	4	Lecture - 4

Course Outcomes (Cos)	Programme Outcomes (Pos)					Programme Specific Outcomes (PSOs)							Mean scores of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	
CO1	3.7	3.4	3.8	3.6	3.5	3.5	3.5	3.6	3.2	3.7	3.2	3.5	3.52
CO2	3.8	3.2	3.6	3.8	3.7	3.2	3.7	3.5	3.2	3.6	3.5	3.7	3.54
CO3	3.4	3.4	3.7	4	3.8	3.5	3.2	3.7	3.8	3.5	3.8	3.2	3.58
CO4	3.2	3.2	3.5	3.8	4	3.4	3.4	3.6	4	3.2	3.4	3.8	3.54
CO5	3.3	3.6	3.2	3.7	3.8	3.2	3.2	3.4	3.7	3.5	3.4	3.7	3.48
Mean Overall Score													3.53

Result: The Score for this Course is 3.53 (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	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Programme : M.Sc
Semester : IV
Sub. Code : EZD

Part III: Elective 4
Hours :5 P/W 75 Hrs P/S
Credits : 5

TITLE OF THE PAPER :ANIMAL BEHAVIOUR

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	2	1	1	1

PREAMBLE:

The course will provide basic knowledge on the broad field of Animal Behaviour and to learn about the behavioural pattern in various group of animals

COURSE OUTCOME	Unit	Hrs P/S
At the end of the Semester the Students will be able to		
UNIT 1 - CO1: Acquire knowledge of fundamental concepts in animal behavior and to know about the pioneers and significance of animal behavior relating inheritance and relationships	1	15
UNIT 2 - CO2: Exhibit critical integrative thinking skills in communication and ecological aspects of orientation ,habit selection and aggression of Animal behavior	2	15
UNIT 3 - CO3: Relate habituation, conditioning and reasoning behavior of Animals	3	15
UNIT4 - CO4: Understand the proximate control of hormones of animal behavior and to gain depth knowledge in motivation and aggregation of animals	4	15
UNIT 5 - CO5: Have a comprehensive understanding to relate theory and practical knowledge , emphasizing animal communication and social behavior to solve problems in society	5	15

SYLLABUS

UNIT I:

Behaviour - Types and mechanism of animal behaviour. Pioneers of animal behavior

- Karl von Frisch, Konard Lorenz and Nikolaas Tinbergen. Significance of animal

behaviour. Reflexes and complex behaviour. Evolution and ultimate causation- Inheritance behaviour and relationships

UNIT II:

Communication - Chemical, visual, olfactory and auditory, species specificity of songs, evolution of language in primates. Ecological aspects of behaviour: Habitat

selection, food selection, optimal foraging theory, anti-predator defences, aggression,

homing territoriality, dispersal, host parasite relations.

UNIT III:

Biological rhythms – Circadian, Lunar and circannual rhythms, orientation and navigation,

migration of fishes, turtles and birds. Learning and memory Conditioning, habituation, insight learning, association learning and reasoning.

UNIT IV:

Neural and hormonal control of behaviour. Genetic and environmental components in the development of behaviour. Motivation: Drive, timing and interaction of drives, physiological basis of motivation, hormones and motivation, aggregation.

UNIT V:

Reproductive behavior - Evolution of sex and reproductive strategies, mating systems, courtship, sexual selection, parental care. Social behaviour, aggregations, schooling in fishes, flocking in birds, herding in mammals, group selection, kin selection, altruism, reciprocal altruism, inclusive fitness , social organization in insects and primates.

Text Book:

1. Agarwal VK. Animal Behaviour (Ethology). S. Chand Pub., New Delhi, 2013

Reference Books:

2. Icock J. An Evolutionary Approach. Sinauer Association, Sunderland, Mass, USA, 2013
3. Bradbury JW and Vehrencamp SL. Principles of Animal Communication. Sinauer Association, Sunderland, Mass, US, 2011
4. Clutton-Brock TH. The Evolution of Parental Care. Princeton University Press, Princeton, NJ, USA, 2012

Course Designer –Dr. C. Rani Vijaya

COURSE CONTENTS AND LECTURE SCHEDULE

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
1.1	Behaviour - Types and mechanism of animal behaviour. Pioneers of animal behavior - Karl von Frisch, Konard Lorenz and Nikolaas Tinbergen	3	Lecture -2, PPT-1
1.2	Pioneers of animal behavior - Karl	2	Lecture -1, PPT-1

	von Frisch, Konard Lorenz and Nikolaas Tinbergen		
1.3	Significance of animal behaviour. Reflexes and complex behaviour.	5	LECTURE-3, ICT - 2
1.4	Evolution and ultimate causation	3	LECTURE-2, ICT -1
1.5	Inheritance behaviour and relationships.	2	LECTURE-2
UNIT 2			
2.1	Communication - Chemical, visual, olfactory and auditory	3	LECTURE-2, PPT-1
2.2	species specificity of songs, evolution of language in primates.	3	Lecture -2, ICT - 1
2.2	Ecological aspects of behaviour: Habitat selection, food selection, optimal foraging theory, anti-predator defences,	4	Lecture-2, ICT - 2
2.3	Aggression, homing territoriality, dispersal, host parasite relations.	5	Lecture -3, ICT -2
UNIT 3			
3.1	Biological rhythms - Circadian and circannual rhythms	5	Lecture -3, Group activity-2
3.2	Orientation and navigation, migration of fishes, turtles and birds.	4	Lecture -2, PPT-2
3.3	Learning and memory	2	Lecture -2
3.4	Memory Conditioning, habituation, insight learning, association learning and reasoning.	4	Lecture -3, Video demonstration and Lecture-1
UNIT 4			
4.1	Neural control of behaviour	3	Lecture-3
4.2	Hormonal control of behaviour	2	Lecture - 2
4.3	Genetic and environmental components in the development of behaviour.	3	Lecture-2, ICT -1
4.4	Motivation: Drive, timing and interaction of drives, physiological basis of motivation,	4	Lecture-2, ICT -2
4.5	Hormones and motivation, aggregation	3	Lecture-2, ICT-1
UNIT 5			
5.1	Reproductive behavior - Evolution of sex and reproductive strategies, mating systems, courtship, sexual selection, parental care.	5	Lecture-3, ICT -2
5.2	Social behaviour, aggregations, schooling in fishes	3	Lecture - 2, ICT -1
5.3	flocking in birds, herding in mammals	2	Lecture-2
5.4	Group selection, kin selection, altruism, reciprocal altruism, inclusive	3	PPT-3

	fitness		
5.5	Social organization in insects and primates.	2	Lecture-2

Course Outcomes (Cos)	Programme outcomes (POs)					Programme specific outcomes (PSOs)							Mean Scores Of Cos
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO 1	4	3	3	3	2	4	2	3	4	3	3	4	3.2
CO 2	4	4	3	3	3	4	4	3	3	3	3	3	3.3
CO 3	4	3	3	3	3	4	3	3	2	3	3	4	3.1
CO 4	5	4	3	3	3	4	3	3	3	3	3	3	3.3
CO 5	3	4	3	3	3	3	4	4	3	3	3	4	3.3
Mean overall score												3.24	

Result: The score for this course is 3.24 (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 = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$
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BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%