KALAIGNAR KARUNANIDHI

GOVERNMENT ARTS COLLEGE FOR WOMEN (AUTONOMOUS)

(Reaccredited with B^{++} by NAAC)

PUDUKKOTTAI -622 001

DEPARTMENT OF ZOOLOGY

SYLLABUS – UG

(2021 – 2022 Onwards)

KALAIGNAR KARUNANIDHI

GOVERNMENT ARTS COLLEGE FOR WOMEN (AUTONOMOUS),

PUDUKKOTTAI -622 001

DEPARTMENT OF ZOOLOGY –BOARD OF STUDIES

CONTENTS

KALAIGNAR KARUNANIDHI

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PUDUKKOTTAI-622 001

DEPARTMENT OF ZOOLOGY - BOARD OF STUDIES

Meeting on 27.05.2020

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Bharathidasan University
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KALAIGNAR KARUNANIDHI GOVERNMENT ARTS COLLEGE FOR WOMEN
(Autonomous)

PUDUKKOTTAI – 622 001

UG COURSE PATTERN – CBCS

PART	COURSE	NO. OF PAPERS	INST. / HRS	CREDIT	TOTAL MARKS
I	Language - Tamil	4	24	12	400
II	Language - English	4	24	12	400
III	CORE COURSE	Hours		Credits	Total Marks
	CORE COURSE	15	73	68	1500
	Allied Course	6	29	18	600
	Major Based Elective	3	14	12	300
IV	Non- Major Elective	2	4	4	200
IV	Skilled Enhancement course VB ES YOGA	 1 1 1	 2 2 1	 2 2 2	 100 100 100
	GS EXA	1 -	1 -	1 1	100 -
TOTAL		41	180	140	4100

Course pattern for UG Zoology Programme

Sem	S.no	Part	Code	Course Code	Course title	Inst Hrs	Credit	CIA + SE	Marks
I	1	I	LC-1	21UT1	Language	6	3	25+75	100
	2	II	ELC-1	21UE1	English	6	3	25+75	100
	3	III	CC-1	21UZO01	Invertebrata	6	5	25+75	100
	4	III	CC/Lab	21UZO02P	Major Practical I	4	4	25+75	100
	5	III	FAC-1	21UAB1	Allied Botany course I	6	3	25+75	100
	6	IV	AEC-VB	21UVB	Value Education	2	2	25+75	100
					Total	**30**	**20**		**600**
II	7	I	LC-2	21UT2	Language	6	3	25+75	100
	8	II	ELC-2	21UE2	English	6	3	25+75	100
	9	III	CC-III	21UZO03	Chordata	5	5	25+75	100
	10	III	CP-1I	21UZO04P	Major Practical II	4	4	25+75	100
	11	III	FAC-II	21UAB2	Allied Botany course II	5	3	25+75	100
	12	III	FAC-III	21UAB3P	Allied Botany course - Practical	4	3	75+25	100
					Total	**30**	**21**		**600**
III	13	I	LC-3	21UT3	Language	6	3	25+75	100
	14	II	ELC-3	21UE3	English	6	3	25+75	100
	15	III	CC-5	21UZO05	Animal Physiology and Biochemistry	6	5	25+75	100
	16	III	CC-6	21UZO06P	Major Practical III	5	5	25+75	100
	17	III	SAC-1	21UAC1	Allied Chemistry - I	5	3	25+75	100
	18	IV	AEC-ES	21UES	Environmental Science	2	2	25+75	100
			SS1	21UZOSS1	Ornamental fish culture	-	2	25+75	100
					Total	**30**	**21**		**700**
IV	19	I	LC-4	21UT4	Language	6	3	25+75	100
	20	II	ELC-4	21UE4	English	6	3	25+75	100
	21	III	CC-7	21UZO07	Developmental Biology and Biodiversity	4	4	25+75	100
	22	III	CP-8	21UZO08P	Major Practical IV	3	3	25+75	100
	23	III	SAC-2	21UAC2	Allied Chemistry - II	5	3	25+75	100
	24	III	SAC-3	21UAC3P	Allied Chemistry – III - Practical	4	3	25+75	100
	25	IV	SEC-1	21UZOSEC1	Pathology And Clinical Laboratory – I	2	2	25+75	100

			SS2	21UZOSS2	Apiculture		2	75+25	100
					Total	**30**	**21**		**700**
V	26	III	CC-9	21UZO09	Cell and Microbiology	5	5	25+75	100
	27	III	CC-10	21UZO10	Genetics and Molecular Biology	5	5	25+75	100
	28	III	CC-11	21UZO11	Biotechnology	4	4	25+75	100
	29	III	CP-12	21UZO12P	Major Practical V	5	5	25+75	100
	30	III	ME-I	21UZOME1	Applied Entomology	4	4	25+75	100
	31	IV	SEC-2	21UZOSEC2	Pathology And Clinical Laboratory – II	2	2	25+75	100
	32	IV	SEC-3	21UZOSEC3	Soft Skill for Professionals	2	2	25+75	100
	33	IV	NME-1	21UB0NME1	Botanical garden and Land Scaping	2	2	25+75	100
	34	IV			Yoga	1	1	25+75	100
					Total	**30**	**30**		**900**
VI	35	III	CC-13	21UZO13	Environmental Biology and Management	5	5	25+75	100
	36	III	CC-14	21UZO14	Immunology and Evolution	6	5	25+75	100
	37	III	CP-15	21UZO15P	Major Practical VI	6	5	25+75	100
	38	III	ME-2	21UZOME2	Biophysics, Biostatistics and Bioinformatics	5	4	25+75	100
	39	III	ME-3	21UZOME3	Bioinstrumentation	5	4	25+75	100
	40	IV	NME-2	21UBONME2	Preservation of Fruits and Vegetables	2	2	25+75	100
	41	V	GS	21UGS	Gender Studies	1	1	25+75	100
	42	V	EXA	21UEXA	Extension Activities	-	1	-	-
					Total	**30**	**27**		**700**
					Gross total	**180**	**140**		**4100**

Self Study Course: 2 Self Study Course Total: 200 Total credits: 4

COURSES OFFERED BY THE DEPARTMENT

S.NO	SUB.CODE	TITLE OF THE PAPER	INS.HRS	CREDITS
CORE COURSES				
1	21UZO01	Invertebrata	6	5
2	21UZO02P	Major Practical I	4	4
3	21UZO03	Chordata	5	5
4	21UZO04P	Major Practical II	4	4
5	21UZO05	Animal Physiology and Biochemistry	6	5
6	21UZO06P	Major Practical III	5	5
7	21UZO07	Developmental Biology and Biodiversity	4	4
8	21UZO08P	Major Practical IV	3	3
9	21UZO09	Cell and Microbiology	5	5
10	21UZO10	Genetics and Molecular Biology	5	5
11	21UZO11	Biotechnology	4	4
12	21UZO12P	Major Practical V	5	4
13	21UZO13	Environmental Biology and Management	5	5
14	21UZO14	Immunology and Evolution	6	5
15	21UZO15P	Major Practical VI	6	5
16	21UZO16	Sericulture	5	5
17	21UZO17	Animal Behaviour and Neuro Physiology	5	5
18	21UZO18	Health and Hygiene	5	5
DEPARTMENTAL ELECTIVE				
19	21UZOME1	Applied Entomology	4	4

20	21UZOME2	Biophysics, Biostatistics and Bioinformatics	5	4
21	21UZOME3	Bioinstrumentation	5	4
22	21UZOME4	Human Nutrition	5	4
23	21UZOME5	Fish Processing Technology	5	4
24	21UZOME6	Wild life Conservation	5	4
NON MAJOR ELECTIVE				
25	21UZONME1	Aquaculture	2	2
26	21UZONME2	Vermiculture	2	2
SELF STUDY PAPERS				
27	21UZOSS1	Ornamental fish culture	2	2
28	21UZOSS2	Apiculture	2	2
ALLIED ZOOLOGY FOR B.SC BOTANY				
29	21UAZ1	Biology of Invertebrates and Chordates	4	3
30	21UAZ2P	Practical Zoology	3	3
31	21UAZ3	Commercial Zoology	4	3
SKILL ENHANCEMENT COURSES				
32	21UZOSEC1	Pathology And Clinical Laboratory – I	2	2
33	21UZOSEC2	Pathology And Clinical Laboratory – II	2	2
34	21UZOSEC3	Soft Skill for Professionals	2	2

B.Sc., ZOOLOGY - QUESTION PAPER PATTERN – Part I, II , III, IV & V

PART	TYPE	Qn.NO	UNIT	Marks for each Qn	Total Marks
A	Answer all the Questions	1 &2	I	2	20
		3&4	II		
		5 &6	III		
		7 &8	IV		
		9&10	V		
B	Internal choice – Answer all the Questions	11a/11b	I	5	25
		12a/12b	II		
		13a/13b	III		
		14a/14b	IV		
		15a/15b	V		
C	Answer any three Questions	16	I	10	30
		17	II		
		18	III		
		19	IV		
		20	V		
	External Marks CIA				75 25

	Max. Marks				**100***

CONTINOUS INTERNAL ASSESMENT PATTERN – UG

THEORY

Exam	**Max.Marks**	**Converted to**
MidSem	40	5
End Sem	40	5
Model	75	10
Assignment	10	5
	Total	**25**

PRACTICAL

External

Practical : 75

Total : 75

Internal:

Model Exam : 10

Performance in the class : 15

Total : 25

New syllabi for B.Sc Zoology

Course code	21UZO01	INVERTEBRATA	L	P	C
Core/Elective/Supportive		CORE COURSE: I	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the level of organization in animal kingdom from unicellular organism to multi-cellular organism.
2. Understand the classification, characteristics and analyze the structural organization of Protozoa
3. Understand the classification, characteristics and analyze the structural organization of Porifera and Coelenterata.
4. Learn theclassification, characteristics and analyze the structural organization of Helminthes, Nematode and Annelids.
5. Studythe classification, characteristics and analyze the structural organization of Mollusca and Echinodermata.

Unit:1	Binomial nomenclature & Protozoa	18 HOURS

1.1 Outline classification of Invertebrates upto class.
1.2 Detailed study – *Paramecium*
1.3 General Topics: Nutrition and Reproduction in protozoa.
1.4 Protozoan parasites in human beings.

Unit:2	Porifera &Coelenterata	18 HOURS

2.1 Detailed study: Sycon -*Scypha*.
2.2 General topics: Canal system and reproduction in sponges.
2.3 Detailed study :*Obelia,*
2.4 General topics: Corals and coral reefs,
2.5 Polymorphism in coelenterates .

Unit:3	Helminthes & Annelida	18 HOURS

3.1 Life cycle of *Taenia solium* and *Ascaris*.
3.2 Nematode parasites – *Ancylostoma, Wuchereria*and *Enterobius*.
3.3 Detailed study : Earthworm.
3.4 General topics : Adaptive radiation in Annelida,
3.5 Excretion in Annelida.

Unit:4	Arthropoda	18 HOURS

4.1 Detailed study – Cockroach ,
4.2 Prawn (Appendages only)
4.3 General topics: Affinities of *Peripatus*,
4.4 Mouth parts and their modifications in insects,
4.5 Insect metamorphosis.

Unit:5	Mollusca & Echinodermata	18 HOURS

5.1 Detailed study – *Pila globosa*.
5.2 General topics : Cephalopoda as an advanced mollusca,

5.3 Torsion in mollusca. 5.4 Detailed study – Star fish. 5.5 General topics : Larval forms and their significance.		
	Total Lecture hours	**90 HOURS**
Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1.	Recall the emergence and diversity of invertebrate fauna.	**K1**
2.	Outline the classification, characteristics and analyze the structural organization of Protozoa.	**K2**
3.	Identify the classification, characteristics and analyze the structural organization of Porifera and Coelenterata.	**K3**
4.	Compare the classification, characteristics and analyze the structural organization of Helminthes, Nematode and Annelids.	**K5**
5.	Elaborate the classification, characteristics and analyze the structural organization of Mollusca and Echinodermata.	**K6**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Textbook(s)		
1	N. Arumugam, K. Sasi Kumar, 2020, Invertebrates Saras Publication	
2	S. K. Valli and C. Rajasekaran :Muthikelumbatravai Vol. I and II (Bard).	
Reference Books		
1	Kotpal R.L. (2013) Invertebrates Rastogi Publication, Meerut	
2	E.L.Jordan and P.S.Verma, (2009) Invertebrate Zoology, S.Chand publications	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.britannica.com/animal/invertebrate	
Course Designed By: Dr.P.Kalyani	**Checked by : Dr. A. Nagasathya**	

Semester	**Code**		**Title of the Course**			**Hours**			**Credits**	
I	**21UZO01**		**Invertebrata**			**6**			**5**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓		□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=44 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO2P	MAJOR PRACTICAL – I INVERTEBRATA	L	P	C
Core/Elective/Supportive		CORE COURSE: II		04	04

Course Objectives:

The main objectives of this course are to:

1. Enhance their practical oriented subject knowledge
2. Understand the structural organization of mouth parts and correlate the mouth parts of insects to their feeding habit
3. Mount the body setae of Earthworm and mouth parts of Cockroach.
4. Dissect various systems of the specimens belonging to Invertebrata
5. Apply knowledge of classification in the identification of specimens of biological importance.

Dissections

Earthworm : Nervous system, mounting of body setae, pineal setae.
Cockroach : Digestive system and nervous system.
Mouth parts : Cockroach

Spotters

Protozoa : *Amoeba, Euglena, Plasmodium, Paramecium,*
Porifera : Sycon, Gemmule and spicules.
Coelenterata : *Obelia* colony, medusa, *Physalia, Aurelia*, Sea Anemone, Corals
Platyhelminthes: Liver fluke (entire), T. S. of liver fluke, Tapeworm entire, T. S. of Tapeworm, Scolex.
Nematoda : *Ascaris* male and female, T. S. of male and female
Annelida : *Neries, Megascolex,* Parapodium of *Nereis, Arenicola*
Arthropoda : Millipede, Centipede, Prawn, *Peripatus*
Mollusca : *Chiton, Dentalium, Solen, Sepia, Octopus, Mytilus*
Echinodermata : Starfish, Sea urchin, Sea cucumber, Pedicellaria

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Compare and contrast the structural organization of mouth parts and correlate the mouth parts of insects to their feeding habits	**K2**
2.	Identify and utilize the knowledge of classification in the identification of specimens of biological importance.	**K3**
3.	Dissect and mount the body setae of Earthworm and mouth parts of Cockroach.	**K4**
4.	Explain different system of animals through dissection in the laboratory work	**K5**
5.	Adapt neat drawing and writing skills	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	P.S. verma (2010) A Manual Of Practical Zoology: Invertebrates, Kindle edition

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://core.ac.uk/download/pdf/11017224.pdf

Course Designed By: Dr. R. Geetha **Checked by : Dr. A. Nagasathya**

Semester	Code		Title of the Course			Hours			Credits	
I	21UZO02P		MAJOR PRACTICAL – I – INVERTEBRATA			4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	□✓	✓	✓	□✓	□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=44 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO03	CHORDATA	L	P	C
Core/Elective/Supportive		CORE COURSE: III	05		05

Course Objectives:

The main objectives of this course are to:

1. Learn the animal organ system and its functional variations from prochordata to higher vertebrate
2. Understand the classification and characteristics of different classes of Chordates
3. Understand the structure and functions of various systems in the Amphioxus, Shark and Frog
4. Understand the structure and functions of various systems in the Calotes, Pigeon and Rabbit
5. Learn structural variations and functional aspects based on their evolutionary advancement

Unit:1	Introduction &Prochordates	18 HOURS

1.1 Classification of chordates upto orders with suitable examples.
1.2 Detailed study: *Amphioxus*,
1.3 Detailed study: Cyclostomata
1.4 Detailed study: *Petromyzon*.
1.5 General topics: Retrogressive metamorphosis in ascidians

Unit:2	Gnathostomata, Pisces & Amphibia	18 HOURS

2.1 Detailed study: Shark excluding endoskeleton.
2.2 General topics: Dipnoi and their affinities,
2.3 Migration of fishes, Accessory respiratory organs in fishes.
2.4 Detailed study: Frog (Excluding Endoskeleton).
2.5 General topics: Adaptation of Gymnophiona with special reference to mode of life
2.6 Parental care in Amphibia.

Unit:3	Reptilia	18 HOURS

3.1 Detailed study of *Calotes* (Excluding Endoskeleton)
3.2 General topics: Identification of Poisonous and non-poisonous snakes,
3.3 Poisonous apparatus, Biting mechanism and first aid.

Unit:4	Aves	18 HOURS

4.1 Detailed study of Pigeon (Excluding Endoskeleton).
4.2 General topics: Flight adaptations,
4.3 Flightless birds.

Unit:5	Mammalia	18 HOURS

5.1 Detailed study of Rabbit (Excluding Endoskeleton).
5.2 General topics: Dentition in Mammals.,
5.3 Brief account on Monotremes and Marsupials.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Outline the emergence and diversity of Chordates	**K2**
2.	Identify the characteristics of different classes of Chordates	**K3**

3.	Compare the morphological and functional aspects of Amphioxus, Shark and Frog.	**K4**
4.	Explain the morphological and functional aspects of Calotes, Pigeon and Rabbit	**K5**
5.	Compile the Evolutionary innovation in Chordates belonging to different classes.	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Thangamani, T. and N. Arumugam, (2019). A text book of Chordates. Saras Publications.
2	Muthukumarasamy, P. and K. Palanivel, 1990. ThandudaiyaVilangugal. Bard.

Reference Books

1	E.L.Jordan and P.S.Verma, (2013) Chordate Zoology, S.Chand publications
2	Ayyar, E. K. and T. N. Ananthakrishnan, (2009)A Manual of Zoology, Vol. II (Chordata), Viswanathan Printer & publisher Pvt. Ltd.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://opentextbc.ca/biology2eopenstax/chapter/chordates/

Course Designed By: Dr.K.Radhika **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
II	**21UZO03**	**CHORDATES**	**5**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO3	✓	✓□		✓	✓□	✓	✓		□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	

Number of Matches(✓)=43Relationship : High

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO04P	MAJOR PRACTICAL II - CHORDATA	L	P	C
Core/Elective/Supportive		CORE COURSE: IV	04		04

Course Objectives:

The main objectives of this course are to:

1. Enhance their practical oriented subject knowledge
2. Mount the placoid scales of Shark.
3. Dissect various systems of the specimens belonging to Chordata.
4. Apply knowledge of classification in the identification of specimens of biological importance.
5. Enhance good drawing and writing skills based on the identification of specimens of biological importance.

Dissections

Fish : Digestive system of Fishes
Shark : Mounting of Placoid scales.
Frog : Mounting of brain.(Virtual)
Arterial system (Virtual)
Venous system (Virtual)

Spotters

Prochordates :*Amphioxus,Asicidian*
Cyclostomata :*Petromyzon*
Pisces : *Scoliodon, Narcine, Arius, Echeneis, Hippocampus*
Amphibia : *Bufo, Hyla,* Axolotl larva,
Reptilia : *Calotes,* Draco, Chameleon,*Phython, Naja naja*, Krait.
Aves : Pigeon, Owl, Vulture, Kingfisher, Parrot, Kiwi.
Mammalia : Rabbit, Loris, Bat, Echidnas, Kangaroo.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Relate the practical knowledge of various specimens	**K2**
2.	Dissect and mount the placoid scales of Shark	**K4**
3.	Distinguish different system of fishes through dissection in the laboratory work	**K4**
4.	Compare the knowledge of classification in the identification of specimens of Biological importance.	**K5**
5.	Adapt the neat drawing and writing skills	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	P.S. Verma,(2007), A Manual of Practical Zoology Chordates, S. Chand publications

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.mlsu.ac.in/econtents/

Course Designed By: Dr.N.Padmavathi **Checked by : Dr. A. Nagasathya**

Semester	Code		Title of the Course			Hours			Credits	
II	21UZO04P		MAJOR PRACTICAL II - CHORDATES			4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓		□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=44 Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 – 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO05	ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	L	P	C
Core/Elective/Supportive		CORE COURSE: V	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the aspects of Nutrition, Digestion and Respiration.
2. Understand the concept of Excretion and Circulation
3. Understand the various aspects of Muscle, Nerve, Reproductive Physiology and Endocrinology.
4. Understand the structure and functions of Biological molecules
5. Understand the metabolic process of Biological molecules

Unit:1	Nutrition & Respiration	18 HOURS

1.1 Digestion, Absorption and Assimilation in man
1.2 Respiratory pigments
1.3 Transport of O2 and CO2 in man
1.4 O2 dissociation curve.

Unit:2	Excretion &Circulation	18 HOURS

2.1 Nitrogeneous wastes – Ammonotelism, Ureotelism and Urecotelism.
2.2 Mammalian kidney – Mechanism of urine formation,
2.3 Heart in Man Blood – composition and function
2.4 Blood clotting, Blood pressure and E.C.G.

Unit:3	Muscle Physiology	18 HOURS

3.1 Types of muscles Ultrastructure and contraction of skeletal muscle, Chemistry of muscular contraction.
3.2 Nerve Physiology–Neuron – Structure – Types, Nerve impulse and conduction.
3.3 Endocrinology- Secretion and Function of Endocrine glands.
3.4 Reproductive Physiology – Structure of Male and Female organs.

Unit:4	Biological molecules	18 HOURS

4.1 Structure - Carbohydrates – Mono (glucose), di (Sucrose) and polysaccharides (Starch)
4.2 Proteins- Primary Structure
4.3 Lipids – Simple lipids.
4.4 Vitamins – water and fat soluble – occurrence, functions and deficiency diseases.

Unit:5	Metabolism	18 HOURS

5.1 Carbohydrates - Glycolysis, Citric acid cycle, Glycogenesis, Glycogenolysis.
5.2 Proteins – Deamination and Transamination.
5.3 Lipids - Beta Oxidation.
5.4 Enyzmes : Characteristics of enzymes – Mechanism of enzyme action.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Analyze the concepts of absorption, assimilation and exchange of gases.	**K4**
2.	Comprehend the process of urine formation, types of nitrogenous wastes, role of Heart and Blood circulation	**K5**

3.	Elaborate about structure, types and functions of Muscle, Nerve cells, reproductive organs and hormonal role.	**K6**
4.	Recall the structure and functions of biological molecules.	**K1**
5.	Illustrate different Metabolic process of biological molecules.	**K2**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Verma, P. S. And V. K. Agarwal,(2017) Animal Physiology. S. Chand and Co.
2	Rastogi S.C. (2007) Essentials of Animal Physiology
3.	Bernice Anantharaj, M., 1998. Udalseyalial, Cresolite Publications.

Reference Books

1	Nagabushnam, R., (2008). Animal Physiology. S. Chand and Co.
2	Lehninger, L., (2004). Biochemistry. W. H. Freeman and Co.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://bio.libretexts.org/
2	https://microbenotes.com/category/biochemistry/

Course Designed By: Dr.R. Geetha **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
III	**21UZO05**	**ANIMAL PHYSIOLOGY AND BIOCHEMISTRY**	**6**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓□		✓	✓□		✓		□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	

Number of Matches(✓)=42Relationship : High

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO06P	MAJOR PRACTICAL III: ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	L	P	C
Core/Elective/Supportive		CORE COURSE: VI		04	04

Course Objectives:

The main objectives of this course are to:

1. Understand the role of temperature in salivary amylase activity and oxygen consumption by fresh water fishes.
2. Understand and enumerate the RBC cells, measure the Blood pressure using Sphygmomanometer.
3. Understand the aspects of Qualitative analysis of Excretory materials
4. Understand the principle in Qualitative analysis of Proteins, carbohydrates and lipids and pH meter.

Animal Physiology

1. Salivary amylase activity in human saliva in relation to temperature.
2. Qualitative tests for Ammonia, urea and uric acid.
3. Enumeration of RBC.
4. Estimation of O2 consumption in a freshwater fish.
5. Recording of blood pressure using Sphygmomanometer.

Biochemistry

1. pH measurement of various water samples using pH meter.
2. Qualitative test for proteins, carbohydrates and lipids.
3. Spotters: pH meter, Centrifuge, Haemocytometer, Thermometer, Sphygmomanometer.

	Total Lecture hours	**90 HOURS**

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the role of oxygen consumption and relationship of temperature in salivary amylase activity.	**K1**
2.	Summarize the role of RBC and Blood pressure.	**K2**
3.	Analyze different Excretory materials.	**K4**
4.	Compare the role of different Biological Instruments.	**K6**
5.	Adapt the techniques related to Animal Physiology and Biochemistry.	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	Plummer, David T.(2004) Introduction To Practical Biochemistry, Tata McGraw-Hill Education Pvt. Ltd.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.cbspd.co.in/laboratory-manual-of-physiology-and-biochemistry

Course Designed By: Dr.S.Amudha **Checked by : Dr. A. Nagasathya**

Semester	Code	Title of the Course	Hours	Credits
III	21UZO06P	MAJOR PRACTICAL III: ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	4	4

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓□	✓	✓	✓□	✓	✓	□✓	□✓	✓
CO4	✓	✓	✓□		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=44 Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO07	DEVELOPMENTAL BIOLOGYAND EVOLUTION	L	P	C
Core/Elective/Supportive		CORE COURSE: VII	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the Theories of developmental process, Gamatogenesis and Fertilization
2. Understand the cleavage patterns, morphogenetic movements and organogenesis and development of organs in Frog.
3. Understand the various aspects of placentation in mammals and fetal membrane in chick.
4. Learn the Basic theories of Origin of Life.
5. Understand the Evolutionary Process.

Unit:1	Developmental Biology	18 HOURS

1. Theories of development – Epigenesis, Pangenesis, Biogenetic law, Germplasm, Mosaic, Regulative and Organizer theories,

1.1 Gametogenesis in mammal – Spermatogenesis, Oogenesis.

1.2 Structure of Mammalian Sperm and Ovum.

1.3 Fertilization – Physiological changes.

Unit:2	Development stages	18 HOURS

2.1Cleavage planes and pattern

2.2 Types of Blastula - Blastulation

2.3 Gastrulation

2.4 Morphogenetic movements

2.5 Fate map

2.6 Organogenesis in Frog (Eye and Ear).

Unit:3	Placentation	18 HOURS

3.1 Foetal membranes in chick – Chorion, Amnion, Allantois and yolk sac.

3.2 Placentation in mammals.

3.3 Classification and Physiology of placenta.

3.4 Test tube baby.

Unit:4	Evolution	18 HOURS

4.1 Origin of life.

4.2 Theories of evolution: Lamarckism, Darwinism, Neo Darwinism, Devries and Modern Synthetic theory of Evolution.

4.3 Mutation- Gene Mutation -chromosomal aberration and Polyploidy.

Unit:5	Evolutionary processes	18 HOURS

5.1 Species Concept - Speciation- Genetic speciation

5.2 Genetic assimilation.

5.3 Mimicry and Colouration.

5.4 Fossils- formation and types of fossils, determination of age of fossils- radio carbon dating.

5.5 Evolution of Man.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the concepts and process of developmental process, Gametogenesis and Fertilization.	**K1**
2.	Compare the methodology of cleavage patterns, morphogenetic movements and	**K2**

	organogenesis and development of organs in Frog.	
3.	Apply the various aspects of placentation in mammals and fetal membrane in chick.	**K3**
4.	Analyse the Basic theories of Origin of Life.	**K4**
5.	Explain the concept of Speciation, formation, type and determine the age of Fossils.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Bernice Anantharaj, M., 1998. Karuvial. Cresolite Publications.
2	Chattopadhyay. S (2012) An introduction to Developmental Biology
3	Bernice Anantharaj, M., 1998. Parinamam. Cresolite Publications
4	N. Arumugam,Organic Evolution, Saras Publication

Reference Books

1	Balinsky, B. I., 1981. An Introduction to Embryology. W. B. Saunders Company, Philadelphia.
2	Verma, P. S., V. K. Agarwal and R. Tyagi, (2006) Chordate Embryology. S. Chand and Co.
3	Strickberger, M.W. (2013) Evolution Jones and Bartlett Publishers

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.biologycorner.com/lesson-plans/evolution-taxonomy/evolution-notes/
2	https://biolearnspot.blogspot.com/2013/11/bsc-zoology-maain-embryology-notes.html

Course Designed By: Dr.P.Kalyani **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
IV	**21UZO07**	**DEVELOPMENTAL BIOLOGYAND EVOLUTION**	**6**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓		✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓		□✓	✓	✓		□✓	
CO4	✓	✓	□✓			✓	✓		✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Number of Matches(✓)=41 Relationship : High

Mapping	1 -20	21 – 40	41 - 60	61 – 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO08P	MAJOR PRACTICAL IV: DEVELOPMENTAL BIOLOGY AND EVOLUTION	L	P	C
Core/Elective/Supportive		CORE COURSE: VIII		04	04

Course Objectives:

The main objectives of this course are to:

1. Understand the various stages of chick blastoderm.
2. Observe the motility of Bull sperm
3. Understand the structure and process of Embryology.
4. Understand the concept of evolution- Homologous and Analogous organs
5. Understand the colouration, Mimicry and fossil organisms

Developmental Biology

Dissections

1. Temporary mounting of chickblastoderm
2. Motility of Bull sperm

Spotters

1. Examination of prepared microslides to study the following;
2. Structure of Sperm and Ovum
3. Frog- cleavage,
4. Yolk plug stage,
5. Blastula,
6. Gastrula.
7. Placentation in Mammals

Evolution

1. Animals of evolutionary significance – *Peripatus, Archaeopteryx.*
2. Homologous organs – Fore limb – modification
3. Analogous organs – wing modification
4. Colouration – *Chameleon, Lycodon, Krait*.
5. Mimicry – leaf insect, Stick insect, Monarch and Viceroy Butterfly.
6. Fossils – *Nautilus, Ammonite*

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the procedure to observe the motility of Bull sperm	**K1**
2.	Illustrate the structure of sperm and ovum of man, various stages of frog Development	**K2**
3.	Identify the various stages of chick blastoderm.	**K3**
4.	Analyze the difference between the Homologous and Analogous organs and its Evolutionary Significance.	**K4**
5.	Examine the pattern of colouration, mimicry and Fossil organisms.	**K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	M.M.Trigunayat & Kritika Trigunayat, (2019) A Manual of Practical Zoology, Scientific Publisher

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.scientificpubonline.com/
Course Designed By: Dr.N.Padmavathi	**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
IV	**21UZO08P**	**MAJOR PRACTICAL IV: DEVELOPMENTAL BIOLOGY AND EVOLUTION**	**4**	**4**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□	✓	✓	□✓	✓	✓	□	✓□	
CO4	✓	✓	□✓			✓	✓		✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓)=43Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO09	CELL AND MOLECULAR BIOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: IX	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the principles of Compound Microscope and the structural and functional aspects of cell and plasma membrane.
2. Learn the structure and the role of cell organelles.
3. Understand the organization of nuclear components and characteristics of cancer cells.
4. gain knowledge about Human Chromosomes.
5. Understand the Central Dogma of the Cell.

Unit:1	Cell Biology	18 HOURS

1.1 Microscopy – Compound
1.2 General Structure of Prokaryotic
1.3 General structure of Eukaryotic cells.
1.4 Cell membrane – structure and function.

Unit:2	Structure and function of cell organelles	18 HOURS

2.1 Mitochondria
2.2 Golgi bodies
2.3 Endoplasmic reticulum
2.4 Ribosomes
2.5 Lyososomes
2.6 Cytoplasmic inclusions.

Unit:3	Nucleus	18 HOURS

3.1 Chromosomes - Giant chromosomes – Polytene and Lampbrush

3.2 Chromosomes cell cycles

3.3 Characteristics of cancer cells.

Unit:4	Molecular Biology	18 HOURS

4.1 Human chromosome Karyotype,
4.2 Pedigree analysis,
4.3 Chromosomal syndrome in man- Turner, Down and klinefelter syndrome.
4.4 Inborn errors of metabolism.
4.5 Genes in populations - Hardy – Weinberg Principle
4.6 Factors affecting Hardy – Weinberg equilibrium.

Unit:5	Nucleic acids	18HOURS

5.1 Structure of DNA
5.2 DNA replication
5.3 Transcription - types of RNA.
5.4 Protein synthesis - Genetic code - Translation.
5.5 Gene Regulation- Lac-Operon model.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the principles of Microscope and structure of cell.	**K1**
2.	Compare the structure and the role of cell organelles	**K2**
3.	Analyze the organization of nuclear components and characteristics of cancer cells.	**K4**

4.	Explain about Human Chromosomes and their Errors.	**K5**
5.	Compile the structure of Nucleic acids and process of Protein synthesis.	**K6**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		

Textbook(s)	
1	Powar, C. B. (2014). Essentials of Cytology. Himalaya Publishing House.
2	Kumar, H, D. (2001). Molecular Biology and Biotechnology, Vikas Publishing House, New Delhi.
3	Bernice Anantharaj, M., 1998. Sellial. Cresolite Publications.
4	Bernice Anantharaj, M., 1998. Marabiyal. Cresolite Publications.
Reference Books	
1	De-Robertis, E. D. P. and E. M. F. De Roberties, (2005) Cell and Molecular Biology. 8thEdn. International Edition informed Hong Kong.
2	Verma, P. S. and V. K. Agarwal, (2021) Cytology, S. Chand and Co.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://ppup.ac.in/
2	https://www.uou.ac.in/
Course Designed By: Dr.A.MaryHelitha	**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
V	21UZO09	CELL AND MOLECULAR BIOLOGY	6	5

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓		✓□	✓
CO4	✓	✓	□✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=44 Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO10	GENETICS AND MICROBIOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: X	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the concepts of Mendelism and process of inheritance.
2. Learn the Gene interaction and Gene Mutation.
3. Study Recombination in Microorganisms and Human Genetics.
4. Understand the Basic techniques and identification of microbes based on staining procedure.
5. Understand the causes, symptoms and prevention of selected microbial diseases in man.

Unit:1	Genetics	18 HOURS

1.1 A brief account of Mendelism - Monohybrid and Dihybrid crosses.
1.2 Linkage
1.3 Crossing over
1.4 Multiple alleles – Blood groups and their inheritance.
1.5 Sex determination in Man.

Unit:2	Gene Interaction	18 HOURS

2.1Non allelic interactions – Complementary, supplementary, duplicate, Epitasis and lethal genes.
2.2 Mutation : Gene mutation, Chromosomal aberrations,
2.3 Aneuploidy and Euploidy

Unit:3	Microbial Genetics	18 HOURS

3.1 Recombination in Bacteria- Transformation, Conjugation, Sexduction,
3.2 Recombination in bacteriophage –
3.3 Transduction, Lytic and isogenic cycles of bacteriophage.
3.4 Human Genetics: Eugenics – Euphenics – Euthenics

Unit:4	Microbiology	18 HOURS

4.1 Nutritional classification of bacteria,
4.2 Gram staining – Gram positive and Gram negative,
4.3 Bacterial culture – Media preparation,
4.4 Growth Curve
4.5 Isolation – Serial dilution technique – spread, streak, pour plate methods.

Unit:5	Microbial diseases in man	18 HOURS

Causes, Symptoms and Prevention

5.1 Bacterial diseases - Tuberculosis, Typhoid, Gonorrhoea.
5.2 Viral diseases - AIDS, Poliomyelitis, Chicken pox, Hepatitis A.
5.3 Fungal diseases – Systemic Mycosis.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the concepts of Mendelism and process of inheritance.	**K1**
2.	Analyze the interactions of the Gene and mutation.	**K4**
3.	Appraise Recombination in Bacteria and Bacteriophage and Human Genetics.	**K5**
4.	Explain the causes, symptoms and prevention of selected microbial diseases in man.	**K5**
5.	Elaborate the Basic techniques and identification of microbes based on staining procedure.	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Verma, P. S. and Agarwal, V. K. (2018), Genetics. S. Chand and Co., New Delhi.
2	D K Maheshwari and R C Dubey (2013), A Textbook Of Microbiology,Kindle publications.
3	Vijayaraman, K. Manikilli, Chellammal (2000). Nunnuirial. &Noeithadaikapiyal. A complete book – 2nd Edn., Chimeeraa.
4	Bernice Anantharaj, M., 1998. Marabiyal. Cresolite Publications

Reference Books

1	Pelczar, M. J. and R. D. Reid, (2010) Microbiology. Tata Mc Graw Hill.
2	Friefelder, D., 1997. Microbial genetics. Narosa Publishing, New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.cliffsnotes.com/
2	https://microbiologyinfo.com/

Course Designed By: Dr.A.Nagasathya **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**			**Hours**			**Credits**	
V	**21UZO10**	**GENETICS AND MICROBIOLOGY**			**6**			**5**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	□✓	✓	✓	□✓	□✓	✓
CO4		✓	□	✓	✓			✓	✓	✓
CO5		✓	✓	✓		✓		✓	✓	✓
Number of Matches(✓)=41 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO11	BIOTECHNOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: XI	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the basic tools and techniques of gene cloning.
2. Understand the principle of blotting techniques, PCR, Production of Monoclonal antibodies and Gene therapy.
3. Understand the various aspects of Industrial Biotechnology.
4. Understand the types and role of Biofertilizer in Agricultural Biotechnology
5. Understand the various aspects of Enzyme Biotechnology

Unit:1	Biotechnology	18 HOURS

1.1 Scope and importance of Biotechnology
1.2 Genetic Engineering
1.3 Tools of Genetic Engineering - Enzymes – Vectors.
1.4 Gene cloning- Isolation of desired DNA – Insertion of DNA into Vector
1.5 Construction of Genomic Libraries.

Unit:2	Molecular Probes	18 HOURS

2.1 Southern, Northern and Western Blotting,
2.2 Polymerase Chain Reaction.
2.3 Immunotechnology – Monoclonal antibodies - Production and uses.
2.4 Genetherapy

Unit:3	Industrial Biotechnology	18 HOURS

3.1 Fermentation - Types of fermentation- Solid state, Submerged and Semi solid,
3.2 Fermenter Construction- Types of Fermenters,
3.3 process of Fermentation – Upstream and Downstream processes,
3.4 Industrial Production of insulin.

Unit:4	Agricultural Biotechnology	18 HOURS

4.1 Biofertilizers – Blue Green Algae, Rhizobium, Azolla, Anabena and Phosphate solubilizer.
4.2 Nitrogen Fixation- Symbiotic and Non-Symbiotic
4.3 Biopesticides.

Unit:5	Enzyme Biotechnology	18 HOURS

5.1 Extraction of enzymes
5.2 Preparation of crude enzymes
5.3 Precipitation of Enzymes
5.4 Immobilization of Enzymes –Methods – Types and Uses.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the techniques of gene cloning.	**K1**
2.	Compare the principles of different Biotechnological techniques.	**K2**
3.	Apply the process of fermentation and production of Insulin.	**K3**

4.	Analyze the role of Biofertilizer and Biopesticides.	**K4**
5.	Explain various aspects of Enzyme Biotechnology.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Textbook(s)		
1	Dubey.R.C. (2014), A text book of Biotechnology. S. Chand and company. New Delhi.	
2	Vijayaraman, K., S. Chellammal and P. Manikili, 1998. Uyiriyathozhilnutpam, Chimeeraa, Trichy.	
Reference Books		
1	Satyanarayana. U (2020) Biotechnology. Books and Allied Pvt ltd, Kolkata.	
2	Gupta, P. K.,(2010) Elements of Biotechnology, Rastogi Publications, Meerut.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.brainkart.com/menu/biotechnology/	
Course Designed By: Dr.G.Sankar	**Checked by : Dr. A. Nagasathya**	

Semester	**Code**	**Title of the Course**				**Hours**		**Credits**	
V	**21UZO11**	**BIOTECHNOLOGY**				**6**		**5**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1		✓	✓	✓	✓			✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□	✓	✓	✓□	✓	✓	□✓	✓□	✓
CO4	✓	✓	✓□		✓	✓	✓	✓		✓
CO5		✓	✓		✓			✓	✓	✓
Number of Matches(✓)=40Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO12P	MAJOR PRACTICAL V: CELL AND MOLECULAR BIOLOGY, GENETICS AND MICROBIOLOGY AND BIOTECHNOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: XII		04	04

Course Objectives:

The main objectives of this course are to:

1. Understand the different aspects of cell function.
2. Understand the basic concepts of Genetics.
3. Understand various techniques in Microbiology.

Cell Biology

1. Chironomus Larva – Mounting of Polytene Chromosome.
2. Onion root tip – Squash preparation of Mitosis.
3. Spotters: Centrifuge and Electrophoresis unit

Genetics and Molecular Biology

1. Recording of Mendelian traits in man.
2. Drosophila – Genetic importance, male and female identification.
3. Pedigree analysis – Human karyotype.
4. ABO Blood grouping and Rh typing
5. Spotters: Structure of DNA, Types of RNA-mRNA, rRNA and tRNA

Microbiology and Biotechnology

1. Smear Preparation, fixing and staining of bacteria – Simple and Gram staining.
2. Motility of bacterial cell – Hanging drop method.
3. Demonstration – Sterilization procedures, Serial dilution technique, Spread plate technique.
4. Spotters – Autoclave, Petri plate, Inoculation loop, Incubator, PCR, Blotting unit,

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the concepts of Cell Biology and Molecular Biology.	**K1**
2.	Compare the different aspects in Genetics.	**K2**
3.	Apply the procedure for Microbiological techniques.	**K3**
4.	Apply knowledge on various instruments in Biotechnology.	**K3**
5.	Compile various technology in Microbiology and Biotechnology	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	M.M. Trigunayat & Kritika Trigunayat, (2019) A Manual of Practical Zoology, Scientific Publisher

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.scientificpubonline.com/

Course Designed By: Dr.S.Amudha **Checked by : Dr. A. Nagasathya**

Semester	Code	Title of the Course	Hours	Credits
V	21UZO12	MAJOR PRACTICAL V: CELL AND MOLECULAR BIOLOGY, GENETICS AND MICROBIOLOGY AND BIOTECHNOLOGY	6	5

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓		
CO2	✓	✓	✓			✓	✓	✓		
CO3	✓	✓□	✓	✓	□✓	✓	✓	✓□	✓□	✓
CO4	✓	✓	□✓		✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓)=42Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO13	ENVIRONMENTAL BIOLOGY AND MANAGEMENT	L	P	C
Core/Elective/Supportive		CORE COURSE: XIII	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the concepts of Abiotic factors.
2. Understand the concepts of Biotic factors.
3. Understand the Community and Population Ecology.
4. Learn thetypes of Pollution.
5. Understand the importance of Solid waste Management and conservation of Forest.

Unit:1	Environmental Biology.	18 HOURS

1.1 Abiotic Factors – soil – texture,
1.2 soil formation,
1.3 Soil profile - light - biological effects.
1.4 Temperature – thermal stratification and adaptations.

Unit:2	Biotic factors	18 HOURS

2.1 Animal relationship – Symbiosis – Commensalism – Mutualism – Antibiosis – Parasitism – Predation – Competition.
2.2 Ecosystem – Definition – Structure Pond ecosystem – Primary production – Secondary production
2.3 Food chain – Food web – Trophic levels – Energy flow
2.4 Ecological pyramids.
2.5 Biogeochemical cycles: Nitrogen and phosphorus.

Unit:3	Community Ecology	18 HOURS

3.1 Types of communities – Characteristics of community – Ecological Niche – Ecotone – Edge effect
3.2 Community Stratification
3.3 Ecological Succession- types and patterns.
3.4 Population Ecology – Population Density – Natality – Mortality – Age Pyramids
3.5 Population growth – Biotic potential and environmental resistance – Population regulation.

Unit:4	Pollution	18 HOURS

4.1 Air pollution – Sources – Effects -Greenhouse effect, Ozone and its importance – Acid rain – Smog.
4.2 Water pollution – Sources – Effects
4.3 Control of water pollution – Primary, secondary, tertiary treatment.

Unit:5	Solid waste management	18 HOURS

5.1 Bioaccumulation-
5.2 Biomagnification.
5.3 Bioremediation-Role of earth worms in bioremediation
5.4 Conservation of forest.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the concepts of Abiotic factors.	**K1**

2.	Compare the importance of Biotic factors.	**K2**
3.	Apply the various aspects of Community and Population Ecology.	**K3**
4.	Analyze the types of Pollution.	**K4**
5.	Adapt themselves with importance of Solid waste Management and conservation of Forest.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Arumugam. N, Concept of Ecology. Saras Publications.
2	Bernice Anantharaj, M., 1998. Sunilaiyial. Cresolite Publications.

Reference Books

1	Odum, E. P. (1971) Fundamentals of Ecology. W. B. Saunders Company, Philadelphia
2	Verma, P. S. and V. K. Agarwal, (2015) Principles of Ecology. S. Chand and Co., New Delhi.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	http://www.uilis.unsyiah.ac.id/
2	https://www.hzu.edu.in/

Course Designed By: Dr. A. Mary Helitha **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
VI	21UZO13	ENVIRONMENTAL BIOLOGY AND MANAGEMENT	6	5

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓		✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO3	✓	□	✓		□✓	✓	✓	✓□	✓□	
CO4	✓	✓	□✓		✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Number of Matches(✓)=42 Relationship : High

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO14	IMMUNOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: XIV	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the about immune system and Lymphoid organs.
2. Understand the concept of Antigen and Antibodies.
3. Understand the concepts of Immune response.
4. Understand the concepts of Hypersensitivity reactions.
5. Understand the principle of Immune techniques.

Unit:1	Immune system	18 HOURS

1.1 Innate and acquired immunity – Active and passive.
1.2 Lymphoid organs – Primary- Thymus and Bone Marrow
1.3 Secondary – Spleen and Lymph Nodes.
1.4 Cells of Lymphoid lineage – Lymphocytes and NK cells.

Unit:2	Antigens and Antibodies	18 HOURS

2.1 Types of Antigens
2.2 Properties of Antigen,
2.3 Structure and function of antibodies - immunoglobulin G

Unit:3	Immune Response	18 HOURS

3.1 Mechanism of Cell mediated Immune Response
3.2 Mechanism of Humoral Immune Response.

Unit:4	Hypersensitivity reaction	18 HOURS

4.1 Factors causing hypersensitivity
4.2 Types of hyper sensitivity – Type I, II, III, IV and V hyper sensitivity reactions.

Unit:5	Immune techniques	18 HOURS

5.1 Principles of Precipitation and Agglutination
5.2 VDRL Slide Test,
5.3 Single and Double Immunodiffusion,
5.4 ELISA,
5.5 Radio Immuno Assay (RIA).

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall about immune system and Lymphoid organs.	**K1**
2.	Compare the properties of antigen, structure and functions of antibodies	**K2**
3.	Explain the mechanism of immune response.	**K3**
4.	Analyze the importance of Hypersensitivity reactions.	**K4**
5.	Elaborate the principles of precipitation and agglutination.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)	
1	Dulsy Fatima, I. and N. Arumugam, 1998. Immunology. Saras Publications.
2	Vijayaraman, K. Manikilli,Chellammal 2000. Nunnuirial. &Noeithadaikapiyal. A complete book – 2nd Edn., Chimeeraa Publications.
Reference Books	
1	Kuby, J. (2013) Immunology, W. H. Freeman, Oxford.
2	Joshi, K. R. and N. O. Osama,(2002) Immunology. Agro Botanical Publishers India.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://microbenotes.com/category/immunology/
Course Designed By: Dr.G.Sankar	**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**			**Hours**			**Credits**	
VI	21UZO14	IMMUNOLOGY			6			5	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓			✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓□	✓	✓	□✓	✓	✓	✓□	✓□	✓
CO4	✓	✓	□✓		✓	✓	✓			✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=43Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO15P	MAJOR PRACTICAL VI: ENVIRONMENTAL BIOLOGY AND MANAGEMENT, IMMUNOLOGY, BIOPHYSICS, BIOSTATISTICS AND BIOINFORMATICS AND APPLIED ENTOMOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: XV		04	04

Course Objectives:

The main objectives of this course are to:

1. Understand the analysis of various factors in the water samples.
2. Understand the significance of Immunology
3. Understand various aspects in Biophysics, Biostatistics and Bioinformatics
4. Understand the various types of pests.
5. Understand the Animal associations and role of various instruments

Environmental Biology:

1. Estimation of Dissolved Oxygen
2. Estimation of Salinity
3. Estimation of Carbon di oxide
4. Estimation of Calcium hardness
5. Mounting of Marine Plankton /Freshwater Plankton
6. Spotters:
   Animal association, Intertidal fauna (Rocky,Sandy, Muddy shores – any 2 examples in each category), Secchi disc.

Immunology

ABO Blood grouping

Biophysics and Biostatistics and Bioinformatics:

1. Beer – lambert's Law verification using colorimeter
2. Calculation of Mean, Mode, Median, Variance, Standard Deviation and Standard error from leaves of plants.
3. Diagram construction – Bar, Histogram, Pie.
4. Spotters:
   Photoelectric colorimeter, Spectrophotometer, Micrometer.
   Input devices: Mouse, Keyboard, Light Pen, Scanner.
   Output devices: Monitor, printer, plotter, Modem
   Internet and its uses (Demonstration).

Applied Entomology – Spotters:

1. Pest of Cultivated crops: Paddy, Vegetables: Brinjal, Bhendi, Trees: Coconut
2. Insects of stored products [any two]
3. Household pests [any two]
4. Disease carrying vectors: House fly and Mosquito.

	Total Lecture hours	**90 HOURS**

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall various parameters in the water samples.	**K1**
2.	Outline the significance of Immunology	**K2**
3.	Apply the procedure for various aspects in Biophysics, Biostatistics and Bioinformatics.	**K3**
4.	Analyze various types of pests.	**K4**
5.	Explain Animal associations and role of various instruments.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books	
1	M.M. Trigunayat & Kritika Trigunayat, (2019) A Manual of Practical Zoology, Scientific Publisher
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.scientificpubonline.com/
Course Designed By: Dr.A.Mary Helitha	**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
VI	**21UZO15P**	**MAJOR PRACTICAL VI: ENVIRONMENTAL BIOLOGY AND MANAGEMENT, IMMUNOLOGY, BIOPHYSICS, BIOSTATISTICS AND BIOINFORMATICS AND APPLIED ENTOMOLOGY**	**6**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓			□✓	✓	✓	✓□	□	✓
CO4	✓	✓	□✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓			✓		✓	✓		✓
Number of Matches(✓)=43 Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO16	SERICULTURE	L	P	C
Core/Elective/Supportive		CORE COURSE: XVI	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the History and development of Sericulture.
2. Study the cultivation, types, diseases and propagation methods of Mulberry.
3. Learn the structural organization and rearing of Silkworm.
4. Learn the procedure for mounting of silkworm for spinning cocoons.
5. Study the process of reeling of cocoons.

Unit:1	Introduction	18 HOURS

1.1 Scope of sericulture
1.2 History of Sericulture
1.3 Development of sericulture in India and Economic importance.

Unit:2	Mulberry cultivation	18 HOURS

2.1 Environmental conditions for cultivation – temperature, humidity and light – preparation of land.
2.2 Mulberry varieties in Tamilnadu
2.3 Methods of propagation – irrigation – manuring – application of fertilizers.
2.4 Pruning – Mulching – Harvesting of leaves – preservation of leaves
2.5 Diseases and pests of mulberry.

Unit:3	Silk worm	18 HOURS

3.1 Morphology of silkworm – larva and moth.
3.2 Physiology of silk gland.
3.3.Life cycle of *Bombyx mori*
3.4 Rearing house – Rearing appliances – Rearing operation. Seed operation – hatching – brushing – feeding – bed clearing – spacing
3.5 Rearing of young age silkworm – Rearing of later stage of silkworm.

Unit:4	Harvesting	18 HOURS

4.1 Mounting of silkworm for spinning cocoons – methods of mounting.
4.2 Harvesting of coccons – Quality of cocoons.
4.3 Non mulberry silkworm – Tasar, Muga and Eri.
4.4 Diseasesof silkworm,
4.5 Pests of silkworm – Prevention and control measures.

Unit:5	Reeling	18 HOURS

5.1 Reeling of cocoons – process of reeling
5.2 Stifling and storage – Sorting and deflossing.
5.3 Reeling equipments.
5.4 Utility of byproducts – mulberry plant, silkworm excreta, pupa and silk waste.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the History and development of Sericulture.	**K1**
2.	Outline the cultivation, types, diseases and propagation methods of Mulberry.	**K2**
3.	Organize the structural organization and rearing of Silkworm.	**K3**
4.	Examine the procedure for mounting of silkworm for spinning cocoons.	**K4**
5.	Elaborate the process of reeling of cocoons.	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Ganga, G. and J. Sulochana Chetty, 1998. An introduction to sericulture. 2nd Edn. Oxford and IBH.

Reference Books

1	Ullal, S. R. and M. N. Narasimhanna, (1981). Hand book of practical sericulture. Central Silk Board, Bombay.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	http://www.gdcboysang.ac.in/

Course Designed By: Dr. A. Nagasathya **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
VI	**21UZO16**	**SERICULTURE**	**6**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	✓□	✓	✓	✓□	□✓	✓
CO4	✓	✓	□		✓		✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Number of Matches(✓)=43 Relationship : High

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO17	ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY	L	P	C
Core/Elective/Supportive		CORE COURSE: XVII	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the Ethology, classification of Behavioral pattern, analysis, reflections and perception to the Environment.
2. Understand Neural and hormonal control of behaviour, Genetic and environmental components in the development of behaviour and Motivation.
3. Understand the Ecological aspects of behaviour, Biological rhythms, Learning and memory.
4. Know the different types of Reproductive behaviour and Social Behaviour.
5. Understand the Thermoregulation and a comparative study on Receptor physiology.

Unit:1	Introduction	18 HOURS

1.1 Introduction- Ethology as a branch of biology- Animal psychology,
1.2 Classification of behavioural patterns, analysis of behaviour (ethogram) - Reflexes and complex behaviour.
1.3 Perception of the environment – mechanical, electrical, chemical, olfactory, auditory and visual.

Unit:2	Behaviour and Motivation	18 HOURS

2.1 Neural and hormonal control of behavior - Genetic and environmental components in the development of behaviour.
2.2 Motivation: Drive, timing and interaction of drives, physiological basis of motivation, hormones and motivation, aggregation.
2.3 Communication: Chemical, visual, light and audio, evolution of language (primates).

Unit:3	Ecological aspects of behavior	18 HOURS

3.1 Habitat selection, food selection, optimal foraging theory, anti-predator defenses, aggression,
3.2 homing territoriality, dispersal, host parasite relations.
3.3 Biological rhythms: Circadian and circannual rhythms, orientation and navigation, migration of fishes, turtles and birds.
3.4 Learning and memory: Conditioning, habituation, insight learning, association learning and reasoning.

Unit:4	Reproductive behaviour	18 HOURS

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

Unit:5	Regulation	18 HOURS

5.1 Thermoregulation: Homoeothermic animals, poikilotherms & Hibernation.
5.2 Receptor physiology a comparative study – Mechano receptor, Photo receptor, Phono receptor Chemo receptor, Equilibrium receptor.
5.3 Bioluminescence

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Relate the knowledge on the Ethology with the classification of Behavioural pattern, analysis,	**K1**

	reflections and perception to the Environment.	
2.	Outline the Neural and hormonal control of behaviour, Genetic and environmental components in the development of behaviour and Motivation.	**K2**
3.	Identify various types of the Ecological aspects of behaviour, Biological rhythms, Learning and memory.	**K3**
4.	Analyze the different types of Reproductive behavior and Social Behaviour.	**K4**
5.	Explain different aspects of Thermoregulation and Receptor physiology.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Reference Books		
1	Kerbs, J.R. and N.B. Davies (2012), An Introduction to Behavioural Ecology. Blackwell, Oxford, U.K.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.sparknotes.com/biology/animalbehavior/behavioralecology/summary/	
Course Designed By: Dr. S.P.Jeyapriya	**Checked by : Dr. A. Nagasathya**	

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
VI	**21UZO17**	**ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY**	**6**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□	✓	✓	□	✓	✓	□	□	✓
CO4	✓	✓	□	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=41 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZO18	HEALTH AND HYGIENE	L	P	C
Core/Elective/Supportive		CORE COURSE: XVIII	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the classification of foods and water standards
2. Study the communicable and non-communicable diseases.
3. Learn about the Arthropod diseases
4. Learn about Occupational Hazards
5. Study the importance of Health Education.

Unit:1	Introduction	18 HOURS

1.1 Scope of health and hygiene
1.2 Classification of foods
1.3 Growth and development, Environment and health.
1.4 Water: Water standards and purification of water.

Unit:2	Communicable diseases and non-communicable diseases	18 HOURS

2.1 Respiratory infections: Diphtheria, Influenza, Tuberculosis.
2.2 Intestinal infections: Typhoid, Ameobiosis.
2.3 Coronary heart disease, Diabetic mellitus.

Unit:3	Infections	18 HOURS

3.1 Platyhelminthes infections – Liverfluke (*Fasciola hepatica)*
3.2 Arthropod Borne infections - Dengue, Zoonosis.

Unit:4	Occupational health	18 HOURS

4.1 Physical
4.2 Mechanical
4.3 Biological
4.4 Psychological hazards.

Unit:5	Health education	18 HOURS

5.1 Health plans of India
5.2 Role of National and International Organization (WHO) in the health care of the community.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the classification of foods and water standards.	**K1**
2.	Outline the causes of communicable and non-communicable diseases.	**K2**
3.	Identify the symptoms caused by the Arthropod diseases	**K3**
4.	Analyse the different types of Health Hazards.	**K4**
5.	Elaborate the Plans and importance of Health Education.	**K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	Park, J. E. and K. Park, (2015) Text book of preventive and Social Medicine, 13thEdn. Banasidas Bhanot,

	Jabalpur.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.jaypeebrothers.com/
Course Designed By: Dr.A.Nagasathya	**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
VI	**21UZO18**	**HEALTH AND HYGIENE**	**6**	**5**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓		□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=42 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOME1	APPLIED ENTOMOLOGY	L	P	C
Core/Elective/Supportive		ELECTIVE COURSE : I	04		04

Course Objectives:

The main objectives of this course are to:

1. Understand the Classification of Insecta.
2. Study about the Harmful Insects.
3. Learn the role of Beneficial Insects.
4. Learn about the pests of House Hold and Public Health.
5. Study the importance of Pest Management.

Unit:1	Introduction	18 HOURS

1. Classification of insects upto orders and their diagnostic characters with familiar and important examples.

Unit:2	Harmful insects: Classification of insect pests.	18 HOURS

2.1 Insect pests - Binomics , life cycle, control measures

2.2 Pests of Paddy- Rice stem borer, Brown plant hopper,

2.3 Sugarcane – Shoot borer, Top borer,

2.4 Coconut – Rhinoceros beetle, Leaf caterpillar

2.5 Cotton – Aphids, Spotted Bollworm.

2.6 Pests of vegetables- Brinjal – Fruit Borer (*Leucinodesorbonalis*), Bendi- Fruit Borer (*Eariasfabia*), Tomato-Fruit Borer (*Helicoverpaarmigera*) and Potato Tuber moth(*Phthorimaeaoperculella*).

Unit:3	Beneficial Insects	18 HOURS

3.1 Species, Binomics, Life cycle and By products of Honeybee,
3.2 Species, Binomics, Life cycle and By products of Silkworm
3.3 Species, Binomics, Life cycle and By products of Lac insect.

Unit:4	Insect pests of house hold and stored products	18 HOURS

4.1 Their biology, mode of infestation, damage caused and control methods of cockroach (*Periplaneta americana*), silver fish (*Lepisma saccharina*), Red flour beetle (*Triboliumcastaneum*) & Rice weevil (*Sitophilus oryzae*).

4.2 Insects in relation to Public Health - Biology, disease transmission and control of *Musca domestica* (cholera), *Anopheles stephensii*(malaria), *Culex quinquefasciatus*(elephantiasis) &*Aedes aegypti* (dengue).

Unit:5	Pest Management	18 HOURS

5.1 Natural control and Artificial control
5.2 Chemical control, Mechanical Control and Biological control
5.3 IPM.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the Classification of Insecta.	**K1**
2.	Outline the different varieties of Harmful Insects.	**K2**
3.	Summarize the role of Beneficial Insects.	**K3**
4.	Explain the pests of House Hold and Public Health.	**K4**
5.	Elaborate the importance of Pest Management.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Nalina Sundari. M.S. and Shanthi. R, (2006) Entomology MJP Publications
2	VasantharajDavid.B.,(2016) Elements of Economic Entomology,Brillion Publications

Reference Books

1	Modern Entomology, D. B. (2016) Tembhare, Himalaya Publishing House.
2	David, B. V., N. C. Muralirangan and Meera Muralirangan, 1992. Harmful and beneficial insects. Popular Book Depot.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.helpforag.app/2018/03/entomology-notes.html

Course Designed By: Dr.N.Padmavathi **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
V	**21UZOME1**	**APPLIED ENTOMOLOGY**	**4**	**4**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓		✓
CO3	✓	□✓	✓	✓	✓□	✓	✓	✓□	□	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓			✓	✓	✓	✓	✓

Number of Matches(✓)=42Relationship : High

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOME2	BIOPHYSICS, BIOSTATISTICS AND APPLICATION OF COMPUTER IN BIOLOGY	L	P	C
Core/Elective/Supportive		ELECTIVE COURSE: II	04		04

Course Objectives:

The main objectives of this course are to:

1. Understand the Basic concepts in Biophysics
2. Study the different methods for the collection and process of Data.
3. Learn the methods of Measures of central tendency.
4. Learn the Basic aspects of Computer in Biology.
5. Understand the basic aspects of Bioinformatics and internet Browsing.

Unit:1	Introduction	18 HOURS

1.1 Scope of Biophysics
1.2 Laws of Thermodynamics.
1.3 Basic concept of colloids – Description – Types,
1.4 Properties: Electro kinetic properties – Donnan's equilibrium, Tyndall effect, Brownian movement, Surface tension, Diffusion and Osmosis.

Unit:2	Biostatistics	18 HOURS

2.1 Data Collection: Primary and secondary data.
2.2 Classification and tabulation.
2.3 Organization of data: Discrete and Continuous series.
2.4 Diagrammatic presentation of data: Bar diagram, Pie diagram, Frequency polygon, Frequency curve and histogram.

Unit:3	Measures	18 HOURS

3.1 Measures of central tendency: Mean, Median, Mode
3.2 Measures of dispersion
3.3 Standard Deviation and Standard Error
3.4 Co-efficient of variation.

Unit:4	Application of Computer in Biology	18 HOURS

4.1 Computer -Basic Components of computers – Input and Output Devices,
4.2 CPU, Memory and its types.

Unit:5	Bioinformatics	18 HOURS

5.1 Basic ideas about Internet Browsing
5.2 World wide web – Email
5.3 Bioinformatics
5.4 Biological Data bases-DNA and Protein
5.5 NCBI,EMBL and PDBI

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Outline the Basic concepts in Biophysics.	**K2**
2.	Summarize the different methods for the collection and process of Data.	**K3**
3.	Recall the methods of Average, Measures of dispersion.	**K1**
4.	Identify the basic components of Computer.	**K3**
5.	Analyze the Biological data in the Databases.	**K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)	
1	Ramakrishnan, P., 1996. Biostatitics. Saras Publications, Nagercoil.
2	Balagurusamy, E., 1984. Programming in Basic, Prentice Hall, New Delhi.
3	Vijayaraman, K., George John and P. Manikili. UyiriyaIyarpiyal, Uyiriyal, KaniniyinPayanpadugal, Uykiriyapulliyiyal .Chimeeraa Publications.
Reference Books	
1	Das, D., 1996. Biophysics and Biological Chemistry, Himalaya Publishing House.
2	Palanichamy, S. and M. Shanmugavelu. (1991) Principles of Biophysics. Paramount Publications.
3	Arora, P. N., (2009). Biostatistics. Himalaya Publishing House.
4	Rajaraman, V., (2003). Fundamentals of Computers, Prentice Hall of India.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialsduniya.com/notes/biological-physics-notes/
2	https://old.amu.ac.in/emp/studym/99991854.pdf
3	https://www.uc.edu/webapps/af/hr/CUSTOMGUIDE/content/content/computerbasics.pdf
Course Designed By: Dr.S.P.Jeyapriya	**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**	**Hours**	**Credits**
VI	**21UZOME2**	**BIOPHYSICS, BIOSTATISTICS AND APPLICATION OF COMPUTER SCIENCE IN BIOLOGY**	**4**	**4**

Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□	✓	✓	□✓	✓	✓	□✓	□✓	✓
CO4	✓	✓	□✓						✓	✓
CO5	✓		✓	✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓)=42 Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOME3	BIOINSTRUMENTATION	L	P	C
Core/Elective/Supportive		ELECTIVE COURSE: III	04		04

Course Objectives:

The main objectives of this course are to:

1. Understand the principles and applications of Microscopy
2. Understand the principles of Centrifuge and pH meter.
3. Understand the principles and applications of analytical techniques and Radioactive Isotopes.
4. Understand the principle and types of Chromatography and Electrophoresis
5. Understand the principles of Biosensor and PCR.

Unit:1	Microscope	18 HOURS

1.1 Microscopy - Principles
1.2 Types - Light - Compound,
1.3 Phase contrast,
1.4 Polarizing
1.5 Electron.

Unit:2	Analytical Techniques -I	18 HOURS

2.1 Centrifuge - Principles
2.2 Types - Clinical, ultra- centrifuges
2.3 pH meter- Sorenson's pH scale,
2.4 Principle and applications.

Unit:3	Analytical Techniques -II	18 HOURS

3.1 Spectroscopy – Principle and application.
3.2 Colorimetry– Principle and application.
3.3 Radio isotopic technique- GM counter, Scintillation counter.

Unit:4	Analytical Techniques -III	18 HOURS

4.1 Chromatography– principle
4.2 Types and application - Paper, Thin layer, Column.
4.3 Electrophoresis – principle, Types
4.4 Application –AGE, PAGE

Unit:5	Analytical Techniques -IV	18 HOURS

5.1 Biosensors –Principle, Types and application
5.2 PCR–Principle, Types and application.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Relate the principle and applications of various types of Microscopy.	**K1**
2.	Explain the principles of Centrifuge and pH meter.	**K2**
3.	Apply various aspects of analytical techniques and Radioactive Isotopes.	**K3**
4.	Categorize the chromatography and Electrophoresis techniques for separation of Different	**K4**

	samples.	
5.	Interpret the principles of Biosensor and PCR.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Textbook(s)		
1	Veerakumari.,2006. Bioinstrumentation, MJP publications Chennai	
Reference Books		
1	M.A. Subramanian (2005), Biophysics (Principles and Techniques) MJP Publishers, Chennai	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	http://unaab.edu.ng/	
Course Designed By: Dr.R.Geetha	**Checked by : Dr. A. Nagasathya**	

Semester	**Code**	**Title of the Course**			**Hours**			**Credits**	
VI	**21UZOME3**	**BIOINSTRUMENTATION**			**6**			**5**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓		✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO3	✓	□✓	✓	✓	✓□	✓	✓	✓□	✓□	✓
CO4	✓	✓	□		✓	✓		✓		✓
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches(✓)=43 Relationship : High										

Mapping	1 -20	21 – 40	41 - 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOE4	HUMAN NUTRITION	L	P	C
Core/Elective/Supportive		ELECTIVE COURSE: IV	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the Food its types and its Biological significance.
2. Understand the importance of vitamins, minerals and water.
3. Understand the calorific value of foods.
4. Study the Nutritive value of foods.
5. Know the nutritional requirements of different age groups, food related problems during pregnancy, adolescence and aged persons.

Unit:1	Introduction	18 HOURS

1. Introduction and scope.
1.1 Carbohydrates,proteinsandlipids–classification
1.2 Sources– digestionandabsorption
1.3 Dailyrequirements–essentialaminoacids–essentialfatty acids.

Unit:2	Nutrients	18 HOURS

2. Vitamins–sourcesandfunctions –deficiencystatus.
2.1 Minerals–sourcesandfunctions –deficiencystatus.
2.2 Waterasanutrient–regulationofwaterbalance.

Unit:3	Energy Requirements	18 HOURS

3.1 Calorific values of food
3.2 Basal metabolic rate
3.3 Energy requirements of man, woman, infants and children.

Unit:4	Nutritional value	18 HOURS

4.1Nutritional value of foods:
4.2 Cereals, fruits, milk, egg, meat, fish.
4.3 Balanced diet.

Unit:5	Nutritional requirements	18 HOURS

5.1 Infants, schoolchildren,
5.2 pregnant and lactating mothers and the aged
5.3 Health education
5.4 Malnutrition

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the Food its types and its Biological significance.	**K1**
2.	Outline the importance of vitamins, minerals and water.	**K2**
3.	Estimate the calorific value of foods.	**K3**
4.	Evaluate the nutritive value of different food products and food processing.	**K4**
5.	Assess the nutritional requirements of different age groups, food related problems during pregnancy, adolescence and aged persons.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books	
1	Mudambi,S.R.(2012)Fundamentals of Food and nutrition. New age International, NewDelhi
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.britannica.com/science/human-nutrition
Course Designed By: Dr.S.P.Jeyapriya	**Checked by : Dr. A. Nagasathya**

Semester	Code		Title of the Course			Hours			Credits	
VI	21UZOME4		HUMAN NUTRITION			4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓		✓□	✓
CO4	✓	✓	✓□	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓	✓	✓	✓		
Number of Matches(✓)=42 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOME5	FISH PROCESSING TECHNOLOGY	L	P	C
Core/Elective/Supportive		ELECTIVE COURSE: V	04		04

Course Objectives:

The main objectives of this course are to:

1. Understand the concepts of Fish Biochemistry
2. Study the role of Fish Microbiology.
3. Learn the procedure for fresh fish handling and preservation.
4. Learn the procedure for freezing of fishes.
5. Study the process of Canning of fishes.

Unit:1	Fish Biochemistry	18 HOURS

1.1 Nutritive value of fish protein
1.2 General characters of fish fat,
1.3 Spoilage of fish at different stages.

Unit:2	Fish Microbiology	18 HOURS

2.1 Microbial spoilage of fish

2.2 Microbial flora in various types of semi-processed and processed fishery products.

Unit:3	Fresh fish handling and preservation	18 HOURS

3.1 Mechanism of spoilage
3.2 Fish analysis–bacterial &chemical reactions–use of ice and salt–use of antibiotics &chemicals

Unit:4	Freezing of fishes	18 HOURS

4.1 Different techniques–physico-chemical changes
4.2 Nutritional changes during freezing

Unit:5	Canning of fishes	18HOURS

5.1 Principles of canning
5.2 Preservation, additives and pickle salting– salting of fish sundrying–bacteriology of salted fish
5.3 Smoking of fish–hot&cold smoking–smoking methods– fishery by products

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the concepts of Fish Biochemistry.	**K1**
2.	Outlinethe role of Fish Microbiology.	**K2**
3.	Apply the procedure for fresh fish handling and preservation.	**K3**
4.	Analyzethe procedure for freezing of fishes.	**K4**
5.	Elaborate the process of Canning of fishes.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)	
1	Govindan,T.K.,1992.Fishprocessingtechnology,Oxofrd&IBH.
Reference Books	
1	Santhanam,R1987.FisheriesScience,DayaPublishingHouse.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://niftem-t.ac.in/olapp/pmfme/upload/mt_handbook_fish.pdf
Course Designed By: Dr.G.Sankar	**Checked by : Dr. A. Nagasathya**

Semester	Code		Title of the Course			Hours			Credits	
VI	21UZOME5		FISH PROCESSING TECHNOLOGY			4			4	
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓	✓		✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	✓□	✓	✓	✓□	✓□	
CO4	✓		□✓	✓	✓		✓	✓	✓	✓
CO5			✓	✓				✓	✓	✓
Number of Matches(✓)=40 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOME6	WILD LIFE CONSERVATION	L	P	C
Core/Elective/Supportive		ELECTIVE COURSE: VII	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the basic concepts in Wild Life Conservation.
2. Study the organization and Wild life Legislation.
3. Learn the Management planning for Wild life conservation.
4. Learn the about caring and controlling diseases of Wild life.
5. Study about the different types of Wild life reserves.

Unit:1	Wild life	18 HOURS

1.1 Values of wild life - positive and negative.
1.2 Our conservation ethics, Importance of conservation, Causes of depletion, World conservation strategies.
1.3 Habitat analysis, Evaluation and management of wild life.
1.4 Physical parameters - Topography, Geology, Soil and water.
1.5 Biological Parameters - food, cover, forage, browse and coverestimation.
1.6 Standard evaluation procedures – remote sensing and GIS-Management of habitats.

Unit:2	Population estimation	18 HOURS

2.1 Population density, Natality, Birth rate, Mortality, fertility schedules and sex ratio computation.
2.2 National Organization,Indian board of wild life.Bombay Natural History Society, Voluntary organization involved in wild life conservation.
2.3 Wild life Legislation – Wild Protection act – 1972, its amendments and implementation.

Unit:3	Management planning of wild life in protected areas.	18 HOURS

3.1 Estimation of carrying capacity.
3.2 Eco tourism / wild life tourism in forests.

Unit:4	Management of excess population & translocation.	18 HOURS

4.1 Bio- telemetry.
4.2 Care of injured and diseased animal.
4.3 Quarantine.
4.4 Common diseases of wild animal.

Unit:5	Protected areas National parks & sanctuaries, Community reserve.	18 HOURS

5.1 Important features of protected areas in India.
5.2 Tiger conservation - Tiger reserve in M.P, in India.Management challenges in Tiger reserve.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the basic concepts in Wild Life Conservation.	**K1**
2.	Outline the different organization and Wild life Legislation.	**K2**
3.	Apply the Management planning for Wild life conservation.	**K3**

4.	Analyzethe procedures for controlling diseases of Wild life.	**K4**
5.	Explain the different types of Wild life reserves.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Reference Books		
1	Gopal Rajesh, Fundamentals of wild life management (2021) Natraj Publishers.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	http://animalrange.montana.edu/documents/extension/thebasicsofwildlifemgmt.pdf	
Course Designed By: Dr.S.P.Jeyapriya	**Checked by : Dr. A. Nagasathya**	

Semester	**Code**		**Title of the Course**			**Hours**		**Credits**	
VI	**21UZOME6**		**WILD LIFE CONSERVATION**			**4**		**4**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓			✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	□✓	✓	✓	□✓	□✓	✓
CO4	✓	✓	□✓			✓	✓	✓		
CO5	✓	✓	✓	✓		✓	✓	✓	✓	✓
Number of Matches(✓)=41 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UAZ1	BIOLOGY OF INVERTEBRATA AND CHORDATA	L	P	C
Core/Elective/Supportive/Allied		ALLIED COURSE: I	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the General characteristics of Protozoa, Porifera and Coelenterates.
2. Learn the General characteristics of Platyhelminthes, Aschelminthes and Annelida.
3. Learn the General characteristicsof Arthropoda, Mollusca and Echinodermata.
4. Understand the General characteristics of Pisces, Amphibia, Reptiles, Aves and Mammals
5. Study the classification, characteristics and analyze the structural organization ofselected species in Invertebrata and Chordata.

Unit:1	Protozoa, Porifera and Coelenterates.	18 HOURS

1.1 General characters of the phyla – Protozoa, Porifera andCoelenterata.
1.2 Type study - *Paramecium, Obelia*.

Unit:2	Platyhelminthes,Aschelminthes, Annelida	18 HOURS

2.1General characters of the phyla- Platyhelminthes ,Aschelminthes, Annelida .

2.2 Type study - *Fasciola hepatica,*Earthworm

Unit:3	Arthropoda Mollusca and Echinodermata	18 HOURS

3.1 General characters of the phyla- Arthropoda Mollusca and Echinodermata.

3.2 Type study - Cockroach and*Pila.*

Unit:4	Pisces,Amphibia and Reptilia	18 HOURS

4.1 General characters of the classes- Pisces,Amphibia and Reptilia.

4.2 Type study-Shark[Excluding endoskeleton],Frog[Excluding endoskeleton]

Unit:5	Aves and Mammalia	18 HOURS

5.4 General characters of the classes -Aves and Mammalia
Type study-Pigeon [excluding endoskeleton]

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the characteristics of Protozoa, Porifera and Coelenterata.	K1
2.	Outline the General characteristics of Platyhelminthes, Ashelminthes and Annelida.	K2
3.	Identify the General characteristics of Arthropoda, Mollusca and Echinodermata.	K3
4.	Categorize the General characteristics of Pisces, Amphibia, Reptiles, Aves and Mammals	K4
5.	Compare and contrast he classification, characteristics and analyze the structural organization ofselected species in Invertebrata and Chordata.	K5

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create	
Textbook(s)	
1	Nair N.C.and Arumugam.N. (2020) Text book of Invertebrates. Saras publications.
2	Thangamani, T. and N. Arumugam. ((2019) Text book of Chordates. Saras publications.
Reference Books	
1	E.L.Jordan and P.S.Verma, (2009) Invertebrate Zoology, S.Chand publications
2	E.L.Jordan and P.S.Verma, (2013) Chordate Zoology, S.Chand publications
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.britannica.com/animal/invertebrate
2	https://opentextbc.ca/biology2eopenstax/chapter/chordates/
Course Designed By: Dr.P.Kalyani	**Checked by : Dr. A. Nagasathya**

Semester	**Code**		**Title of the Course**			**Hours**			**Credits**	
III	**21UAZ1**		**BIOLOGY OF INVERTEBRATA AND CHORDATA**			**4**			**4**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**				
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓	□	□✓	✓
CO4	✓		□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=43Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UAZ2	COMMERCIAL ZOOLOGY	L	P	C
Core/Elective/Supportive/Allied		ALLIED COURSE: II	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand the Rearing procedure for Bee keeping
2. Learn the various aspects in Sericulture
3. Learn the methodology for maintaining farms for Pearl Oyster culture and Lac culture.
4. Study about the formation of Poultry farming.
5. Study about the formation of Diary farming.

Unit:1	Apiculture	18 HOURS

1.1 Honey bee – Types, Life history, Bee Hive, Honey production,
1.2 Apiary Equipment, Honey extraction, Extraction of Beeswax,
1.3 Diseases of Honey Bees,
1.4 Enemies and predators of Honey Bees,
1.5 Uses of Honey.

Unit:2	Sericulture	18 HOURS

2.1 Types – Mulberry and NonMulberry Silk Worm,
2.2 life history of *Bombyx mori*
2.3 Silk glands, Uses of Silk.
2.4 Rearing of Silk worm,
2.5 Diseases and pests.

Unit:3	**Pearl Oyster Culture** and **Lac culture**	18 HOURS

3.1 Biology of Pearl Oyster,
3.2 Types of Pearls,
3.3 Culture of pearls - Culture methods, Formation of Pearls.
3.4 Lac insect - lifecycle and culture,
3.5 Predators and parasites of Lac.

Unit:4	Poultry Farming	18 HOURS

4.1 Types of Poultry – Poultry Housing
4.2 Poultry Nutrition
4.3 Rearing of Layers and Broilers
4.4 Diseases and their prevention – Ranikhet , Fowl pox, Coccidiosis
4.5 Poultry Products.

Unit:5	Dairy Farming	18HOURS

5.1 Cattles-Gir,Sindhi,Jersey,Murrah and Buffaloes.
5.2 Management of cow-Dairy house
5.3 Diseases-Mastitis,Rinder pest,Foot and Mouth disease
5.4 Nutritive value of milk
5.5 Pasteurization-Dairy products and byproducts

	Total Lecture hours	90 HOURS

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1.	Recall the types, culturing equipment and uses of Honey Bee.	**K1**
2.	Outline the types, cultivation procedure and the methodsfor rearing of Silkworm.	**K2**
3.	Identify the cultivation methods for Pearl Oyster and Lac culture.	**K3**
4.	Compare the classification, characteristics and methods for Poultry farming.	**K4**
5.	Explain the classification, characteristics and methods for Dairy farming.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Textbook(s)		
1	Arumugam.N and Murugan.T Applied Zoology (2015)Saras Publication	
Reference Books		
1	Sukla,G.S.andUpadhyay,V.B.(2000)EconomicZoologyRastogiPublications,Meerut,India.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://onlinecourses.swayam2.ac.in/cec20_ge23	
Course Designed By: Dr.K.Radhika		**Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**				**Hours**		**Credits**	
IV	**21UAZ2**	**COMMERCIAL ZOOLOGY**				**4**		**4**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1		✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓	□	□	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=42Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UAZ3P	PRACTICAL ZOOLOGY	L	P	C
Core/Elective/Supportive/Allied		ALLIED COURSE:III	06		05

Course Objectives:

The main objectives of this course are to:

1. Enhance their practical oriented subject knowledge
2. Mount the body setae of Earthworm and mouth parts of Cockroach.
3. Dissect Alimentary canal, Arterial system andBrain of the specimens belonging to Invertebrata and Chordata.
4. Apply knowledge of classification in the identification of specimens and economic importance of its products.
5. Enhance good drawing and writing skills based on the identification of specimens.

Dissections

Cockroach : Alimentary canal

Frog : Arterial system [Virtual]

Mountings

Earthworm : Body setae

Cockroach : Mouth Parts

Frog : Brain[Virtual]

Spotters

Specimens :*Paramecium, Plasmodium Obelia, Fasciola, Ascaris, Nereis,* Cockroach, *Penaeus, Pila,* Starfish, Shark, Frog, *Calotes,* Pigeon, Rabbit.

Products

Honey, bees wax, lac, silk, wool, cod liver oil, pearl, poultry product (Egg).

Economic importance

Honey bee, Housefly, Mosquito, Cockroach, *Bombyx mori*, Cocoon, Pearl oyster, Termite, Silverfish, *Oryctes rhinoceros.*

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the practical knowledge of various specimens	**K1**
2.	Outline the structural organization of mouth parts in Cockroach.	**K2**
3.	Identify and mount the body setae of Earthworm and mouth parts of Cockroach.	**K3**

4.	Dissect the parts of Arterial System and Brain of given specimens.	**K4**
5.	Adapt neat drawing and writing skills	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Reference Books

1	P.S. Verma,(2007), A Manual of Practical Zoology Chordates, S. Chand publications
2	P.S. Verma (2010) A Manual Of Practical Zoology: Invertebrates,Kindle edition

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://core.ac.uk/download/pdf/11017224.pdf
2	https://www.mlsu.ac.in/econtents/

Course Designed By: Dr.K.Radhika **Checked by : Dr. A. Nagasathya**

Semester	**Code**	**Title of the Course**				**Hours**		**Credits**	
IV	**21UAZ3P**	**PRACTICAL ZOOLOGY**				**4**		**4**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1		✓	✓	✓	✓		✓	✓	✓	✓
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	□✓	✓	✓	□✓	□✓	✓
CO4	✓	✓	□✓		✓	✓	✓	✓		✓
CO5	✓	✓	✓	✓		✓	✓	✓	✓	
Number of Matches(✓)=42Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZONME1	AQUACULTURE	L	P	C
Core/Elective/Supportive		NONMAJOR ELECTIVE COURSE: I	02		02

Course Objectives:

The main objectives of this course are to:

1. Understand the selection criteria for Aquafarming.
2. Learn the culture of different fishes.
3. Learn the methodology for maintaining Shirmp farming.
4. Study about the Ornamental fish culture
5. Study the harvesting and marketing technology

Unit:1	Introduction	18 HOURS

1.1 Scope – Aquaculture farm– Site selection
1.2 Design and construction – pond preparation.
1.3 Hydrological parameters of farm management.

Unit:2	Culture techniques	18 HOURS

2.1 Culture of Indian major carps
2.2 Culture of *Lates calcarifer*.

Unit:3	Shrimp Farming	18 HOURS

3.1 Shrimp farming, Hatchery techniques
3.2 Feed management, live feed, farming techniques.

Unit:4	Culture of ornamental fishes	18 HOURS

4.1 Aquarium – design and construction
4.2 Types of aquarium fishes – egglayers-Goldfish, Angelfish, Fighterfish and Gourami
4.3Live bearers –Molly, Platy, Guppy and Sword tail

Unit:5	Marketing	18HOURS

5.1 Harvesting and Preservation
5.2 Marketability and Economics Role of MPEDA.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the selection procedure for Aquafarming.	**K1**
2.	Outline the culture of different fishes.	**K2**
3.	Identify the methodology for maintaining Shirmp farming.	**K3**
4.	Construct the methodology for the Ornamental fish culture.	**K4**
5.	Explain the harvesting and marketing technology	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)

1	Arumugam.N. (2019) Aquaculture Saras Publication.

Reference Books	
1	Jhingran, V. G., 1997. Fish and fisheries of India. Hindustan Publishing Co., New Delhi.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.fao.org
Course Designed By: Dr.G.Sankar	**Checked by : Dr. A. Nagasathya**

Semester	**Code**		**Title of the Course**			**Hours**		**Credits**	
IV	**21UZONME1**		**AQUACULTURE**			**4**		**4**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓			✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	□✓	✓	✓	□✓	✓	✓	□✓	□✓	✓
CO4	✓	✓	□✓			✓	✓	✓		
CO5	✓	✓	✓	✓		✓	✓	✓	✓	✓
Number of Matches(✓)=41 Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZONME2	VERMICULTURE	L	P	C
Core/Elective/Supportive		NON MAJOR ELECTIVE COURSE: II	02		02

Course Objectives:

The main objectives of this course are to:

1. Understand the Ecological and Geographical distribution of Earthworms.
2. Learn the culture and productivity of Earthworms.
3. Study the techniques of Vermiculture.
4. Learn the Methods and Management of Vermicomposting.
5. Study the Production and marketing technology

Unit:1	Introduction	18 HOURS

1.1 Scope and importance of Vermitechnology
1.2 Ecological classification of Earthworms – epigeic, anecic and endogeic forms
1.3 Humus feeders and Humus farmers- Litter, top soil and sub soil types.

Unit:2	Soilreclamation	18 HOURS

2.1 Physical, chemical and biological changes brought by earthworm in soil
2.2 Vermiwash – earthworm casts.

Unit:3	Vermiculture technology	18 HOURS

3.1 Steps involved in Vermiculture Technique
3.2 Required conditions for Vermiculture –oxygen, temperature, moisture, pH, salinity and sunlight.
3.3 Predators & food preference
3.4 Economic importance of Earthworm.

Unit:4	Vermicomposting	18 HOURS

4.1 Steps involved in Vermicomposting
4.2 Vermibed construction
4.3 Methods of Vermicomposting - Pit method,Heap method, Bin method, Windrow method and continuous flow system.

Unit:5	Production	18 HOURS

5.1 In door and Large scale production of Vermicompost
5.2 Role of Vermitechnology in Waste Management and agriculture.

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the the Ecological and Geographical distribution of Earthworms.	**K1**
2.	Outline the methods for production of Earthworm.	**K2**
3.	Summarize the Economic importance of Earthworm.	**K3**
4.	Compare and Contrast the different methods in Vermicomposting.	**K4**
5.	Analyzethe role of Vermitechnology in different fields.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

Textbook(s)	
1	Seetha lekshmy.M and Shanthi.R 2017 Vermitechnology Saras Publications
Reference Books	
1	Edwards, C. A. and P. J. Bohlen, 1996. Ecology of Earthworms, 3rdEdn. Chapneau and Hall.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://everything.com/vermitechnology
Course Designed By: Dr.A.Maryhelitha	**Checked by : Dr. A. Nagasathya**

Semester	**Code**		**Title of the Course**			**Hours**		**Credits**	
IV	**21UZONME2**		**VERMICULTURE**			**4**		**4**	
Course Outcomes (COs)	**Programme Outcomes (POs)**					**Programme Specific Outcomes (PSOs)**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓		✓	✓	✓	✓		✓	✓	✓
CO3	✓	□✓		✓	□✓	✓	✓	□	□✓	✓
CO4	✓	✓	□✓	✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓	✓	✓	✓	✓	
Number of Matches(✓)=44Relationship : High										

Mapping	1 -20	21 – 40	41 – 60	61 - 80	81 – 100
Matches	1-14	15-29	30-34	**35-44**	45-50
Relationship	Very Poor	Poor	Moderate	**High**	Very High

Course code	21UZOSEC1	PATHOLOGY AND CLINICAL LABORATORY – I	L	P	C
Core/Elective/Supportive		Skilled Enhanced courses I	06		05

Course Objectives:

The main objectives of this course are to:

1. Understand basic concepts of laboratory requirements.
2. Understand the principles of laboratory instruments.
3. Learn the procedure for the preparation of reagents
4. Learn the methodology for the collection and analysis of Blood
5. Understand modern laboratory instruments.

Unit:1	Organization of clinical laboratory	18 HOURS

1.1 Safety measures - Chemical, fire and Electrical
1.2 Glassware –Description of Glassware, its use, handling and care.
1.3 Lab Technician Duties and Responsibilities
1.4 Professionalism and Ethics in laboratory workers

Unit:2	Instrumentation	18 HOURS

2.1 Light Microscope
2.2 Incubator, Hot Air Oven, Autoclave
2.3 Laminar Air flow Chamber, Water Bath
2.4 Centrifuge, MicrotomeHaemocytometer, Haemoglobinometer

Unit:3	Solvents	18 HOURS

3.1 Buffer and pH
3.2 Molar solutions - Physiological saline, Turkey's fluid, Hayem's fluid
3.3 Use of chemicals and their interactions, danger signs, production techniques, and disposal methods.

Unit:4	Collection of blood	18 HOURS

4.1 Anticoagulants - Separation of Serum and Plasma
4.2 Blood cell count and differential count
4.3 Estimation of Haemoglobin (Sahlis Method)
4.4 Clotting time -bleeding time
4.5 ESR
4.6 Blood smear and for observation parasites.

Unit:5	Analyzing Techniques	18HOURS

5.1 Semi and Fluid Auto Analyzer
5.2 ELISA
5.3 PCR
5.4 HaemotologyAnalyser
5.5 HPLC Analysis for Haemoglobin Fraction

	Total Lecture hours	90 HOURS

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Recall the basic concepts of laboratory requirements.	**K1**
2.	Outline the principles of laboratory instruments.	**K2**
3.	Explain the procedure for the preparation of reagents	**K3**
4.	Categorize the methodology for the collection and analysis of Blood	**K4**

5.	Compile the modern the laboratory techniques and instruments.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		
Reference Books		
1	Mukherjee KL. (2010).*Medical Laboratory Technology*. Volume 1, 2 and 3. Tata McGraw-Hill Education, India.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://apps.who.int/iris/bitstream/handle/10665/42295/9241545305.pdf	
Course Designed By: Dr.S.Amudha		**Checked by : Dr. A. Nagasathya**

Course code	**21UZOSEC2**	**PATHOLOGY AND CLINICAL LABORATORY – II**	**L**	**P**	**C**
Core/Elective/Supportive		**Skilled Enhanced courses I**	**06**		**05**

Course Objectives:

The main objectives of this course are to:

1. Understand basic concepts of various analysis
2. Understand the procedure for urine analysis
3. Learn the Basic concepts of Microbiology
4. Learn the methodology of Microtomy
5. Understand screening of Blood samples.

Unit:1	**Analysis**	**18 HOURS**

1. Renal function tests,
1.1 Liver function tests,

Unit:2	**Urine analysis**	**18 HOURS**

2. 1 Urine: Collection and preservation
2.2 Composition – volume – appearance and odors - Specific gravity - Microscopic examination.
2.3 Measurement of glucose and protein.
2.4 Fecal examination: Microscopic – Occult blood
2.5 Helminthes Parasites. Semen analysis: count andmotility.

Unit:3	**Microbial analysis**	**18 HOURS**

3.1 Wet Preparations of microbes
3.2 Staining preparations: Simple & Gram staining methods
3.3 Antibiotic susceptibility testing.

Unit:4	**Microtome analysis**	**18 HOURS**

4.1 Microtome: Fixating – dehydration – clearing – infiltration – embedding
4.2 Block preparation –Sectioning – Mounting – Staining.
4.3 Biopsy for cancer.

Unit:5	Screening analysis	18HOURS
5.1 Screening of donor compatibility testing, safety, procurement of supplies. 5.2 Screening donor's blood for infectious agents -HIV, HCV, HBV, *Trepanoma palladium*, *Plasmodium* 5.3 ABO – Rh blood groups		
	Total Lecture hours	**90 HOURS**

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1.	Recall the basic concepts of renal and liver function tests	**K1**
2.	Outline the procedure for urine analysis	**K2**
3.	Apply the procedure for the Microbiological techniques.	**K3**
4.	Analyze the methodology for Microtomy techniques.	**K4**
5.	Explain the pathogens in the Blood samples.	**K5**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create		

Reference Books	
1	Mukherjee KL. (2010).*Medical Laboratory Technology*. Volume 1, 2 and 3. Tata McGraw-Hill Education, India.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://apps.who.int/iris/bitstream/handle/10665/42295/9241545305.pdf

Course Designed By: Dr.A.Nagasathya **Checked by : Dr. A. Nagasathya**