

2021-2022

B.Sc ZOOLOGY
Course Structure and Syllabus

(For the candidates admitted from the academic year 2020-2021 onwards)

CHOICE BASED CREDIT SYSTEM (CBCS)



THANTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Approved by NAAC, Affiliated to Bharathidasan University)

ELAMBALUR, PERAMBALUR – 621 220



Thanthai Hans Roever College (Autonomous), Elambalur, Perambalur - 621 220
Bachelor of Zoology - UG Course Structure under CBCS
(For the candidates admitted from the academic year 2020-2021 onwards)

Semester	Part	Subject Code	Course Title	Ins. Hours/ Weeks	Credits	Exam Hours	CIA (Max)	ESE (Max)	Total (Max)
1	I	20UT1	Tamil-I (Ilakiyam- kavithai, Sirukathai, Urainadai, Ilakkia Varalaru)	6	3	3	25	75	100
1	II	20UE1	English -I (Communicative English)	6	3	3	25	75	100
1	III	20UZO1CC1	Invertebrata	5	4	3	25	75	100
1	III	20UZO1CP1	Invertebrata (P)	3	3	3	40	60	100
1	III	20UBO1AC1	Botany I	3	3	3	25	75	100
1	III	20UBO1AP1	Botany I (P)	3	-	-	-	-	-
1	III	20UZO1PE1	Professional English for Life science	2	2	3	25	75	100
1	IV	20UVE	Value Education	2	2	3	25	75	100
Total				30	20				700
2	I	20UT2	Tamil-II (Idaikkala Illakiyam, Nadagam, Puthinam, Ilakkiya varalaru)	6	3	3	25	75	100
2	II	20UE2	English -II (Communicative English)	6	3	3	25	75	100
2	III	20UZO2CC2	Chordata	5	4	3	25	75	100
2	III	20UZO2CP2	Chordata (P)	3	3	3	40	60	100
2	III	20UBO2AC2	Botany II	3	3	3	25	75	100
2	III	20UBO2AP1	Botany I & II (P)	3	3	3	40	60	100
2	III	20UZO2PE2	Professional English for Life science	2	2	3	25	75	100
2	IV	20UES	Environmental Studies	2	2	3	25	75	100
Total				30	23				800
3	I	20UT3	Tamil-III (Kappiya Ilakkiyam, Nadagam, Ilakkiya varalaru)	6	3	3	25	75	100
3	II	20UE3	English -III (Communicative English)	6	3	3	25	75	100
3	III	20UZO3CC3	Cell and Molecular Biology	6	4	3	25	75	100
3	III	20UZO3CP3	Cell and Molecular Biology (P)	3	3	3	40	60	100
3	III	20UCH3AC3	Chemistry I	4	4	3	25	75	100
3	III	20UCH3AP2	Chemistry (P)	3	-	-	-	-	-
3	IV	20UZO3NME1:1	Non Major Elective I-Human Anatomy And Physiology	2	2	3	25	75	100
Total				30	19				600

4	I	20UT4	Tamil- IV (Palan Ilakkiyam, Ilakiya varalaru, Podhu Katturai)	6	3	3	25	75	100
4	II	20UE4	English - IV (Communicative English)	6	3	3	25	75	100
4	III	20UZO4CC4	Genetics	4	4	3	25	75	100
4	III	20UZO4CP4	Genetics (P)	3	3	3	40	60	100
4	III	20UCH4AC4	Chemistry II	4	4	3	25	75	100
4	III	20UCH4AP2	Chemistry (P)	3	3	3	40	60	100
4	III	20UZO4NME2	Non Major Elective II-Human diseases	2	2	3	25	75	100
4	IV	20UZO4SBE1:1	Ornamental fish farming	2	2	3	25	75	100
		20UZO4SBE1:2	Sericulture						
		20UZO4SBE1:3	Medical Lab technology						
			Total	30	24				800
5	III	20UZO5CC5	Animal Physiology	5	5	3	25	75	100
5	III	20UZO5CC6	Immunology	5	5	3	25	75	100
5	III	20UZO5CC7	Ecology	5	5	3	25	75	100
5	III	20UZO5CP5	Animal physiology, Immunology & Ecology (P)	4	3	3	40	60	100
5	III	20UZO5MBE1:1	Economic Entomology	5	4	3	25	75	100
		20UZO5MBE1:2	Wild life conservation and Management						
		20UZO5MBE1:3	Food nutrition and health						
5	III	20UZO5SBE2:1	Applied Zoology	2	2	3	25	75	100
		20UZO5SBE2:2	Vermi technology						
		20UZO5SBE2:3	Aquaculture						
5	IV	20UZO5SBE3:1	Health education	2	2	3	25	75	100
		20UZO5SBE3:2	Poultry farming						
		20UZO5SBE3:3	Dairy technology						
5	IV	20USSD	Soft Skills Development	2	2	3	25	75	100
			Total	30	28				800
6	III	20UZO6CC8	Developmental Biology	6	6	3	25	75	100
6	III	20UZO6CC9	Evolution	6	6	3	25	75	100
6	III	20UZO6CP6	Developmental Biology & Evolution (P)	5	4	3	40	60	100
6	III	20UZO6MBE2:1	Biochemistry and Biophysics	6	4	3	25	75	100
		20UZO6MBE2:2	Parasitology						
		20UZO6MBE2:3	Toxicology						
6	III	20UZO6MBE3:1	Bioinformatics and Biostatistics	6	4	3	25	75	100
		20UZO6MBE3:2	Insect vectors and diseases						
		20UZO6MBE3:3	Environmental and public health						
6	V	Extension Activities	Extension Activities	-	1	-	-	-	-
6	V	Gender Studies	Gender Studies	1	1	3	25	75	100
			Total	30	26				600
			Grand Total	180	140				4300

Language Part – I	-	4
English Part –II	-	4
Core Paper	-	9
Core Practical	-	6
Allied Paper	-	4
Allied Practical	-	2
Non-Major Elective	-	2
Skill Based Elective	-	3
Major Based Elective	-	3
Environmental Studies	-	1
Value Education	-	1
Soft Skill Development	-	1
Professional English	-	2
Gender Studies	-	1
Extension Activities	-	1 (Credit only)

* for those who studied Tamil upto 10th +2 (Regular Stream)

+ Syllabus for other Languages should be on par with Tamil at degree level

those who studied Tamil upto 10th +2 but opt for other languages in degree level under Part I should study special Tamil in Part IV

** Extension Activities shall be outside instruction hours

Non Major Elective I & II – for those who studied Tamil under Part I

a) Basic Tamil I & II for other language students

b) Special Tamil I & II for those who studied Tamil upto 10th or +2 but opt for other languages in degree programme

Note:

Internal Marks

External Marks

1.Theory	25	75
2.Practical	40	60

3. Separate passing minimum is prescribed for Internal and External marks

NME Papers offered to Other Department

20UZO3NME1- Human Anatomy and Physiology

20UZO4NME2-Human Diseases

FOR THEORY

The passing minimum for CIA shall be 40% out of 25 marks [i.e. 10 marks] The passing minimum for University Examinations shall be 40% out of 75 marks [i.e. 30 marks]

FOR PRACTICAL

The passing minimum for CIA shall be 40% out of 40 marks [i.e. 16 marks] The passing minimum for University Examinations shall be 40% out of 60 marks [i.e. 24 marks]

List of Skill Based Elective Courses

Skill Based Elective	Course code	Title of the course
Skill Based Elective-1	20UZO4SBE1:1 20UZO4SBE1:2 20UZO4SBE1:3	Ornamental fish farming Sericulture Medical Lab technology
Skill Based Elective-2	20UZO5SBE2:1 20UZO5SBE2:2 20UZO5SBE2:3	Applied Zoology Vermi technology Aquaculture
Skill Based Elective-2	20UZO5SBE3:1 20UZO5SBE3:2 20UZO5SBE3:3	Health Education Poultry Farming Dairy technology

List of Major Based Elective Courses

Major Based Elective	Course code	Title of the course
Major Based Elective-1	20UZO5MBE1:1 20UZO5MBE1:2 20UZO5MBE1:3	Economic Entomology Wild life conservation and management Food nutrition and health
Major Based Elective-2	20UZO6MBE2:1 20UZO6MBE2:2 20UZO6MBE2:3	Biochemistry & Biophysics Parasitology Toxicology
Major Based Elective-3	20UZO6MBE3:1 20UZO6MBE3:2 20UZO6MBE3:3	Bioinformatics and Biostatistics Insect vectors and diseases Environmental and public health

SEMESTER– I

Coursecode:20UZO1CC1

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks: 75

CORECOURSE1–INVERTEBRATA

Course Outcomes:

On completion of the course students will be able gain

- Knowledge on animal taxonomy and biology of protozoans to echinodermata.
- Ability to classify protozoans. The learner to understand the diversity and basic taxonomy of Non chordates.
- The learner will get an idea of adaptation and importance of non–chordates.
- The learner to identify the animal at basic level.
- The paper will give a strong observation skill and prompt to think about its conservation, sustainable economic utilisation and its potentials in technological prospects.

UnitI

Taxonomy: Definition, Principles of classification – symmetry and coelom – Units of classification –

Binomial nomenclature–Outline classification of Animal kingdom up to order level with example,

Flowchart only.

UnitII

Protozoa and Porifera: TypeStudy: Paramoecium–General topics: Protozoan parasites –Life cycle

ofplasmodium–locomotion and nutritionin protozoa. –**Typestudy:** Asconsponge,

Generalorganizationandhistology–**Generaltopic:** Canal system of sponges- Spicules in sponges.

UnitIII

CoelenterataandHelminthes: TypeStudy: Obelia, StructureofObeliacolony, Medusa, Nematocyst

and Life cycle (Metagenesis) –**Type Study:** Fasciola hepatica (Liver Fluke) –Ascaris; External

characters and Life cycle–**General topic:** Polymorphism Coelenterata– Nematode parasites

andtheiradaptation.

UnitIV

Annelida and Arthropoda: Type Study: Earthworm; External morphology, setae and Nephridia –

Type Study: Penaeus (Marine Prawn); External morphology, Appendages, Reproductive System

andDevelopment –**General topic:** Metamerism in Annelids – mouth parts of insects (Honey bee,

House flyandCockroach) – Beneficialinsects (Honey, SilkandLac))–Helpful insect, Productive insect.

UnitV

Mollusca and Echinodermata: Type Study: Pilaglobosa; External morphology, Digestive System and Respiratory System – **General topic:** Cephalopods as an advanced Mollusc – Economically important Mollusca – Larval forms in Echinodermata – **Type Study:** Star fish External morphology, Pedicellaria and water vascular system.

Total topics	Local	Region	National	Global
28	2	3	2	28

Books for references

1. Invertebrate Zoology by Arumugam N. *et al.*, Saras Publications, Kottar, Nagercoil–2012
2. Ekambaranatha Iyar and T.N. Ananthkrishnan. 1992. A Manual of Zoology, Vol.I.(Invertebrata). Parts I&II. Viswanathan&Co.
3. Jordon, E.L. and P.S. Verma. 1995 Invertebrate Zoology. 12th Edn. Sultan Chand & co
4. Dhama P.S. and J.K. Dhama (2003) Invertebrate Zoology, R. Chand and company, New Delhi.
5. Kotpal R.L. (2005) Invertebrate Zoology, Third Edition published by Rakesh Rastogi for Rastogi Publications, Meerat.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	20UZO1CC1	Invertebrata					5	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 (✓)=35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER– I

Coursecode: 20UZO1CP1

Instruction:Hours:3

Credit:3

ExamHours:3

InternalMarks:40

ExternalMarks:60

COREPRACTICAL1–INVERTEBRATA

Course Outcomes:

- Gain knowledge to identify various animals based on morphological features.
- Understand the principle and use of microscopes.
- List the various invertebrate animals in a given class.
- Identify various larval stages and development in invertebrate groups.
- The student will be able to understand, classify and identify the diversity of animals.

Dissection Charts: Virtual

1. Earthworm: Nervous system.
2. Cockroach: Digestive system.
3. Cockroach: Circulatory system.
4. Pila: Digestive system

Mounting Charts:

1. Earthworm–Body setae
2. Cockroach–Trachea
3. Honey Bee – Mouthparts and Sting
4. Pila–Radula

Spotters:

1. Protozoa–Paramecium Entire, Paramecium Conjugation, Euglena
2. Porifera–Simple Sponge, Gemmule, Spicules
3. Coelenterata–Obelia Colony, Medusa of Obelia, Sea Anemone,
4. Helminthes–Liver Fluke, Redia Larva, Cercaria Larva, Ascaris Male and Female
5. Annelida–Earthworm, Nereis, Heteronereis, Leech
6. Arthropoda–Prawn, Zoa Larva, Mysis Larva, Peripatus, Honey Bee and Silk Worm
7. Mollusca– Pila, Sepia, Octopus, Pearl Oyster
8. Echinodermata–Star Fish, Sea–Urchin, Sea–Cucumber, Bipinnaria Larva

Total topics	Local	Region	National	Global
16	4			12

TEXTBOOK

1. Allaby, M. (Ed.). Oxford Dictionary of Zoology. Oxford University Press, Oxford, 1999.
2. Meglitsch, P. A. and Schram, F. R.. Invertebrate zoology (Third Edition). Oxford University Press, New York, 1991.

REFERENCE

1. Brusca & Brusca. Invertebrates, Second Edition. Sinauer Assoc., Inc. Sunderland, MASS, USA, 2003.
2. Pearse & Buchsbaum, . Living Invertebrates. The Box wood Press. Pacific Grove, CA, USA, 1987.
3. Pechenik, . Biology of the Invertebrates, Seventh Edition. McGraw Hill Education, New York, NY, USA, 2015.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	20UZO1CP1	Invertebrata(P)					3	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
CO2	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
CO3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CO4	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CO5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Number of Matches(✓)=36 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER-II

Coursecode:20UZO2CC2

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks:75

CORECOURSE II-CHORDATA

CourseOutcomes

- On completion of the course students will be able.
- The learner to understand the diversity and basic taxonomy of chordates.
- The learner will get an idea of adaptation and importance of chordates.
- The learner to identify any vertebrate animal at basic level.
- The paper will give a strong observation skill and prompt to think about its conservation, sustainable economic utilisation and its potentials in technological prospects.
- Study and understand the various systems, adaptation and dentition in Mammals

Unit I

Prochordata & Pisces: General characters and classification of Chordata (upto class) with examples – **Type Study:** Amphioxus – Scolidon – **General topics:** Affinities of Hemichordates – Retrogressive metamorphosis in Ascidia – Salient features of Cyclostomata – Accessory respiratory organs in fishes – Types of Fins and function,

Unit II

Amphibia: Classification and characters – Amphibia (up to order with examples) – **Type Study:** Frog – **General topics:** Metamorphosis of Amphibian – Limbless Amphibians – Parental care in Amphibian – Paedomorphosis.

Unit III

Reptilia: Classification and characters of Reptilia (upto order with examples) – **Type Study:** Calotes – **General topics:** Identification of Poisonous and non-poisonous Snakes – Poison apparatus and types of poison – Skull of Reptiles – Salient features of Chelonians – Crocodilia.

Unit IV

Aves: Classification and characters of Aves (upto order with examples) – **Type Study:** Pigeon – **General topics:** Flightless Birds – Flight Adaptations in beak modification in birds – feet modification in birds – Migration of birds – Flightless birds

Unit V

Mammals: Classification and characters of Mammals (up to order with examples) – **Type Study:** Rabbit – **General topics:** Diversity of Marsupials – Affinities of Prototheria – Aquatic mammals and adaptation – Dentition in mammals – Adaptive radiation in Mammals.

Total topics	Local	Region	National	Global
38	6	6	6	38

Text Book

1. Arumugam N Animal Diversity – Volume – 2 – Chordata, Saras Publication, Nagercoil

2. Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N A Text Book of Chordates, Saras Publication, Nagercoil.
3. Ekambaranatha Ayyar and T.N. Ananthkrishnan, Manual of Zoology Vol – II, S. Viswanathan Pvt. Ltd. Chennai..
4. Kotpal RL Modern Text Book of Zoology Vertebrates, Rastogi Publications, Meerut.
5. Young, J.Z. 1950. Life of Vertebrates. Clarendon Press, Oxford, UK.
6. Pough Harvey F, Christine M .Janis and John B. Heiser .2002. Vertebrate Life, Pearson Education Inc. New Delhi.
7. Verma PS, Chordate Zoology, S Chand Publishers, New Delhi

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	20UZO2CC2	Chordates					5	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
CO2	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		
CO3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CO4	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CO5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Number of Matches(✓)=36 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER-II

Coursecode: 20UZO2CP2

Instruction:Hours:3

Credit:3

ExamHours:3

InternalMarks:40

ExternalMarks: 60

COREPRACTICALII –CHORDATA

Course Outcomes:

- To understand the structure, function and behavior of select vertebrate types through the observation of both living and preserved specimens.
- Understandthebasicconceptsaboutchordates.
- Reinforcingbasiclaboratoryskillsincluding microscopy, dissectionandcarefulobservation;
- Providingyou withtheabilityto recognizehemajorgroupsofvertebrate,
- To increasing understanding of the methods of investigating animal evolution as well the currentstateofour knowledge

Dissection:Virtual

1. Frog:Arterialsystem.
2. Frog: Seventh cranial nerve.
3. Frog: Digestive system
4. Calotes:Venoussystem

MountingCharts:

1. Shark–Placoidsscales
2. Frog–Brain

Spotters:

A) Classifyandgivingreasons:

Amphioxus, Balanoglossus, Shark, Hippocampus, Najanaja(Cobra), Pigeon, Rabbit

B) DrawandLabeledSketch:

Frog–PectoralGirdle, Pelvicgirdleand, Hyoidapparatus, QuillFeather, Carapace,

C) BiologicalSignificance:

Balanoglossus,Petromyzon,Echeneis, Narcine,Ichthyophis,Axolotllarva,ChameleonandBat

D) Commentondentitionofthefollowing:

Skull of Rabbit,Dog and Human

Total topics	Local	Region	National	Global
10	2			8

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
I	20UZO2CC2	Chordates					5	4			
CourseOut comes(COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	
CO2	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
CO3		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CO4	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CO5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Number of Matches(✓)=35 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER–III

Coursecode:20UZO3CC3

Instruction:Hours:6

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks:75

CORECOURSEIII–CELLANDMOLECULARBIOLOGY

CourseOutcomes

On completion of the course students will be able

- To understand the Principles of microscopes and Cytological techniques
- To describe the structure and functions of cell and cell organelles
- To recognize the properties of cytoplasm and ultra structure of nucleus.
- To explain cell cycle and cell division
- To obtain knowledge on structure and functions of DNA and types of RNA

UNIT I

Microscopy: Principles and applications of Light, Phase Contrast, Fluorescent Microscope – **Electron Microscopes:** SEM – TEM – **Micro–technique;** tissue fixation, sectioning and staining – Ultrastructure organization of virus – Different types of bacteria – bacteria and animal cell.

UNIT II

Plasma Membrane: Ultra structure, Unit membrane and fluid mosaic models, Membrane proteins – peripheral and integral proteins – functions of plasma membrane – **Cytoplasm:** structure and composition, physical and biological properties – **Endoplasmic Reticulum:** ultra structure and functions.

UNIT III

Golgi complex: Morphology, structure, role in secretion – formation of acrosome – other functions – **Lysosome and Centrosome:** Morphology, chemistry and functions – **Mitochondria:** ultrastructure and functions – **Ribosomes:** ultrastructure and functions.

UNIT IV

Nucleus: ultrastructure of interphase nucleus – **Nucleolus and Chromosome:** structure and functions – Giant chromosomes: Polytene and Lampbrush chromosomes – **Cell divisions:** Mitosis and Meiosis – Cell cycles and its significance.

UNIT V

Molecular structure of DNA. DNA: Replication in prokaryotes and eukaryotes – DNA: repair mechanisms – DNA cloning – **RNA:** Types and functions – Genetic code – Gene Regulation – **Protein synthesis:** **Transcription,** Translation and post-translational modifications – Cancer Biology – Apoptosis – mechanism of programmed cell death – Stem cells – Application of stem cells.

Total topics	Local	Region	National	Global
35	2	2	2	35

Books for Reference:

1. Verma, P.S. and V.K. Agarwal. 2003. Cytology (Cell Biology and Molecular Biology). S. Chand Company Ltd, New Delhi.
2. Powar, C.B. 1997. Cell Biology. Himalaya Publishing House, Bombay.
3. Kumar, H.D. 2003. Molecular Biology. Vikas Publishing House Pvt. Ltd., New Delhi.
1. De Robertis, E.D.P. and De Robertis E.M.F. 1995. Cell and Molecular Biology. 8th Edition, B.I. Waverly Pvt., Ltd., New Delhi.
2. Freidfelder, D. 2003. Molecular Biology. Narosa Publishing House, New Delhi.
3. Turner, P.C., McLennan, A.G., Bates, A. and White, M.R.H. 2001. Molecular Biology. Second Edition. Viva Books Pvt. Ltd., New Delhi.
4. Verma, P.S. and V.K. Agarwal. 1998. Cell Biology. S. Chand Company Ltd., New Delhi.
5. Arumugam, N. 2001. Cell Biology. Saras Publications, Nagercoil.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits						
III	20UZO3CC3	Cell and Molecular Biology	6	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 (✓) = 35 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER–III

Coursecode: 20UZO3CP3

Instruction:Hours:3

Credit: 3

ExamHours:3

InternalMarks:40

ExternalMarks:60

CORE COURSE III–CELL AND MOLECULAR BIOLOGY

Course Outcomes

On completion of the course students will be able

- To understand the Principles of microscopes and Cytological techniques
- To describe the structure and functions cell and cell organelles
- To recognize the properties of cytoplasm and ultra structure of nucleus.
- To explain cell cycle and cell division
- To obtain knowledge on structure and functions of DNA and types of RNA

I. Cytometry

1. Compound microscope
2. CameraLucida
3. StageandOcularMicrometers

II. SlidePreparation

1. Buccalsmear.
2. Mitosisinonionroottip squash.
3. SquashpreparationofGrasshoppertestes.

III. Studyofpreparedslidesofhistology.

Animalcell –Mitochondria –Nucleus –DNAhelicalstructure –ColumnarEpithelium–
Ciliated epithelium– Glandular Epithelium – Cartilage T.S – Bone T.S – Cardiac
Muscle –Striatedmuscle –NonStriatedmuscle– Neuron – C.SofmammalianTestis–
Ovary.

Total topics	Local	Region	National	Global
7	4	1	1	1

Course Code: 20UZ03NME1
Instruction Hours: 2
Credits: 2

Exam Hours: 3
Internal Marks: 25
External Marks: 75

NON MAJOR ELECTIVE COURSE - I

HUMAN PHYSIOLOGY

Objectives:

1. To provide basic knowledge about human physiology.
2. To study the various systems in the human body and their functions.

Course outcomes

- Acquire comprehensive knowledge of structure and physiology of various organs in the body
- Acquired comprehensive knowledge of respiratory organ and its functions
- This course focuses on anatomical terminology, anatomical identification and physiological processes of human body
- Acquired comprehensive knowledge of excretion
- Acquired comprehensive knowledge of endocrine glands- structure, secretions and functions.

UNIT - I Cell

Cell General introduction of human systems–Cells under electron microscope - Recent concepts – **Tissues:** Classification, structure and function.

UNIT – II Physiology of digestion and respiratory system

Digestive System - Anatomy of gastro-intestinal tract - Digestion and absorption of carbohydrates, proteins and fats - Anatomy and physiology of respiratory organs - Gaseous exchange in the lungs, mechanism of respiration.

UNIT - III Excretory System, Physiology of Nerve and Muscle

Structure of kidney - formation of urine, acid-base balance, skin temperature regulation, water balance - ADH regulation in excretion- Conduction of nerve impulses - Physiology of muscle contraction - **Nervous System:** General anatomy of nervous system - functions of the different parts reflexes, autonomic nervous system - **Sense Organs** Physiology of vision, hearing, taste, smell and cutaneous sensations.

UNIT – IV Blood

Composition, constituents, functions, wounds, hemorrhage - clotting - reticulo - endothelial system, body defence against diseases - **Heart and Circulation** - Anatomy of the heart - structure of the heart and blood vessels - properties of cardiac muscle - origin and conduction of heart beat -cardiac cycle, cardiac output, heart

sounds, blood pressure - definition and factors affecting blood pressure and ECG.

UNIT - V Endocrinology

Endocrinology: Pituitary, thyroid, parathyroid, adrenal and pancreas - functions of the hormones and their relationships - Reproductive System Anatomy of male and female reproductive organs - hormonal regulation of female reproductive function - menstruation, fertilization, pregnancy, lactation - hormone influence.

Total topics	Local	Region	National	Global
34	1	1	1	34

Text Books

1. Gupta, A.P., (2010). Anatomy and physiology. Agra: Sumit Prakashan.
2. Moorthy, A.M., (2014). Anatomy Physiology and Health Education. Karaikudi: Madalayam publication.
3. S.C. Rastogi. Essentials of Animal Physiology. New Age International Publishers. 2001.

References

1. Guyton, A.C. Functions of the Human Body, W.B. Saunders Co., Philadelphia.
2. Vander, A.J, Sherman, J.H. and Luciano, D.S. Human Physiology - the Mechanisms of Body Functions, 2nd ed., TMH Publishing Co., Ltd.,
3. Subramaniam, S. and Madhavan Kutty, K. 1971. The Text Book of Physiology, 1st ed., Orient Longman Ltd.
4. Best, CH and NB Taylor, The living body, latest edition, Asia publishing house, Bombay.
5. Ham, A.W., Histology, Latest edition. Pitman Medical Publishing Ltd., London,

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO3NME1	Human physiology					2	2			
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	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER-IV

SEMESTER-IV

Coursecode:20UZO4CC4

Instruction:Hours:4

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks: 75

CORE COURSE IV: GENETICS

Objective:

To learn the mechanism of inheritance pattern and its use in medical science.

Course Outcomes

On completion of the course students will be able

- To acquire basic information on genetics and Mendelian laws
- To understand multiple alleles and pedigree analysis in human traits.
- Students will be able to describe the flow of genetic information.
- Students will be able to explain role of genes and micro organisms.
- The students will able to explain how mutation occur and how its role in adaptation and speciation.

Unit I

Mendelian Genetics: Mendelian Laws of Inheritance – Test cross & Back Cross – Multiple alleles – Polygenic inheritance – Incomplete dominance – Co-dominance – Importance of *Drosophila* in genetics – Culture methods – Sex identification – Mutants of *Drosophila*.

Unit II

Linkage & Crossing Over: Epitasis, Lethal genes – Linkage in *Drosophila* – Crossing over – Mechanism and theories – Chromosomal maps & its construction – Chromosomal Aberrations – Gene Mutations – Physical & Chemical mutagens – DNA repair.

Unit III

Inheritance

Sex determination in animals – X linked & Y linked inheritance – Genic Balance theory – Barr bodies – Chromosomal variation & Nondisjunction – Euploidy – Aneuploidy – Monosomy – Trisomy (Klinefelter, Turner & Down syndromes) – Cytoplasmic inheritance.

Unit IV

Mutations

Sickle cell anemia – Inborn errors of Metabolism: Phenylketonuria – Alkaptonuria – Albinism – Pedigree Analysis – Eugenics – Euthenics – Genetic Counselling – Inbreeding – Outbreeding.

Unit V:

Modern Genetics

Concept of Gene: Gene frequency – factors affecting - gene frequency – Cistron – split gene – promoter – repetitive DNA – Transposons – Bacterial genome – Transformation – Conjugation, Factor – Sexduction – Transduction – Generalised – Specialised Plasmids – Operon concept: Lac – trp operons (outlines).

Total topics	Local	Region	National	Global
55	1	1	1	55

Books for reference

1. Gardner EJ Principles of genetics. London, UK, John Wiley & Sons, Inc.
2. Meyyan RP Fundamentals of Genetics, Saras Publication Nagercoil.
3. Primrose SB, Twyman R. Principles of gene manipulation and genomics. John Wiley & Sons; 2013 May 28.
4. Strickberger MW, Genetics, Pearson publishers.
5. Verma PS & Agarwal VK Genetics, S. Chand Publishers, New Delhi.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	20UZO4CC4	Genetics					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 (✓) = 37 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER– 1V

Coursecode: 20UZO4CP4

Instruction:Hours:3

Credit:3

ExamHours:3

InternalMarks:40

ExternalMarks:60

COREPRACTICAL–1VGENETICS

Objectives:

- Students will communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing.
- Be able to describe the genetics and its mechanisms.

Course Outcomes:

- To understand how the behavior of chromosomes during meiosis can explain Mendelian traits.
- To understand how inheritance patterns are affected by position on chromosomes.
- To understand the similarities and differences between how genetic information is passed on in male and female.
- To understand chromosomal trisomy and other karyotypes.
- Understand blood cells as differential and its groupings.

Genetics

1. *Drosophila*: male and female identification, Mutant forms (from pictures), Genetic importance.

2. Observation of simple Mendelian traits in man.

3. Human Karyotypes: Normal, Down's syndrome, Klinefelter's syndrome, Turner's syndrome.

4. Recording of Mendelian traits in humans.

1. Human Blood Grouping

6. Human Rh factors

Total topics	Local	Region	National	Global
6	3	1	1	1

RelationshipMatrixforCOs, POsandPSOs

Semester	Code	Title oftheCourse					Hours	Credits			
IV	20UZO4CP4	Genetics(P)					3	3			
Course		ProgrammeOutcomes(POs)					ProgrammeSpecificOutcomes(PSOs)				
Outcomes(COs)		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1			✓	✓	✓	✓	✓	✓	✓		✓
CO2			✓		✓	✓		✓		✓	
CO3		✓	✓	✓	✓		✓		✓		✓
CO4			✓	✓	✓	✓	✓	✓		✓	
CO5		✓		✓	✓	✓		✓	✓		✓
NumberofMatches(✓)=34		Relationship:High									

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

Course Code: 20UZO4NME2
Instruction Hours: 2
Credits: 2

Exam Hours: 3
Internal Marks: 25
External Marks: 75

NON MAJOR ELECTIVE COURSE - II

HUMAN DISEASES

Objectives:

1. To impart the knowledge of important human diseases with respect to their causative agent, clinical symptoms, pathogenesis, mode of transmission, prevention and treatment.

Course Outcomes

On completion of the course students will be able

- Define common disease terms and major categories of human disease.
- Describe the most common diagnostic tests and procedures.
- Describe the major disorders, diagnostic methods and treatments, including drug therapy and surgery of each body system to include those listed in the course outline.
- Describe the terms associated with basic pharmacology and how communicable diseases are transmitted and controlled.
- Describe the most common genetic disorders, their causes, method of diagnosis and treatments

UNIT - I

Communicable Diseases: Symptoms - Prevention and Control of Communicable Diseases - Community Diagnosis: Tuberculosis – covid 19

UNIT - II

Non-communicable Diseases: Symptoms, Prevention and Control of Non-Communicable Diseases - Community Diagnosis: Alzheimer's - Asthma - Chronic Kidney Disease - Diabetes

UNIT – III

Hereditary disease: Symptoms, Prevention - Control measures of Diseases: Cystic fibrosis - Sickle Cell Anemia - Marfan syndrome.

UNIT - IV

Zoonotic disease: Symptoms, Prevention - Control measures: Anthrax - Animal influenza - avian influenza.

UNIT - V

Nutritional deficiency: Symptoms, Prevention - Control measures of Diseases: Rickets - Goiter - Anemia - Beriberi.

Total topics	Local	Region	National	Global
23	5	5	5	23

References

1. *Textbook of human disease in dentistry* by M. Greenwood, R. A. Seymour & J. G. Meechan UK.
2. White, Tim (19 December 2014). "What is the Difference Between an 'Injury' and 'Disease' for Commonwealth Injury Claims?" *TindallGask Bentley*. Archived from the original on 27 October 2017. Retrieved 6 November 2017.
3. "What is the deadliest disease in the world?" *WHO*. 16 May 2012. Archived from the original on 17 December 2014. Retrieved 7 December 2014

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
I	22UZO4NME2	Human Diseases					2	2			
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(✓) = 39 Relationship: High											

Mapping	1-29%	30-59%	60-69%	70-89%	90-100%
Matches	1-14	15-29	30-34	35-44	45-50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER-IV

Coursecode:20UZO4SBE1:1

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks: 75

SKILL BASEDELECTIVE ORNAMENTALFISHFARMING

CourseOutcomes:

Oncompletionofthe course studentswillbe able

- To gain knowledge on introduction and importance of ornamental fish culture
- To understand and importance of freshwater and marine ornamental fishes
- To describe the Mass production of fancy fishes
- To get knowledge on harvesting methods of fishes
- To realize the economic status of ornamental fishes

UNIT I

Importance and scope of ornamental fish culture, Economics –Commercial value–potential trends in ornamental fish farming in the world and in India– Budget required for setting up an Aquarium – Fish Farm as a Cottage Industry.

UNIT II

Important freshwater and marine ornamental fishes –Indigenous –Exotic species: Guppy, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish, Butterfly fish, Zebra fish, Koi, Tetra, Molly, Glass fish, Cichlids, Hippocampus and Scat fishes.

UNIT III

Mass production of fancy fishes: Preparations for breeding – breeding behaviour of chosen fishes– molly and fighter fish – Induced breeding –Food and feeding: Preparation and composition of formulated fish feeds – Live feeds: rotifers, tubifex– Live fish transport–Fish handling, packing and forwarding techniques.

UNIT IV

Aquarium design, Construction and preparation: size, shape, substrate, ornamental aquatic plants–Construction and functions of Bio filters, aerators –accessories for fish tanks– hood and light, nets, suction tube - Benefits of monoculture – polyculture.

UNIT V

General Aquarium maintenance – Maintenance of water quality: controlling ammonia build up –Temperature–pH, feeding regimes –Disease management: Common bacterial, viral, fungal, protozoan and crustacean infections their treatment and control– Hazards for ornamental fish culture – General benefits of Aquarium.

Total topics	Local	Region	National	Global
31	7	14	2	8

Books for references

1. Santhanam, R., N. Sugumaran and Natarajan. P. 1987. A manual of Fresh water aquaculture. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Shanmugam, K. 1992. Fishery Biology and Aquaculture. Leo Pathipagam, Madras.
3. Jameson, J.D. and R. Santhanam (1996). Manual of ornamental fisheries and farming technology. Fisheries College and Research Institute, Thoothukudi.
4. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consume Book Ltd., London.
5. Jhingran V.G., 1991: Fish and Fisheries in India – Hindustan Publ. Co. New Delhi – India.
6. Mill Dick, 1993: Aquarium Fish, DK Publ. Co. Inc. New York – USA.
7. Day, F, 1978: Fishes of India Vol. I & II, William Danis and Sons, India. Gupta, S.K and Gupta, P.C. 2006. General and Applied Ichthyology. S. Chand and Company Ltd. New Delhi.
8. Mitchell Beazley, 1998. The complete guide to tropical aquarium fish care. Read and Consume Book Ltd., London

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits						
IV	20UZO4SBE1:1	Ornamental fish farming	2	2						
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 (✓) = 37 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER-IV

Coursecode:20UZO4SBE1:2

Instruction:Hours:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILL BASED ELECTIVE SERICULTURE

On completion of the course students will be able

- To gain knowledge on introduction and importance of sericulture
- To understand classification and biology of silk moth
- To describe the tools of sericulture
- To get knowledge on harvesting methods in sericulture
- To realize the economic status of sericulture

Unit-I

Introduction

-Importance of sericulture - Mulberry plant -

Classification of commercial varieties of mulberry - Mulberry plant cultivation practices - Moriculture

Unit-II

Classification and Biology of silk moth – familiar and economically important types of silkworms – life cycle study of *Bombyx mori* – Diseases of silkworms – fungal, bacterial, viral and nematode diseases – deficiency diseases and their remedial measures.

Unit-III

Tools of sericulture: cultural methods and management of mulberry silk worms – Silk worm rearing operations – Chawki rearing – late age rearing techniques.

Unit-IV

Harvesting methods; Physical and commercial characters of cocoons – Reeling operations – importance of byproducts of Sericulture – Economic importance of sericulture.

Unit-V

Economics of Sericulture: Future and progress of sericulture in India – Role of State and central silk board – employment opportunities – Prospects of sericulture as self-employment as cottage industry.

Total topics	Local	Region	National	Global
24	12	5	5	2

Books for Reference:

1. Ganga, G. 2003: comprehensive sericulture Vol-I, Moriculture – Oxford – IBH Publ. Co. India.
2. Ganga, G. 2003: comprehensive sericulture Vol –II Silkworm rearing – Oxford – IBH Publ. Co. India.
3. Ganga, G. and Sculochana Chetty, J. 1997: An Introduction to sericulture Oxford – IBH Publ. Co. India.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	20UZO4SBE1:2	Sericulture					2	2			
Course		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
Outcomes(COs)		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓		✓	✓	✓	✓	✓		✓
CO2			✓		✓	✓	✓	✓		✓	✓
CO3			✓	✓	✓				✓		✓
CO4			✓	✓	✓	✓	✓	✓		✓	✓
CO5		✓		✓	✓	✓	✓	✓	✓		✓
Number of Matches(✓)=36Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER-IV

Coursecode:20UZO4SBE1:3

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILL BASED ELECTIVE MEDICAL LAB TECHNOLOGY

Objectives

To understand the importance of lab technology

Course Outcomes:

On completion of the course students will be able

- Learn the safety issues in laboratory conditions and acquire knowledge on the safety disposal of waste materials
- To familiarize techniques for the analysis of blood, urine and microbes under disease conditions
- Acquire knowledge on the use of RIA, ELISA, WESTERN BLOT, WIDEL TEST and DNA Finger Printing.
- Acquire knowledge on medical lab technology.
- Acquire knowledge on estimations sugar, Albumin, Ketone bodies, lipids etc.

Unit-I

Laboratory&Safety

The laboratory: Safety-Contaminants: Physical, Chemical, Biological Contaminants. – Universalworkprecautions(NWP) for laboratory personnel. – DisposingofBiomedicalwaste.

Unit-II

HematologicalParameters

Haemoglobincontent-DifferentialCount-Haematocrit-packedcellvolume –MCH – MCHC – MCV- Erythrocyte sedimentation rate – RBC fragility test – platelet count- Reticulocytocrit-haemorrhagicdisorders –clottingtime –Bleeding time –prothrombin time.

Unit –

IIIUrineTe sts

Knowledge and skill in the study and analysis of urine – Physical parameter –Colour, odor,pH, Density-Chemical parameters – Sugar, Albumin, Ketone bodies and their clinicalsignificances–pregnancytests.

Unit-IV

MicrobialParameters

Microbial analysis of Blood, Urine, Faeces, Sputum-ParasiticanalysisinBloodandFaeces- Analysisofsemen-cerebrospinal fluidforclinicalinvestigation

Unit-V

ModernAnalysis

Moleculardiagnostict Techniques-RIA-ELISA –WESTERNBLOT –WIDELTEST-PCR- DNAfingerprinting.

Total topics	Local	Region	National	Global
36	4	0	6	26

Text Book

1. Ramnik and Sood (2009) Medical Laboratory Techniques, Jaypee Brothers, New Delhi.
2. Kanai L. Mukherjee and Swarajit Ghosh (2009) Medical Laboratory Techniques, , Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
3. B. S. Chauhan (2009) Principles of Biochemistry and Biophysics, first edition, Luxmi publishers, New Delhi.
4. Garrod, L.P. (2008) Medical Laboratory Techniques, BMJ publishers, USA.
5. Estridge, B.H., Reynolds, A.P. and Walters N.J. (2007) Basic Clinical Laboratory Techniques, Cengage Learning, Hyderabad.
6. Singh, A. and Singh, R (2004) Biophysical Chemistry (Principles and Techniques) Campus Books International, New Delhi.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
IV	20UZO4SBE1:3	MedicalLab technology					2	2			
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(✓)=38Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5CC5

Instruction:Hours:5

Credit:5

ExamHours:3

InternalMarks:25

ExternalMarks: 75

COREVII: ANIMALPHYSIOLOGY

Course Outcomes:

On completion of the course students will be able.

- The students will be able to explain how the various organ systems are coordinated and controlled.
- The students will be able to list the functions of various organs in relation to physiological processes.
- The students will develop the idea of multilevel controlling and feedback mechanism in relation to various physiological functions.
- The students will be able to understand the basic physiological process related to adaptation, metabolism and major requirements.
- To make aware of the students about how the structure–function relationships synchronise along with the molecular signals.

Unit I

Nutrition & Respiration

Nutrition: Digestion and absorption of carbohydrates, proteins and lipids – Minerals and Vitamins: their deficiency – Hormonal control of digestion – Respiratory pigments: structure of haemoglobin – Transportation of gases – Bohr Effect – Regulation of respiration – bronchitis, asthma – Physiological effects of smoking.

Unit II

Circulation & Excretion

Blood: composition and functions – Mechanism of clotting – bleeding – Types of Hearts – Heartbeat and pacemaker – Cardiac cycle – Cardiac rhythm – ECG – Pulse and blood pressure – Nephron structure and mechanism of urine formation – Excretory products – Osmoregulation in fishes.

Unit III

Muscle & Nerve Physiology

Types of muscles – Ultrastructure of striated muscle – Muscle contraction & properties – Neuron structure and types – Impulse propagation – synaptic transmission, neurotransmitters – Reflex action – Nervous disorders: epilepsy, Alzheimer's disease, Parkinson's disease.

Unit IV

Structure of eye, physiology of vision, visual elements and pigments, photochemistry of vision – Eye defects; myopia, hyperopia, presbyopia, astigmatism, cataract, Structure of ear and mechanism of hearing – Hearing impairments: deafness, labyrinthine disease – Olfactory, gustatory and tactile sense organs.

Unit V

Reproductive Physiology

Endocrine glands in man – Hormones, action and disorders – Feedback mechanism – Outlines of mechanism of hormonal activity – Puberty – Adolescence – Pregnancy – Parturition – Lactation – birth control.

Total topics	Local	Region	National	Global
43	1	1	1	43

Books for reference:

1. Arumugam N & Mariakuttikan A Animal Physiology Saras Publications, Nagercoil.
2. Bhagavan NV, Medical biochemistry, fourth edition Academic Press.
3. Guyton AC, Hall JE, Text Book of Medical Physiology, Elsevier
4. Jain AK Textbook of Physiology. Avichal Publishing Company.
5. Lehninger AL, Michael Cox, Nelson DL, Biochemistry. Macmillan.
6. Tyagi BS, Agarwal VK & Verma PS Animal Physiology S. Chand Publishers, New Delhi

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course	Hours	Credits						
V	20UZO5CC5	Animal Physiology	5	5						
Course	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
Outcomes (COs)	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓		✓		✓	✓	✓
CO2	✓		✓		✓	✓	✓		✓	
CO3		✓	✓	✓		✓		✓		✓
CO4	✓	✓		✓		✓	✓	✓	✓	✓
CO5		✓	✓		✓	✓	✓	✓	✓	✓
Number of Matches(✓)=35 Relationship: High										

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER– V

Coursecode:20UZO5CC6

Instruction:Hours:5

Credit:5

ExamHours:3

InternalMarks:25

ExternalMarks: 75

CORECOURSEVI–IMMUNOLOGY

Courseoutcomes

On completion of the course students will be able.

- To describe lymphoid organ and immune system.
- To gain information regarding immunoglobulin and immune deficiency diseases.
- Development of knowledge on the cellular origin and organ involvement in immunity and how the immune system can fight infections and diseases.
- Knowledge on development of body immune mechanisms and their applications.
- Understanding of current immunology news and issues.

Unit I

Scope, History – Innate immunity – Acquired immunity– Structure and functions of Primary lymphoid organs–Secondary lymphoid organs – Cells of Immune System: Types of Lymphocytes – Macrophages, Antigen Presenting Cells, Mast cells – Polymorphonuclear cells.

Unit II

Antigens: Types and Properties of Antigens – Haptens – Adjuvants – Immunoglobulins – Types – Structure and Functions – Biological properties of Antibodies – Synthesis of Antibodies – Vaccines and its types.

Unit III

Immune response: Antigen: Antibody reaction - Primary immune response - Secondary immune response – Humoral immunity – Cell mediated Immune response – Role of B cells in Antibody production – Cytokines – Lymphokines .– Heparin.

Unit IV

Major Histocompatibility Complex in man; Human Leukocyte Antigen (HLA)– Complements: Salient features, Functions – Hypersensitivity types- Anaphylaxis – Auto Immune diseases – Immunodeficiency diseases.– types– primary and secondary.

Unit V

Immunological Techniques: Agglutination – Precipitation – Simple double and single radial immune diffusion – Counter current and Rocket – Immunoelectrophoresis – ELISA – Western Blotting– Southern Blotting – Northern Blotting – WIDAL–VDRL test– Hybridoma technology.

Total topics	Local	Region	National	Global
51	1	1	1	51

Books for Reference:

1. Nandhini Shetty
(1994) Immunology, Introductory Text Book, New Age Int. (P) Ltd. Publications, New Delhi.
2. Dulsy Fatima et al., (2000) Immunology, Saras Publications, Nagercoil, Tamil Nadu.
3. Roitt, (3rd Edition) Immunology, Crover Medical Publishing Company, London
4. Barret, J.T. (1983) Text Book of Immunology (5th Edition), The C.V. Mos by Company.
5. Richard, H.M. (1992), Immunology (2nd Edition), Williams and Wilkins, Baltimore Maryland.
6. Hidemann, W.H. (1980) Essentials of Immunology, Elsevier Science Publishing Co. Inc.
7. Weinn. D.M. and Steward, L. (1993), Immunology, Singapore Publishers Private Ltd.,

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5CC6	Immunology					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 (✓) = 37 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER– V

Coursecode:20UZO5CC7

Instruction:Hours:5

Credit:5

ExamHours:3

InternalMarks:25

ExternalMarks: 75

CORECOURSEVII–ECOLOGY

Course Outcomes:

On completion of the course students will be able.

- The student to present an overview of diversity of life forms in an ecosystem, will be able to differ between Qualitative & Quantitative study.
- The learner can correlate choice of habitat for organisms to Abiotic Factors, aspects of energy transfer.
- To explain the necessity for and adaptations, providing examples.
- The learner can understand the reasons and capable of managing pollution and after effects.
- The learner will be able to understand the value & need of Biodiversity conservation

Unit I

Ecological concepts

Concept of Ecosystem structure & function – Abiotic factors – Light, Water, Temperature and Soil and their impact – Limiting factors – Concept of Species – Population dynamics and Growth curves – Population Ecology – Community Ecology.

Unit II

Nutrient cycles / Biogeochemical cycles & Interactions: Carbon, Sulphur, Nitrogen and Phosphorous – Food chain & web – Pyramids & Trophic levels, Energy flow – Animal relationships: Mutualism – commensalism – parasitism – competition – predation.

Unit III

Habitat Ecology

Ecosystem: characteristic features, types and faunal adaptations in Freshwater (Lotic & lentic) – Marine, estuarine, mangrove, tundra, Savanna, cave, forest and desert ecosystems – Ecotone edge effect – Significance Conservation of wetlands – Ecological succession – Ecological effects of dams, hydroelectric projects – Aquaculture.

Unit IV Pollution:

Types, causes, effects (with examples) & management of Land, Water, Air, Thermal and Pesticide pollution – Nuclear Hazards – Management of Solid waste, Plastic waste, Medical waste and e-waste – Global warming and climate change.

Unit V

Conservation Biodiversity: Definition, loss & cause – IUCN – CITES – Brief outlines of Indian laws of conservation – Biodiversity hotspots in India – Indian Endangered species & conservation – Community reserves – Sanctuaries, National parks, Tiger reserves in Tamil Nadu – Afforestation & Deforestation – Human animal conflicts.

Total topics	Local	Region	National	Global
37	2	3	10	26

Booksforreferences:

1. ArumugamNConceptsof Ecology, Saras Publication, Nagercoil.
2. GuptaPK, Cytology, Genetics & Evolution, Rastogi Publications, Meerut.
3. VermaPS, &AgarwalVK, Environmental Biology: PrinciplesofEcology, SChandPublishers, NewDelhi.
4. SharmaPD, ElementsofEcology, RastogiPublications, Meerut.
5. ChapmanJL&ReissMJ, Ecology: PrinciplesandApplications, CambridgeUniversityPress, New Delhi.
6. OdumEP, FundamentalsofEcology, W. B.SaundersCollegePublishing, Philadelphia.
7. ArumugamNOrganicEvolution, SarasPublication, Nagercoil.
8. CaughleyG, SinclairAR. Wildlifeecologyandmanagement. BlackwellScience.
9. Divan S, RosencranzA.Environmentallawandpolicyin India:Cases,materialsandstatutes.New Delhi: Oxford UniversityPress.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5CC7	Ecology					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(✓)=38Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode: 20UZO5CP5

Instruction:Hours:4

Credit:3

ExamHours:3

InternalMarks:40

ExternalMarks:60

COREPRACTICAL- V

ANIMALPHYSIOLOGY, IMMUNOLOGYANDECOLOGY

Objectives:

- To impart an overview of basic physiological functions of various organs system in human.
- To make an awareness about various effects of pollution and its management.
- To make awareness to the students about how the structure–function relationship synchronise along with the molecular signals.
- Students are able to understand immunological techniques.

Course Outcomes:

- An understanding of invertebrate and vertebrate animal physiology, emphasizing control mechanisms and response strategies used to cope with different external environments.
- Students will appreciate how physiological plasticity is key to maintaining and adjusting physiological processes in terrestrial and aquatic animals.
- Acquire knowledge on Immunological techniques.
- Familiarize the modern laboratory techniques applicable to the diagnosis and monitoring of diseases involving the immune system.
- Understand analytical estimation procedures of chief nutrients

Animal Physiology

1. Human Salivary Amylase activity in relation to Temperature and pH.
2. Effects of Temperature on the ciliary activity of Freshwater Mussel and calculation of Q₁₀
3. Identification of Nitrogenous Waste Products.
4. Total count of RBC and WBC & Differential count of WBC.
5. Quantitative tests for Carbohydrates, Proteins, and Lipids.
6. Simple tests for Sugar, Albumin, and Urea in Human Urine.
7. Estimation of Haemoglobin.

Spotters

Centrifuge, pH meter, Colorimeter, ECG, Sphygmomanometer, Pregnancy test kit, Haemoglobinometer, Haemocytometer, Amino acids Model.

Immunology

Primary and Secondary Lymphoid organs in fish – Immunoglobulins: IgA, IgG, IgM and IgE.

Spotters: Immunoelectrophoresis, ELISA, Blotting techniques: Southern, Northern, Western.

Ecology

1. Estimation of dissolved oxygen.
2. Estimation of salinity.
3. Estimation of Calcium.
4. Mounting and identification of plankton (freshwater/ marine).
5. Construction of a food web diagram based on a field visit.
6. Spotters: Animal association, Intertidal fauna, Secchi disk, Maximum and minimum thermometer, Barometer, Luxmeter, Turbidity meter, Electrical conductivity meter.
7. Visit to a local polluted area; Solid waste/ sewage treatment plant.

Total topics	Local	Region	National	Global
16	12	0	0	4

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5CP5	Animal physiology, Immunology & Ecology(P)					4	3			
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(✓)=35 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5MBE1:1

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks:75

MAJOR BASED ELECTIVE ECONOMICENTOMOLOGY

Course Outcomes:

On completion of this course students will be able to:

- Understands role of insects in agriculture.
- Studies insect structure and function.
- Realising various insect pests of various food, fibre, oil and other crops.
- Learn to apply various agricultural equipments.
- Understands insect pest management.
- Practices will give hand on training to the learner.

UNIT I

Insect Pests: Definition – Classification – Primary and Secondary pests – Major and Minor pests – Pests of Paddy – Sugarcane – Cotton, Their Biology, Nature of damage and management methods (Any four Major pests for each crop) – Pest outbreak – Pest resurgence – Pests of stored products and their Management methods.

UNIT II

Principles of insect control: Prophylactic measures; An overview of cultural, mechanical, physical, biological and chemical methods – Pesticides: classification – types of pesticide formulation – mode of action – toxicity – Nonconventional methods of Insect Management: Insect Growth Regulators (IGRs) – Repellents – Antifeedents – Pheromones – Chemosterilants – Irradiation – Quarantine methods – Botanical Pesticides and their use in management of insect pests of crops

UNIT III

Integrated Pest Management (IPM): Definition and Integration of methods – Potential components of IPM and its application – Insect plant interactions – Pest – Predator Complex – Ecological balance – Economic Threshold Levels (ETLs) – LD50 – LC50.

UNIT IV

Beneficial insects: Economic importance of honey bee – silk worm – lac insect – Pollinators – Soil builders – scavengers – Biological control agents of Insect Pests: Pathogens – Parasites and Predators – Utilization of Biocontrol agents in managing insect pests.

UNIT V

Insects and Diseases: Biology of insect vectors *i.e.*, Housefly, Mosquito, Flea, Pediculus and Cockroaches– Mode of transmission pathogens and epidemiology of typhoid fever – Dengue – plague – Relapsing fever.

Total topics	Local	Region	National	Global
45	5	10	5	25

Books For References

1. David, B.V. 2001. Elements of Economic Entomology. Popular Book Depot, Chennai.
2. Fenemore, P.G. and Prakash, A. 2006. Applied Entomology. New Age International (P) Limited Publishers, New Delhi.
3. Chapman, R.F. 1988. The Insects Structure and function. Cambridge University Press, U.K.
4. Kumar, A. and Nigam, P.M. 2003. Economic and Applied Entomology. Emkay Publications, Delhi.
5. Pedigo, L.P. 2003. Entomology and pest management. Pearson Education (Singapore) Pvt. Ltd., Delhi.
6. Prakash, I. and Mathur, R.P. 1987. Management of Rodent Pests. ICAR, New Delhi.
7. Singh, R. and Sachan, G.C. 2004. Elements of Entomology. Rastogi Publications, Meerut.
8. Fitzwater, W.D. and Prakash, I. 1989. Handbook of vertebrate pest control. ICAR, New Delhi.
9. Ambrose, D.P. 2004. General Entomology. Kalyan Publishers, West Bengal.
10. Rathinasamy, T.K. 1986. Medical Entomology. S. Viswanathan and Co., Madras, India.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5MBE1:1	Economic Entomology					5	4			
Course		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
Outcomes (COs)		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓		✓			✓	✓	✓	✓
CO2		✓	✓	✓		✓		✓	✓	✓	✓
CO3			✓	✓		✓	✓	✓	✓	✓	✓
CO4		✓	✓		✓			✓	✓	✓	✓
CO5			✓	✓		✓	✓	✓	✓	✓	✓
Number of Matches(✓)=36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER– V

Coursecode:20UZO5MBE1:2

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks: 75

MAJORBASEDELECTIVE

WILDLIFECONSERVATIONANDMANAGEMENT

Course Outcomes:

On completion of this course student will be able to:

- Understand the IUCN categories.
- Understand the distribution and biology of Indian wildlife including their conservation status.
- Gain insight on the different methods and projects implemented including various laws.
- To know the acts and regulations for the conservation of wildlife.
- To know Zoos, Zoological Parks, Wildlife Sanctuaries, National Parks & Tiger Reserves.

Unit I:

Wildlife Management: Basic concepts and principles – Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA – WWF– Project Tiger–Project Elephant–Project Crocodile

Unit II:

Evaluation of Wildlife habitat: Define habitat, Forest habitat types – basic survey techniques of habitats – Vegetative analyses – Point centered quadrat, Quadrat, strip transect– Habitat manipulation: Food, Water, shade, impact and removal of invasive alien species

Unit III:

Population Estimation: Basic concepts and applications – Direct count (block count, transect methods, Point counts, visual encounter survey, waterhole survey) – Indirect count (Call count, track and signs, pellet count, pugmark, camera trap, DNA fingerprinting and aerial photography).

Unit IV:

Human–animal Conflicts: Basic concepts, reason for conflicts – Identification of damages caused by wild animals and control measures – Case studies: Elephant, gaur, wild boar, monkey, tiger and leopard – Translocation of Wild animals: Principles, Methods and application.

Unit V:

Zoos, Zoological Parks, Wildlife Sanctuaries, National Parks & Tiger Reserves: Definition in-situ and ex-situ conservation, formation, management and administration – Case studies; VOC park zoo – Arignar Anna Zoological Park – Srivilliputtur Wildlife Sanctuary – Vedanthangal birds sanctuary – Mukkuruthi National Parks – Guindy National Parks – Mudumalai Elephant and Tiger Reserves – Periyar Tiger Reserves – Nilgiri Biosphere Reserve.

Total topics	Local	Region	National	Global
34	11	2	10	11

BooksforReferences:

1. Saharia, V.B.1982WildlifeinIndia,NatarajPublishers,DehraDun
2. Seshadri,B.1986India’sWildlifereserves,Sterling Pubrs Pvt.Ltd.,NewDelhi
3. Giles,R.H.Jr.(Ed)1984.Wildlife ManagementTechniques3rdedition.The wildlifeSociety,Washington.D.C.NatarajPublishers,Dehradun.India
4. Dasmann, Rf.1964, Wild life Biology. John and Wiley and sons Newyork. Pp231.
5. Robinson, Wl. andEric, G. Bolen, 1984.Wildlife Ecology and Management MacMillan Publishing Co, Ny. Pp478.
6. B.Sc.Zoology(WildlifeBiology)2013 -14onwardsAnnexureNo.24BPage2of13SCAADate:24.04.2015

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5MBE1:2	Wildlifeconservationand Management					5	4			
Course		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
Outcomes(COs)		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓	✓		✓			✓	✓	✓	✓
CO2		✓	✓	✓		✓		✓	✓	✓	✓
CO3		✓	✓	✓		✓	✓	✓	✓	✓	✓
CO4		✓	✓		✓			✓	✓	✓	✓
CO5			✓	✓		✓	✓	✓	✓	✓	✓
Number of Matches(✓)=37Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER-IV

Coursecode:20UZO5MBE1:3

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks:75

MAJOR BASED ELECTIVE FOOD NUTRITION AND HEALTH

Course Outcomes:

On completion of this course student will able to:

- Appreciatetherelationship betweenfood,nutritionandhealth.
- Explaindigestion,absorption,functionsandfoodsourcesofvariousnutrients.
- Understandthe concept ofbalanceddietsandmenuplanning.
- Describedifferentmethodsofcookingandwaystopreventnutrient losses.
- Planandpreparemealsandnutritiousdishesforvariousagegroupsandassessnutritionalstatu sofadults.

Unit1

Introduction to Food and Nutrition: Basic terms used in study of food and nutrition – Methodsof assessment of nutritional status – Functions of food–physiological, psychological and social –Understandingrelationshipbetweenfood, nutritionandhealth.

UnitII

Nutrients:Classification –Digestion – Absorption –Functions –dietarysources –RDA – clinicalmanifestations of deficiency–excess of the following in brief: Energy– Carbohydrates – lipids–proteins

Unit III

Vitamins: Fat soluble vitamins–A, D, E and K –Water soluble vitamins – thiamine, riboflavin,niacin, pyridoxine, folate, vitamin B12 and vitamin C–Minerals: calcium, iron, iodine, fluorine, copper and zinc–Deficiency of vitamin A.

UnitIV

PlanningBalancedMealsandSelectionofHealthyFoods:Food Groups–Concept of Balanced Diets – Mal nutrition—Healthy and Fad Diets – Factor saffecting meal planning

UnitV

Methods of Cooking and Nutrient Retention: Dry, moist, frying - microwave cooking–

Advantages, disadvantages–Effect of various methods of cooking on foods and nutrients–
Preventing nutrient losses.

Total topics	Local	Region	National	Global
31	1	1	1	28

Books for References

1. Bamji MS, Krishnaswamy K, Brahman GNV (2016). *Textbook of Human Nutrition*, 4th edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
2. Chadha R and Mathur P eds. (2015). *Nutrition: A Lifecycle Approach*. Hyderabad: Orient Blackswan.
3. Longvah T, Ananthan R, Bhaskarachary K and Venkaiah K. (2017). *Indian Food Composition Tables*. National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India, Hyderabad.
4. Seth V, Singh K, Mathur P. (2018). *Diet Planning Through the Lifecycle Part I: Normal Nutrition – A Practical Manual*. 6th Edition. Delhi: Elite Publishing House.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5MBE1:3	Food nutrition and health					5	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 (✓) = 34 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5SBE2:1

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILL BASED ELECTIVE

APPLIED ZOOLOGY

Course Outcomes:

- Students will also know about the planning and construction of vermin–farm, which will help them to start up with small scale vermi–farm.
- Students will learn the types, organization and life history of honey bees for production of honey–as an apiculture and the economic importance of Sericulture with global perspective.
- To understand scope and status of Aquaculture and to know the habitat, food & feeding of fowls. They will understand the breeding and rearing of chickens, even about the disease and products of poultry.
- To know about the different breeds of buffaloes and cows.
- To understand status of Dairy industry and the role of cooperative societies. About the management, control of parasites and disease of livestock's.

UNIT I

Vermiculture: Classification of earthworm; Species of Earthworms – Life cycle of *Lampitoma mauritii*– Preparation of vermin bed – Vermiwash– Vermicompost – Economic importance – Earthworms in medicine – bio waste management –Organic farming.

UNIT II

Apiculture: Classification of honey bee–Species of Honey Bees – colonial structure of honey bee – Biology of Honey bee – Types of bee hives –Extraction of honey – Nutritive and medicinal value of honey.–

Lac culture: Classification of lac insect – species of lac insect – host plant – Types : Life cycle of Lac insect – Extraction of Lac – Processing, purification – Economic importance of Lac–Uses of Lac: Medicinal, Industrial and Ornamental.

UNIT III

Sericulture: Classification –Species; Life cycle of *Bombyxmori*–Rearing of silk worm –Paraffin paper rearing – Box rearing – New net method – Co-operative methods –Moriculture – types of mulberry plants – planting methods –Diseases of silk worm: Protozoan – Bacterial –Viral diseases (each two) –Reeling of silk –Economic importance of sericulture – Marketing of silk–Mari culture

UNIT IV

Aquaculture: Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed – Induced breeding – Fish diseases – rearing methods – Furunculosis– Epizootic Ulcerative Syndrome (EUS) – Vibriosis – Fresh water Prawn culture – Ornamental fish culture.

UNIT V

Poultry farming: Types of fowls – Rearing methods of Broilers and Layers –Poultry nutrition – Poultry diseases (NCD, IBV & Fowls) – Marketing of egg – Issues and limitations of poultry farming.**Dairy farming:** Breeds of Dairy animals (Cow, Buffalo and Goat) and their characteristics – Dairy products.

Total topics	Local	Region	National	Global
56	9	26	9	12

Booksforreferences

1. Ganga.GandSulochanaChetty.J.,AnintroductiontoSericulture(2ndedition)Oxford&IBH Publishingcompany.
2. Shukla.G.S.andUpadhya.V.B.EconomicZoology(RastogiPublications).
3. Ahsan,Jand Sinha,S.P.AHandbookonEconomicZoology,S.Chand&Co.
4. Sardersingh–BeekeepinginIndia.
5. Santhanam–Aquaculture.
6. Ullal.S.R. andNarasimhanna, M.N–CentralSilkBoard,Govt.ofIndia, Bombay.
7. Singh– Livestockand poultryproduction.
8. Jhingran–Fishandfisheries.
9. T.V.R. Pillai–CoastalAquaculture.
- 10.Maineproductexport development authority–Freshwaterfishes, Ornamentalfishes,Shrimphculture–MPEDAPublicationseries.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5SBE2:1	Applied Zoology					2	2			
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(✓)=36Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5SBE2:2

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILL BASED ELECTIVE VERMITECHNOLOGY

Course Outcomes:

On completion of the course students will be able to:

- To understand the principles of site selection for vermiculture.
- To describe different types of vermi-bed practices.
- To know the criteria for vermiculture species selection and water quality management.
- To describe nutritional requirements and feed formulation for vermiculture organisms
- To acquire knowledge of vermicomposting in Agriculture and Horticultural practices

Unit I

History of Indian earthworm – need for vermiculture – Earthworm classification – Morphology and anatomy – Biology of *Lampitoma ruitii* – roles of earthworm in composting.

Unit II

Vermicomposting materials and their classification – Feeding habits and food for composting worms.

Unit III

Vermicomposting methods: Small scale and large scale pit methods – heap method – window method etc – Factors affecting vermicomposting such as - Temperature, pH, moisture etc.,

Unit IV

Vermicomposting in Homes – Maintenance of vermicomposting beds – Harvesting the worms – Earthworm predators – parasites and pathogens.

Unit V

Application of vermicomposting in Agriculture and Horticultural practices – Advantages of vermicomposting – Effect of vermicompost in soil properties.

Total topics	Local	Region	National	Global
20	4	10	3	3

Books for references

1. Edwards C.A and Batear, B. 1996. Biology of Earthworms. Chapman and Hall. London. Ismail, S.A. 1997.
2. Vermicology – The Biology of Earthworms. Orient Longman. India.
3. Ranganathan L.S. 2006. Vermibiotechnology from soil health to human health. Agrobios India.
4. Gupta P.K. 2008. Vermicomposting for sustainable agriculture. Agrobios. India.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZ05SBE2:2	Vermitechnology					2	2			
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(✓)=35 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER– V

Coursecode:20UZO5SBE2:3

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILL BASED ELECTIVE AQUACULTURE

Objective:

To study the economic importance of aquaculture and acquire skills in establishing Fish farm.

Course Outcomes:

On completion of the course students will be able

- Explain the concepts of fisheries.
- Gain the knowledge about freshwater fish culture and marine aquaculture like oyster, shrimp etc.,
- Comparative analysis of aquaculture.
- Imparts the techniques of fish culture and disease managements.
- Explore the fish marketing and quality control norms.

UnitI

Scope of aquaculture in India–Definitionof aquaculture Principlesofsiteselectionforfishfarms – water, soil, typesandotherparameters.

UnitII

Types of aquaculture–Monoculture–Polyculture–Integratedfarming –Pondculture–Penand Cage culture –Raftculture –Race wayculture–Warmandcoldwaterfishculture.

UnitIII

Criteriaforselectionofvariety–Seedprocurementandstockingmanagement. – Waterqualitymanagement–cultivable species of fishes, integrated forming, –Advantages of poli culture and mono culture.

UnitIV

Nutritionalrequirementsandformulationofartificialdiets – Breeding andculture offreshwaterfishes: Catla–*Mrigala*–Rohu–Tilapia.

UnitV

Mariculture: Cultureofedibleoyster–pearloyster – mussels –clams – seurchins – seaCucumbers–Marketing local and global.

Total topics	Local	Region	National	Global
30	11	9	7	3

Booksforreferences:

1. FishandFisheriesinIndia,Jhingran,V.G.,1982,HindustanPublishingCorporation,NewDelhi
2. PrinciplesandpracticesofPondAquaculture,Annan,J.F, R.O.SmittermanandG. Tehebenoglous(Eds),1983,OreganStateUniversity,U.S.A.
3. HomeAquarium:aquaticgemaandtropicalfish,1970,MakinosJapanPublications

RelationshipMatrixforCOs,POsandPSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5SBE2:3	Aquaculture					2	2			
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(✓)=34Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5SBE3:1

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILLBASEDELECTIVE

HEALTH EDUCATION

Course Outcomes

On completion of the course students will be able to

- To understand the principle and types of food.
- To describe different types of pollution.
- To know the preventive methods against air and waterborne diseases.
- To describe nutritional requirements and feed for good health
- To acquire knowledge about Mental health

UNIT I

Health: Definition, Dimensions of health – **Health education:** Definition, principles – **Nutrition and health:** Balanced diet – macronutrients – micronutrients – vitamins and minerals – **Food hygiene:** perishable: nonperishable – shelf life – sterilization – food poisoning.

UNIT II

Environment & Health: Water – Air – Noise pollution – Pollutants: Effects, prevention and control – Effects of smoking and alcoholism – Causes effects and control measures of Life style diseases: Stroke – Obesity – Type I diabetes – Type II diabetes.

UNIT III

Concept of disease: Phases of disease – Prepathogenesis and Pathogenesis – concept of prevention and control – **Common Helminthic and Arthropod borne diseases**– **Immunity:** Types of vaccinations – Live – Attenuated – Killed – Toxoid – Transgenic vaccines.

UNIT IV:

Air and Water Born Diseases: Bacterial and Viral diseases – Causative agents and factors – Mode of transmission: air – water – droplets – contact – Symptoms and treatment of Tuberculosis – Typhoid – cholera – Hepatitis A & B. – dysentery – gastroenteritis

UNIT V

Mental Health: Definition, characteristics – causes and prevention of mental health – Occupational health & hazards, prevention – Health care services – Primary health care – Hospitals – Principles of First Aid – First aid procedures for Accidents, food poisoning, snake bites and heart attacks.

Total topics	Local	Region	National	Global
48	7	4	10	27

BooksForreferences:

1. E.Park&Park:TextbookofPreventiveandSocialMedicine(PublishedbyBanarsid
osBhanot,1stEdition,1278NapierTown.)
2. Leelavathy.S.Nair,Revisedenlargededition.ATextbookofInvertebrates,SarasPu
blications.2001

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5SBE3:1	Healtheducation					2	2			
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(✓)=38Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5SBE3:2

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks:75

SKILL BASED ELECTIVE

POULTRYSCIENCE

Course Outcomes:

On completion of the course students will be able to

- To know the habitat, food & feeding of fowls.
- They will understand the breeding and rearing of chickens, even about the disease and products of poultry.
- Students will also know about the planning and construction of poultry farm, which will help them to start-up with small scale poultry farm.
- Students will understand the economic importance of breeds with global perspective.
- Students will understand about the equipments, management, pest, predators and disease of chicks

Unit I

Introduction to poultry keeping – poultry industry in India – important breeds of poultry – desi, – Chittagong – leghorn.

Unit II

Construction of poultry house – types – layer house – broiler house – poultry house equipments

Unit III

Poultry feeds – feed formulation – essential nutrients – nutrition deficiency syndrome – ratio for chick and broiler.

Unit IV

Hatchery – nutritional value of egg – marketing of egg – by products of poultry.

Unit V

Common diseases of poultry: raniket – coccidiosis – coryza – vaccination programme.

Total topics	Local	Region	National	Global
24	2	10	6	6

Books for References:

1. Modern aspects of commercial Poultry keeping. Gnanamani A.R. Giri Publication, Madurai.
2. A text book of Animal Husbandry Banerjee G.C. Oxford & IBH publishing Co Pvt. Ltd., New Delhi. 8th Edition
3. Poultry keeping in India. Naidu P.M.N. Indian Council of Agricultural Research, New Delhi
4. Poultry production. Singh R.A. New Delhi

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
V	20UZO5SBE3:2	Poultryfarming					2	2			
Course		Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
Outcomes(COs)		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					✓		✓	✓	✓	✓	✓
CO2			✓			✓		✓	✓	✓	✓
CO3			✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓			✓			✓	✓	✓	✓	✓
CO5	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Number of Matches(✓)=35Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER– V

Coursecode:20UZO5SBE3:3

Instruction:Hours:2

Credit:2

ExamHours:3

InternalMarks:25

ExternalMarks: 75

SKILLBASEDELECTIVE

DAIRYTECNOLOGY

Course Outcomes:

On completion of the course students will be able to

- To understand status of Dairy industry and the role of cooperative societies.
- To explore the importance of Livestock to agriculture and its relation to national economy.
- To know about the different breeds of buffaloes and cows.
- To know about the management, control of parasites, bacterial and viral disease of livestock's.
- To know about the causative agent of different types of microbial diseases and its control measures.

Unit I

Dairy farming: Definition–, Scope–Role of Co-operative societies in milk production- marketing -General dairy farm practices – identification, dehorning, castration, exercising, grooming, weighing. Care of animals at calving and management of neonates.

Unit II

Dairy breeds of India and its classification– Exotic cow breeds: Jersey–Red Sindhi–Indian breeds: Kangayam–Buffalo: Murrah.

Unit III

Feed and Nutrition: Feed nutrients required by animal body. – Feed resources for milk production and their nutritive values – Measures of feed energy. Nutrients requirements for growth and milk production. Feeding standards.

Unit IV

Milk: Composition–Nutritive value–Pasteurization of milk–Milk products: Butter–Ghee–Cheese.

Unit V

Bacterial diseases: Anthrax, Mastitis–Viral diseases: Foot, mouth disease–Non-contagious disease, Milk fever

Total topics	Local	Region	National	Global
32	3	3	21	5

Books for References:

1. Ibraheem Kutty C.
And Sheeba Khamer, Milk Production and processing. Daya publishing House, Delhi, 2014.
2. Banerjee G.C. A text book of Animal Husbandry Oxford & Ltd., New Delhi. 8th Edition.
3. The complete technology book on Dairy and Poultry industries with farming and processing. National Institute of Industrial Research Board, Delhi. 2012.
4. Hand book of Dairy farming to produce milk with packaging. EIRI

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
V	20UZO5SBE3:3	Dairytechnology					2	2			
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(✓)=37 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Coursecode:20UZO6CC8

Instruction:Hours:6

Credit:6

ExamHours:3

InternalMarks:25

ExternalMarks:75

CORECOURSEVII: DEVELOPMENTALBIOLOGY

Course Outcomes:

On completion of the course students will be able to:

- The learner to understand methodological approaches to the study of embryonic development and the characteristics of the principal experimental models.
- The students to identify embryonic structures in preparations, photographs and diagrams.
- The students to develop an idea, how to arrange sequences in developmental processes in order.
- The learner to understand the derivatives of embryonic structures.
- The students will be able to attain a basic conceptual knowledge of the principal cellular mechanisms of development and identify the genetic and molecular elements that are involved.
- The students will be able to explain the clinical implications of development and the mechanisms that intervene in developmental alterations.

Unit I

Gametes & Fertilization

Basic concepts of developmental biology – Structure and types of Spermatozoa – Mammalian egg – Egg membranes – Patterns of egg – organization of egg – origin of polarity – Spermatogenesis – Oogenesis – Fertilization – Mechanism – theories and significance – Parthenogenesis.

Unit II

Blastulation & Gastrulation: Cleavage; Planes and Patterns – Factor controlling cleavage, Fate map and its construction – Blastulation, Morphogenetic movements – Gastrulation of frog – Gastrulation of chick.

Unit III Organogenesis

Development of Brain, Eye and Heart in frog – Development of Nervous system in chick – Foetal membranes in chick – Placentation in Mammals – Development of Pro, Meso and Metanephric kidneys.

Unit IV

Applied Embryology

Organizer concept – Structure – mechanism of induction and competence – Nuclear transplantation – teratogenesis – Regeneration: types, events and factors – Embryonic stem cell significance – Methods to culture embryo.

Unit V

Embryological Techniques

Ostrous, Menstrual cycle and menopause – Pregnancy – Trimesters, development –

Erythroblastosis foetalis–Twins: types–Infertility- causes–Test tube baby– Assisted Reproductive Technology–Embryo transfer–Amniocentesis.

Total topics	Local	Region	National	Global
43	0	0	0	43

Books for reference

1. Arumugam N A Text Book of Embryology, Biotechnology Saras Publication Nagercoil.
2. Balnisky B I An Introduction to Embryology, W.B. Saunders and Co.
3. Berril N J, Kars G (1986). Developmental biology, McGraw Hills
4. Gilbert S F (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland and, Massachusetts, USA.
5. Majumdar N N Vetebrate embryology; Tata McGraw–Hill, New Delhi.
6. Verma P S & Agarwal V K Chordate Embryology, S. Chand Publishers, New Delhi.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	20UZO6CC8	Developmental Biology					6	6			
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 (✓)=36		Relationship:									

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER VI

Coursecode:20UZO6CC9

ExamHours:3

Instruction:Hours:6

InternalMarks:25

Credit:6

ExternalMarks:75

CORECOURSEIX: EVOLUTION

Course Outcomes:

On completion of the course students will be able

- Students to describe the history and development of evolutionary thought list and describe the evidence for evolution and its required corollaries and mechanisms by which evolution occurs.
- Students to describe the history of life on earth.
- Students to explain how speciation occurs and reasons for extinction.
- Students can make knowledge of how major vertebrate forms evolved in the earth.
- To gain an idea of the distribution of the various faunal components.

Unit I

Evidences of Evolution

Origin of life: Abiogenesis – Biogenesis – Cosmic theory – Biochemical origin of life – Urey– Miller experiment – Evidences of evolution: Morphological, Anatomical, Embryological, Physiological Biochemical, paleontological.

Unit II

Theories of Organic Evolution

Lamarckism– Neo Lamarckism– Darwinism – Neo Darwinism – Mutation theory– New version of mutation theory– Modern Synthetic theory of evolution – Natural selection – Convergent– Divergent evolution

Unit III:

Adaptation & Isolation

Adaptation– Colouration and Mimicry (types and significance)– Non adaptive traits– Neotony and Significance– Isolation: Mechanism and Speciation – Hardy Weinberg Equilibrium– Genetic drift– Basic outlines of Molecular evolution.

Unit IV

Animal Distribution

Zoogeographical regions – Palaearctic, Nearctic, Neotropical, Oriental, Australian and Ethiopian regions– their Climatic and faunal peculiarities– Wallace line, Discontinuous distribution– Continental Drift – Geological time scale (Up to periods for Paleozoic & Mesozoic era; up to epoch for Cenozoic era).

Unit V

Evolution of Higher forms

Evolutionary significance of Dipnoi – Origin of Amphibians – Golden age of Reptiles –

Major types of Dinosaurs, reason for extinction– Affinities of Archaeopteryx –Outlines of evolution of Man–Outlines of evolution of Horse– Dating of fossils

Total topics	Local	Region	National	Global
39	0	0	0	39

Books for references

1. Verma PS, and Agarwal VK Cell Biology, Genetics, Evolution and Ecology, S Chand and Co Publishers, New Delhi.
2. Gupta PK, Cytology, Genetics and Evolution, Rastogi Publications, Meerut.
3. Arumugam N Organic Evolution, Saras Publication, Nagercoil.

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	20UZO6CC9	Evolution					6	6			
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(✓)=35 Relationship:											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High

SEMESTER – VI

Coursecode: 20UZO6CP6

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:40

ExternalMarks:60

CORE PRACTICAL VI DEVELOPMENTAL BIOLOGY AND EVOLUTION

Objective:

- To elucidate the segmental changes in pattern, development and organization of the developing embryo and to highlight the interaction of cells and their role in fetal formation.
- Wealth of our natural resources and conservation measures to be taken and create awareness of the laws governing environment.

Course Outcomes:

- Be able to list the types of characteristics that make an organism ideal for the study of developmental biology.
- Be familiar with the events that led up to fertilization.
- Be able to describe the first four rounds of cell division in different groups.
- Be able to describe the stages and cellular mechanisms for gastrulation.
- Able to understand difference between specification and determination.

Developmental Biology

1. Observation of the structure of live spermatozoa of Bull.
2. Observation of prepared microslide to study
 - a. Egg, cleavage, blastula and yolk plug stage in frog.
 - b. Hen's egg
 - c. Metamorphosis of frog
 - d. Chick embryo – 24hrs, 36hrs, 48hrs, 72 hrs and 96hrs

Evolution

1. Animals of evolutionary importance: Peripatus, Limulus, Archaeopteryx.
2. Homologous organs: Forelimbs of Frog.
3. Analogous organs: Wings of Insects and Birds.
4. Fossils: Trilobite, Nautilus.
5. Mimicry: Leaf insects, Stick insects, Monarch and Viceroy butterfly.
6. Colouration: Chameleon, Lycodon.

Total topics	Local	Region	National	Global
11	6	0	0	5

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
VI	20UZO6CP6	DevelopmentalBiology& Evolution(P)					5	4			
CourseO utcomes (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(✓) =34Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Coursecode:20UZO6MBE2:1

ExamHours:3

Instruction:Hours:6

InternalMarks:25

Credit:4

ExternalMarks: 75

MAJOR BASED ELECTIVE BIOCHEMISTRY AND BIOPHYSICS

Course outcomes:

On completion of the course students will be able to:

- Able to familiarize the instrumental principles and their techniques
- Learn the types of cell communication and the structures associated.
- Describe the structures and various cellular functions associated with the macromolecules found in cells.
- Learn the principles and mechanism of protein synthesis.
- To acquire advanced knowledge of molecular biology of prokaryotes, and eukaryotes.

Unit–I

Biochemical Compounds

Structure of Atoms, Molecules – chemical bonds – stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, Electrostatic Force) – Biological Importance of Water, pH and Buffers.

Unit–II

Biomolecules

Carbohydrates: Classification – structure, function, properties – Metabolism of carbohydrates: TCA Cycle – Glycolysis – Gluconeogenesis – HMP Shunt – Proteins: Classification – Structural organization of proteins (Primary, secondary, tertiary and quaternary structures) – Amino acids: Definition, Classification, properties,

Unit–III

Biomolecules

Lipids: Classification – structure, function, properties of simple and compound Lipids –

Biological importance of sterols, cholesterol – Phospholipids – Bile acids – Fatty acid Biosynthesis – Beta oxidation of fatty acids.

Unit–IV

Nucleic Acids & Enzymes

Nucleic acids: Composition and Properties of nucleic acids.– Enzymes: Definition,–Classification and functions of enzymes –Co–enzymes –Iso–enzymes –Allosteric enzymes –Abzymes – Bioenergetics – oxidative phosphorylation – coupled reaction – group transfer –biological energy transducers.

Unit–V

Biophysical Techniques

Separation Methods: Sedimentation – Chromatography methods –Spectroscopies – Introduction and applications of FTIR–Mass spectroscopy–. Nuclear Magnetic Resonance (NMR) – Radiation Biophysics–Introduction and medical applications.

Total topics	Local	Region	National	Global
43	1	2	1	39

Books for reference:

1. Satyanarayana, U, (2015), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
2. Avinash Upadhyay, Kakoli Upadhyay and Nirmalendu Nath, (2019), Biophysical Chemistry, Himalya Publications
3. Satyanarayana, U and Chakrapani, U (2009), Essentials of Biochemistry, Books and Allied (P) Limited, Kolkata.
4. Jain, J.L. (2007), Fundamentals of Biochemistry, S. Chand & Co. Ltd., New Delhi. Department of Zoology M.Sc 020., Syllabus–2018–2
5. Stryer, L. (2006), Biochemistry, W.H. Freeman and Co., New York.
6. Chatterjee, H.N. and Spindle, R. (2005), Text Book of Medical Biochemistry, Jaypee Brothers, New Delhi.
7. Nelson, D.I. and Cox, M.M. (2004), Lehninger Principles of Biochemistry, III Edition, Mac Millan Worth Publishers, New York.
8. Devlin, T.M. (2003), Biochemistry, Wiley–Liss, New York.

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
VI	20UZO6MBE2:1	Biochemistryand Biophysics					6	4			
CourseO utcomes (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(✓)=35 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Coursecode:20UZO6MBE2:2

ExamHours:3

Instruction:Hours:6

InternalMarks:25

Credit:4

ExternalMarks: 75

MAJOR BASED ELECTIVE

PARASITOLOGY

Course Outcomes:

On completion of the course students will be able

- Understand the biology behind host–parasite interactions
- Learn about epidemiological concepts of parasitic infections of global importance
- Trained to diagnose, identify and detect some important parasites
- Learn pathological changes associated with parasite infections
- Discuss the role of vectors and intermediate hosts in parasite transmission

Unit I

General concepts: Animal associations and evolution of host – Parasite relationship –Immune response and self–defense mechanisms –immune evasion and biochemical adaptations of parasites –Zoonosis.

Unit II

Leishmaniasis: Sand fly biology in the life cycle of *Leishmania* parasites – critical role for sandfly midgut microbiota in *Leishmania*–development and transmission –epidemiology – detection –protective and pathologic immune responses in leishmaniasis–immune evasion mechanisms –drug targets –mechanism of drug resistance –vaccine strategies.

Unit III

Sleeping sickness: Epidemiology –mode of infection –serum resistance in zoonotic trypanosomes – immunity and immune evasion mechanisms – dynamics of antigenic variation and VSG diversification –drug targets –mechanism of drug resistance –vaccine strategies.

Unit IV

Gastro–intestinal and other parasites: Amoebiasis: Epidemiology –Detection – immunity and immune evasion mechanisms –drug targets – mechanism of drug resistance –vaccine strategies –Schistosoma–Wuchereria, Brugia–Ancylostoma–Trichinella–Dracunculus– Epidemiology–mode of infection –detection –immunity and immune evasion mechanisms – drug targets –mechanism of drug resistance –vaccine strategies.

Unit V

Beyond humans: Parasites of veterinary importance – Parasitic insects – mites – ticks – parasites of insects and their significance – nematode parasites of Animals morphology –biology, lifecycle and infection of crop plants by major plant parasitic nematodes –host parasite interactions.

Total topics	Local	Region	National	Global
50	0	0	0	50

Books for references

1. Foundations of Parasitology, Roberts L.S. and Janovy J., McGraw-Hill Publishers, New York, USA.
2. Modern Parasitology: A Textbook of Parasitology, FEG Cox., Wiley-Blackwell, U.K.
3. Parasitology: A Conceptual Approach, Eric S. Loker, Bruce V. Hofkin

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
VI	20UZO6MBE2:2	Parasitology					6	4			
CourseO utcomes (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(✓)=35 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Coursecode:20UZO6MBE2:3

Instruction:Hours:5

Credit:4

ExamHours:3

InternalMarks:25

ExternalMarks:75

MAJOR BASED ELECTIVE\

TOXICOLOGY

Course Outcomes:

On completion of the course students will be able to:

- Upon completion of this unit, the students should have an understanding of basic principles, factors and effect of toxic substances in the body parts.
- Students should gain knowledge of mechanisms of action for toxic substances also understand the exposure, uptake, metabolism, distribution and excretion of toxicants.
- Students should know different categories of toxic substances/pesticides.
- Students would be able to understand heavy metal toxicity.
- To gain a general view of the topic by bridging human toxicology and ecotoxicology.

Unit I

Definition and scope of toxicology: Eco-toxicology and its environmental significance – Toxic effects: Basic for general classification & nature – Dose Response relationship: Synergism – Antagonism – Determination of ED₅₀– LD₅₀ – Acute– Chronic exposures.

Unit II

Factors influencing Toxicity: Pharmacodynamics–Chemodynamics–dose conversion between animals and human– Diagnosis of toxic changes in liver and kidneys – Metabolism of drugs: paracetamol and aspirin with their toxic effects on tissues.

Unit III

Toxicity testing: Test protocol – Genetic toxicity testing – Mutagenesis– assays: In vitro Test systems – Bacterial Mutation Test – Ames Test – Fluctuation Tests – *In vivo* Mammalian Mutation tests–N repair assays, –Chromosome damage test – Evaluation of Apoptosis necrosis.

Unit IV

Pesticide toxicity: **Insecticides: Organochlorines – Anticholinesterases – Organophosphates – Carbamates – Fungicides – Herbicides – Environmental consequences of pesticide toxicity – Biopesticides: Food Toxicity – Role of diet in cardio–vascular disease and cancer –**

Toxicology of food additives

Unit V

Metal Toxicity: Toxicology of Arsenic, mercury, lead and cadmium –

Environmental factors, affecting metal toxicity effect of light, temperature & pH – noise – colour.

Total topics	Local	Region	National	Global
40	0	1	0	39

Books for references:

1. Klaassen, C.D (8th Eds.). (2013). *Casarett and Doull's toxicology: the basic science of poisons*. New York: McGraw-Hill.
2. John A. Timbrell (4th Edn) (2008) *Principles of biochemical toxicology*. Taylor & Francis Ltd, London,.
3. Smart, R.C., & Hodgson, E. (4th Eds.). (2013). *Molecular and biochemical toxicology*. John Wiley & Sons.
4. Relevant review articles/research papers/handouts of latest development in the subject.

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
VI	20UZO6MBE2:3	Toxicology					6	4			
CourseO utcomes (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(✓)=34 Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Coursecode:20UZO6MBE3:1

ExamHours:3

Instruction:Hours:5

InternalMarks:25

Credit:4

ExternalMarks:75

MAJOR BASED ELECTIVE

BIOINFORMATICS AND BIostatISTICS

Course Outcomes:

On completion of the course students will be able to:

- Deals with the primary and secondary databases, collection, storage and retrieval of databases, knowledge of freeware, software and hardware.
- The sequence databases, sequence format, annotation and archival of databases will be understood.
- The choice of alignment, local alignment, global alignment, scoring matrices, codon usage analysis, RNA fold analysis, splice site identification will also be studied by the students.
- They will understand types of data, their organization and various graphical representation methods to represent data, and will enable students to understand the basic statistics and its importance in research.
- Student will be able to calculate various measures of central tendencies, measure of dispersion and measure of kurtosis and skewness and its importance.

BIOINFORMATICS

Unit-I

Introduction :computer – types of modern computers – operating systems – type of operating systems – applications of MS – WORD – MS – EXCEL – MS – PPT – Documentation and Presentation of Bio Statistical data – Browsers – search engines – Use of Internet – Messenger – E – mail – **Basic Knowledge of Medical transcription.**

Unit-II

Biological databases: Definition – Literature databases – NCBI – Pubmed, – Medline – Protein and Nucleic acid Sequence – databases and their relationship – PIR, Swiss – Prot, Gene Bank – DDBJ – Structural Databases – PDB – SCOP – CATH – Structural visualization tools, RasMol, – Swiss – PDB viewer.

Unit-III

DNA and RNA sequencing: Pairwise sequence Alignment – Scoring Matrices – PAM – BLOSUM –

statistics of alignment scored Dot Plot – local and global alignment – Database searching – FASTA – BLAST – multiple sequence alignment clustalW – Phylogenetic Trees – PHYLIP.

BIOSTATISTICS

Unit-IV

Definition and Scope: Census and sampling methods – collection and presentation of data – Diagrams and graphs; Bar – Pie – Histogram – Line graph – concept to Statistical population and sample characteristics of frequency distribution.

Unit-V

Measures of central tendency: Mean – Median – Mode – Measures of Dispersion – Range, Quartile deviation – Mean deviation – Standard deviation – Test of significance (t-Test) – chi square test

Total topics	Local	Region	National	Global
63	1	0	0	62

Books for Reference:

1. Gupta SP 1996. Statistics – S. Chand and Co., New Delhi.
2. Jerold H. Zar 1984. Bio Statistical analysis [2nd edition] printice Hall of International edition.
3. Goutham Roy 2002. Introduction to Computing and computing lab and Cad Books and allied [pvt] ltd. Kolkata.
4. Christine Solomon. MS. OFFICE for Win – Microsoft office press. Developing Application with MS – OFFICE – Microsoft Office Press.
5. Cynthia Gibbs. Developing Bioinformatics Computer Skills. Sheoff Publishers & Distributors Pvt. Ltd, Mumbai.
6. Arthur. M. Lesk 2003. Introduction to Bioinformatics, Oxford University Press, New Delhi
7. Arthur. M. Lesk, Introduction to protein Structures Oxford University Press, New Delhi, 2000
8. Baxevanis, A and Outlette 2005. Bioinformatics a practical guide to the analysis of genes and proteins, Willy – Interscience, Hoboken, NJ. USA.

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
VI	20UZO6MBE3:1	Bioinformaticsand biostatics					6	4			
CourseO utcomes (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(✓) =35Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Coursecode:20UZO6MBE3:2

ExamHours:3

Instruction:Hours:5

InternalMarks:25

Credit:4

ExternalMarks: 75

MAJOR BASED ELECTIVE

INSECT VECTORS AND DISEASES

Course Outcomes:

On completion of the course students will be able

- To describe the economic classification of insects.
- To understand the types of insect development.
- To know pests of stored products and their control.
- To describe pest control methods and application.
- To understand the production and marketing of pesticides.

Unit I

Introduction: Economic classification of insects – Types of pests – crawling pest – flying insect – rodents and others – types of damage Caused by pests in crops – causes for insects assuming pest status – outbreak of pests.

Unit II

Types of insect development: ametabola – metabola (hemi metabola, holometabola, paurometabola and hypermetabola) – Pests of agricultural importance – their bionomics – lifecycle and control measures of paddy – ground nut – cotton – tomato – coffee – Banana.

Unit III

Pests of stored products and their control: Household pests – cockroach and termites, and their control – pest in relation to public health – rodents and their control – Mosquito borne diseases and their control measures.

Unit IV

Pest control methods and application: cultural, mechanical, biological and chemical methods – classification of pesticides – LC₅₀ and LD₅₀ values – First Aid and precautions in handling pesticides – pesticide spraying appliances – Residual effects of pesticides on nontarget organisms.

Unit V

Pesticide industry: production and marketing – recent trends in pest control – pheromones, attractants, repellants and chemosterilants – Integrated pest management, its importance & applications.

Total topics	Local	Region	National	Global
32	12	9	1	6

Books for Reference:

1. Vasantharaj David and T. Kumaraswami 1988. Elements of Economic Entomology Popular Book Depot, Chennai.
2. Nayar, K.K., Ananthkrishnan, T.N. and B. V. David 1992 General and Applied Entomology Tata McGraw, New Delhi.
3. P.G. Fenemore and Alka Prakash 1997 Allied Entomology, Wiley Eastern Ltd., New York.
4. Wigglesworth J.B., 1994. Insect Physiology, Chapman and Hall, London.
5. Temphare D.B., 1984A. Text Book of Insects Morphology, Physiology and Endocrinology. S. Chand and Co., New Delhi.
6. A. Upadhyaya, K. Upadhyaya and N. Nath, 2003 Biophysical Chemistry, Principles and Techniques, 3rd Ed, Himamalya publishing house.
7. H.B. Bull, F.H. Davis, 1971. An introduction to physical Biochemistry 2nd Ed, Philadelphia
8. Gurumani. N 2006. Research methodology for biological sciences MJ P publ. Chennai.

Relationship Matrix for COs, POs and PSOs

Semester	Code	TitleoftheCourse					Hours	Credits			
VI	20UZO6MBE3:2	Insectvectorsanddiseases					6	4			
CourseO utcomes (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(✓) =36Relationship:High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	VeryPoor	Poor	Moderate	High	VeryHigh

SEMESTER – VI

Course code:20UZO6MBE3:3

Exam Hours: 3

Instruction: Hours: 6

Internal Marks: 25

Credit: 5

External Marks: 75

MAJOR BASED ELECTIVE

ENVIRONMENTAL AND PUBLIC HEALTH

Objective:

Human resources in the science of public health, with a firm understanding of the determinants of health and the public health system in the country.

Course outcomes:

- This course will provide the knowledge and skills necessary to assess their impact on public health and sustainability.
- The health/disease distinction is irrelevant for most decisions and represents a conceptual straight jacket.
- The cause of environmental pollution and design appropriate control measures to improve the health outcomes
- Sophisticated and mature clinical decision making requires that we free ourselves from the disease.
- Develop an arbitrary plan of action to improve the waste disposal methods.

Unit I

Determinants of health – Health indicators; Personal hygiene; Public health; health – Dynamics of disease transmission – host, agents, environment.

Unit II

Concepts of Health and Disease – Nutrition and Health: Classification of foods – Nutritional deficiencies – Vitamin and Mineral deficiencies – Balanced diet – Nutritional requirements of special groups.

Unit III

Environment and Health: Types of Pollution – Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Land pollution. – Radiation – effects; Solid waste and excreta disposal – Impact of pollutants on Health.

Unit IV

Communicable Diseases: Measles, Cholera, Amoebiasis, Malaria, Filariasis, Japanese encephalitis, Swine flu, STD and AIDS. – Non Communicable Diseases: Coronary Heart Disease. Hypertension Diabetes, Obesity, Stroke, Cancer.

Unit V

Health care services in India – Health planning in India – Health Programmes in India, –WHO – Non-Governmental Voluntary Health organizations – First Aid and Nursing methods –Dressing, Care, Duties, Preparations

Total topics	Local	Region	National	Global
25	0	4	4	17

Text books:

1. Park and Park. Text book of Preventive and Social Medicine. M/s. BanarsidasBhanot Publishers, Jabalpur, 1995

Books for Reference:

1. Verma, S. Medical Zoology, Rastogi Publications, New Delhi, 1998

Relationship Matrix for COs, POs and PSOs

Semester	Code	Title of the Course					Hours	Credits			
VI	22UZO6MBE3:3	Public 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(✓) = 36 Relationship: High											

Mapping	1–29%	30–59%	60–69%	70–89%	90–100%
Matches	1–14	15–29	30–34	35–44	45–50
Relationship	Very Poor	Poor	Moderate	High	Very High