#### POST GRADUATE PROGRAM – M. Sc. ZOOLOGY

#### CHOICE BASED CREDIT SYSTEM (CBCSPATTERN)

#### (FOR THE CANDIDATES ADMITTED FROM 2023 - 2024.... ONWARDS) NATURE COURSE TITLE OF THE COURSE TOTAL OF THE MARKS SE EXAM PAPER Μ IH СР DURATION CODE CIA ESE CORE: FUNCTIONAL MORPHOLOGY OF 23PZO1C01 CC 5 4 3 25 75 100 **INVERTEBRATES** (Skill Development) CORE: FUNCTIONAL MORPHOLOGY OF 23PZO1C02 CC 5 4 3 25 75 100 VERTEBRATES (Skill Development) CORE: AQUACULTURE 23PZO1C03 CC 5 4 3 25 75 100 AND FISHERIES (Entrepreneurship) CORE: I BIOSTATISTICS, BIOTECHNIQUES 23PZO1C04 CC 5 75 4 3 25 100 AND RESEARCH METHODOLOGY (*Employability*) ELECTIVE: GENERAL AND APPLIED 23PZO1E01/ ENTOMOLOGY(Entre DSE 4 3 25 75 100 4 23PZO1E02 preneurship) / ELECTIVE: STEM CELL BIOLOGY **23PZO2CP1** PRACTICAL I CC 3 \_ \_ \_ \_ \_ CC **23PZO2CP1** PRACTICAL II 3 -\_ \_ \_ \_ CORE: MOLECULAR 23PZO2C05 GENETICS CC 5 4 3 25 75 100 Π

(Skill Development)

		CORE: HORMONES							
	23PZO2C06	AND HEALTH	CC	5	4	3	25	75	100
		(Skill Development and							
		Employability)							
		PHYSIOLOGY AND						75	
	23PZO2C07	BIOCHEMISTRY	CC	5	4	3	25		100
		(Skill Development and							
		(Employability)							
		CORE:							
	23P702C08	DEVELOPMENTAL	CC	5	Λ	3	25	75	100
	251 202000	BIOLOGY	cc	5	7	5	25	15	100
		(Employability)							
		ELECTIVE:							
	21P702F01/	EVOLUTION /		4	4	3		75	
		ELECTIVE:	DSE				25		100
	21PZO2E02	BIODIVERSITY AND							
		EUNCTIONING							
	23PZO2CP1	PRACTICAL I	СС	3	4	3	25	75	100
	23PZO2CP2	PRACTICAL II	CC	3	4	3	25	75	100
		CORE: GENERAL		5			25		
	22PZO3C09	AND APPLIED	CC		Λ	3		75	100
		MICROBIOLOGY	cc		4	5		15	
		(Skill Development)							
		CORE:	aa	5		2	25		100
	22PZO3C10	BIOTECHNOLOGY	CC		4	3		15	
		(Employability)							
		CORE: DAIRY							
	22PZO3C11	TECHNOLOGY	CC	5	4	3	25	75	100
		(Entrenreneurshin)							
		CORE:							
III									
	22PZO3C12	INIMUNOLOG Y	CC	5	4	3	25	75	100
		(Skill Development							
		and Employability)							
		ELECTIVE:							
	21PZO3E01/	TOXICOLOGY	DOP	4	4	2	25		100
	21PZO3E02	(Skill Development)	DSE	4	4	3	25	15	100
		/ELECTIVE:							
	22DZO4CD2	WILDLIFE BIOLOGY	CC	2		2	40	60	
	22F204CF3	PRACTICAL III		3	-	3	40	00	-
	22PZO4CP4	PRACTICAL IV	CC	3	-	3	40	60	-

	22PZO4C13	CORE:ENVIRONMEN TAL BIOLOGY ( <i>SkillDevelopment</i> )	CC	6	5	3	25	75	100
	21ZO4E01/ 21PZO4E02	ELECTIVE: CELL COMMUNICATION AND CELL SIGNALING / ELECTIVE: DISEASE BIOLOGY ( <i>Employability</i> )	DSE	6	4	3	25	75	100
	22PZO4CP3	PRACTICAL III	CC	3	4	3	40	60	100
	22PZO4CP4	PRACTICAL IV	CC	3	4	3	40	60	100
IV	22PZO4PVV	PROJECT AND VIVA–VOCE	CC	1 0	5		50	50	100
		DIGITAL SECURITY		2	2	-	-	-	50
		MOOC COURSE		-	2+ 2	-	-	-	-
				1 2 0 + 2	90 + 2 + 2 +2 +2				2200 + 50

(CC- Core Course, DSE- Discipline Specific Elective)

#### Value Added Course

Name of the Course	Ma	rks	Instructional Hours
	Internal	External	
Certificate Course in	50	50	30 Hrs
Industrial Microbiology	50	50	

#### **SEMESTER: I**

## COURSE CODE: 23PZO1C01 TITLE OF THE COURSE: CORE: FUNCTIONAL MORPHOLOGY OF INVERTEBRATES

#### (Skill Development)

#### **COURSE OBJECTIVES**

- To understand the principles of Taxonomy, Nomenclature and General organization of Invertebrates.
- To appreciate the differences in the functional Organization of Locomotion, Feeding, respiration and Circulation of Invertebrates
- To understand the functional mechanism of the Nervous, Excretory and Reproductive systems among the Phyla of Invertebrates.

#### **COURSE OUTCOMES**

#### At the end of the course the students will have the ability to:

CO 1	Demonstrate the different grades of organization, symmetry and metamerism in invertebrates	К3
CO 2	Appraise the different mode of feeding and locomotion in invertebrates	K4
CO 3	Discriminate the types of circulation and organs of respiration	K5
CO 4	Defend the progression in advances of Nervous system and sense organs	K5
CO 5	Evaluate the progressive development of the Excretory organs and the occurrence of both asexual and sexual reproduction among Invertebrates	К5

#### SYLLABUS

#### Credits: 4

#### **Instructional hours: 75 Hrs**

# UNIT I: GENERAL PRINCIPLES OF ANIMAL TAXONOMY(K3) (15Hrs)

Definition of taxonomy, systems of classification (artificial, natural and phylogenetic) - Systematic hierarchy. Principles of Taxonomy -Holotype, Paratype, Nomenclature (Binomial, Trinomial); International code of Zoological nomenclature - Taxonomic procedures; new trends in taxonomy.General organization of Invertebrates – Grade of organization (Protoplasmic level, Cellular level, Tissue level and organ level of organization) – Symmetry (Radial, Biradial and Bilateral) – Coelom (Acoelom, Pseudocoelom and Coelom) – Metamerism – Cephalisation.(*Beyond the Curriculum: Body plan, Type of Deuterostome and Protostome*)

## UNIT II: LOCOMOTION AND FEEDING HABITS (K4) (15Hrs)

Locomotion and adaptive mechanism in invertebrates-Flagellar, ciliary movements in Protozoa - Hydrostatic movement in Coelenterata, Annelida, and Echinodermata. Feeding habits: Nutrition and feeding mechanism in invertebrates-Nutrition in protozoa, Types and mode of feeding-Feeding diversity in insects- Filter feeding in Lower metazoans, Crustacean, Mollusca and Echinodermata - functional mechanism.

(Self Study: -Locomotion and adaptive mechanism in invertebrates)

#### **UNIT III: RESPIRATION AND CIRCULATION(K5)**

#### (15Hrs)

Organs of respiration- Gills (Crustacea), lungs (Pila), and trachea (Insecta) – respiratory pigments - Mechanism of respiration;Circulation – Cyclosis (Paramecium), Diffusion (Sponge), Open circulatory system (cockroach) and closed circulatory system (Neries).

## UNIT IV: NERVOUS SYSTEM AND SENSE ORGANS(K5) (15Hrs)

Primitive nervous system in Coelenterata and Echinodermata; advanced nervous system in Annelida, Arthropoda (Crustacea and Insecta) and Molluca (Cephalopoda); Sense organs - simple and compound eye, statocyst and osphradium, nuchal organs, tactile and olfactory receptors.

(Self Study: Sense organs - simple and compound eye)

UNIT V: EXCRETION AND REPRODUCTION(K5) (15Hrs)

Organs of excretion - coelom, coelomoducts, nephridia, green glands and Malphigian tubules, Mechanisms of excretion; Reproduction - asexual (Paramecium), alternation of generation (Obelia), sexual (Fasciola and Nereis); Larval forms of Crustacea and Echinodermata and their evolutionary significance.

#### **TEXT BOOKS**

- 1. Barrington, EJW 1969, *Invertebrate Structure and functions*, English Language Book Society.
- Kotpal, RL 2014, Modern Text Book of Zoology, Invertebrates (9<sup>th</sup> Edition) Rastogi Publications, Meerut.

#### **REFERENCE BOOKS**

- 1. Borradile, LA. 1958, The Invertebrata. Cambridge University Press.
- 2. Gardinar, MS 1972. Biology of the Invertebrates, McGraw Hill Book Co., New York.
- Barnes, RSK., Calow, P, Olive, PJW., Golding, DW and Spicer, JI 2002. The Invertebrates: A New Synthesis. 3<sup>rd</sup> Edition. Blackwell Science, USA.
- 4. Ruppert, Fox and Barness 2015. Invertebrate Zoology: A Functional Evolutionary Approach, 7<sup>th</sup> Edition, Cengage India.

#### **BLENDED LEARNING**

#### **UNIT V: EXCRETION AND REPRODUCTION**

TOPIC	LINKS
Organs of excretion - coelom,	
coelomoducts, nephridia, green glands	https://youtu.be/u_qqLLsgymo
and Malphigian tubules, Mechanisms of	https://youtu.be/U5Hbb5sZ3mk
excretion	
Reproduction - Asexual (paramecium)	https://youtu.be/zT_3de3J39s
Alternation of generation (obelia)	https://youtu.be/tupucXr_RuQ
Sexual (fasiola and nereis) -	https://www.youtube.com/watch?v=EsLyqAq-ePw
Larval forms of crustacean and	https://youtu.be/OqUI4lvkDew
echinodermataand their Evolutionary	https://youtu.be/1rAYMxj2600
significance	

#### **PO1** PO2 PO3 **PO4 PO5 PO6 PO7 PO8 PO9** PO10 **PO11** PO12 PSO1 PSO2 CO1 3 3 3 2 2 3 2 2 2 2 2 3 3 1 **CO2** 3 3 3 3 3 3 3 3 2 3 2 2 2 3 **CO3** 3 3 2 2 2 3 3 3 3 3 3 2 3 3

#### MAPPING OF CO's WITH PO's AND PSO's

CO4	3	3	3	3	3	3	3	2	3	2	2	2	3	3
CO5	3	3	3	3	3	3	3	2	3	2	2	2	3	3

(Correlation: 3- High, 2- medium, 1- Low)

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Group discussion(Unit V)	Once in a Semester

Course designed by	Verified by HOD
Dr. Sajani Jose	Dr. PawlinVasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	
	MILL ON
	111
	Principal

#### **SEMESTER: I**

#### COURSE CODE: 23PZO1C02

## TITLE OF THE COURSE: CORE: FUNCTIONAL MORPHOLOGY OF VERTEBRATES

#### (Skill Development)

#### **COURSE OBJECTIVES**

- To understand the outline classification of Vertebrates.
- To infer the differences in Structure and Function of the Integument, Circulatory and Respiratory systems.
- To distinguish the functions of Nervous and Reproductive systems among different Vertebrates.

#### **COURSE OUTCOMES**

#### At the end of the course the students will have the ability to:

CO 1	Summarise the classification of Vertebrates up to the order level	K2
CO 2	Distinguish the derivatives of the integuments and its functional differences.	K2
CO 3	Appraise the evolution of Heart and the different types of Respiratory mechanisms	K4
CO 4	Differentiate the functions of the Central and Autonomous Nervous system	K5
CO 5	Evaluate the functional mechanism of Kidney and Genital Organs and Accessory glands of Vertebrates	К5

#### SYLLABUS

#### Credits: 4

#### **Instructional hours:**

#### 75Hrs

## UNIT I: CLASSIFICATION OF VERTEBRATES(K2)

#### (15Hrs)

Outline classification of vertebratesupto orders with examples;Chordate characters and their classification into three Sub phyla; Super class Pisces and super class Tetrapoda.

#### (Beyond the Curriculum: Species Identification through molecular methods)

### UNIT II: VERTEBRATE INTEGUMENT AND ITS DERIVATIVES (K2)

#### (15Hrs)

General structure and functions of skin and its derivatives - Glands, Scales, Horns, Claws, nails, hoofs, feathers and hairs.

(Self study: Derivatives of the skin)

## UNIT III: CIRCULATORY AND RESPIRATORY SYSTEMS (K4)

#### (15Hrs)

General plan of circulation in various groups – Evolution of heart and aortic arches and portal systems – lymphatic systems; Respiration – Internal and external respiration; Respiratory organs and Types of respiration – Gill, Cutaneous, Buccal, Pulmonary and Diaphragmatic.

#### UNIT IV: NERVOUS SYSTEM(K5)

#### (15Hrs)

 $Comparative \ anatomy \ of \ the \ brain \ in \ relation \ to \ its \ functions; \ Nerves-cranial \ and \ peripheral$ 

nerves - Autonomous nervous system

(Self Study: Autonomous nervous system)

#### **UNIT V: URINOGENITAL SYSTEM(K5)**

#### (15Hrs)

Types and Functions of Kidneys- Pro, Meso and Meta nephric kidneys Reproductive system, Male and Female Gonads and Gono ducts – accessory reproductive glands.

#### **TEXT BOOKS**

- 1. Young JZ 2006, The life of Vertebrates, Oxford University Press.
- 2. Jordan EL and VermaPS 2002. Chordate Zoology. Chand S and Co. New Delhi.

#### **REFERENCE BOOKS**

- Gurudharsan Singh and Bhaskar, H 2002, Advanced Chordate Zoology, Campus books, New Delhi
- Kotpal, RL 2000. Modern Textbook of Zoology: Vertebrates. Rastogi Publications, Meerut.
- 3. William S. Beck, Karel, F, Liem and George Gaylord Simpson 2000. *Life: An introduction to biology*. Harper Collins Publishers, New York.

#### **BLENDED LEARNING**

## UNIT V: URINOGENITAL SYSTEM UNIT

TOPIC	LINKS
Types and Functions of Kidneys	https://www.youtube.com/watch?v=vE8YdrMyjVU
Pro, Meso and Meta nephric	https://www.youtube.com/watch?v=nXoYAZLgWmo
Kidney	
Reproductive system	https://www.youtube.com/watch?v=pgIiyhemuVk
Male and Female Gonads	https://www.youtube.com/watch?v=z_Spct66Nhw
Accessory reproductive glands.	https://www.youtube.com/watch?v=LnRd78aK4io

## MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	2	3	2	2	2	2	3
CO2	3	3	3	3	3	2	2	2	3	2	2	2	3	3
CO3	3	3	3	3	3	2	2	2	3	2	2	2	3	3
CO4	3	3	3	3	3	2	2	2	3	2	2	2	3	3
CO5	3	3	3	3	3	2	2	2	3	2	2	2	3	3

(Correlation: 3- High, 2- medium, 1- Low)

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Group discussion (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by
Mrs. JANSI RANI. A	NP11.1m
	Principal

#### **SEMESTER: I**

#### COURSE CODE: 23PZO1C03

### TITLE OF THE COURSE: CORE: AQUACULTURE AND FISHERIES

(Entrepreneurship)

#### **COURSE OBJECTIVES**

- To highlight the scope of aquaculture and some common food fishes
- To present the aquaculture potential in India and the Inland fishery resources
- To define the water quality standards for aquaculture and the type of culture methods
- To explain the various techniques in induced breeding and cryopreservation

#### **COURSE OUTCOMES**

#### At the end of the course the students will be able to:

CO 1	Understand the scope of aquaculture and the types of food fishes in marine and fresh water.	K1
CO 2	Illustrate riverine, lake, reservoir, estuarine fishery resources in India	K2
CO 3	Demonstrate the water quality standards for aquaculture and different culture methods	K3
CO 4	Present the characteristics of shrimp, lobster, pearl oyster, green mussels and their culture methods.	K4
CO 5	Analyze the hormone techniques for induced breeding and methods for sperm preservation	K5

#### SYLLABUS

#### Credits: 4

#### Instructional hours:

75Hrs

#### UNIT I: INTRODUCTION TO AQUACULTURE (K1)

#### (15Hrs)

Definition, aim and objectives, Importance of aquaculture, History of aquaculture in different countries and strategies to be adopted at National level. South Indian food fishes (fresh water) eight order: Cypriniformes, Clupeiformes, Mugiliformes, Ophiocephaliformes,

Perciformes, Mastacembeliformes, Beloniformes and Anguilliformes (give two examples of each order) - Marine water fishes eight orders: Clupeiformes, Perciformes, Thunniformes, Polynemiformes, Pleuronectiformes, Anguilliformes, Beloniformes and Scopeliformes.

#### **UNIT II: AQUACULTURE POTENTIAL (K2)**

#### (15Hrs)

Aquaculture potential in India: Inland fishery resources - Ganga, Brahmaputra, Indus, East coast and West coast river system. Lakesterine fisheries - Definition and salient features of temperate lakes, Types of lake and lake formation, Indian fresh water lake, Cold water Fisheries - Exotic cold water fishes. Estuarine fisheries - Definition of estuary and Estuarine area of India, Ecological Characteristics of Estuary, Biota of Estuarine, Types of estuaries, Chilka Lake.

## UNIT III: WATER QUALITY STANDARDS AND CULTURE METHODS FOR AQUACULTURE (K3)

#### (15Hrs)

Physical factors: Depth, pressure, Temperature, Light, Turbidity and color, Control of turbidity. Chemical factors: pH, Salinity, Total hardness, alkalinity, Carbonates and bicarbonates, CO2, Ammonia, Dissolved nitrogen, Calcium, Phosphorus, Trace elements, Organic matter, Dissolved oxygen and Nutrients. Biological factors. Culture Methods: Mono culture, Poly culture, sewage fed fish culture, Paddy cum fish culture, integrated fish culture, Extensive and Intensive fish culture.

#### (Self Study: Monoculture)

#### UNIT IV: CHARACTERISTICS AND TYPES OF CULTURE AND DISEASES (K4)

#### (15Hrs)

Prawn fisheries, Types of prawn fisheries, Culture of marine prawns, Marine prawn rearing, Methods of Prawn fisheries from sea and estuaries. Preservation and processing of prawn, Export of Prawn, Environment issues in Prawn culture. Shrimp culture - Lobster culture - Pearl oyster culture, Green mussels culture. Fish Pathology, Diseases of fish - Nutrient diseases, Intrinsic diseases, Pathogens - Bacterial, Viral, Fungal, Algal and Protozoan. Parasite Flukes, Cestodes, Nematodes, Annelids, Crustaceans. Cancer of fishes.

#### (Beyond the Curriculum : Design and Construction of Aquafarms)

#### UNITV: HORMONES AND MODERN TECHNIQUES (K5)

#### (15Hrs)

Induced breeding: Artificial Fertilization by stripping or artificial insemination, Hyphophysation, Collection, rearing and selection of brooders, Breeding techniques, Factors influencing induced breeding. New generation drugs for induced breeding - Human chorionic Gonadotropin (HCG), LH, Progesterone, Anti estrogens, Ova prim. Cryopreservation, Problems associated with induced spawning.

#### (Self Study: Induced breeding)

#### VISIT TO A FISHERY UNIT

#### **TEXT BOOKS**

- Gupta, SK and Gupta, PC 2006, *Generaland Applied Ichthyology (Fish and Fisheries)*. (1<sup>st</sup> edition), S. Chand and Company Ltd. Ram Nagar New Delhi.
- Kameleswer Pandey and Shukla JP 2010, *Fish and Fisheries*. (2<sup>nd</sup> revised Edition), Rastogi Publication, Meerut.
- 3. Srivastava, CBL 2008. *A text book of fishery science and Indian fisheries*. (3<sup>rd</sup> revised edition) Kitab Mahal, Allahabad.

#### **REFERENCE BOOKS**

- Rath, RK 2000, Freshwater Aquaculture (1<sup>st</sup> edition), Scientific publishers, Jodhpur, India.
- Agarwal, SC 1996, *Fishery Management* (2<sup>nd</sup> edition), Ashish Publishing house, New Delhi.
- Jingran, VG 1991, Fish & Fisheries of India(1<sup>st</sup> edition), Hindusthan Publishing Corporation, New Delhi.

#### **BLENDED LEARNING**

#### UNIT IV: CHARACTERISTICS AND TYPES OF CULTURE AND DISEASES

TOPIC	LINKS
Prawn fisheries	https://www.slideshare.net/mobile/anwarullahkhan1/prawn-
	fisheries
Types of prawn	https://youtu.be/0CTOjMu4G_8
fisheries	
Culture of marine	https://youtu.be/x7qKbmFthFM
prawns	https://www.youtube.com/watch?v=i0TVbv7ysHY&list=PLaoUj3
	RqjbRW4cRrwZuepOFZvF2HmMQQL&index=255
Marine prawn rearing	https://www.youtube.com/watch?v=Sm4NzbhA8WI

Methods of Prawn	https://youtu.be/dTlwIIHYs7k
fisheries from sea and	https://www.fishingaustralia.com.au/prawning-guide
estuaries	
Preservation and	https://www.youtube.com/watch?v=NIzOZT7RhhE
processing of prawn	https://www.youtube.com/watch?v=8DVhfnX_Y9I
	https://www.youtube.com/watch?v=fRg-GA_6dBk
	https://www.youtube.com/watch?v=lBndKEFWJsA
Export of Prawn	https://dir.indiamart.com/impcat/shrimp.html?biz=20
	https://www.youtube.com/watch?v=NSTdt0ghOLQ
Environment issues in	https://youtu.be/pMXrYQuLYV0
Prawn culture	
Shrimp culture	https://www.studyandscore.com/studymaterial-detail/prawn-
	culture-introduction-steps-in-prawn-culture
	https://www.youtube.com/watch?v=iimJ3aSQQ54
Lobster culture	https://youtu.be/gaX8brdZT3k
Pearl oyster culture	https://www.youtube.com/watch?v=BJks0Uhx7ec
	https://www.youtube.com/watch?v=yj5AaM5IAD4
	https://www.youtube.com/watch?v=bwvcI5ergDU
Green mussels culture	https://youtu.be/K1efcZmJoR4
	https://youtu.be/1c4Hv5t5QNk
Fish Pathology	https://youtu.be/Ml65FYzH6B4
Diseases of fish	https://youtu.be/q6zmgEjMiVg
	https://youtu.be/rq7P0mdUFBI
Nutrient diseases	https://zeenews.india.com/news/eco-news/snow-trout-chocolate-
	mahseer-fishes-high-in-nutrient-value_704580.html
Intrinsic diseases	https://study.com/academy/lesson/etiology-of-disease-definition-
	<u>example.html</u>
Pathogens	https://youtu.be/EmSlG_xodgM
Bacterial	https://youtu.be/Y_f3d4gS7LU
	https://youtu.be/gXZSL-eCmT8
Fungal	https://www.veterinaryworld.org/2008/February/Fungus%20diseas
	e%20in%20fish,%20diagnosis%20and%20treatment.pdf
Algal	https://www.sepro.com/aquatics/algae-corner/algae-corner-fish-
	<u>kill-causes</u>
Protozoan	https://youtu.be/yoJ3HeV1CSE
Parasite- Flukes	https://youtu.be/2sz8yRNmGRM
	https://youtu.be/hG0GDARPpks
	https://youtu.be/2oE0VDjAh30
	https://youtu.be/r68h71xjCfE
Cestodes	https://www.slideshare.net/mobile/harapriyabehera3/endoparasite-
	<u>of-fish</u>
Cancer of fishes	https://m.petmd.com/fish/conditions/cancer/c_fi_Cancer_and_Tum
	<u>Ors</u>

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2	1	3	3	2	1	2	3	2
CO2	3	1	2	2	3	3	2	2	3	3	1	1	2	2
CO3	3	3	3	2	2	2	2	2	3	2	2	2	3	3
CO4	2	3	2	2	3	3	3	2	2	3	2	2	3	3
CO5	3	2	3	2	3	3	2	2	3	3	2	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

S.No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field Visit(Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr.Sajani Jose	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
Mrs.JANSI RANI.A	
	N6-11.1w
	Principal

#### **SEMESTER: I**

#### COURSE CODE: 23PZO1C04

#### TITLE OF THE COURSE:CORE: BIOSTATISTICS, BIOTECHNIQUES AND RESEARCH METHODOLOGY (Employability)

#### **COURSE OBJECTIVES**

- To apply statistical methods in biological studies
- To understand the physical principles involved in bio techniques
- To understand and design a research problem

#### **COURSE OUTCOMES**

#### At the end of the course the students will be able to

CO 1	Calculate the measures of central tendencies, dispersion and correlation	К3
CO 2	Compute regression, probability and test of significance for different samples	К3
CO 3	Classify different bio techniques for cell and molecular studies	К3
CO 4	Formulate and construct a hypothesis for a research problem	K6
CO 5	Apply the mechanics of documentation in report or thesis writing	К3

#### SYLLABUS

## Credits: 4

#### **Instructional hours:**

#### 75Hrs

#### UNIT I: Measures of Central tendency, Measures of Dispersion and Correlation (K3)

#### (15Hrs)

Measures of Central tendency - requisites of good average, Arithmetic mean, median and mode, merits and limitations.Measuresof dispersion - properties and significance, Standard deviation, merits and limitations. Coefficient of variation, Standard error, Correlation - types, methods of studying correlation, Karl Pearson's co-efficient of correlation and Rank correlation.

(Self study: Central tendency - Mode)

#### UNIT II: Regression, Probability and testing of hypothesis (K3)

#### (15Hrs)

Regression – regressive lines, methods of least square, difference between correlation and regression analysis, methods of obtaining regression lines, regression equations and regression co-efficient. Probability distribution - binomial distribution, properties and importance.Theory of testing hypothesis – Student't' test and Chi square test and its application. ANOVA - one way and two way classification, Duncan's multiple range test (DMRT).

### (*Self study:*Duncan's multiple range test (DMRT) UNIT III: BIO-TECHNIQUES (K3)

#### (15Hrs)

Micro technique - fixation, mounting and staining procedures. Microscopy - Phase contrast, Interference microscopes, principles, working mechanism and applications. Electron microscopy - Transmission and Scanning electron microscope, principles, working mechanism and applications.Biological application of X-rays, UV rays and lasers.

## (Beyond the Curriculum: Biopsy procedures used to diagnose cancer) UNIT IV: RESEARCH PROBLEM AND INTERPREATATION (K6) (15Hrs)

Research - definition, types of research, research process, Formulating the problem, Review of literature, development of working hypothesis, Research design, determining sample design, collecting and analyzing data, hypothesis testing, Interpretation techniques, preparation of report or thesis, criteria of good research, problems encountered by researchers

## UNIT V: DOCUMENTATION AND REPORT WRITING (K3) (15Hrs)

Documentation - significance of report writing, different steps, layout of report, types of report. Mechanics of writing a research report and precautions - size and physical design, use of tables and figures and their placement, numbering, footnotes to tables and figures, treatment of quotations, documentation style, referencing system, special capitalization, alphabetical and chronological order, editing and evaluating the final report, oral presentation.

#### **TEXT BOOKS**

- 1. Gupta, SP 2017, Statistical methods (45th edition), Sultan Chand & Sons, New Delhi.
- Kothari, CR and Gaurav Garg 2017, *Research Methodology: Methods and techniques* (3<sup>rd</sup> edition), New Age International Publishers Pvt Ltd, New Delhi.
- 3. Veerakumari, S 2006, *Bioinstrumentation*(1<sup>st</sup> edition), MJP Publishers, New Delhi.

#### **REFERENCE BOOKS**

- Ranjith Kumar 2014, *Research methodology* (3<sup>rd</sup> Edition), Vivek Mehra for SAGE Publication India Pvt Ltd, New Delhi.
- Pranab Kumar Banerjee 2012, Introduction to Biostatistics (4<sup>th</sup> edition), S. Chand &Company Ltd Ram Nagar, New Delhi.
- 3. Ramakrishnan, P 2016, *Biostatistics* (4<sup>th</sup> edition), Saras publication, Nagercoil, Tamilnadu.

#### **BLENDED LEARNING**

#### UNIT IV: RESEARCH PROBLEM AND INTERPRETATION

TOPIC	LINKS
Research - definition, types of research	https://youtu.be/0BuLk8DdlSQ
Research process	https://youtu.be/07nYgNTWz7Q
Formulating the problem	https://youtu.be/2e2dK5mIvf0
Review of literature	https://youtu.be/rgoCln11Sds
Development of working hypothesis	https://youtu.be/65IBWjdS8
Research design(Unit V)	https://youtu.be/GaSmD308H0I
Determining sample design,	https://youtu.be/bQ5_PPRPjG4
Collecting and analyzing data	https://youtu.be/HFGVJJMDo4I
Hypothesis testing and Interpretation	https://youtu.be/m9pG3SItprI
Preparation of report or thesis	https://youtu.be/XJZIITMKNXk
Criteria of good research	https://youtu.be/-1NugkV5Ipc
Problems encountered by researchers in	https://youtu.be/1QG59HB5BSg
India	

#### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	2	3	3	3	1	2	3	3	3	3
CO2	3	3	3	3	2	3	3	3	1	2	3	3	3	3

CO3	3	3	1	1	1	1	1	3	1	3	2	3	2	3
CO4	2	2	3	3	3	3	3	3	3	2	2	3	3	3
CO5	2	2	3	3	3	3	3	3	3	2	3	3	3	3

(Correlation: 3- High, 2- medium, 1- Low)

S.No	Assessment methods	Frequency of assessment
1.	End semester examination	Once in a semester
2.	CIA I	Once in a semester
3.	CIA II	Once in a semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Report writing (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. B. Karpagam	Dr.PawlinVasanthi Joseph
Dr.Sajani Jose	
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	
	No-11.1w
	Principal

#### **SEMESTER: I**

#### COURSE CODE: 23PZO1E01

## TITLE OF THE COURSE: ELECTIVE: GENERAL AND APPLIED ENTOMOLOGY (Entrepreneurship)

#### **COURSE OBJECTIVES**

- To study the classification of Insects up to Order and their morphology.
- To understand the physiology of Respiration and types of metamorphosis in Insects.
- To know about the economic importance of insects.

#### **COURSE OUTCOMES**

#### At the end of the course the students will able to

CO 1	Classify different types of insects on the basis of morphological characters.	K2
CO 2	Differentiate the mouthparts and Locomotory organs based on Nutrition and	K3
	Movement.	
CO 3	Demonstrate physiological mechanism of insects based on their Habitat.	K3
CO 4	Apply the knowledge of Diversity and diagnostic features of Honey bees in	K3
	management and Pasturage.	
CO 5	Apply the knowledge of Mulberry cultivation and silkworm rearing in the	K3
	production of silk.	

#### **SYLLABUS**

#### Credits: 4

#### **Instructional hours: 75**

#### Hrs

UNIT I: COLLECTION, PRESERVATION AND CLASSIFICATION OF INSECTS(K2)

#### (15Hrs)

Collection: Methods and Equipments (Nets, Killing Jars, Aspirators and Suction devices, Beeting sheets, Sifters, Separators, Extractors and Traps.) Collection of Aquatic and soil insects. Rearing cages preservation, Mounting, Labeling, Housing the collection,

Protecting the specimens. Packing and shipping the specimens: Pinned animals, Specimens in vials, Microslides, Live specimens. Classification of insects: Metabola and Ametabola (Hemimetabolus and Holometabolous).

## UNITII: MORPHOLOGY OF INSECTSMOUTH PARTSAND LOCOMOTORY ORGANS (K3)

#### (15Hrs)

Mandibulate mouth parts and Haustellate mouth parts: chewing- lapping type, Rasping- Sucking, piercing and sucking type, – sponging type – siphoning type. Locomotory Organs: Legs and Wings: Leg of a typical insect, Locomotory modifications of legs. Typical insect wing structure and venation, Modification of insect wings (Number, size, venation, Function and Texture, Wing Coupling, Resting Position, Colouration, Hairs and Scales in wings).

# UNIT III: RESPIRATION AND REPRODUCTION OF INSECTS (K3) (15Hrs)

Respiration: Tracheal respiration - types of tracheal system - mechanism of gaseous exchange, moulting of tracheal system - tracheal gills - plastron respiration - integumental. Respiration – blood gills - spiracular gills. Types of reproduction:Parthenogenesis, Viviparity, Polyembryonic reproduction. Metamorphosis: types and Classification of insects based on types of metamorphosis -hormonal control of metamorphosis – evolution of metamorphosis.

#### **UNIT IV: APICULTURE (K3)**

#### (15Hrs)

Honey bee:Diversity and diagnostic features Colony organization: Queen, Worker and larvae development, social behaviour of bees, diseases and pest of honeybees. Bee products: Honey, bee wax, pollen grains, royal jelly, Bee Keeping Equipments, Bee Management, Bee Pasturage.

(Self study: Colony organization)

## UNIT V: SERICULTURE(K3) (15Hrs)

Mulberry cultivation, Silkworm races and life cycle, diseases and pest of silkworm; Grainage technology: Breeding station and Grainages. Silk worm rearing: Facilities and Operations. Silk reeling: Cocoon cooking- Drying and storage- Brushing- Reeling- Finishing and Marketing.

#### (Self study: Diseases and pest of silkworm)

#### **TEXT BOOKS**

- Chapman, R F 2002, *Insect Structure and Function*, (1<sup>st</sup> edition), Kalyani Publication, New Delhi.
- Dunston P Ambrose 2004, *The insect, structure, function and Biodiversity*, (1<sup>st</sup>edition), Kalyani Publication, Chennai.
- Nalina Sundari. MS andSanthi R, 2006, *Entomology*, (1<sup>st</sup> edition), MJP Publishers, New Delhi.

#### **REFERENCE BOOKS**

- Vasanthraj David, B 2001, Elements of Economic Entomology, Popular Book Depot, Chennai.
- 2. Peter W Price 1997, Insect Ecology. (3<sup>rd</sup> edition), Wiley Publishers, New Jersey, USA.

#### **BLENDED LEARNING**

#### **UNIT V: SERICULTURE**

TOPIC	LINKS
Mulberry cultivation	https://www.youtube.com/watch?v=KltyZc7rudw
Silkworm races	https://www.youtube.com/watch?v=N5IeI-nUg60
Life cycle	https://www.youtube.com/watch?v=8DzGXGBhF-U
Diseases and pest of silkworm	https://www.youtube.com/watch?v=iY09p6DbgDg
Grainage technology	https://www.youtube.com/watch?v=lxq8UAH-j38
Silk work rearing	https://www.youtube.com/watch?v=cTiDbl_KHII
Silk Reeling technology	https://www.youtube.com/watch?v=tEmQQlXt_Vg
Marketing	https://www.youtube.com/watch?v=Lqidp2KBq8k

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	1	2	2	1	2	3	1	2	2	2	1	2	3
CO2	3	2	2	2	1	1	2	1	2	2	1	2	1	3
CO3	3	1	2	1	2	1	2	2	3	1	2	1	2	2

#### MAPPING OF CO's WITH PO's AND PSO's

CO4	3	2	1	2	1	1	3	1	1	2	1	3	2	1
CO5	3	1	2	2	2	1	2	1	1	2	2	3	2	1

(Correlation: 3- High, 2- medium, 1- Low)

S.No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field work (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Dr. Roopavathy. J	
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	N6-11.1w
	Principal

#### **SEMESTER: I**

#### COURSE CODE: 23PZO1E02

#### TITLE OF THE COURSE: ELECTIVE: STEM CELL BIOLOGY

#### **COURSE OBJECTIVES:**

- To provide a comprehensive view of Embryonic and Adult stem cells.
- To elucidate the role of stem cells in ageing and clinical therapy.

#### **COURSE OUTCOMES:**

#### At the end of the course the students will have the ability to:

CO 1	Describe the origin and characterization of stem cells.	K1
CO 2	Summarize the characterization, properties and progressive differentiation of stem cells into lineage organs.	K2
CO 3	Paraphrase the potency and characterization of mesenchymal and haematopoietic stem cells.	K2
CO 4	Illustrate the role of stem cells in aging, tissue repair and regeneration.	K3
CO 5	Appraise the ethical concern and clinical outcomes of stem cell therapy.	K4

#### SYLLABUS

#### Credits: 4

#### **Instructional hours: 75**

#### Hrs

#### UNIT I: INTRODUCTION TO STEM CELL BIOLOGY (K1)

#### (15Hrs)

Stem cell definition, origin and hierarchy; stemcell properties; Identification and Characterization- potency and differentiation; niche of stemcell; overview of different stem cell types (embryonic stem cell, adult stem cell and inducedpluripotent stem cells).

(Self Study-stem cell properties, Identification and Characterization)

UNIT II: EMBRYONIC STEM (ES) CELL (K2) (15Hrs)

Characterization and properties of ES cells -pluripotency and self-renewal of ES; molecular mechanisms regulating pluripotency andmaintenance of the stem state; progressive differentiation of ES into ectoderm lineage organs (skin, brain and nerve), mesoderm lineage organs (Heart, kidney, muscle, bone and blood) and endoderm lineage organs (Lung, liver, stomach, pancreas and intestine).

#### UNIT III: ADULT STEM CELL (K2)

(**15Hrs**) Mesenchymal stem cell (MSC) – sources, properties (plasticity,homing and engraftment), potency and characterization; Haematopoietic Stem Cell (HSC) –sources, properties, potency and characterization; steps involved in production of inducedPluripotent Stem Cell (iPSC); role of yamanaka factor in iPSC.

#### UNIT IV: STEM CELL AND AGING (K3)

#### (15Hrs)

Aging theory; cell cycle; telomere and telomerase; senescenceof stem cell; role of stem cell in aging; tissue repair and regeneration of adult stem cell.

## UNIT V: CURRENT STEM CELL THERAPIES (K4) (15Hrs)

Advantages and disadvantages of Embryonic Stem Cells (ESC) and adult stem cell -Mesenchymal Stem Cells (MSC) and Hematopoietic Stem Cells (HSC) therapy; Ethical concern on stem cell therapy; current stem cell therapyfor various diseases; clinical outcome of stem cell therapy; state of clinical trials in adult stemcell for various disease.

#### (Self Study-Advantages and disadvantages of Embryonic Stem Cells)

#### **TEXT BOOKS**

- Kiessling, A.A. (2006). Human Embryonic Stem Cells (Second Ed.) Jones &Barlett Publishers.
- 2. Lanza, R. (2013). Essentials of stem cell biology. 3<sup>rd</sup> edition, Academic Press.

#### **REFERENCE BOOKS**

- 1. Turksen, K. (2004). Adult stem cells. Humana Press, Inc.
- Thomson, J *et al.* (2004). Handbook of stem cells: Embryonic/Adult and fetal stem cells (Vol. 1 & 2). Academic Press.

 Institute of Medicine (2002). Stem cells and the future of regenerative medicine. National Academy Press.

#### **BLENDED LEARNING**

#### **UNIT-V CURRENT STEM CELL THERAPIES**

TOPIC	LINKS
Advantages and disadvantages of	https://www.youtube.com/watch?v=jIo3J8EDckU
Embryonic Stem Cells	https://www.youtube.com/watch?v=jIo3J8EDckU
	https://www.youtube.com/watch?v=rHcFzEbVgUk
	https://www.youtube.com/watch?v=PQqtIEkWFNg
Adventages and disadventages of	https://www.youtube.com/watch?v=_u9fM4h-4LA
Advantages and disadvantages of	https://www.youtube.com/watch?v=u3HI9EkTZZo
	https://www.youtube.com/watch?v=fp5H3SslskQ
	https://www.youtube.com/watch?v=NzKT7Czq_hw
Advantages and disadvantages of	https://www.youtube.com/watch?v=g8FQOjlATgg
Mesenchymal Stem Cells	https://www.youtube.com/watch?v=YXonyqj9NvA
Advantages and disadvantages of	https://www.youtube.com/watch?v=pZW691Mv7Bc
Hematopoietic Stem Cells	https://www.youtube.com/watch?v=I2ubTHV1xg4
	https://www.youtube.com/watch?v=k4HDeGt0lGY
	https://www.youtube.com/watch?v=7QfHsS4Y_L4
Current Stem Cell therapies	https://www.youtube.com/watch?v=V5FaMFp-2m0
	https://www.youtube.com/watch?v=AsIgpsk9UQw
	https://www.youtube.com/watch?v=-9PHCFrFl_k
	https://www.youtube.com/watch?v=AuDxBQYeiS4
Clinical outcome of stam call	https://www.youtube.com/watch?v=uKqktf1V2e4
thereasy	https://www.youtube.com/watch?v=ABAvvlRQT3k
шегару	https://www.youtube.com/watch?v=Y94CC-89Tvw
	https://www.youtube.com/watch?v=YI0QApaTASw
State of aliginal trials in a dult	https://www.youtube.com/watch?v=3zzJGqEF2_w
state of clinical trials in adult	https://www.youtube.com/watch?v=drOWKyTL0K8
stemcen for various disease	https://www.youtube.com/watch?v=3orSvpgj1sc

#### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	2	3	3	3	2	2	3	3	2	1	2	3	2
CO2	3	2	3	2	2	2	1	2	3	2	1	1	3	1
CO3	3	2	3	2	1	2	3	2	3	2	1	2	3	3
CO4	2	2	3	2	2	2	3	3	3	2	1	2	3	3
CO5	3	2	3	3	3	2	3	3	3	2	2	3	3	3

(Correlation: 3- High, 2- medium, 1- Low)

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Quiz (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. B. Karpagam	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI.A	
	N6-11.1w
	Principal

#### **SEMESTER: II**

#### COURSE CODE: 23PZO2C05

#### TITLE OF THE COURSE:CORE: MOLECULAR GENETICS

#### (Skill Development)

#### **COURSE OBJECTIVES**

- To understand the fine structure of genes.
- To explain the modification and repair mechanism of genes.
- To get an overview of transposons, molecular markers and human genome project.

#### **COURSE OUTCOMES**

#### At the end of the course the students will have the ability to:

CO 1	Describe the chemical structure of nucleic acids and mechanism of recombination	K2
CO 2	Define the fine structure of gene and organization of genetic material	K2
CO 3	Infer the different mechanisms for repair of genes, its rectification and regulation of gene expression	К3
<b>CO 4</b>	Classify molecular markers and restriction maps for gene sequencing	K3
CO 5	Demonstrate the important concept and techniques in genetic engineering and human genome project for solving issues in health	K4

#### **SYLLABUS**

Credits :4

#### **Instructional hours : 90Hrs**

## UNIT I: MOLECULAR STRUCTURE AND RECOMBINATION (K2) (18 Hrs)

DNA (Molecular structure, Chemical structure and functions); RNA (Molecular structure, Chemical structure and functions); Molecular mechanism of homologous recombination, Molecular models of recombination (Holliday model, Holliday structure, Hybrid DNA model involving double strand breaks); Specific recombination in bacteriophage  $\lambda$ ; DNA mediated transposition (Bacterial insertion sequences, Bacterial transposons, Transposon in eukaryotes); Retrotransposons

(Self study: Structure and function of DNA)

#### **UNIT II: FINE STRUCTURE OF GENE (K2)**

#### Hrs)

Fine structure of Gene; Split genes, Characteristics of split genes; Overlapping genes; Pseudogenes and its evolutionary significance; Repetitive & unique DNA sequences -Chromosomal DNA content and C-value paradox; Technique for detecting repetitive DNA, Repetitive DNA in the form of satellite DNA (*In situ* hybridization of Satellite DNA & Squash dot hybridization); Selfish DNA

## UNIT III: DNA REPAIR MECHANISM (K3) (18 Hrs)

DNA Repair – Direct repair, Excision repair, Mismatch repair; Regulation of transcription initiation (Regulatory proteins), Regulation of gene expression in eukaryotes (Response elements, differential gene expression, positively regulated eukaryotic promoters), Remodeling of chromatin structure during gene activation, Inhibition of gene expression by gene repressors, Enhancer elements

(Self study: Types of DNA repair mechanisms)

## UNIT IV: MOLECULAR MARKERS AND GENE SEQUENCING (K3) (18 Hrs)

DNA based molecular markers and its uses; Restriction mapping – Restriction cleavage and Gel electrophoresis, Construction of restriction maps; Isolation of genes; DNA sequencing technologies (Maxam and Gilbert's chemical degradation method, Sanger's dideoxynucleotide synthetic method, Automated DNA sequences, Direct DNA sequencing using PCR)

## UNIT V: CONCEPTS AND TECHNIQUES IN GENETIC ENGINEERING (K4) (18 Hrs)

Concept of genetic engineering, Restriction enzymes, Vectors for gene cloning (Plasmids, Bacteriophage as vectors, Cosmid as vectors); Steps involved in gene cloning (Isolation of cloning vectors, Selection of gene cloning organism, Isolation of desired DNA to be cloned, Construction of recombinant DNA, Transformation, Culture and isolation of recombinant DNA from non recombinant DNA); cDNA technology; The Human Genome Project.

(Beyond the Curriculum: Genome editing)

**TEXT BOOKS** 

- Ajoy Paul 2015, *Textbook of cell and molecular biology*, (4<sup>th</sup> edition), Books and Allied (P) Ltd, Kolkata.
- Gupta, P K 2017, Cell and Molecular Biology, (5<sup>th</sup> edition), Rastogi Publication, Meerut.

#### **REFERENCE BOOKS**

- Read, P 1996, Human Molecular Genetics 'Tom Strachan an Andrew Bios'. (1<sup>st</sup> edition), Scientific Publications, UK.
- Watson, JD, Hopkins, NH, Roberts, JW, Steitz, JAand Weiner, AM1987, Molecular Biology of the Gene. (4<sup>th</sup> edition), The Benjamin/Cummings Publishing Company, Menlo Park, California.
- 3. Darvell, J*et al*2002. *Molecular Cell Biology*, (7<sup>th</sup> edition), Garland Publishing Iwc, New York.
- 4. Meyers. RA 1995, *Molecular Biology and Biotechnology*, (1<sup>st</sup> edition), A Comparative desk reference: Meyers RA(Ed.). VCH Publishers (UK) Ltd, Cambridge.

#### **BLENDED LEARNING**

#### UNIT IV: MOLECULAR MARKERS AND GENE SEQUENCING

TOPIC	LINKS
DNA based molecular markers and its uses	https://youtu.be/NnNJSU4xLqo
Restriction mapping – Restriction cleavage	https://youtu.be/GsWo8dCivWs
Gel electrophoresis	https://youtu.be/4OJAzQsZnbo
Construction of restriction maps	https://youtu.be/uNvF9ZBufTk
Isolation of genes	https://youtu.be/W_9XwwHFBk4
Sanger's dideoxynucleotide synthetic	https://youtu.be/FyHRio1yyhO
method	
Automated DNA sequences	https://youtu.be/CN21sVuXkkw
Direct DNA sequencing using PCR	https://youtu.be/q27r-ZBw911

	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	2	2	2	2	3	1	2	2
CO2	3	2	2	2	2	1	2	1	1	1	2	1	1	1
CO3	3	3	3	2	1	2	2	1	2	2	3	1	1	2
<b>CO4</b>	3	3	2	2	2	1	2	2	2	3	2	1	1	2

#### MAPPING OF CO's WITH PO's AND PSO's

CO5	3	3	3	2	2	1	2	2	2	2	3	2	2	3
(Convolutions 3 High 2 modium 1 Low)														

(Correlation: 3- High, 2- medium,1- Low)

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Quiz (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. R. Dhivya	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	NO 11 1m
	11112
	Principal

#### **SEMESTER: II**

### COURSE CODE: 23PZO2C06 TITLE OF THE COURSE:CORE: HORMONES AND HEALTH

#### (Skill Development and Employability)

#### **COURSE OBJECTIVES**

- To provide knowledge on the structure of endocrine glands
- To know the functioning of endocrine glands
- To understand the role of hormones in reproduction and behaviour

#### **COURSE OUTCOMES**

#### At the end of the course the students will be able to:

CO 1	Describe the structure and function of various endocrine glands	K1			
CO 2	Relate the diseases in man with hypo and hyper functioning of glands	K2			
CO 3	Demonstrate the role of hormones in mineral and glucose metabolism	K3			
<b>CO 4</b>	Predict the role of hormones in the occurrence of infertility and cancer	K4			
CO 5	Distinguish neuroendocrine mechanism which shows positive and negative	К5			
	behaviour				

#### SYLLABUS

#### Credits: 4

#### **Instructional hours: 75 Hrs**

#### UNIT I: STRUCTURE AND FUNCTION OF ENDOCRINE GLAND (K1) (15Hrs)

Structure, anatomy, histology, synthesis of hormones, metabolism of hormones, physiological role of hormones and clinical aspects of Pituitary gland - adeno and neurohypophysis, Thyroid gland, Parathyroid gland, Pancreas, Adrenal gland- cortex and medulla, Gonads- testis and Ovaries, Pineal gland.

(Beyond the Curriculum: Thymus Gland)

## UNIT II: HYPO AND HYPER FUNCTIONING OF GLANDS (K2) (15Hrs)

Hypo and hyper functioning glands - Pituitary gland(Gigantism and Dwarfism), Thyroid gland (Graves disease, Cretinism), Para thyroid gland (Hypo and hyper parathyroidism), Pancreas (Diabetes mellitus, Diabetes insipidus), Adrenal gland (Pheochromocytoma, Cushing's syndrome)

(Self study:Diabetes mellitus)

#### **UNIT III: ROLE OF HORMONES (K3)**

Minerals and bone metabolism and role of vitamin D3, Calcitonin and parathormone, clinical aspects of hypo and hyper secretion of hormones. Glucose metabolism and the role of pancreatic islets - alpha and beta cells.Hormones in food digestion and assimilation - clinical aspects.Hypertension.

#### (Self study: Hypertension)

#### UNIT IV: REPRODUCTIVE HORMONES(K4)

#### (15Hrs)

Hormones in reproduction: puberty, pregnancy, progesterone, estrogen, human chorionic gonodotrophin. Male hormone: testosterone, androgen, hypogonadism, infertility, gonadal tumors, contraception in male and female. Cancer in the reproductive tract, breast cancer and prostate cancer in male.

#### **UNIT V: HORMONES IN BEHAVIOUR (K5)**

#### (15Hrs)

Hormones in behavior: Motivation, Memory, Perception, Attention-Schizophrenia, Mental depression. NeuroHypophysial Hormones and Behaviour - Oxytocin and Vasopresin

#### **TEXT BOOKS**

- Chandra Negi, S 2009, *Introduction to endocrinology:* (1<sup>st</sup> edition), PHI Learning Private Ltd, New Delhi.
- 2. Reena Mathur 2010 , Animal Behaviour: (3rd edition), Rastogi Publication, Meerut.

#### **REFERENCE BOOKS**

- Francis, S Green Span, John D, Baxter 1994, Basic and clinical endocrinology (4<sup>th</sup>edition), Appletone and Lange, Norwalk Connecticut, USA.
- 2. Chatterjee, CC1981, Human Physiology (9th edition), Medical Allied Agency, Calcutta.
- 3. David O Norris 1985, *Vertebrate Endocrinology* (2<sup>nd</sup> edition), Lea and Febiger, Philadelphia.
- Good man and Maurice, H 2003, *Basic and medical endocrinology*. (3<sup>rd</sup> edition), Academic Press. London.
- Mandal, Falik Baran 2010, *Text Books of Animal Behaviour* (1<sup>st</sup> edition), PHI Learning Private Limited, New Delhi.

#### **BLENDED LEARNING**

#### **UNIT IV: REPRODUCTIVE HORMONES**

#### (15Hrs)

TOPIC	LINKS
Hormonog in pubarty	https://youtu.be/X1m4Dyr1N18
nonnones in puberty	https://youtu.be/6e-YIruVSLM
Hormones in pregnancy	https://youtu.be/9dPNI4HnmjY
Progesterone	https://youtu.be/Wp4JjMJYLqk
Estrogen	https://youtu.be/eK7Gp6AWnuY
Human chorionic gonodotrophin	https://youtu.be/nHHRcCPUuCE
Testosterone	https://youtu.be/k4e70nG3T8U
Androgen	https://youtu.be/sf201Mr0zVI
Hypogonadism	https://youtu.be/DDVlh0Xtnqw
Infertility	https://youtu.be/NQ3cS1q_rtI
Gonadal Tumors	https://youtu.be/BDuOAt4h430
Contraception in male and female	https://youtu.be/ZFj6E-F0AJ0
Cancer in the reproductive tract	https://www.youtube.com/watch?v=NBBkLCfdZ1g
Breast cancer	https://youtu.be/jPtCkcILCGU
Prostate cancer in male	https://youtu.be/zg3j5Ig4dJY

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	3	2	3	1	1	3	3	3
CO2	3	3	2	2	1	1	2	2	3	1	1	3	2	3
CO3	3	3	2	2	2	1	2	2	3	1	1	3	3	3
CO4	3	3	2	2	2	1	2	2	3	1	1	3	3	3
CO5	3	3	2	2	2	1	2	2	3	1	1	3	2	3

(Correlation: 3- High, 2- medium,1- Low)

S. No	Assessment methods	Frequency of assessment
1	End semester examination	Once in a semester
2	CIA I	Once in a semester
3	CIA II	Once in a semester
4	Model	Once in a Semester
5	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Case study (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. B. Karpagam	Dr. Pawlin Vasanthi Joseph
Dr. J. Roopavathy	

Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	Principal

#### **SEMESTER: II**

#### SUBJECTCODE: 23PZO2C07

## TITLE OF THE COURSE:CORE: ANIMAL PHYSIOLOGY & BIOCHEMISTRY (Skill Development and Employability)

#### **COURSE OBJECTIVES**

- To understand the physiology of Circulation, Excretion, Neural and Muscular system.
- To understand the basic metabolism and biochemistry of cellular functions.
- To understand Ionic Regulation and Biological Rhythms in animals.

#### **COURSE OUTCOMES**

At the end of the course the students will able to:

CO 1	Explain the physiology of Circulation and Excretion in Vertebrates.	K1
CO 2	Relate the changes during Biochemical processes in Nerves and	K2
	Muscles.	
CO 3	Analyze the physiological changes due to hormonal secretions.	К3
CO 4	Analyze various Biochemical Parameters.	K3
CO 5	Estimate the activity of enzymes and its clinical diagnosis.	K4

#### **SYLLABUS**

#### Credits: 4 Hrs

**Instructional Hours: 90** 

#### UNIT I: RESPIRATION & EXCRETION (K1)

#### (18Hrs)

Types of respiratory pigments and their Oxygencarrying capacities, Diffusion of gases in the Lungs, Transport of oxygen in the blood, Oxygen dissociation curve, Carbon dioxide dissociation curve, Patterns of nitrogen excretion: Urea cycle, Structure of Nephron, and Physiology of excretion.

(Self study: Structure of Nephron)

## UNIT II: NERVE & MUSCLE PHYSIOLOGY (K2)

#### (**18Hrs**)

General structure, function of muscle and Biochemistry of contractile proteins.Mechanism of muscle contraction, Neurotransmitters, Physiology of vision, hearing, touch and taste.

#### (Beyond the Curriculum: Control and Coordination: Physiology of Nervous System)

#### UNIT III: TEMPERATURE& IONIC REGULATION (K3)

#### (18Hrs)

Temperature regulation in ectotherms (Freeze tolerance, Freeze Avoidance, By Heat shock response), Temperature regulation in endotherms (Maintaining internal core temperature, Stable core temperature, Role of hypothalamus in integrating the thermo sensory inputs); Osmotic and ionic regulation; Hormonal role in osmoregulation; Biological clocks (Circannual, Circatidal, Circalunar, Semilunar and Circadian clocks); Bioluminescence - Physiology and Significance

#### (Self study: Biological rhythms)

UNIT IV: STRUCTURE & METABOLISM OF BASIC NUTRIENTS (K3) (18Hrs)
Classification of Carbohydrates - Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides; Metabolism of carbohydrates, Classification of proteins - Simple, Conjugated and Derived Proteins, Metabolism of proteins and Aminoacids; Classification of lipids Simple, Compound, Derived and substances associated with lipids; Metabolism of lipids.

## UNIT V: ENZYMES (K4) (18Hrs)

Properties of Enzymes, Classification of enzyme, Mechanism of enzyme action, Coenzymes, Mechanism of Coenzyme action, examples of Coenzymes, Factors affecting Mechanism action, Enzymes of clinical interest – Creatine phosphokinase, Asparate amino transferase, Alanine amino transferase, Lactate dehydrogenase and Alkaline phosphatase.

### **TEXT BOOKS**

- Nagabhushanam, R 2003, *Text of Animal Physiology* (2<sup>nd</sup> edition), Oxford and IBH Publishing Company Pvt Ltd, Delhi.
- 2. Ambika Shanmugam 2001, *Fundamentals of Biochemistry for Medical Students* (8<sup>th</sup> edition), Lippincott Williams & Wilkins, Philadelphia, Pennsylvania, United States.
- 3. Hoar W S 1987, General and comparative Physiology, Prentice Hall New Delhi, India.

### **REFERENCE BOOKS**

- 1. Berry, AK 1995, *Textbook of Animal Physiology with related Biochemistry*, (11<sup>th</sup>edition), Emkay publications, Delhi.
- 2. Goel, KA and Sastry, KV 1995, *Textbook of Animal Physiology* (6<sup>th</sup> edition), Rastogi Publication, Meerut.
- 3. Lauralee Sherwood, HillarKlandorf, Paul Yancey2013, *Animal Physiology: From Genes to organisms* (2<sup>nd</sup> Edition), Yolanda Cossio, USA.
- 4. Lehninger, AL 1998. *Biochemistry* (1st edition), US Worth Publishers Inc, New York

### **BLENDED LEARNING**

### **UNIT V: ENZYMES**

TOPIC	LINKS
	https://youtu.be/G7ZAwUdBNFE
Introduction to Enzymes	https://youtu.be/Qn4dgym1tag
	https://youtu.be/A1xWfd0fcjo
Properties of Enzymes	https://youtu.be/Y86JMsVCzoQ

	https://youtu.be/Gy3fEdy9cCA
	https://youtu.be/kYaeo8R4MaU
	https://youtu.be/OQf5VktnK0U
	https://youtu.be/-fnc3iDteVQ
	https://youtu.be/FXYnrSDZrcs
Classification of anyuma	https://youtu.be/aClHf2NuhPg
Classification of enzyme	https://youtu.be/vhIN8e8_dgU
	https://youtu.be/XvOhcDcb-BU
Mechanism of enzyme action	https://youtu.be/nJTkPyIhC-k
	https://youtu.be/spwDq9ZG_Tg
	https://youtu.be/0vvUIIulzMk
Coenzymes Mechanism of Coenzyme	https://youtu.be/bubY2Nm7hVM
action	https://youtu.be/aztVklpxsTo
examples of Coenzymes	https://youtu.be/c-f7tc_VO-0
Factors affecting Mechanism action	https://youtu.be/dhAiTiqUv3w
	https://youtu.be/48x8ddi_Ur4
	https://youtu.be/t6PHzaQaLks
	https://youtu.be/vk9TinJV44I
Enzymes of clinical interest- Creatine	https://youtu.be/x92OSUNLf0I
phosphokinase	https://youtu.be/U0hVLx_ua6Y
Asparate amino transferase (SGPT)	https://youtu.be/lxLmbR9uThk
	https://youtu.be/aZni6VaXa8w
Alanine amino transferase (SGOT)	https://youtu.be/ozUCfjn113U
	https://youtu.be/9oX6WQsSbGc
	https://youtu.be/Xp5QVjmg7EU
Lactate dehydrogenase	https://youtu.be/8GttpL2x6IA
	https://youtu.be/1t-13qixS-Y
	https://youtu.be/03x8hrE7S-Y
Alkaline phosphatase.	https://youtu.be/Vc2PSR00KfY
	https://youtu.be/T9oZ8orLYUI

### MAPPING OF CO's WITH PO's AND PSO's

IVII NI I														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	3	3	3	2	2	2	1	3	3	2	1	2	3	2
CO2	3	1	2	2	3	3	2	2	3	3	1	1	2	2
CO3	3	3	3	2	2	2	2	2	3	2	2	2	3	3
CO4	2	3	2	2	3	3	3	2	2	3	2	2	3	3
CO5	3	2	3	2	3	3	2	2	3	3	2	3	3	3

(Correlation: 3- High, 2- medium, 1- Low)

### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Group discussion (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr.Sajani Jose	Dr. Pawlin Vasanthi Joseph
Dr. R. Dhivya	
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	N6-11.1w
	Principal

### SEMESTER: II

### SUBJECTCODE: 23PZO2C08

### TITLE OF THE COURSE:CORE: DEVELOPMENTAL BIOLOGY

### (Employability)

### **COURSE OBJECTIVES**

- To provide a comprehensive view of the Basic concepts of development of the embryo and the genes involved
- To elucidate on the implications of totipotency and pleuripotency
- To infer the importance of cell to cell communication and differentiation in embryogeny

### **COURSE OUTCOMES**

### At the end of the course the students will able to:

CO 1	Illustrate the basic concepts of development for morphogenetic gradients , genomic equivalence and cytoplasmic determinants	К3
CO 2	Interpret the role of polarity and symmetry in an egg and the molecular perspectives of fertilization	K3
CO 3	Deduce the importance of embryonic stem cells and its applications	K4
<b>CO 4</b>	Appraise the cell to cell interaction and post embryonic development	K4

### SYLLABUS

### Credits: 4 Hrs

### **Instructional Hours: 75**

### UNIT I: BASIC CONCEPTS OF DEVELOPMENT(K3)

### (15Hrs)

Basic concepts of development:Potency,commitment,specification,induction,competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development. Genes contributing to gonad development – Role of SF1, WT1, SRY and SOX (*Beyond the Curriculum:Induced Breeding of Fish*)

# UNIT II: EARLY EMBRYOGENESIS MOLECULAR PERSPECTIVES OF FERTILIZATION

### (K3)

### (15Hrs)

Polarity, symmetry and chemodifferention of egg. Role of maternal contribution in early embryogenesis – masked RNA; Molecular perspectives of fertilization: Recognition of egg and sperm, sperm attraction, acrosome reaction, species –specific recognition, cortical reaction, activation of egg metabolism, fusion of genetic material.

### UNIT III: EMBRYONIC STEM CELL AND GENES GOVERNINGBODY PLAN (K4)

#### (15Hrs)

Totipotency and pleuripotency of cleavage and gastrula nuclei – nuclear transplantation experiments in amphibians – Embryonic stem cell and its application. Genes that pattern *Drosophila* body plan: morphogenetic gradients, cascades and signaling pathways in *Drosophila* development – Homeo box concept and its role

(Self study: Totipotency and pleuripotency of cleavage)

# UNIT IV: ORGANIZER, INDUCTION AND POST EMBRYONIC DEVELOPMENT K4)

### (15Hrs)

(15Hrs)

Cell-cell interaction, adhesion and communication – Organizer and induction: Spemann's classical experiment, molecules of Nieukoopcenter – activin, noggin, BMP4, Wnt, FGF and retinoic acid – chemistry and mechanism. Limb development in vertebrates. Post embryonic development – larval formation, metamorphosis, Environmental regulation of development.

### (Self study: Cell-cell interaction, adhesion and communication)

### UNIT V: DIFFERENTIATION AT GENE LEVEL (K5)

Differentiation – definition, differentiation at tissue level - epithelio-mesenchymal interaction, differentiation at organ level – cyclopia and acephaly, role of Hox D gene, Hox A gene. Concept of gene knock out, abnormal differentiation – teratoma and teratogens.Programmed cell death.

### **TEXT BOOK**

- 1. Vasundara Rao 1994, Developmental Biology-A Modern Synthesis, Oxford IBH, New Delhi
- Gilbert, BF 2006, *Developmental Biology*(9<sup>th</sup>Edition), Sinaur Associates Inc. Publishers, Sunderland, Massachusetts USA.

### **REFERENCE BOOKS**

- 1. Balinsky, BI 1981, Introduction to Embryology. (5thEdition), Saunders, Toppan.
- 2. Lewis Wolpert 2002, Principles of Development(2<sup>nd</sup>Edition), Oxford University Press.
- 3. Nakamura, O and Sulo, J 1978, *Organizer A milestone of a Half Century from Spemann*, Elsevier/North Holland Biomedical Press. Amsterdam.
- 4. Russo, VEA, Brody, S, Cove, D and Ottolenghi, S 1992, *Development. The Molecular Genetic Approach.* Springer Verlag, Berlin.

### **BLENDED LEARNING**

### **UNIT V: DIFFERENTIATION AT GENE LEVEL**

TOPIC	LINKS
Differentiation at Gene level	https://www.youtube.com/watch?v=spgY0iswlPg https://www.youtube.com/watch?v=9AI3BkKQhn0

	https://www.youtube.com/watch?v=gwAz_BtVuLA
differentiation at tissue level	https://www.youtube.com/watch?v=gwAz_BtVuLA
differentiation at tissue level	https://www.youtube.com/watch?v=spgY0iswlPg
onithalia masanahymal interaction	https://www.youtube.com/watch?v=ZRM-663T0yA
epimeno-mesenchymai interaction	https://www.youtube.com/watch?v=uwXCYeMyQb0
differentiation at organ level –	https://www.youtube.com/watch?v=N3kU05wDHxk
cyclopia and acephaly	https://www.youtube.com/watch?v=YtvL-LQlPrU
	https://www.youtube.com/watch?v=bu_OQA6WmiU
	https://www.youtube.com/watch?v=CTKgaFAgwEc
role of Hox D gene	https://www.youtube.com/watch?v=HwrXeQTCcXY
	https://www.youtube.com/watch?v=YrBwcnHAsBg
	https://www.youtube.com/watch?v=MwuOyew_0Ws
role of Hoy A gene	https://www.youtube.com/watch?v=QnNVzV5yDH8
Tote of Hox A gene.	https://www.youtube.com/watch?v=Wx2EGHgclCs
	https://www.youtube.com/watch?v=vXk7Mta33-0
	https://www.youtube.com/watch?v=d97Z8Xk3ZuI
Concept of gene knock out,	https://www.youtube.com/watch?v=bLswCr5xo9w
	https://www.youtube.com/watch?v=PooN1OvgDKE
	https://www.youtube.com/watch?v=iN6uQYQ-hRU
teratoma and teratogens	https://www.youtube.com/watch?v=cKHX8r6DFVo
	https://www.youtube.com/watch?v=nExRpxd6NpI
Programmed cell death.	https://www.youtube.com/watch?v=wkWLmlSUlqg
	https://www.youtube.com/watch?v=Ft-2LCqmdQY
	https://www.youtube.com/watch?v=-vmtK-bAC5E
	https://www.youtube.com/watch?v=R_A1Tuca0Yk

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	3	2	3	1	2	3	3	3	1	2	1	3
CO2	3	3	3	2	2	1	3	3	3	3	1	2	3	3
CO3	3	3	3	2	1	1	2	3	3	3	1	2	3	3
CO4	3	3	3	2	3	1	1	1	3	2	1	2	1	3
CO5	3	3	3	2	1	1	1	1	3	2	1	2	1	3

(Correlation: 3- High, 2- medium, 1- Low)

### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester

3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field work (Laboratory visit) (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. R. Dhivya	Dr.Pawlin Vasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	N6-11-14
	Principal

### **SEMESTER: II**

### COURSE CODE: 23PZO2E01

### TITLE OF THE COURSE: ELECTIVE: EVOLUTION

### **COURSE OBJECTIVES**

- To provide a comprehensive knowledge of the mechanism of evolution in the light of recent information.
- To understand the mechanism of species formation and trends in evolution.
- To present the consequences of evolutionary forces and the adaptive modifications in living organisms.

### **COURSE OUTCOMES**

### At the end of the course the students will have the ability to:

CO 1	Identify the evolutionary forces for equilibrium and variation in a population	K1
CO 2	Recall the fossil types and dating of fossils which determine the evolutionary rates	K1
CO 3	Interpret the mechanism of reproductive isolation for the origin of species	K2

CO 4	Differentiate the evolutionary progress and the role of mutation, genetic recombination and adaptation in evolution	K3
CO 5	Demonstrate the importance of speciation and molecular trees in the course of organism evolution	K4

### **SYLLABUS**

**Total Credits: 4** 

### **Instructional hours: 75**

#### Hrs

# UNIT I: MECHANISM OF EVOLUTION (K1) (15Hrs)

Evidence of evolution (Evidences from biogeography, Taxonomy, Comparative anatomy, Intermediate forms, Paleontology, Embryology, Biochemistry and Physiology, Cytogenetics, Artificial selection); Equilibrium in population (Hardy Weinberg Principle - Key assumptions, predictions and applications); Variation in population - Types of variation, Sources of variation (Point mutation, Chromosomal mutation, Recombination); Polymorphism (Phenotypic polymorphism, Chromosomal polymorphism, Transient versus stable polymorphism); Evolutionary forces (Natural selection, Migration, Random genetic drift, Bottleneck effect, Founders effect).

(Self Study: Chromosomal mutation)

### UNIT II: PALEONTOLOGY (K1)

### (15Hrs)

Fossils - Types of fossils, Formation of fossils, Interpretation of fossil records, Laws, Allometry, Dating of fossils; Determination of evolutionary rates; Geological time scale (Azoic era, Archeozoic era, Proterozoic era, Paleozoic era, Mesozoic era) (*Self Study: Fossil types*)

### UNIT III: ISOLATION MECHANISM AND ORIGIN OF SPECIES (K2)(15Hrs)

Mechanism of reproductive isolation: Isolation by time, Isolation by distance, Geographical isolation, Reproductive isolation, Gametic isolation; Types of isolating mechanisms (Pre-zygotic and Post zygotic isolating mechanisms); Origin of species (Micro evolution, Meso evolution, Macro evolution)

# UNIT IV: SYNTHETIC THEORY AND EVOLUTIONARY PROGRESS (K3) (15Hrs)

Mutation, Adaptation, Selection concept, Concept of species - Gene flow, Barriers; The Origin of inter specific sterility, Genetic Recombination in Evolution, Evolutionary progress (Morphological complexity, Expansion of life, Evolutionary trends)

### UNIT V: MODIFICATION OF NEO-DARWINISM (K4)

### (15Hrs)

Neutral Theory; Molecular Clock; Morphology and Speciation; Punctuated Equilibrium Theory; Molecular trees (Globin Phylogenetic Tree, Taxonomic Trees); Molecular and Organismal Evolution - The New Synthesis.

### **TEXT BOOKS**

- Sanjib Chattopadhyay 2012, Evolution, Adaptation and Ethology: Evolution, Adaptationand Ethology (3<sup>rd</sup> edition), Books and Allied (P) LTD, Kolkata.
- 1. Jha AP1993, *Genes and Evolution*(1<sup>st</sup> edition), Macmillan India Ltd, Bangalore.

### **REFERENCE BOOKS**

- 1. Edwin H. Colbert 1967, *Evolution of the vertebrates* (4<sup>th</sup> edition), John Wiley & sons,Inc, New York.
- Yadev, BN Kumar D2000, Vertebrate Zoology and Evolution (1<sup>st</sup> edition), DayaPublishing House, Trinagar, Delhi.
- Veer BalaRastogi 2017, Organic Evolution(13<sup>th</sup>edition), Medtech Publications, NewDelhi.
- Edwin H. Colbert, Michael Morales, Eli C. Minkoff 2011, Evolution of the Vertebrates: A History of the Backboned Animals through Time (5<sup>th</sup> edition), Wiley-Blackwell, New Jersey, USA.

### **BLENDED LEARNING**

### UNIT V: MODIFICATION OF NEO-DARWINISM

TOPIC	LINKS
Neutral Theory	https://youtu.be/t8hKvh7AkV8
Molecular Clock	https://youtu.be/rMSVwWYXIjg
Morphology and Speciation	https://youtu.be/ISYfRd0KtJA

Punctuated Equilibrium Theory	https://youtu.be/tLPhoI3cgyk
Globin Phylogenetic Tree	https://youtu.be/AledGzy_n8s
Taxonomic Trees	https://youtu.be/mzCVAm5ADwM
Molecular and Organismal Evolution	https://youtu.be/mA7BE3mEb64
The New Synthesis	https://youtu.be/gDj9LfaQM

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	1	3	2	2	3	2	2	1	3
CO2	3	3	3	3	3	1	3	3	2	3	3	1	1	2
CO3	3	2	1	2	3	1	2	1	1	1	2	1	1	2
CO4	3	1	3	3	3	1	2	1	1	1	2	1	1	1
CO5	3	1	2	3	3	1	2	2	2	2	2	1	1	2

(Correlation: 3- High, 2- medium,1- Low)

### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Quiz (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr. Pawlin Vasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	

	Principal	No-11.1w
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### **SEMESTER: II**

### COURSE CODE: 23PZO2E02

### TITLE OF THE COURSE:ELECTIVE: BIODIVERSITY AND ECOSYSTEM FUNCTIONING

### **COURSE OBJECTIVES**

- To enumerate the different mechanisms of biodiversity monitoring.
- To explain Habitat fragmentation, multi-trophic dynamics and ecosystem processes as a part of Ecosystem function.
- To highlight theories and processes in landscape ecology.

### **COURSE OUTCOMES**

### At the end of the course the students will have the ability to:

CO 1	Explain and interrelate biodiversity with reference to species diversity.	K2
CO 2	Relate the theories between biodiversity and ecosystem function.	К3
CO 3	Interpret the pattern and effect of biodiversity and stability in soil ecosystem.	К3
<b>CO 4</b>	Establish the theories and structure of landscape ecology	K4
CO 5	Analyze the Spatial data processing, GIS and Remote sensing in landscape ecology	K4

### Credits: 4

### **Instructional hours: 75**

### Hrs

# UNIT I: BIODIVERSITY MONITORING (K2) (15Hrs)

Measuring global biodiversity and its decline with special reference to mammals, birds, herpetofauna, fish and insects; Local and regional biodiversity-niche assembly theories, Unified Neutral theory; Threats to species diversity - Habitat loss, Habitat fragmentation and species extinction, Endemism and biodiversity, Population bottleneck, Genetic drift, inbreeding depression, Risks to biodiversity extinction, Extinction vortex.

## UNIT II: BIODIVERSITY AND ECOSYSTEM FUNCTION – I (K3) (15Hrs)

Theories on relation between biodiversity and ecosystem function - Species Complementarity, Sampling effect, Redundancy; Decline of global biodiversity and loss of ecosystem function; Functional diversity and ecosystem functioning; Insurance Hypothesis -The effect of habitat fragmentation and dispersal on ecosystemfunctioning.

### (Self Study:Decline of global biodiversity and loss of ecosystem function)

# UNIT III: BIODIVERSITY AND ECOSYSTEM FUNCTION I - II (K3) (15Hrs)

Biodiversity and stability in soil ecosystem - pattern processes and the effect of disturbance; Global pollinator loss and their effect on crop production and non-crop plant reproduction; Multi-trophic dynamics and ecosystem processes; The economics of biodiversity and ecosystem function.

#### (Self Study:biodiversity and ecosystem function)

# UNIT IV: LANDSCAPE ECOLOGY I (K4) (15Hrs)

Theories in landscape ecology - Hierarchy theory and the structure of the landscape, Percolation theory, Metapopulation theory, Systems source-sink, Scale and landscape, Scaling the landscape, Change of scale perception, Importance of parameters at different scales.

# UNIT V: LANDSCAPE ECOLOGY II (K4) (15Hrs)

Processes in the landscape – Disturbance, Fragmentation, Landscape connectivity, Corridors; Methods in landscape ecology - Spatial data processing, fractal geometry approach, Remote sensing in landscape ecology (RS),Geographic Information System (GIS), Spatially explicit population models (SEPM).

### **TEXT BOOKS**

- 1. Michel Loreau, Shahid Naeem, Pablo Inchausti. (2002), Biodiversity and Ecosystem Functioning: Synthesis and Perspectives. OUP Oxford; Illustrated edition.
- 2. Kurt Jax. (2010). Ecosystem Functioning (Ecology, Biodiversity and Conservation) Kindle Edition. Cambridge University Press; Illustrated edition.

### **REFERENCE BOOKS**

1. Krishnamurthy K.V. (2003). Textbook of Biodiversity. Science Publishers, Inc., Enfield New Hampshire, USA.

2. Gary M. Lovett, Clive G. Jones, Monica G. Turner, Kathleen C. Weathers. (2005). EcosystemFunction in Heterogeneous Landscapes. Springer Publications

### **BLENDED LEARNING**

### UNIT IV: LANDSCAPE ECOLOGY

TOPIC	LINKS
Theories in landscape	https://www.youtube.com/watch?y=lcmLl98mEaLo
ecology	
Hierarchy theory and the	https://www.youtube.com/watch?y=ycgOPN37nWU
structure of the landscape	<u>mtps.//www.youtube.com/wutch.v=yegor1(52hWO</u>
Percolation theory	https://www.youtube.com/watch?v=mxfhqJGSFLk
Metapopulation theory	https://www.youtube.com/watch?v=oSpcHooKA9s
Systems source-sink	https://www.youtube.com/watch?v=6sQt1N0nBeE
Scale and landscape	https://www.youtube.com/watch?v=h1J46foOW4s&t=203s
Scaling the landscape	https://www.youtube.com/watch?v=DEfYYf1-hVY
Change of scale perception	https://www.youtube.com/watch?v=qFXLw4662N4

Importance of parameters at different scales.

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	2	3	3	3	2	1	2	2	3
CO2	2	2	3	2	2	2	3	3	3	2	1	2	2	2
CO3	1	2	3	2	2	2	3	3	3	1	1	2	2	2
CO4	1	2	3	2	2	2	3	3	3	1	1	2	2	3
CO5	1	2	3	3	2	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2- medium, 1- Low)

### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field survey (Unit V)	Once in a Semester

Verified by HOD:
Dr.PawlinVasanthi Joseph
Approved by :
10-11.1m
Principal
[ 

### SEMESTER: III

### COURSE CODE: 22PZO3C09

### TITLE OF THE COURSE: CORE: GENERAL AND APPLIED MICROBIOLOGY (Skill Development)

### **COURSE OBJECTIVES**

- To identify different types of microbes and their structure.
- To understand the role of microbes in agriculture, biopesticide and biofertilizer production.
- To facilitate information about various microbial diseases and self preventive measures against allergy causing agents.

### **COURSE OUTCOMES**

### At the end of the course the students will have the ability to:

CO 1	Identify different microbes and their general structure	K1
CO 2	Differentiate methods of culturing bacteria and measures for their maintenance	K2
CO 3	Demonstrate the role of microbes in agriculture, waste water treatment and biodeterioration	К3

CO 4	Classify different types of aeroallergens and its management	K3
CO 5	Categorize the different microbial disease, its diagnosis and treatment	K5

#### **SYLLABUS**

Credits: 4

**Instructional hours: 75** 

#### Hrs

### UNIT I: MICROORGANISMS (K1)

### (15Hrs)

Scope of microbiology; Outline classification of microorganisms (Bacteria, Virus, Algae, Fungi); Structure of typical bacteria (Capsule, Flagella, Pili and Fimbriae, Cell wall, plasma membrane); Structure of virus; fungi and algae(Cell wall, Plasma membrane, Cytoplasm).

### **UNIT II: BACTERIAL CULTURE (K2)**

### (15Hrs)

Different types of culture media used in microbiology; Culture techniques employed in microbiology; Anaerobic culture methods; Bacterial growth - Parameters of growth, Growth in continuous culture, Growth in batch culture, Synchronous growth; Isolation, purification and maintenance of pure culture; Sterilization techniques - Physical methods of sterilization, Chemical methods of sterilization.

(Beyond the Curriculum: Bio Medical Waste Management)

### UNIT III: AGRICULTURAL MICROBIOLOGY (K3)

### (15Hrs)

Role of microbes in soil fertility (Carbon cycle, Nitrogen cycle, Phosphorus cycle, Sulphur cycle, Symbiotic microbes in crop production); Biofertilizers (Production of bacterial biofertilizer, Algal biofertilizer, Endophytic nitrogen fixers, Mycorrhizal biofertilizer); Biopesticides (Bacterial and viral insecticides, Entomopathogenic fungi); Water microorganisms (Marine water microbes, Fresh water microbes); Use of microbes in waste water treatment (Small scale sewage treatment, Large scale sewage treatment)

(Self study: Biofertilizers)

### UNIT IV: AEROMICROBIOLOGY(K3) (15Hrs)

Aeromicroflora of pharmacy, hospitals, houses, storage materials; Aeroallergens and aeroallergy (Dust, Pollen grains and Cosmetics); Management of aeroallergy (Measures to avoid aeroallergy and air filtration using different air filters)

### UNIT V: MEDICAL MICROBIOLOGY (K5)

#### (15Hrs)

Normal microflora of the human body; Common bacterial diseases- Diagnosis and Treatment (Tuberculosis, Syphilis) Common viral diseases - Diagnosis and Treatment (AIDS, Meningitis); Protozoan diseases - Diagnosis and Treatment (Malaria, Amoebiasis); Fungal diseases - Diagnosis and Treatment (Dermatitis, superficial and deep systemic), Biodeterioration of pharmaceutical products

### (Self study: Diagnosis and treatment of microbial diseases)

### **TEXT BOOKS**

- Dubey, RC and Maheshwari, DK 1999, *Textbook of Microbiology* (1<sup>st</sup> edition), Chand S and company, New Delhi.
- 2. Pelczar, MJ. et al 1993, Microbiology (5th edition), McGraw Hill, New York.

#### **REFERENCE BOOKS**

- Ananthanarayanan, K and Jayaram Panicker, CK 2005, *Text book of Microbiology* (7<sup>th</sup> edition), Orient Long man.
- 2. Sharma, PD 2004, *Microbiology* (2<sup>nd</sup> edition), Rastogi Publications, Meerut.
- Deb, WC 1982, *Microbes and diseases of man* (1<sup>st</sup> edition), CSB Publishers and distributors, New Delhi.
- 4. Lilian E Hawker and Alan H Linton 1981, *Microorganisms: Functions, form and environment*. (2<sup>nd</sup> edition), Edward Arnold Publishers limited, London.

#### **BLENDED LEARNING**

#### **UNIT V: MEDICAL MICROBIOLOGY**

TOPIC	LINKS
Normal microflora of the human body	https://youtu.be/Ybk7E7SLbWw
Common bacterial diseases (Tuberculosis) - Diagnosis and Treatment	https://youtu.be/74Qttu8DEZI

Common bacterial diseases (Syphilis) - Diagnosis and Treatment	https://youtu.be/1906icvgr1s
Common viral diseases (AIDS) - Diagnosis and Treatment	https://youtu.be/5g1ijpBI6Dk
Common viral diseases (Meningitis) - Diagnosis and Treatment	https://youtu.be/gIHUJs2eTHA
Protozoan diseases (Malaria)- Diagnosis and Treatment	https://youtu.be/wY-3psl1iBE
Protozoan diseases (Amoebiasis)- Diagnosis and Treatment	https://youtu.be/WZxgy3SpqBI
Fungal diseases (Dermatitis) - Diagnosis and Treatment	https://youtu.be/HW_w1IgE-Zw
Fungal diseases (superficial and deep systemic) - Diagnosis and Treatment	https://youtu.be/z5w4Sw2DBzA https://youtu.be/gQU4CWW27j8
Biodeterioration of pharmaceutical products	https://youtu.be/I_1jNtkVWH4

### MAPPING OF CO's WITH PO's AND PSO's

	PO	PO1	PO1	PO1	PSO	PSO								
	1	2	3	4	5	6	7	8	9	0	1	2	1	2
CO 1	2	3	1	1	1	2	2	1	1	2	1	1	1	2
CO 2	3	3	3	2	1	2	2	1	1	2	2	1	1	2
CO 3	3	2	2	1	1	3	3	2	2	3	3	2	3	2
CO 4	2	2	2	1	2	2	2	2	1	3	2	2	2	3
<b>CO</b> 5	2	2	1	2	2	2	2	1	2	2	2	2	3	3

### (Correlation: 3- High, 2- medium,1- Low)

ASSESSMENT TOOLS	
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S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field work (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Dr. R. Dhivya	
Checked by CDC :	Approved by :
	Principal

### **SEMESTER: III**

### COURSE CODE: 22PZ03C10

### TITLE OF THE COURSE: CORE: BIOTECHNOLOGY

### (*Employability*)

### **COURSE OBJECTIVES**

- To understand the principles and techniques of Biotechnology
- To provide knowledge on the applications of Biotechnology in various fields.

### **COURSE OUTCOMES**

### At the end of the course the students will be able to:

CO 1	Describe the procedures involved in animal cell culture and	K1
	cryopreservation	
CO 2	Explain the genetic engineering process involved in the production of	K2
	human health care products	
CO 3	Differentiate blotting techniques and nanoparticles in the application of	K2
	biological process	
CO 4	Apply the basic principles of biotechnology in fermentation, single cell	K3
	protein and bioremediation	
	<b>r</b>	

### **SYLLABUS**

Credits: 4

**Instructional hours:** 

### 75 Hrs

## UNIT I: CELL CULTURE AND ANIMAL BIOTECHNOLOGY (K1) (15Hrs)

History of animal cell culture - requirements of animal cell, tissue and organ culture, isolation and disaggregation of tissue - physical and enzymatic methods, Establishment of cell culture, cultivation of animal cells in bioreactors, Insect cell culture, Somatic cell fusion and Organ culture, Valuable products from cell culture (Tissue plasminogen activator, blood factor, Erythropoietin). Cryobiology - definition, methods of cryopreservation, Cell cryobank.

# UNIT II: GENETIC ENGINEERING FOR HUMAN HEALTH (K2) (15Hrs)

Production of hormones (Insulin, Somatotropin and Somatostatin), Production of Vaccines (Polio, Rabies, Hepatitis B).Prevention, cure and diagnosis of diseases (Parasitic disease through DNA probes and production of Monoclonal antibodies).Gene therapy - Types, methods of gene transfer, success of gene therapy.DNA profiling methods and its application.

### (Self study: Production of Vaccines)

### UNIT III: TECHNIQUES IN BIOTECHNOLOGY (K2) (15Hrs)

Polymerase chain reaction (PCR) and Reverse transcription mediated PCR. Blotting Techniques - Northern blotting, Southern blotting and Western blotting, Enzyme linked immunosorbent assay (ELISA), Random fragment length polymorphism (RFLP). Basics of Nano Biotechnology - dimensions and applications, Nano particles - carbon nanotube, colloidal gold, nanostructure and nanoscale iron particles.

# UNIT IV: MICROBIAL AND ENVIRONMENTAL BIOTECHNOLOGY(K3) (15Hrs)

Fermentation - production of vitamins (vitamin B12), organic acids (citric acid), alcohol (ethyl alcohol), Production of alcoholic beverages (wine), aminoacids (L - glutamate), antibiotics (pencillin). Single cell protein - advantages of producing microbial protein, nutritive value of SCP, production of algal biomass (spirulina), production of bacterial biomass, production of yeast biomass. Bioremediation – Insitu and exsitu bioremediation, bioremediation of hydrocarbons, industrial waste, xenobiotics.

(Beyond the Curriculum: Environmental DNA metabarcoding)

### UNIT V: BIOTECHNOLOGY IN AGRICULTURE AND FORESTRY (K5)

#### (15Hrs)

Application in agriculture - improvement of hybrids, encapsulated seeds, production of disease resistant plants, production of stress resistant plants and transfer of nif genes into eukaryotes. Application in horticulture and forestry - micro propagation, invitro establishment of mycorrhiza. Transgenic plants- marker genes, transgenic plants for crop improvement, molecular farming from transgenic plants.

(Self study: Application of biotechnology in horticulture)

#### **TEXT BOOKS**

- Dubey, RC 2003, A textbook of Biotechnology (1<sup>st</sup> edition), S. Chand & Co., Ltd., Ramnagar, NewDelhi:
- Gupta, PK 2001 *Elements of Biotechnology* (1<sup>st</sup> edition), Rastogi Publications, Meerut.

#### **REFERENCE BOOKS**

- 1. Shanmugam, S 2010, *Nanotechnology* (1<sup>st</sup> edition), MJP Publishers, New Delhi.
- Ignacimuthu, SJ 1995, *Basic Biotechnology* (1<sup>st</sup>edition), Tata McGrew Hill, NewYork
- Kumar, HD 1991, A Textbook of biotechnology (1<sup>st</sup> edition), Affiliated East West Press Pri., Ltd., New Delhi.
- Rema, LP 2008, Applied Biotechnology (5<sup>th</sup> edition), MJP Publishers. Chennai, Tamilnadu.

### **BLENDED LEARNING**

### UNIT V: BIOTECHNOLOGY IN AGRICULTURE AND FORESTRY

TOPIC	LINKS
Application in agriculture improvement of	https://youtu.be/3eT-On_hukE
hybrids, production of disease resistant	https://youtu.be/oliikQyRCtc
plants, production of stress resistant plants	https://www.youtube.com/watch?v=VsYax7b09GU
Encapsulated seeds	https://youtu.be/pmujvEPdS3w
Application in horticulture and forestry -	https://youtu.be/SLmbyI3xDII
micro propagation, <i>invitro</i> establishment of	https://youtu.be/o2GKPQt39ZI
mycorrhiza.	https://youtu.be/7dVjg0d-yqA
Transgenic plants- marker genes,	https://youtu.be/E_FniowPVTI
transgenic plants for crop improvement	https://www.youtube.com/watch?v=6GG634muj00
Molecular farming from transgenic plants.	https://youtu.be/uFUBeKIss-M https://www.youtube.com/watch?v=uFUBeKIss-M

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	3	2	2	1	3	3	3
<b>CO2</b>	3	3	2	2	2	2	2	3	2	2	1	3	3	3
CO3	3	3	2	2	2	2	2	3	2	2	1	3	3	3
CO4	3	3	2	2	2	2	2	3	2	2	1	3	3	3
CO5	3	3	2	2	2	2	2	3	2	2	1	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

ASSESSMENT TOOLS

S.No	Assessment methods	Frequency of assessment
1.	End semester examination	Once in a semester
2.	CIA I	Once in a semester
3.	Model	Once in a Semester
4.	CIA II	Once in a semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field work (Institutional visit) (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Dr. B. Karpagam	
Checked by CDC :	Approved by :
	Principal

### **SEMESTER: III**

### COURSE CODE: 22PZO3C11

### TITLE OF THE COURSE: CORE: DAIRY SCIENCE TECHNOLOGY

### (Entrepreneurship)

#### **COURSE OBJECTIVES**

- To define the quality of market milk and the methods of treatment.
- To understand the effects of heat and the role of microbes in the quality of milk.
- To provide a comprehensive view of different milk products and their marketing.

### **COURSE OUTCOMES**

At the end of the course the students will be able to:

CO 1	Define the quality of milk and the treatment procedures	K1
CO 2	Describe the physical properties and chemistry of fluid milk	K1
CO 3	Estimate the effect of heat on the quality of milk and its nutritive value.	K2
CO 4	Explain the role of microbes in milk, sources of contamination and its control	K2
CO 5	Classify the milk products and factors influencing the quality	K3

### **SYLLABUS**

### Credit: 4

### Instructional hours:

### 75 Hrs

UNIT I: TYPES OF MARKET MILK AND ITS PROCESSING (K1) (15Hrs)

Market milk, types of market milk, Market milk industry, Quality of market milk. Collection and transportation of milk- Types of collection system, Transportation, cooling and grading of milk. Processing of milk - reception, storage, filtration, clarification, cream separation, standardization. Heat treatment- Pasteurization, Sterilization, Homogenization.

### (Beyond the Curriculum: Recent Advances in Dairy Industry)

### UNIT II: CHEMISTRY OF FLUID MILK (K1)

Composition, Major and minor components of fluid milk, chemistry of milk protein and milk lipids, Physico-chemical properties of fluid milk. Physical properties of milk protein, lipids and its types.

#### UNIT III: HEAT EFFECT ON MILK (K2)

Protein denaturation, salt and pH, casein alteration, serum protein denaturation, casein – whey protein interaction, lactose reaction. Coagulation of concentrated milk, salt balance and heat stability of concentrated milk, dried milk, effect of storage conditions on stability of dried milk. Nutritive value.

### UNIT IV: MICROBIOLOGY OF FLUID MILK (K2)

Beneficial microorganisms, Spoilage microorganisms, Pathogenic microorganism, Microbial population dynamics in milk, Effect of processing on the microbiology of milk. Clean milk Production- Practices related to milk animals, milking, environment, post milking operations. Contaminants in milk.

### (Self Study: Spoilage microorganisms)

#### **UNIT V: MILK PRODUCTS (K3)**

Composition, food and nutritive value, Production and collection, neutralization, standardization, pasteurization. Manufacture of different types of milk product, packaging, storage and distribution of milk products. Defects in milk product, prevention and uses of milk products.

### (Self Study: Pasteurization)

#### **TEXT BOOKS**

- Sukumar, De 2007, *Outlines of Dairy technology* (1<sup>st</sup> edition), Oxford University Press, Noida, Uttar Pradesh, India.
- 2. Shivashraya Singh 2014, *Dairy Technology* (Volume I&II), New India Publishing Agency, New Delhi.
- Webb, Johnson and Alford 2005, *Fundamentals of Dairy Chemistry* (1<sup>st</sup> edition reprint), Satish Kumar Jain for CBS Publisher & Distributor pvt, Ltd.

### **REFERENCE BOOKS**

 NIIR Board of Diary Technologist 2005, Modern technology of milk processing an dairy product (2<sup>nd</sup> edition), National institute of industrial research, Delhi.

#### (15Hrs)

### (15Hrs)

(15Hrs)

### (15Hrs)

- Parihar, Pradeep and Leenaparihar 2006, *Dairy microbiology* (1<sup>st</sup> edition), Agrobios, Jothpur, India.
- Webb, Byrom 1987, Fundamentals of Dairy Chemistry (1<sup>st</sup> edition), CBS publications, New Delhi.

### BLENDED LEARNING UNIT IV: MICROBIOLOGY OF FLUID MILK

ТОРІС	LINKS
Beneficial microorganisms	https://youtu.be/dW7rPrGH7vY
Spoilage microorganisms	https://www.youtube.com/watch?v=pucrkgwTl5Y
Pathogenic microorganism	https://youtu.be/h1-rgZR82nk
Microbial population dynamics in	https://youtu.be/HTZfUzjNhtI
milk	
Effect of processing on the	https://www.youtube.com/watch?v=JHzEkjVDaSo
microbiology of milk.	
Clean milk Production	https://youtu.be/dl9dag5VUcA
Contaminants in milk.	https://www.youtube.com/watch?v=i-pwt_CSxJQ

### MAPPING OF CO'S WITH PO'S AND PSO'S

	<b>P0</b>	P01	P01	P01	PSO	PSO								
	1	2	3	4	5	6	7	8	9	0	1	2	1	2
CO 1	2	3	2	2	3	3	2	2	3	3	3	2	1	2
CO 2	2	1	2	2	2	2	1	1	2	2	1	1	2	2
CO 3	2	1	3	1	2	2	2	1	2	2	2	2	2	1

CO	2	2	1	2	2	2	2	1	3	3	1	2	1	2
4														
СО	2	2	2	3	3	3	1	2	2	2	1	2	1	2
5														

(Correlation: 3- High, 2- medium,1- Low)

### ASSESSMENT TOOLS

S.NO	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field work (Diary Unit) (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. J. Roopavathy	Dr.PawlinVasanthi Joseph
Dr. R. Dhivya	
Checked by CDC :	Approved by :
	Principal

### SEMESTER: III

### COURSE CODE: 22PZO3C12

### TITLE OF THE COURSE: CORE: IMMUNOLOGY

### (Skill Development and Employability)

### **COURSE OBJECTIVES**

- To recognize antigens, immunoglobulins and vaccines in the immune process of the body
- To enumerate the humoral and cell mediated response and the role of the Major Histocompatibility systems
- To describe the different types of immune tolerance and immunotechniques

### **COURSE OUTCOMES At the end of the course the students will be able to:** Describe the types of immunity, antigens, immunoglobuling.

CO 1	Describe the types of immunity, antigens, immunoglobulins and antibody diversity	K2
CO 2	Differentiate the humoral mediated response from the cell mediated response	K2
CO 3	Demonstrate the importance of major histocompatibility complex on organ transplantation and tumour immunology	K3
CO 4	Relate auto-immunity and hypersensitivity to immune tolerance and immune response	К3
CO 5	Devise immuno-techniques and Hybridoma technology for immune responses in animals	K4

### **SYLLABUS**

### Credits: 4 Hrs

### **Instructional Hours: 75**

### UNIT I: IMMUNOGLOBULINS AND ANTIGENS (K2)

### (15Hrs)

Immune System- Primary and secondary Lymphoid organs-structure and functions.

Types of Immunity – Innate, acquired, passive, active, primary, secondary, humoral and cell mediated. Antigens – Immunogenicity, antigenicity, Immunogens, adjuvants, epitopes, Hapten and carrier. Immunoglobulins– Structures, types, distribution and biological functions. Genetic basis of

Antibody diversity, Ig-class switching, Regulation of antibody synthesis. Super Immunoglobulins.

Vaccines – Principles and types.

### UNIT II: HUMORAL AND CELL MEDIATED RESPONSE (K2)

### (15Hrs)

Humoral immune response – Antigen processing & presentation –T-cell receptor, T, B cell activation - clonal proliferation-cytokine influence-kinetics of primary and secondary immune response-. Cell mediated immune response - Phagocytosis, role of TC, Macrophages and NK-cells, ADCC-influence of cytokines. Mechanism of CMI. Complements - Mode of activation, classical and alternate pathways, Toll like receptors.

# UNIT III: ORGAN TRANSPLANTATION AND TUMOUR IMMUNOLOGY (K3) (15Hrs)

Major Histocompatibility (MHC) systems – Genetics organization of MHC in mouse, HLA in man. Structure and functions of MHC molecules. Organ transplantation – Types of Graft, allograft rejection (pathology, mechanism and immune suppression) graft versus host reaction. Tissue typing tests – Lymphocytotoxicity and MLR. Tumour Immunology – Tumour antigens, immune response to tumour, immune surveillance, immunodiagnosis, immunotherapy for the treatment of cancer (antibodies and vaccines).

(Self study : Organ transplantation – Types of grafts)

### UNIT IV: AUTOIMMUNITY AND HYPERSENSITIVITY (K3) (15Hrs)

Immune tolerance- Types- natural, acquired (mechanism of T & B cell) tolerance. Autoimmunity – Theories, mechanism, disorders (organ specific and systemic). Hypersensitivity– Types, mechanisms and disorders. Immune response to-viral (HIV), bacterial (tuberculosis), parasitic (malarial) infections, congenital (SCID, LAD and CGD) and Acquired Immuno deficiency.

(Beyond Curiculum: Immune response to Covid-19 SARS CoV2)

## UNIT V: IMMUNOTECHNIQUES (K4) (15Hrs)

Antigen –Antibody reactions – Precipitation and agglutination. Immunotechniques– Immunodiffusion, RIA, Immunodetection of antigen in cells - Immunofluorescence microscopy - Direct test with labeled antibody and tissues, Indirect test with labeled secondary antibody, Confocal microscopy, Flow cytometry, FISH and GISH. Detection and quantitation of antigen by antibody- The nephelometric assay for antigen, Chromatin immunoprecipitation (ChIP) assays.

### **TEXT BOOKS**

- Kuby, J 2007, *Immunology* (6<sup>th</sup> edition), WH Freeman & Company, New York. Fathimunisa
- 2. Roitt, I 2002, *Essential Immunology* (6<sup>th</sup> edition) Elsevier Science Publishing Company, New York.

### **REFERENCE BOOKS**

- 1. Begum 2014, Immunology, PHI Learning Pvt. Ltd., Delhi
- Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt 2006, (11<sup>th</sup> edition) Wiley Blackwell.
- Tizard, IR 1995, *Immunology An introduction* (4<sup>th</sup> edition) Saunders College Publications, Philadelphia.
- Lydyard, MA. Whelan and Fanger MV 2000, *Instant Notes in Immunology*, Bios Scientific Publishers Ltd, Oxford, 2000.

#### **BLENDED LEARNING**

### UNIT V: IMMUNOTECHNIQUES AND HYBRIDOMA TECHNOLOGY

TOPIC	LINKS
Monoclonal antibodies	https://youtu.be/nxxBVaXHW5Q
Anti gen Ab rxn	https://youtu.be/3W67OH3v2lU
Immunodiffusssion	https://youtu.be/EDTgjmuOm84
ELISA	https://youtu.be/YJ0-qQslqqQ
RIA	https://youtu.be/JtbcqkiFf7w
Western blot	https://youtu.be/Yh69yHJMWPc
Immuno fluroscence ab tech	https://youtu.be/jMDfd28i7Is

Flow cytometry	https://youtu.be/EQXPJ7eeesQ
FISH	https://youtu.be/2Z29usot2Dg
GISH	https://youtu.be/_g-dUpG_psg

### MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3	2	2	2	3	3	2	3	2	3
CO2	3	3	3	3	3	2	2	1	3	3	2	2	1	3
CO3	3	3	3	3	3	2	2	1	3	3	2	2	2	3
CO4	3	3	3	3	3	2	2	1	3	3	2	2	3	3
CO5	3	3	3	3	3	2	3	2	3	3	3	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field work (Laboratory visit) (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. R. Dhivya	Dr.PawlinVasanthi Joseph
	-
Checked by CDC :	Approved by :
	Principal

### **SEMESTER: III**

### COURSE CODE: 21PZO3E01

### TITLE OF THE COURSE: ELECTIVE: TOXICOLOGY

### (Skill Development)

### **COURSE OBJECTIVE**

- To provide a comprehensive view of natural resources, biodiversity and energy resources and their management.
- To study about the Global environmental changes and their remedial measures.
- To understand the impacts of pollution and their management.

### **COURSE OUTCOMES**

### At the end of the course the students will be able to:

CO 1Exemplify the different toxicants in the environment.K1

CO 2	Compare the toxicological testing methods based on the duration of exposure.	K2					
CO 3	Relate the different levels of responses to quantity and duration of toxic						
	doses on test animals.						
CO 4	Demonstrate the modification of action of heavy metals on organisms.	K3					
CO 5	Analyze the Environmental Impact and Risk Assessment for	K5					
	bioaccumulation of Xenobiotics.						

#### **SYLLABUS**

Credit: 4 Instructional Hours: 75 Hrs UNIT I: CONCEPT AND SCOPE OF TOXICOLOGY (K1)

### (15Hrs)

Disciplines of Toxicology. The principal divisions and branches of toxicology (Environmental Toxicology: Environmental Pollution, Environmental Contaminant, Environmental Toxicant); Forensic Toxicology - Classification of poisons (Corrosives, Irritants, Neurotics and cardiac Poisons) - Symptoms and Treatment. Economic Toxicology (Food Toxicology and Drug Toxicology).Clinical Toxicology; Toxicants in air, Water and Food. Toxicity - categories of Toxic effects - principle aspects of Toxicity, Scope and importance of Toxicology.

# UNIT II: TOXICOLOGICAL TESTING METHODS (K2) (15Hrs)

General test design. Types of toxicity test - Types based on number and condition. Single species test, multiple species test and eco system test. Types of test based on exposures of toxicants- single dose test and multiple dose tests. Types of test based on the length of exposure objectives, experimental design, route of the administration, dosage and number of animal, observation and examination, evaluation. Acute toxicity test, Sub acute toxicity test, Chronic toxicity test and other tests (teratogenic, reproductive, carcinogenic, skin toxicity and eye toxicity test), behavioral response test and functional test.

#### UNIT III: DOSE RESPONSE RELATIONSHIP (K2)

Selection of doses, duration of exposure - acute exposure, subacute exposure, sub chronic exposure and chronic or life term exposure. Types of human exposure: intentional exposure, occupational exposure, environmental exposure, accidental poisoning and intentional poisoning. Categories of toxic effects. Types of dose - response relationship: Quantitative dose response relationship and Quantum dose response relationship; cumulative response relationship; threshold limit and margin of safety.

(Self study: Types of human exposure)

## UNIT IV: MODE OF ACTION OF TOXICANTS (K3) (15Hrs)

Receptor concept – categories of receptor (neurotransmitter responses, hormone, drug and silent receptors) Mechanism of action of receptor: Involvement of acetylate 72yclise and Role of calcium iron channel; Factors affecting the functions of Receptors. Mechanism of action of commonly used toxicant – Mechanism of action of toxic action of Metals, Mechanism of action of pesticides, Mechanism of action of environmental carcinogen, Mechanism of action of teratogens, Mechanism of action of ionizing and non – ionizing radiations. Modifying factors pertaining to xenobiotic chemicals, factors Pertaining to exposure, factors pertaining to the surrounding medium and factors pertaining to organism.

## UNIT V: BIOACCUMULATION, ENVIRONMENTAL IMPACT AND RISK MANAGEMENT (K5)

#### (15Hrs)

(15Hrs)

Bioaccumulation of Xenobiotics: Bioconcentration, Bioaccumulation and Biomagnification; Process of bioaccumulation, Illustration of biomagnification of important Xenobiotics; Factors affecting Biomagnification; elimination of xenobiotics and important cases of Biomagnification of Xenobiotics. Environmental impact assessment and risk assessment.

### **TEXT BOOKS**

 Kamaleshwar Pandey, Shukla, JP and Trivedi, SP 2005, *Fundamentals of Toxicology*. (1<sup>st</sup> edition), New Central Book Agency (P) Ltd, Kolkata
- 2. Sharma, PD 2009, *Toxicology*, (2<sup>nd</sup> edition), Rastogi Publications, Meerut.
- Rajeev Tyagi 2013, *Environmental Toxicology & Chemistry*, (1<sup>st</sup> edition), Mangalam Publishers and Distributors, Delhi.

# **REFERENCE BOOKS**

- 1. Battachaya, S 2011, Environmental Toxicology, Books and Allied Pvt. Ltd. Kolkata.
- Subramanian, MA 2004, *Toxicology Principals & methods* (1<sup>st</sup> edition), MJP Publishers, New Delhi.
- Sharma, BK 2005, *Environmental Biochemistry*, Krishna Prakasham Media (P) Ltd., Meerut.

#### **BLENDED LEARNING**

#### UNIT IV: MODE OF ACTION OF TOXICANTS

TOPIC	LINKS
Receptor concept	https://youtu.be/ffWE9_jK1_Y
categories of receptor	https://www.youtube.com/watch?v=jHcl8TJE6so https://youtu.be/z3bFBMzyKE8
neurotransmitter responses, hormone, drug and silent receptors	https://youtu.be/WORIhbaRABg
Mechanism of action of receptor	https://youtu.be/hhUuFCrDOlw
Involvement of acetylate cyclase and Role of calcium iron channel	https://youtu.be/4_6z7Yn48SI https://youtu.be/5Spii9akKfU
Factors affecting the functions of Receptors	https://youtu.be/kaoRrzakjGE
Mechanism of action of commonly used toxicant	https://youtu.be/tJ4ATgW8iBw
Mechanism of action of toxic action of Metals	https://youtu.be/z3bFBMzyKE8 https://youtu.be/mCkrIRpbglk
Mechanism of action of pesticides	https://youtu.be/VaJDO8F7dbs
Mechanism of action of environmental carcinogen	https://youtu.be/lQgKjd8qsIc

Mechanism of action of teratogens	https://youtu.be/9QIScZ5eRp0
	https://youtu.be/iN6uQYQ-hRU
Mechanism of action of ionizing and non -	https://youtu.be/HxYcI7uXuhA
ionizing radiations	
Modifying factors pertaining to xenobiotic	https://jeb.biologists.org/content/218/1/71
chemicals	https://www.frontiersin.org/articles/10.3389/fgene.
	<u>2012.00248/full</u>
	https://www.news-medical.net/health/Drug-
	Metabolism.aspx
factors Pertaining to exposure	https://youtu.be/wC2_7Ror3qY
	https://youtu.be/wuPUULCqJWg

# MAPPING OF CO's WITH PO's AND PSO's

	PO	РО	PO1	PO1	PO1	PSO	PSO							
	1	2	3	4	5	6	7	8	9	0	1	2	1	2
CO 1	2	3	3	1	1	1	3	1	1	2	1	1	1	2
CO 2	3	3	3	2	2	3	3	3	3	1	2	1	3	2
CO 3	3	3	2	1	2	3	3	3	3	1	2	1	3	2
CO 4	3	2	1	2	2	1	2	2	2	2	2	1	2	2
CO 5	3	2	2	2	2	1	1	2	2	2	2	2	2	2

(Correlation: 3- High, 2- medium,1- Low)

# ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Conference participation (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
	Principal
	-

# **SEMESTER: III**

# COURSE CODE: 21PZO3E02

### TITLE OF THE COURSE: ELECTIVE: WILDLIFE BIOLOGY

#### **COURSE OBJECTIVES**

- To describe the protected area concept, wildlife tools, techniques and practices.
- To illustrate the rescue operations and captive breeding of wild animals and the legislative acts and preventive measures against wildlife trade.

### **COURSE OUTCOMES**

#### At the end of the course the students will have the ability to:

CO 1	Differentiate the concepts of corridors, biosphere reserve and joint forest management.	K1
CO 2	Demonstrate wildlife techniques like sampling methods, census, survey and camera traps.	К3
CO 3	Apply techniques of telemetry, GIS, GPS and remote sensing for wildlife studies.	К3
CO 4	Analyze the capture methods, transportation, captive breeding and management programmes in wildlife.	K4
CO 5	Infer the Indian scenario of wildlife trade, preventive measures and legislative acts.	K4

#### **SYLLABUS**

#### Credits: 4

#### **Instructional hours: 75**

#### Hrs

#### UNIT 1: PROTECTED AREA CONCEPT (K1)

### (15Hrs)

Protected areas – Concept and Design; Concept of Biosphere reserve; Concept of corridor; UNESCO World Heritage Site; Concept of Joint Forest Management.

# UNIT 2: WILDLIFE TOOLS, TECHNIQUES AND PRACTICES I (K3)

### (15Hrs)

Wildlife census techniques – Abundance/density estimation in wildlife studies, Sampling methods, Census techniques used in wildlife survey; Bird census methods; Pugmark census; Camera traps in wildlife research.

### (Self Study - Census techniques used in wildlife survey)

# UNIT 3: WILDLIFE TOOLS, TECHNIQUES AND PRACTICES II (K3) (15Hrs)

Wildlife telemetry – Radio telemetry, Satellite telemetry, GPS – GSM Tracking, Application of wildlife telemetry; Remote sensing, Resolution of census, Geographic Information System (GIS), Geographic positioning system (GPS), Data analysis in Remote sensing in GIS, Applications in Wildlife studies.

# UNIT 4: CAPTURE, HANDLING, RESCUE OPERATIONS AND CAPTIVE BREEDING

# OF WILD ANIMALS AND THEIR MANAGEMENT (K4)

#### (15Hrs)

Capture methods, Handling, Transportation of captured animals; Concept of captive breeding, Re-introduction of captive breeds and conservation breeding; Wildlife management Projects in India – Project Tiger and Project Elephant.

# UNIT 5: WILDLIFE TRADE: ASSESSMENT, DOCUMENTATION, PREVENTIVE MEASURES AND LEGISLATION (K4)

#### (15Hrs)

Wildlife trade – Indian Scenario, Smuggling of wildlife products, Measures against illegal trade, Legal Perspectives of Wildlife conservation, Acts related to wildlife conservation, Government organization, Institutes in Conservation initiatives.

# (Self Study - Legal Perspectives of Wildlife conservation)

# **TEXT BOOKS**

- Goutam Kumar Saha and Subhendu Mazumdar. (2017). Wildlife Biology An Indian Perspective. Asoke K. Ghosh, PHI Learning Pvt. Ltd, New Delhi.
- 2. B. B. Hosetti. (2012). Wildlife management in India. Daya Publishing House.

# **REFERENCE BOOKS**

- M.M. Ranga. (2002). Wildlife: Management and Conservation. Agrobios, Jodhpur, India.
- 2. S.N. Dhyani. (1994). Wildlife management. South Asia Books Pvt Ltd, India.

#### **BLENDED LEARNING**

# UNIT 4: CAPTURE, HANDLING, RESCUE OPERATIONS AND CAPTIVE BREEDING OF WILD ANIMALS AND THEIR MANAGEMENT

TOPIC	LINKS
Capture methods, Handling, Transportation of captured animals	https://youtu.be/tq2MTD1F9-0
Concept of captive breeding	https://youtu.be/qdAnsH-yaYs
Re-introduction of captive breeds and conservation breeding	https://youtu.be/b-7o1VQAwsg
Wild life management project in India	https://youtu.be/rclhnkMjJu0
Project tiger	
Project elephant	https://youtu.be/rclhnkMjJu0

#### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester

6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Field survey (Unit V)	Once in a Semester

# MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	3	3	3	3	3	3	3	2	2	2	2	3
CO2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	2	3	2	2	2	3	3	3	3	2	2	2	2	2
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

Course designed by	Verified by HOD:
Dr. J. Roopavathy	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
	Principal

### **SEMESTER: IV**

# COURSE CODE: 22PZO4C13 TITLE OF THE COURSE: CORE: ENVIRONMENTAL BIOLOGY (Skill Development)

# **COURSE OBJECTIVES**

- To provide a comprehensive view of natural resources, biodiversity and energy resources and their management.
- To study Global environmental changes and their remedial measures.
- To understand the impacts of pollution and its management.

### **COURSE OUTCOMES**

#### At the end of the course the students will able to:

CO 1	Describe the different types of Natural Resources and their management.					
CO 2	Identify conventional and non conventional energy resources, their production and usage.	K1				
CO 3	Relate the existing status of Biodiversity with the conservative strategies adopted in India.	K2				
CO 4	Predict Natural disasters and climate change due to global warming	K4				
CO 5	Analyse the effect of pollution and its prevention.	K5				

# SYLLABUS

Credits: 5 Hrs

# **Instructional Hours: 75**

#### UNIT I: NATURAL RESOURCES AND THEIR MANAGEMENT (K1)

#### (15Hrs)

Classification of natural resources, water resources, water conservation, types of water resources and their uses, composition of natural water, rain water harvesting, water shed management, wetland resources, air resources, agriculture and forestry resources and range land resources, mineral resources, conservation of mineral resources, depletion of natural resources, conservation of natural resources.

# (Self study: conservation of natural resources) UNIT II: ENERGY CRISIS AND NONCONVENTIONAL SOURCES (K1) (15Hrs)

Conventional energy sources - Coal, Air, Natural Gas, Fuel Wood, Hydropower and Nuclear energy. Non - Conventional energy sources - Solar, Wind, Tidal, Waves Geothermal and Biomass Energy (Hydrogen from algae and bacterial). Biogas, Energy plantations and Biodiesel.

# UNIT III: BIODIVERSITY AND CONSERVATION (K2) (15Hrs)

Biodiversity of India, Endemic and Endangered species, India as a mega diversity nation, conservation of biodiversity: In - situ and Ex - situ, conservation strategies, Man - wild life conflicts, causes and remedial measures of man-animal conflicts. Bioethics and conservation, causes of extinction. Status of Biodiversity conservation in India. Present scenario of Biodiversity and wildlife conservation in India.

(Self study: Man-wild life conflicts)

# UNIT IV: GLOBAL ENVIRONMENTAL CHANGES AND SUSTAINABLE DEVELOPMENT (K4)

Global Warming – Climate change, Green house effects, Ozone depletion, acid rain and nuclear accidents and holocaust. Effect of global warming and remediation, International efforts to tackle climate change. Space Ecology: Natural Disaster: Tsunami - earth quake, flood, cyclone, landslides. Sustainable development: Concept & Strategies, Human impacts on Natural resource. Threats, Principles of sustainable development, International efforts and perspective and strategies in India.

(15Hrs)

### (Beyond the Curriculum: Biosphere and its Functioning)

# UNIT V: POLLUTION AND MANAGEMENT (K5) (15Hrs)

Artificial intelligence in Environmental Biology - Management of waste (Industry 4.0) Pollution and its types (Air, Water, Soil, Marine, thermal, noise and nuclear – causes, effects and control measures); Sources of Pollution, Kinds of pollution, Effect of Pollution; Eutrophication, Mercury pollution, Fluoride pollution, Symptoms and Prevention and control. Management of environmental pollution. Management of Waste: Chemical hazardous waste, Multihazardous waste, Chemical–Radioactive–Biological Waste, Determining the Regulatory Status of a Waste.

# FIELD VISIT- To places of Ecological importance.

### **TEXT BOOKS**

- 1. Sharma, PD 2012, *Ecology and Environment* (9<sup>th</sup> edition), Rastogi Publication, Meerut.
- Verma, PS and Agarwal, VK 1985, *Principles of ecology* (3<sup>rd</sup> edition), S Chand and Company, Ram Nagar, New Delhi.

# **REFERENCE BOOKS**

- 1. Purohit, SS and Agrawal Ashok 2007, *Ecology and Environmental Biology*, (Student edition), Jodhpur.
- 2. Pandey, SN and Misra SP. 2011, *Environment and Ecology*, Ane books Pvt. Ltd, New Delhi.
- Eugene P Odum 1972, *Fundamentals of Ecology*, (10<sup>th</sup> edition), W.B. Saunders, Company, London.
- 4. Clark, GL 1954, *Elements of Ecology*, John Wiley and sons.

#### **BLENDED LEARNING**

# UNIT IV: GLOBAL ENVIRONMENTAL CHANGES AND SUSTAINABLE DEVELOPMENT

TOPIC	LINKS
Global Warming	https://youtu.be/ROspLxNkNNw

Climate change	https://youtu.be/GoUffZlOwfk
Green house effects	https://youtu.be/C7IyBEX1Wws
Ozone depletion	https://youtu.be/-e_CyneWOXA
Acid rain and nuclear accidents holocaust.	https://youtu.be/Gbt-mNb0d_0
	https://youtu.be/1cjSOP1J3os
Effect of global warming and remediation	https://youtu.be/cedhb6zvy_4
International efforts to tackle climate change	https://youtu.be/LpN9tFggoWQ
Space Ecology	https://youtu.be/zrCAXyerHVM
Natural Disaster – Tsunami	https://youtu.be/YyYaO6ax0sU
earth quake	https://youtu.be/qpfhpGV_gtk
flood	https://youtu.be/DWJ3qKbk5n0
cyclone	https://youtu.be/k6PlOuzMzFY
Landslides	https://youtu.be/c6JFbTRnjSI
Sustainable development Concept &	https://youtu.be/8v4sZSDz484
Strategies	https://youtu.be/axHwdjtX69g
	https://youtu.be/EMe7pFZ0XeE
Human impacts on Natural resource	https://youtu.be/FiYvYmHBhQ8
Threats, Principles of sustainable	https://youtu.be/mNaOE2zYnFI
development,	
International efforts and perspective and strategies in India.	https://youtu.be/EMe7pFZ0XeE

# MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3	3	3	3	1	2	2	2	2	2
CO2	3	3	3	3	3	3	3	3	1	2	1	2	1	1

CO3	3	3	3	3	3	3	3	3	3	2	1	2	2	3
CO4	3	3	3	3	3	3	3	3	3	2	1	1	2	1
CO5	3	3	3	3	3	3	3	3	2	1	2	2	2	3

(Correlation: 3- High, 2- medium, 1- Low)

# ASSESSMENT TOOLS

S. NO	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Case study (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
, and the second s	-
Checked by CDC :	Approved by :
	Principal

# SEMESTER: IV COURSE CODE: 21PZO4E01

# TITLE OF THE COURSE: ELECTIVE: CELL COMMUNICATION AND CELL SIGNALING

### (Based on CSIR – JRF – NET Examinations)

# **COURSE OBJECTIVES**

- To provide an understanding of cell to cell understanding and signalling.
- To understand the mechanism of transduction by neurotransmitters.
- To provide an overview of alternation of cell cycle and immune response of antigens.

# **COURSE OUTCOMES**

# At the end of the course the students will have the ability to:

CO 1	Describe the cell to cell adhesion and its application	K1
CO 2	Associate the role of hormones in cell to cell signalling and activation of receptors	K2
CO 3	Relate the role of transmitters in sensory transduction	K2
CO 4	Show that alternation of cell cycle can lead to the production of proto oncogene and further to oncogene	K4
CO 5	Analyze that apoptosis, ageing and hypersensitivity is an independent response of B and T cells to antigens	K5

# SYLLABUS

#### Credits: 4

# **Instructional hours :**

#### 75 Hrs

# UNIT I: CELL INTERACTIONS (K1)

# (15Hrs)

Junctions between cells - Desmosomes and Tight junctions, Communication via Gap junctions and Plasmodesmata; Cell to cell adhesion - invertebrates, vertebrates, Cell adhesion molecules, Adhesion and intercellular junctions; Applications of cell to cell adhesion - Invasion by Bacteria, Protozoa and Cancer cells.

# UNIT II: CELL TO CELL SIGNALING (K2)

# (15Hrs)

Role of extracellular signals in cellular metabolism - Specific receptors - Lipophilic hormones interact with cytosolic and nuclear receptors, Interaction of water soluble hormones

with cell surface receptors, Prostaglandins, Regulation of hormones (Hormone receptors detected by binding to radioactive hormones), Epinephrine receptors and activation of Adenylatecyclase, Detection of Beta adrenergic receptors by ligand binding, Hormone analogs in study of receptor action, G- protein cycle and Protein kinase activation by cAMP.

# UNIT III: NEUROTRANSMITTERS AND SENSORY TRANSDUCTION (K2) (15Hrs)

Artificial intelligence in neurology: promising research and proven applications (Industry 4.0). Catecholamines - Evoking post synaptic potential, Excitatory and inhibitory responses of many synapses, Adenylatecyclase, GABA; Endorphins and Enkephalins, Problem in cell to cell recognition, Sensory transduction - Visual system, Retinal rod cell exited by single photon, Hyperpolarization of rod cells, Absorption of photon triggers isomerization of retinal and activation of Opsin, Cyclic GMP.

# UNIT IV: CELL CYCLE REGULATION AND ONCOGENES (K4) (15Hrs)

Mitotic cell cycle –-Alternation in cell cycle; Cell cycle regulation - Factors modifying the cell cycle; Identifying oncogenes, Oncogene types, Tumour suppressor genes; Alternations changing Proto - oncogenes into Oncogenes.

(Self study: Mitotic cell cycle)

# UNIT V: B- CELL AND T-CELL RESPONSE TO ANTIGENS (K5) (15Hrs)

Stages of B cell response - Cell to cell interaction, Activation by cytokine, B cell response; Thymus independent antigens, Plasma cells, Germinal centers; Antigens provoking cytotoxic T-cell responses – Endogenous antigen and super antigens; Apoptosis and Aging; Cytotoxic T-cell responses - Adhesion phase, Target cell perforation; Delayed hypersensitivity reactions.

(Self study: Apoptosis and Aging)

#### **TEXT BOOKS**

 David E Sadava, Jones and Bartlett 1993, *Cell Biology organelle structure and function* (1<sup>st</sup> edition), Jones and Bartlett Publishers, Inc, Burlington, Massachusetts. (Unit I)

- James Darnell, Harvey Lodish and David Blatimore 1986, *Molecular cell Biology* (3<sup>rd</sup> edition), Scientific American Books, New York. (Unit II and III)
- Stephen L Wolfe 1993 Molecular and cellular Biology (2<sup>nd</sup> edition), Wadsworth Publishing Company, California. (Unit IV)
- Ian R Tizard 1984, *Immunology an Introduction* (4<sup>th</sup> edition), Saunders Publication, Philadelphia. (Unit V)
- Ajoy Paul 2011, *Text Book of cell and molecular Biology* (2<sup>nd</sup> edition), Books and Allied Pvt Ltd. Kolkata. (Unit V).

#### **BLENDED LEARNING**

# UNIT IV: CELL CYCLE REGULATION AND ONCOGENES

ΤΟΡΙΟ	LINKS
Mitotic cell cycle	https://youtu.be/DwAFZb8juMQ
Alternation in cell cycle	https://youtu.be/WRH7xG7q6Sg
Cell cycle regulation	https://youtu.be/eqJqhA8HSJ0
Factors modifying the cell cycle	https://youtu.be/VLJF8Pf8spw
Identifying oncogenes, Oncogene types	https://youtu.be/d5OErxtJsk0
Tumour suppressor genes	https://youtu.be/HORqbHYksQo
Alternations changing Proto - oncogenes into Oncogenes	https://youtu.be/5of1K-pyEjA

# MAPPING OF CO's WITH PO's AND PSO's

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	3	3	3	3	2	3	2	3	1	2	3	2	3
CO 2	3	3	2	2	2	1	2	2	3	1	2	3	2	3
CO 3	3	3	2	2	2	1	2	2	3	1	2	3	2	3
CO 4	3	3	3	3	3	1	3	3	3	3	2	3	2	3

CO	3	2	3	3	3	1	3	2	3	1	2 2	3	3	2
5	5	5	5	5	5	1	5	2	5	1	2	5	5	5

(Correlation: 3- High, 2- medium, 1- Low)

# ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit II)	Twice in a Semester
6	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Group discussion(Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
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	Principai

# **SEMESTER: IV**

# COURSE CODE: 21PZO4E02

# TITLE OF THE COURSE: ELECTIVE: DISEASE BIOLOGY

#### (*Employability*)

## **COURSE OBJECTIVES**

- To highlight the use of Recombinant DNA Technology and PCR techniques for diagnosis of diseases.
- To discuss the role of Omics technology, gene therapy, stem cell therapy, Nanotechnology and targeted tissue engineering for addressing human diseases.

### **COURSE OUTCOMES**

#### At the end of the course the students will have the ability to:

CO 1	Describe the pathophysiology of bacterial and viral diseases.	K2
CO 2	Illustrate the usage of rDNA technology in the diagnosis of diseases.	K3
CO 3	Demonstrate the use of various PCR techniques in the diagnosis of diseases.	K3
CO 4	Demonstrate the role of Omics technology and gene therapy in treating human diseases.	K4
CO 5	Relate the role of stem cell therapy and nanotechnology in treating various diseases in human beings.	K4

#### **SYLLABUS**

## Credits: 4

# **Instructional hours: 75**

#### Hrs

# UNIT I: COMMUNICABLE AND NON-COMMUNICABLE DISEASES (K2) (15Hrs)

Communicable and non-communicable human diseases - brief outline and pathophysiology of diseases caused by bacteria (Cholera - *Vibrio cholerae*, Leprosy - *Mycobacterium leprae*, Tetanus - *Clostridium tetani*); viruses (Corona virus causing covid-19,

H1N1 virus strain causing swine flu and Nipah virus causing acute respiratory illness and fatal encephalitis) and salient metabolic disorders

## UNIT II: RECOMBINANT DNA TECHNOLOGY (K3)

#### (15Hrs)

Recombinant DNA technology and creation of recombinant molecules; Role of genes within cells, genetic elements that control gene expression, restriction and modifying enzymes, safety guidelines of recombinant DNA research; Restriction mapping, design of linkers and adaptors, Characteristics of plasmid and phage vectors, prokaryotic and eukaryotic expression vectors, Screening of libraries with DNA probes and with antisera; Transgenesis and knockout animals.

### (Self Study-genetic elements that control gene expression)

#### UNIT III: PCR FOR DISEASE BIOLOGY (K3)

#### (15Hrs)

Polymerase Chain Reaction as a tool for disease biology; Nested PCR, Taqman assay, RACE PCR, RAPD, site directed mutagenesis

# UNIT IV: OMICS TECHNOLOGY (K4)

# (15Hrs)

Omics technology to address genetic basis of human diseases (Genomics, transcriptomics, proteomics, metabolomics); Gene therapy in disease biology – gene therapy for cystic fibrosis, adenosine deaminase deficiency and severe combined immunodeficiency (SCID).

# UNIT V: STEM CELL, NANOTECHNOLOGY AND TARGETED TISSUE ENGINEERING (K4)

#### (15Hrs)

Stem cells as tool to repair damaged tissue; Nanotechnology - Nanomaterials for cancer diagnosis, Nanomaterials for cancer therapy, Nanotechnology in organ printing; targeted tissue engineering - current therapies and future prospects (autografting, allografting, xenografting, man-made, biomimetic materials and devices).

#### **TEXT BOOKS**

 Nessar Ahmed, Maureen Dawson, Chris Smith, Ed Wood. (2006). Biology of Disease. Taylor & Francis; 1st edition.  Jonathan Phillips, Paul G. Murray, Paul Kirk. (2001). Second Edition. The Biology of Disease. Wiley-Blackwell.

# **REFERENCE BOOKS**

- Preeti Arivaradarajan and Gauri Misra. (2019). Omics Approaches, Technologies And Applications: Integrative Approaches For Understanding OMICS Data. Springer; 2<sup>nd</sup> ed. 2019.
- Robert Lanza and Anthony Atala. (2014). Essentials of Stem Cell Biology. Third Edition. Academic Press.

### **BLENDED LEARNING**

#### **UNIT IV: OMICS TECHNOLOGY**

TOPIC	LINKS
Genomics	https://youtu.be/E0T6tYQeXxY
Transcriptomics	https://youtu.be/rOAWexMmdZ8
Proteomics	https://youtu.be/vnW9kH0agcE
Genomics, transcriptomics and proteomics	https://youtu.be/0mqz94bRma8
Metabolomics	https://youtu.be/L1svFdst5D8
Gene therapy - cystic fibrosis	https://youtu.be/K5sVWJsHmp4
Gene therapy - adenosine deaminase deficiency	https://youtu.be/cFOIEmFicfA
Gene therapy - severe combined immunodeficiency	https://youtu.be/PTq86zjPEdk
Gene therapy - severe combined immunodeficiency	https://youtu.be/yLqhEZKxsoo

# MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	2	2	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3

CO3	3	2	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

# ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	End Semester Examination	Once in a Semester
2.	CIA I	Once in a Semester
3.	CIA II	Once in a Semester
4.	Model	Once in a Semester
5.	Assignment (Unit I and Unit III)	Twice in a Semester
6.	Seminar (Unit III and Unit IV)	Twice in a Semester
7.	Group discussion (Unit V)	Once in a Semester

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
	Principal

# PRACTICALS

#### **SEMESTER I**

#### COURSE CODE: 23PZO2CP1

# TITLE OF THECOURSE: COREPRACTICAL - I

(Covering Courses: Functional Morphology of Invertebrates, Functional Morphology of Vertebrates, Aquaculture and Fisheries, BiostatisticsBiotechniques, General and Applied Entomology)

#### **COURSE OBJECTIVES**

- > To identify animal diversity and to relate the structure and function of organs.
- > To estimate biochemical parameters in fishes and Insects.
- > To appreciate Molecular Techniques and Cytological studies in Insects.

# **COURSE OUTCOMES**

At the end of the Practical's the students will be able to

	Majorpracticals	
CO1	Interpret the importance of the result output in Aquaculture and Fisheries,	K4
	Biostatistics, Entomology	
CO2	Minorpracticals	KA
	Deduce the microscopic structure of the cell Organelles for Entomology	N4
	Spotters	
CO3	To compare and contrast the structure of Insects and working mechanism of	K2
	Instruments	
	Record	
CO4	Transfer the diagrammatic representation and Results of experimental work	K3
	through a record presentation	
	SlidePreparation	
CO5	Prepare microtome slides and whole mount slides through a process of	K3
	microtechniques	

# FUNCTIONAL MORPHOLOGY OF INVERTEBRATES

Identification and study of sections of coelenterates, Aschelminthes& Annelids to understand the different types of coelom

Identification and study of organisms to the type of feeding a) Chaetopterus and b) Mytilus Identification and mounting with a suitable diagram of the different types of appendages in Prawn.

Relationship between the structure and function of a) Parapodia b) Gills c) Green glands

d) Flame cells e) Organs of a) Mechanoreception and b) Photoreception.

Identification and relating the type of reproduction in Protozoans & Polychaetes

# FUNCTIONAL MORPHOLOGY OF VERTEBRATES

Relationship between the structure and function of a) skin and its derivatives (scales,

nails and horn) b) Skull of Rabbit c) Dentition in mammals d) Neuron.

Identification and study of accessory respiratory organs in fishes and birds

Relationship of the organism to the type of egg laying.

Identification of a given animal for its parental care.

#### AQUACULTURE AND FISHERIES

Spotters – Marine and Inland Fishes

Identify- different nets, crafts and gears.

Identify- fish parasites and diseases

Morphometric and Meristic characters of fish

Length weight relationship and calculation of "K" value.

Quantitative estimation of protein from fish muscle.

Qualitative & Quantitative estimation of fatty acids from cod liver oil, ghee and Coconut oil.

Visit to a fishery unit.

# BIOSTATISTICS AND BIOTECHNIQUES BIOSTATISTICS

Collection and construction of frequency distribution using any biological samples data

Calculate the arithmetic mean and chi square test for the above data.

#### **BIOTECHNIQUES**

Prepare serial sections of tissues and staining – 5 Permanent Slides to be submitted for the practical exam.

Prepare whole mount for the given specimen – 5 permanent slides to be submitted for the practical exam.

Spotters – Microtome

Microscopy - Compound, Binocular Research microscope.

### GENERAL AND APPLIED ENTOMOLOGY

#### **GENERAL ENTOMOLOGY**

Spotters – Identification of the following insect orders using dichotomous keys – (Any two examples) Orthoptera, Lepidoptera, Coleoptera, Diptera, Hymenoptera.

Mouth parts – biting and chewing (cockroach), chewing and lapping (honey bee), piercing and sucking (mosquito & bedbug), sponging (housefly), siphoning (butterfly). Counting of total haemocytes in haemolymph of cockroach

Estimation of nitrogenous waste products in the excreta of cockroach

### **COMMERCIAL INSECTS**

Spotters – Queen bee, drones, worker bees, bee wax, honey, beehive and honeybee rearing

equipments. Silk moth, silkworm-instars, mulberry leaves, reeling machines,

silkworm rearing equipments.

Dissect and mount silk gland.

Dissect and mount the sting of honeybee.

# MAPPING OF CO's WITH PO's AND PSO's

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	3	3	3	3	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3	2	3	3
<b>CO4</b>	3	3	3	2	3	2	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	2	3	3

(Correlation: 3- High, 2- medium,1- Low)

# ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	Internal Practical Exam	
	Major Practicals	Once in a Semester
	Minor Practicals	
	Spotters	
2.	Record	Once in a year
3.	Microtome Slide Preparation	Once in a year
4.	Whole Mount Slide Preparation	Once in a Year
5.	Aquaculture Visit	Once in aYear
6.	End Semester Practical Examination	End of each Year

Course designed by	Verified by HOD:
Dr. R. Dhivya	Dr. Pawlin Vasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	Principal

# **SEMESTER: II**

# COURSE CODE: 23PZO2CP2

# TITLE OF THE COURSE: CORE PRACTICAL II

# (Covering Courses: Molecular Genetics, Hormones and Health Animal Physiology and Biochemistry, Developmental Biology, and Evolution)

# **COURSE OBJECTIVE**

- To analyze and estimate the experiments in Hormones and Health, Physiology and Biochemistry.
- > To perform cell studies and Smear Preparation under Developmental Biology.
- > To appreciate the evolutionary studies in terms of limbs and wings of Vertebrates.

# **COURSE OUTCOMES**

At the end of the Practical's the students will be able to

	Majorpracticals	
CO1	Examine and analyses the effect of relationship in Animal Physiology,	K4
	Boichemistry and Hormones and Health	
CO2	Minorpracticals	K5

	Determine the clinical significance of tests under Physiology and	
	Biochemistry	
	Spotters	
CO3	Classify evolutionary structure, physiological importance of connective	K2
	tissues and Hormonal dysfunction	
	Record	
CO4	Transfer the diagrammatic representation and Results of experimental work	K2
	through a record presentation	

### **MOLECULAR GENETICS**:

Identification of different stages of meiosis (slides) Grasshopper testis

Identification of barr body in buccal smear epithelium.

Squash preparation of Salivary Gland Chromosomes in Insect Larva - Chironomous

Spotters - DNA and RNA

Identification of finger prints and their pattern of inheritance.

# HORMONES AND HEALTH

Effect of thyroxin on oxygen consumption of fish

Estimate the amount of glucose present in fish blood using ACTH

# **SPOTTERS**

#### **Histological features**

(i)Pituitary gland (ii) Thyroid gland (iii) Parathyroid (iv) Adrenal gland

(v) Pancreas (vi) Testis (vii) Ovary

### **Hormonal dysfunction**

(i) Gigantism (ii) Dwarfism (iii) Cretinism (iv) Goitre (v) Cushing's syndrome

(vi) Pheochromocytoma (vii) Breast cancer (viii) Prostrate cancer

# ANIMAL PHYSIOLOGY ANDBIOCHEMISTRY

Patterns of osmotic response of earthworm in hetero-osmotic media Preparation of haemin crystals Bleeding time and clotting time Effect of salinity on the metabolic rate of fishes Quantitative estimation of haemoglobin in blood Study of salivary amylase in relation to temperature and pH. SGOT and SGPT estimation- demonstration only. Estimation of glucose from blood Estimation of protein by Lowry *et al.*, method

### **SPOTTERS**

#### **Physiological Importance**

(i) Striated muscle (ii) Non – Striated muscle (iii) Nerve cell (iv) Eye (v) Ear

# **DEVELOPMENTAL BIOLOGY**

Cell dissociation

Sperm smear preparation

Urchin development/ Zebra fish development, Hydra regeneration.

Observation of regeneration potential in tadpole.

### **SPOTTERS**

#### **Biochemical Significance**

(i) SGOT (ii) SGPT

#### **EVOLUTION**

#### **SPOTTERS**

#### **Evolutionary Evidences**

Homologous Structure - Limbs of Vertebrate (Frog, Pigeon and Rabbit )

Analogous Structure – Wings of Vertebrate (Insect, Birds and Bat)

Connecting Link – Archaeopteryx and Duck billed platypus

#### **Adaptations:**

Aquatic: SharkScansorial: MonkeyAerial: Pigeon

Fossorial : Squirrel

#### MAPPING OF CO's WITH PO's AND PSO's

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	3	3	3	3	3	3	3	3	3

# (Correlation: 3- High, 2- medium, 1- Low)

### ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment				
1.	Internal Practical Exam					
	Major Practicals	Once in a Semester				
	Minor Practicals					
	Spotters					
2.	Record	Once in a year				
3.	End Semester Practical Examination	End of each Year				

Course designed by	Verified by HOD:
Dr. J. Roopavathy	Dr.PawlinVasanthi Joseph
Checked by CDC :	Approved by :
Mrs. JANSI RANI. A	N6-11.1m
	Principal

#### **SEMESTER: IV**

#### COURSE CODE: 22PZO4CP3

# TITLE OF THE COURSE: CORE PRACTICAL III

# (Covering Courses: General and Applied Microbiology, Applied Biotechnology, Dairy Technology Immunology and Toxicology)

# Objective

- To perform experiments and Biotechnology, Diary Science Technology and Toxicology.
- > To isolate microbes and to study the Biochemical characteristics.
- To understand the working of various instruments for Biotechnology and Diary Science Technology.

At the end of the Practical's the students will be able to

C01	Major practicals	K4
	Estimate and analyze the results under Biotechnology, Microbiology and	
	Toxicology	
CO2	Minor practicals	K4
	Apprize, microscopic preparation and Biochemical Characteristics of	
	Bacteria	
CO3	Spotters	K2
	Infer the preparation of medium, streaking techniques and working	
	principles of instruments	
CO4	Record	K3
	Transfer the diagrammatic representation and Results of experimental work	
	through a record presentation	
CO5	Industrial visit	K3
	Articulate the concepts in theory and practical through field visits in	
	Biotechnology and Dairy Science Technology	

# MICROBIOLOGY

Micro measurement of yeast.

Isolation of microorganisms from water .soil.

Isolation of microorganisms from soil.

Microbial analysis of spoiled bread

Serial dilution and plating of microorganisms.

Hanging drop experiment.

Biochemical characteristics of bacteria (Any 4 tests)

Culture techniques

Gram staining bacteria.

#### BIOTECHNOLOGY

Isolation and estimation of DNA from samples (Animal Tissue)

Isolation and estimation of RNA from samples (Animal Tissue)

Blotting Techniques (Southern, Western, Northern) Photographs

PCR technique – demonstration only.

Artificial seed technology

# DAIRY SCIENCE AND TECHNOLOGY

Qualitative analysis of milk (Methylene Blue Reductase Test)

Determination of Lactose in Milk

Determination of Magnesium in milk

Record of Dairy visit

#### IMMUNOLOGY

Preparation of erythrocyte and protein antigens

Immunization- Blood sampling method and sampling antisera.

Natural haemagglutination.

Double Immunodiffusion.

Single Radial Immunodiffusion.

Immunoelectrophoresis.

Complement mediated haemolysis.

ELISA – Demonstration.

Immunodiagnostic test -Pregnancy test

### TOXICOLOGY

Estimation of Sodium in the haemolymph of Cockroach/ Fish

Estimation of Potassium in the haemolymph of Cockroach/ Fish

Enzyme assay of SGOT in Fish

Enzyme assay of SGPT in Fish

INSTRUMENTATION: Laminar flow hood, Colony counter, Autoclave,

Spectrophotometer,

Colorimeter, ELISA, Gel doc, Micropipette, centrifuge.

CULTURE MEDIA: Nutrient agar, Rose bengal agar and Kenknight agar,

PLATING TECHNIQUES: Pour plate, Streak plate, Stab culture, agar slant

Р	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3	3	3	3	3	3	3

#### MAPPING OF CO's WITH PO's AND PSO's

3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
4	3	3	3	2	3	2	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

# ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment		
	Internal Practical Exam			
1	Major Practicals	Once in a Semester		
1.	Minor Practicals	Once in a Semester		
	Spotters	-		
2.	Record	Once in a year		
3.	Dairy Visit	Once in a year		
4.	End Semester Practical Examination	End of each Year		

Course designed by	Verified by HOD:
Dr. Sajani Jose	Dr.PawlinVasanthi Joseph
-	-
Checked by CDC :	Approved by :
	Principal
	L L

# SEMESTER IV

# **COURSE CODE: 22PZO4CP4**

# TITLE OF THE COURSE: CORE PRACTICAL - IV

# (Covering Courses: Environmental Biology and Cell communication and cell

# signalling)

# **COURSE OBJECTIVES**

- > To quantitatively estimate the amount of gases and inorganic ions in water samples.
- > To study the interrelationships of animals in different ecological habitats.
- > To appreciate the role of immune cells in transduction and signalling.

# **COURSE OUTCOMES**

At the end of the Practical's the students will be able to

CO1	<b>Major practicals</b> Assess and measure the amount of inorganic salts and grams in water	K4
	samples	
CO2	Minor practicals	K4
	Detect the presence of planktons are estimate the amount of inorganic salts in water	
CO3	Spotters	K2
	Explain the adaptive features and specific relation of animals and the	
	importance of cell signaling in Communication	
CO4	Record	K3
	Transfer the diagrammatic representation and Results of experimental work	
	through a record presentation	
CO5	Educational tour	K3
	Construct valuable observations in to tangible learning, through an	
	Educational tour to places of biological importance	

#### **Environment biology**

#### **Physical parameters**

Determination of temperature of water samples.

Estimate the amount of total solids in water samples.

Measurement of Electrical conductivity of the water samples

#### **Chemical parameters**

Estimate pH in water samples

Estimate the amount of oxygen in water samples.

Estimate the amount of carbon dioxide present in water samples.

Estimate the amount of Salinity present in water samples.

Estimate the amount of Alkalinity present in water samples.

#### Nutritive parameters

Estimate the amount of Calcium and Magnesium present in water samples. Estimate the amount of Phosphate present in water samples. Estimate the amount of Silicate present in water samples.

Estimate the amount of Iron present in water samples.

# **Plankton analysis**

Quantitative and qualitative analysis of fresh water planktons

Quantitative and qualitative analysis of marine water planktons

# **SPOTTERS:**

#### **Adaptive features**

Amphibia, Reptiles, Aves, Mammals

#### Inter specific relationship

i) Parasitism	: Ascaris lumbricoides
ii) Commensalism	: Echines
iii) Predation	: Crocodile
iv) Mutualism	: Sea anemone on hermit crab

### Cell communication and cell signaling

: i) Bacteria ii) Protozoa iii) Cancer cell
: i) Nerve cell
: i) Mitosis (Normal cell cycle)
: i) Eye
: i) T- Cell ii) B-Cell
: i) Lipophilic hormone ii) Water soluble
hormone iii) Prostaglandin iv) Epinephrine

Field visit to places of Ecological Importance Record

# MAPPING OF CO's WITH PO's AND PSO's

Р	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
4	3	3	3	2	3	2	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

(Correlation: 3- High, 2- medium,1- Low)

# ASSESSMENT TOOLS

S. No	Assessment Methods	Frequency of Assessment
1.	Internal Practical Exam	
	Major Practicals	
	Minor Practicals	Once in a Semester
	Spotters	
2.	Record	Once in a Year
3.	Educational Tour and Field Visit	Once in a Year
4.	End Semester Practical Examination	End of each Year

Course designed by	Verified by HOD:
Dr. Karpagam	Dr.PawlinVasanthi Joseph

Checked by CDC :	Approved by :
	Principal

### VALUE ADDED COURSE SEMESTER: II

# COURSE CODE: 22PCCIM01

TITLE OF THE COURSE: CERTIFICATE COURSE: INDUSTRIAL MICROBIOLOGY

# **COURSE OBJECTIVES**

• To highlight the mechanism of strain development and substrates for fermentation.

• To describe in detail the process of Fermentation, Product recovery and Microbial transfer

#### **COURSE OUTCOMES**

#### At the end of the course the students will have the ability to:

CO1	Identify different strains of microbes and the process of strain optimisation	K1
CO2	Distinguish the process of fermentation for different substrates	K2
CO3	Illustrate the different process of fermentation and the application of computers in the fermentation process	K2
CO4	Demonstrate the different methods of product recovery	К3
C05	Compute the differences in steroid and non steroid transformation	К3

#### **Instructional Hours: 30**

Hrs

#### UNIT I: SCREENING FOR NEW METABOLITES (K1) (6 hrs)

Screening for new metabolites - Primary metabolites, Secondary metabolites – Strains used in Screening, Test systems - Strain development- selections of mutants – Random screening, selective isolation- strain optimization.

#### UNIT II: SUBSTRATES FOR INDUSTRIAL FERMENTATION (K2) (6 hrs)

Substrates for industrial fermentation – Carbon sources, Nitrogen sources – Fermentation system – Gas distribution by stirring, Stirred Bioreactors, Reactors for Immobilized enzymes or cells – scale up- significance of scale up.

#### UNIT III: METHODS OF FERMENTATION (K2) (6 hrs)

Fermentation Process - Inoculum preservation, Growth of Inoculum, fermenter preculture production fermentation, Instrumentation – Use of computers.

#### UNIT IV: PRODUCT RECOVERY (K3) (6 hrs)

Product recovery – Unit operation – Filter systems, Centrifugation, Disintegration of microorganisms, Chromatography, Extraction, Crystallization and precipitation, drying and Yield.
## UNIT V: MICROBIAL TRANSFORMATION (K3)

## (6 hrs)

Types of Bioconversion reactions, Procedures for biotransformation – Transformation of steroids and sterols – Microbial break down of sterol side chains – Transformation of nonsteroid compounds- Prostaglandins, Transformation of Antibiotics, Transformation of Pesticides

## **TEXT BOOKS**

- Wulf Crueger and Anneliese Crueger, 2005, Biotechnology: A Textbook of Industrial Microbiology (2<sup>nd</sup> Edition), Panima Publishing Corporation, New Delhi/ Bangalore.
- 2. L E Casida, JR, 2009, Industrial Microbiology, New Age International Publishers.