

B.Sc. ZOOLOGY

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
I	20U1LT1/LA1/LF1/LH1/LU1	I	Language – I		6	3	25	75	100
	20UCN1LE1	II	English - I		6	3	25	75	100
	20UZOICC1	III	Core – I	Biology of Invertebrates	5	5	25	75	100
	20UZO1CC2P		Core – II	Practical-I: Biology of Invertebrates	3	2	20	80	100
	20UCH1AC1		Allied – I	Inorganic, Organic and Physical Chemistry - I	5	4	25	75	100
	20UCH1AC2P		Allied – II	Practical – I – Volumetric Estimation	3	2	20	80	100
	20UCN1AE1	IV	AEC-I	Value Education	2	2	100	-	100
		TOTAL			30	21			700
II	20U2LT2/LA2/LF2/LH2/LU2	I	Language – II		6	3	25	75	100
	20UCN2LE2	II	English – II		6	3	25	75	100
	20UZO2CC3	III	Core – III	Biology of Chordates	6	5	25	75	100
	20UZO2CC4P		Core – IV	Practical-II: Biology of Chordates	3	2	20	80	100
	20UCH2AC3		Allied – III	Inorganic, Organic and Physical Chemistry - II	4	3	25	75	100
	20UCH2AC4P		Allied – IV	Practical – II– Organic Analysis	3	2	20	80	100
	20UCN2SE1	IV	Skill Enhancement Course - I @	Soft Skills Development	2	2	100	-	100
		TOTAL			30	20			700
III	20U3LT3/LA3/LF3/LH3/LU3	I	Language– III		6	3	25	75	100
	20UCN3LE3	II	English – III		6	3	25	75	100
	20ZO3CC5	III	Core– V	Cell & Molecular Biology	4	4	25	75	100
	20UZO3CC6P		Core– VI	Practical-III: Cell & Molecular Biology	3	2	20	80	100
	20UBO3AC5		Allied– V	Applied Botany I	4	3	25	75	100
	20UBO3AC6P		Allied–VI	Laboratory Course for Applied Botany I	3	2	20	80	100
	20UZO3GE1	IV	Generic Elective I #		2	2	-	100	100
20UCN3AE2	AEC-II		Environmental Studies	2	2	100	-	100	
		TOTAL			30	21			800
IV	20U4LT4/LA4/LF4/LH4/LU4	I	Language–IV		6	3	25	75	100
	20UCN4LE4	II	English– IV		6	3	25	75	100
	20UZO4CC7	III	Core– VII	Animal Physiology	5	5	25	75	100
	20UZO4CC8P		Core - VIII	Practical-IV: Animal Physiology	3	2	20	80	100
	20UBO4AC7		Allied– VII	Applied Botany II	5	3	25	75	100
	20UBO4AC8P		Allied–VIII	Laboratory Course for Applied Botany II	3	2	20	80	100
	20UZO4GE2	IV	Generic Elective - II#		2	2	-	100	100
20UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-	
		TOTAL			30	21			700
V	20UZO5CC9	III	Core – IX	Biostatistics, Bioinformatics & Computer Application	6	5	25	75	100
	20UZO5CC10		Core – X	Genetics	5	5	25	75	100
	20UZO5CC11		Core – XI	Microbiology	5	5	25	75	100
	20UZO5CC12		Core - XII	Developmental Biology	5	5	25	75	100
	20UZO5DE1P	IV	DSE – I **		5	4	20	80	100
	20UZO5SE2		Skill Enhancement Course II@		2	2	-	100	100
	20UZO5SE3		Skill Enhancement Course – III @		2	2	-	100	100
20UZO5EC1		Extra Credit Course - I	General Intelligence for competitive examinations	-	4*	--	100*	100*	
		TOTAL			30	28			700
VI	20UZO6CC13	III	Core– XIII	Biochemistry and Biophysics	5	5	25	75	100
	20UZO6CC14		Core– XIV	Immunology	5	5	25	75	100
	20UZO6CC15		Core - XV	Economic Entomology	5	5	25	75	100
	20UZO6CC16		Core - XVI	Environmental Biology and Evolution	5	5	25	75	100
	20UZO6DE2P		DSE II **		5	4	20	80	100
	20UZO6DE3		DSE III **		4	4	25	75	100
	20UCN6AE3	IV	AEC-III	Gender Studies	1	1	100	-	100
20UZO6EC2		Extra Credit Course - II	Zoology for competitive examinations	-	4*	--	100*	100*	
20UZOAECA		Extra Credit Course for all	Online Course	-	1*	--	-	-	
TOTAL					30	29			700
GRAND TOTAL					180	140	-	-	4300

Generic Electives for other major departments

SEM	COURSE CODE	COURSE TITLE
III	20UZO3GE1	Human Health and Hygiene
IV	20UZO4GE2	Vermiculture Technology and Organic Farming

@Skill Enhancement Course

SEM	Elective No.	COURSE CODE	COURSE TITLE
V	II	20UZO5SE2A	Applied Zoology
		20UZO5SE2B	Water Pollution Management
V	III	20UZO5SE3A	Poultry Science
		20UZO5SE3B	Pisciculture

****Discipline Specific Elective**

SEM	D S Elective No.	COURSE CODE	COURSE TITLE
V	I	20UZO5DE1AP	Practical – V : Biostatistics & Bioinformatics & Computer application, Genetics, Microbiology and Developmental Biology
		20UZO5DE1B	Instrumentation
VI	II	20UZO6DE2AP	Practical – VI: Biochemistry and Biophysics, Immunology, Economic Entomology and Environmental Biology and Evolution
		20UZO6DE2B	Wildlife Biology
VI	III	20UZO6DE3A	Biotechnology
		20UZO6DE3B	Recombinant DNA Technology

Allied Zoology for B.Sc., Botany

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
III	20UZO3AC5	III	Allied – I	General Principles in Zoology	4	3	25	75	100
	20UZO3AC6P		Allied – II	Practical - General Principles in Zoology	3	2	20	80	100
Total					7	5			200
IV	20UZO4AC7	III	Allied – III	Commercial Zoology	5	3	25	75	100
	20UZO4AC8P		Allied – IV	Practical - Commercial Zoology	3	2	20	80	100
Total									200
Grand Total					15	10	--	--	400

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UZO1CC1	Core – I	BIOLOGY OF INVERTEBRATES	5	5	100	25	75

Course Outcomes

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

1. Acquire knowledge on animal taxonomy and biology of Protozoans. Ability to classify Protozoans.
2. Classify Porifera and Coelenterata and acquire knowledge on Poriferans and Coelenterates.
3. Describe taxonomy of Platyhelminthes and Aschelminthes and acquire knowledge on the biology of Platyhelminthes and Aschelminthes.
4. Classify Annelida and Arthropoda and acquire knowledge on the biology of Annelids and Arthropods.
5. Report the classifying features of Mollusca and Echinodermata and acquire knowledge on the biology of Molluscs and Echinoderms.

UNIT I: Taxonomy & Protozoa

15 hours

Principles and methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of animal taxonomy.

General characters and classification of protozoa up to classes

Type study: *Paramecium* - general organization, nutrition, and reproduction.

General topics: Plasmodium life cycle Protozoan diseases in Man; Malaria, Leishmaniasis # Trichomoniasis, and Amoebiasis. #

UNIT II: Porifera & Coelenterata

15 hours

General characters and classification up to classes.

Type study: *Sycon*- general organization and reproduction.

Type study: *Obelia*- Structure of *Obeliacolony*, reproduction in *Obelia*.

General topics: Canal system in Sponges, Corals and # coral types # and Coral Reefs. Polymorphism in Coelenterates.

UNIT III: Platyhelminthes & Aschelminthes

15hours

General characters and outline classification up to classes.

Type study: Liver fluke (*Fasciola*)-Morphology, excretory and reproductive system and lifecycle.

Type study: *Ascaris*- Morphology, excretory and reproductive system.

General topics: Helminth parasites in Man. #Economic importance of Aschelminthes#.

UNIT IV: Annelida & Arthropoda

15 hours

General characters and classification up to classes.

Type study: Earthworm-Morphology, digestive, excretory and reproductive systems.

Type study: Fresh water Prawn (*Palaemon*): morphology, digestive, excretory and reproductive systems.

General topics: Larval Forms in Crustacea, Mouth parts in Insects. # Peripatus - general account #

UNIT V: Mollusca & Echinodermata

15 hours

General characters and classification up to classes.

Type study: Snail (*Pila*) – Morphology, Digestive, Respiratory, Excretory, and Reproductive systems.

Type study: Starfish - morphology, Water vascular system.

General topics: Larval forms of Echinoderms. # Economic importance of Molluscs and Echinoderms #.

Minor phyla: General account on Rotifera and Ectoprocta

#.....# Self-study portion

Text Book:

Kotpal, R.L. Invertebrates, Rastogi Publication, Meerut. 11th Edition, 2017.

Books for Reference:

1. Jordan, E.L. and Verma. P. S. Invertebrate Zoology, S. Chand & Co. 3rd Edition, 2007.
2. Ekambaranatha Ayyar, Outlines of Zoology. Vols. I & II S. Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai. 1993.

Web Reference:

1. <http://www.itis.usda.gov/itis/status.html>
2. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours	Credits			
I	20UZO1CC1		BIOLOGY OF INVERTEBRATES			5	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓
Number of Matches= 38, Relationship : HIGH										

Prepared By:

Prof. S.N. Sheik Umar Sahith

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
I	20UZO1CC2P	Core – II	PRACTICAL - I BIOLOGY OF INVERTEBRATES	3	2	100	20	80

Course Outcomes

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

1. Understand the different functional systems of Cockroach, Silk moth through dissection
2. Identify and prepare slides of various Invertebrate species to study their structures
3. Classify providing apt features for the taxonomy, draw labelled sketches along with their biological significance
4. Relate the structure and functions of selected Invertebrates
5. Culture a few live feed organisms; make a thorough study on given ecosystem.

I. Major Practicals:

Cockroach / Silk moth-Nervous, Digestive and Reproductive systems
Prawn – Nervous system

II. Minor Practicals:

Identification of Mosquitoes (3 different genera)
Earthworm - Body setae&Penial setae
Mouth parts -Honey Bee, Housefly, Mosquito, and Cockroach.
Prawn - appendages

III. Spotters:

a) Classify giving reasons:

Entamoeba, Paramecium, Euglena, Sycon, Hydra, Obelia, Aurelia, Sea anemone, Planaria, Taenia, Ascaris, Nereis, Palaemon, Penaeus, Crab, Spider, Butterfly, Rhinoceros beetle, Pila, Freshwater mussel, Octopus, Chiton, Dentalium, Sepia, Starfish, Sea urchin and Sea cucumber.

b) Draw Labelled Sketch:

T.S. of Taenia, T.S. of Fasciola, Ephyra larva, Nauplius larva, Zoea larva

c) Biological Significance:

Sponge –Gemmule, Physalia, Leech, Peripatus, Limulus, Bipinnaria,

d) Relate structure and function:

Taenia –Scolex, Nereis – Parapodium, Penaeus –Petasma, Star fish –Tube feet and Pedicellariae, Earthworm - Body setae and Penial setae.

IV Record

A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

V Group Project:

Culture of Brine shrimp/ Drosophila/ Chironomous/ Plankton

VI Field study:

Visit to any ecological park and submission of report with photographs

Text Book

Meglitsch,P.A. and Schram,F.R. Invertebrate Zoology (Third Edition). Oxford University Press, New York. 1991.

Reference

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

Web Reference

1. <http://www.itis.usda.gov/itis/status.html>
2. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits		
I	20UZO1CC2P	PRACTICAL - I BIOLOGY OF INVERTEBRATES					3	2		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓		✓	✓	✓		✓	
CO2	✓		✓	✓	✓	✓		✓	✓	
CO3	✓	✓	✓		✓		✓			✓
CO4	✓	✓		✓	✓		✓	✓		✓
CO5		✓	✓	✓	✓	✓		✓	✓	✓
Number of Matches= 35, Relationship : HIGH										

Prepared By:

Dr. M. Salahudeen

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UZO2CC3	Core – III	BIOLOGY OF CHORDATES	6	5	100	25	75

Course Outcomes

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

1. Understand the general and specific characteristics of different classes and organization of Chordates
2. Describe the general characters of Amphibians and relate them to their lifestyle.
3. Understand the taxonomy and morphology of Reptiles with reference to snakes in South India.
4. Classify Aves and acquire knowledge on the biology and adaptations of Birds.
5. Discuss the Mammalian features with systems and significant adaptations.

Unit I: Protochordates and Pisces

18 hours

General characters and outline classification.

Type study: Amphioxus – Digestive, excretory and reproductive systems.

Type study: Scoliodon - External characters, Digestive, Respiratory, #Circulatory#, Nervous and Urinogenital systems

General Topic: Fish migration, Accessory respiratory organs in Fishes, Fins and Scales of Fishes

UNIT II: Amphibia

18 hours

General characters and outline classification.

Type study: Frog - External characters, Digestive, Respiratory, Circulatory, #Nervous# and Urinogenital systems

General Topic: Parental care in Amphibians, Neoteny and Paedogenesis.

UNIT III: Reptilia

18 hours

General characters and outline classification-

Type study: Calotes - External characters, Digestive, Respiratory, Circulatory, #Nervous# and urinogenital systems.

General Topic: Snakes of India; Identification of Poisonous and Non-poisonous snakes. Evolutionary significance of Archaeopteryx.

UNIT IV: Aves

18 hours

General characters and outline classification-

Type study: Pigeon - External Characters, Digestive, #Respiratory#, Circulatory and Urinogenital systems.

General Topic: Flightless Birds, Flight adaptation and Migration in Birds, Beak and Feet in Aves.

UNIT V: Mammalia

18 hours

General characters and outline classification-

Type study: Rabbit - External characters, Digestive, Respiratory, #Circulatory#, Nervous and Urinogenital systems.

General Topic: Dentition in Mammals, Adaptations of Aquatic Mammals.

#.....# Self study portion

Text Books:

1. EkambaranathaAyyar.M&Ananthkrishnan.T.N., A Manual of Zoology Vol.II- Part I & II., S.VishwanathanPvt.Ltd, Chennai, 2010.

Books for Reference:

1. Kotpal, R.L. Modern text book of Zoology - VERTEBRATA, 4th Edition, Rastogi Publication, Meerut., 2017-2018.
2. Jordan, E.L. &Verma, P.S. Chordate Zoology. New Delhi: S. Chand. (2013).
3. Springer, J.T. & Holley, D. An Introduction to Zoology: Investigating the AnimalWorld. Massachusetts. Jones& Bartlett Learning (2013).
4. Young, J.Z. Life of Vertebrates. Clarendon Press Oxford, (1950).

Web reference:

1. www.earthlife.net
2. www.iaszoology.com
3. www.sanctuaryasia.com
4. www.oercommons.org

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
II	20UZO2CC3	BIOLOGY OF CHORDATES					6	5				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓		✓	✓	✓		✓			
CO2	✓		✓	✓	✓	✓		✓	✓			
CO3	✓	✓	✓		✓		✓			✓		
CO4	✓	✓		✓	✓		✓	✓		✓		
CO5		✓	✓	✓	✓	✓		✓	✓	✓		
Number of Matches= 35, Relationship : HIGH												

Prepared By:
Dr. M. Salahudeen

Checked by:
Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
II	20UZO2CC4 P	Core – IV	PRACTICAL – BIOLOGY OF CHORDATES	3	2	100	20	80

Course Outcomes:

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

1. Understand the different functional systems of Frog through virtual laboratory techniques
2. Evaluate the patterns of Contours of scales in different fishes; and describe the types of Feathers in birds
3. Classify and provide reasons for taxonomy; Sketch and label parts together with their biological significance
4. Relate the structure and function of fishes, birds and mammals
5. Observe and report the ecosystem

I. Major Practicals:

Virtual laboratory technique: Arterial system, Venous system, Digestive system and Reproductive system of Frog.

Demonstration Dissection: Digestive system, Nervous system and Reproductive system of Fish.

II. Minor Practicals:

Mounting: Placoid, Ctenoid, Cycloid scales
Gill of fish, Fins of fish, Quill feather

III. Spotters:

a) Classify giving reasons:

Balanoglossus, Ascidia, Amphioxus, Anabas, Tilapia, Eel, Exocoelotus, Echinocentrus, Ichthyophis, Rhacophorus, Ambystoma, Hemidactylus, Viper, Cobra, Duck, Eagle, Owl, Bat, Loris.

b) Draw Labelled Sketches:

T.S of Amphioxus, Poison apparatus: Snake
Frog - Pectoral girdle, Pigeon - Pelvic girdle

c) Biological Significance:

Ascidian tadpole larva, Ichthyophis, Chameleon, Exocoelotus – flying fish

d) Relate structure and function

Rabbit - Dentition, Synsacrum in Bird, Echinocentrus - Sucker

IV Group Project

Visit to any biodiversity centre / spots and submission of report.

V Record Note

* A record of lab work shall be maintained and submitted at the time of Practical Examination for valuation.

Text Book

Jayasurya., Arumugam, N., Thangamani., Prasannakumar., Narayanan.L.M. Practical Zoology Volume -2. Saras publication, Nagercil. 2013.

Books for Reference:

Ekambaranatha Ayyar, Outlines of Zoology. Vol. I & II S.Viswanathan (Printers &Publishers) Pvt. Ltd., Chennai,1993

Web Reference

1. https://en.wikipedia.org/wiki/Evolutionary_radiation
2. <https://books.google.co.in/books?id=tEhO->

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
II	20UZO2CC4P	PRACTICAL - II BIOLOGY OF CHORDATES					3	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	√		√	√	√	√	√	√	√	√		
CO2	√		√	√	√	√	√		√	√		
CO3		√	√	√	√	√			√	√		
CO4	√	√	√	√	√	√			√	√		
CO5		√	√	√	√	√	√	√		√		
Number of Matches= 36, Relationship : HIGH												

Prepared by:

Dr P.Rajasekar

Checked by:

Dr I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UZO3CC5	Core – V	CELL AND MOLECULAR BIOLOGY	4	4	100	25	75

Course Outcomes:

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

1. Understand the basic Structural organization of Prokaryotic, Eukaryotic cells, Plasma membrane and cytoplasm.
2. Apply the knowledge, skill, and awareness to topics like Ultra Structure of cell components.
3. Integrate the knowledge of Nucleus and chromosomes and cell cycle.
4. Analyse the most important of DNA and RNA structure, replication of DNA and interpret the RNA protein synthesis.
5. Understand the Cancer cell and analyse the important of oncogenes and knowledge about tumor suppressor gene.

UNIT I: Cell Organization

12 hours

Prokaryote and Eukaryote cell - Cell organization and components, Ultra structure of Plasma membrane – #Unit membrane#, Fluid mosaic model and functions. Cytoplasm: Components and functions.

UNIT II: Cell Organelles

12 hours

Ultra structure and functions of Endoplasmic Reticulum, Ribosomes, Golgi complex, #Lysosomes# and Mitochondria.

UNIT III: Nucleus and Cell Division

12 hours

Structure and functions of Nucleus, Nucleolus, Nuclear envelope, #Nuclear pore# complex and Chromosomes. Cell Cycle and Cell division - Mitosis and Meiosis.

UNIT IV: Nuclear Material and Protein Synthesis

12 hours

DNA and RNA: Molecular structure, Types and functions of DNA and RNA. DNA replication. Protein synthesis: Transcription and #Translation#.

UNIT V : Cancer Biology

12 hours

Cancer cells: Characteristics, causes and types, treatment and prevention- Oncogenes – #Apoptosis#- Tumor suppressor Gene.

Self-study#

Text Book:

1. Verma, P.S and Agarwal V.K. Concepts of Molecular Biology, Chand & Company Ltd., New Delhi. 2015.

Books for Reference:

1. Gupta, P.K. A text book of Cell and Molecular Biology, Rastogi Publications, Meerut. 1999.
2. Powar, C.B. Essentials of Cytology, Himalayan Publishing House, New Delhi. 2nd Edition, 1997.
3. De Robertis, E.D.P. and De Robertis, E.M.F. Cell and Molecular Biology, VIII Ed., Lea and Febiger, Philadelphia. 1987.

Web Reference:

1. [https://en.wikipedia.org/wiki/Cell_\(biology\)](https://en.wikipedia.org/wiki/Cell_(biology))
2. <https://www.ncbi.nlm.nih.gov/books/NBK9940/>
3. <http://marjoriebrandlab.com/sitebuildercontent/sitebuilderfiles/hfspworkshop.pdf>
4. http://genome.tugraz.at/MolecularBiology/WS11_Chapter_12.pdf
5. https://en.wikipedia.org/wiki/Cell_cycle
6. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/9780470374252.fmatter>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours	Credits			
III	20UZO3CC5		CELL AND MOLECULAR BIOLOGY			4	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓		✓	✓		✓
CO2	✓	✓	✓		✓	✓	✓		✓	✓
CO3	✓	✓		✓	✓	✓		✓	✓	
CO4	✓	✓		✓	✓		✓	✓		✓
CO5			✓			✓			✓	✓
Number of Matches= 34, Relationship : Moderate										

Prepared by:

Dr. K. Prabakar

Edited By

Dr. I Joseph A Jerald

Note:

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UZO3CC6P	Core – VI	PRACTICAL - III CELL AND MOLECULAR BIOLOGY	3	2	100	20	80

Course Outcomes

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

1. Acquire skill on Microscopy and Micrometry
2. Enhance knowledge and skill on experimenting Mitotic and Meiotic division.
3. Isolate and identify the different cells and tissue types
4. Generate knowledge on RNA and DNA extraction
5. Standardize and design the Mounting of muscle fibers
 1. Study of Compound Microscope: Setting and Handling Procedure.
 2. Measurement of cell dimensions by using stage and ocular micrometer.
 3. Squash preparation of Onion root tip for study of Mitotic stages.
 4. Squash preparation of grasshopper testis for Meiotic stages.
 5. Smear preparation of human blood for RBC and WBC studies.
 6. Squash preparation of Salivary gland of Chironomus larva for Polytene Chromosome studies.
 7. Squash preparation of Salivary gland of Drosophila larva for Polytene Chromosome studies.
 8. Isolation of DNA from blood samples - Group
 9. Separation of DNA using Agarose gel electrophoresis - Demo
 10. Mounting of muscle fibers
 - Skeletal muscle: Sarcomeres and myofibrils
 - Cardiac muscles: Heart muscles
 - Smooth muscles: CS of artery
 - Fibrous muscles: CS of tendon
 11. Models of DNA, tRNA and DNA replication.
 12. Spotters: Epithelial, Muscular, Vascular tissues. Cancer cells, sarcoma, myeloma, Lymphoma, Leukemia

Record Note

* A record of lab work to be maintained and submitted at the time of Practical examination for valuation.

Text Books:

1. Chaitanya, K.V. A Lab Manual of Cell and Molecular Biology, Prentice Hall India Learning Private, 2013.

Books for Reference:

1. Trigunayat, M.M. A Manual of Practical Zoology: Biodiversity, Cell Biology, Genetics & Developmental Biology, Scientific Publishers 2019.
2. Mehdi Laboratory Procedures In Haematology Manual, Jaypee Brothers Medical Publishers 2006.

Web reference:

1. https://www.bjcancer.org/Sites_OldFiles/_Library/UserFiles/pdf/Cell_Biology
2. <https://sjce.ac.in/wp-content/uploads/2018/04/Cell-Biology-Genetics-Labor>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
III	20UZO3CC6P	PRACTICAL - III CELL AND MOLECULAR BIOLOGY					3	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓		✓	✓	✓		✓	✓		
CO2	✓		✓	✓	✓	✓		✓	✓	✓		
CO3		✓	✓		✓	✓	✓		✓			
CO4	✓	✓		✓			✓	✓		✓		
CO5	✓		✓	✓	✓	✓		✓	✓	✓		
Number of Matches= 36, Relationship : HIGH												

Prepared By:

Dr. S. Mohamed Hussain

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UZO3GE1	GE I	Human Health and Hygiene	2	2	100	--	100

Course Outcomes

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

1. Understand the dimensions of Health education, importance of Balanced diet and Food hygiene.
2. Demonstrate the relationship between Environment and Health and control measures of Life style diseases.
3. Summarize the common infectious disease & control and preventive measures.
4. List the basic principles of medical microbiology, it covers mechanisms of disease transmission, diagnosis and control.
5. Acquire knowledge on Human Mental Health and able to apply these principles to understanding and provide First Aid.

UNIT I: Nutrition and Health

6 hours

Definition – Dimensions of health. Health education: Definition – objectives – principles. Nutrition and health: -Balanced diet: macronutrients – micronutrients – vitamins and minerals. - Hygiene Practices of the different categories of family members Food hygiene: perishable – nonperishable – shelf life – sterilization – #food poisoning#.

UNIT II: Environment and Health

6 hours

Water, Air and Noise pollution. Pollutants: Effects, prevention and control -- Effects of smoking and alcoholism. Causes effects and control measures of Life style diseases: Stroke - Obesity – type 2 diabetes - Food adulteration: common adulterants, and health hazards. #Food standards and food laws#. National and International; PFA, FSSAI, HACCP, ISO

UNIT III: Concept of Disease

6 hours

Phases of disease – Pre-pathogenesis and Pathogenesis –concept of prevention and control – Common Protozoan, Helminthic and #Arthropod borne diseases#. Immunity: Types of vaccinations– Live – Attenuated – Killed – Toxoid – Transgenic.

UNIT IV: Communicable Diseases

6 hours

Bacterial and Viral diseases – Causative agents and factors. Mode of transmission: air – water – droplets – contact - Symptoms and treatment of Cholera, Tuberculosis, Typhoid, Hepatitis A & B and AIDS. Environmental Sanitation - #Family planning#: Definition – scope – contraceptive devices - Vitamin deficiencies.

UNIT V: Mental Health

6 hours

Definition - characteristics – causes and prevention of mental health - Occupational health & hazards – prevention. Basic aspects of personal hygiene – Alzheimer - Parkinson's. Health care services – Primary health care – Hospitals – #Principles of First Aid# – First aid procedures for Accidents, food poisoning, snake bites and heart attacks.

Text Book:

1. E. Park & Park: Textbook of Preventive and Social Medicine, Published by Banarsidos Bhanot, 2019
2. Ananthanarayanan,R and Jayaram Panicker,C.K. Text Book of Microbiology, Orient Longman, Chennai- 2000.
3. Sharma.P.D Environmental Biology and Toxicology, Rastogi Publication 2003

Book for Reference:

1. Richard.t Wright, Dorothy F,Boorse, Environmental Science, PHI Learning Publication, New Delhi, 2011.
2. Dubey R.C and Maheswari D.K. Text book of Microbiology, S.Chand and Company Ltd, New Delhi. 2009.
3. Thomas, C.G.A. Medical Microbiology, ELBS Publications. 1988.
4. Sarada Subramanyam and Madavankutty.K, Text book of Human Physiology S.Chand Publication-2014

Web reference:

1. <https://www.moscmm.org/pdf/Ananthanarayan%20microbio.pdf>
2. [https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_\(Kaiser\)](https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Kaiser))
3. <https://www.pdfdrive.com/medical-microbiology-d18737002.html>
4. <https://markmanson.net/5-books-for-dealing-with-anxiety-and-depression>
5. <https://protect.iu.edu/environmental-health/public-health/communicable-diseases/index.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Code		Title of the Paper			Hours	Credits			
III	20UZ03GE1		Human Health and Hygiene			2	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√	√	√	√	√	√	√		√	√
CO2		√		√		√	√	√		√
CO3	√		√		√	√	√		√	
CO4	√	√		√		√		√	√	√
CO5	√	√	√		√		√	√	√	√
Number of Matches= 36, Relationship : High										

Prepared by:

Dr. R. Krishnamoorthy

Checked by:

Dr. I. Antony Joseph Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UZO4CC7	Core – VII	ANIMAL PHYSIOLOGY	5	5	100	25	75

Course Outcomes

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

- Record the significance of nutrition and balanced diet; report the physiology of digestion, absorption and assimilation.
- Appraise the components of the respiratory and circulatory systems and their role.
- Summarize the excretory products; demonstrate the structure and functions of kidney and homeostatic mechanisms.
- Interpret the muscle types, mechanisms in neurotransmission and muscle coordination.
- Distinguish the types and functions of endocrine glands and justify hormonal role in reproductive physiology.

UNIT I: Nutrition and Digestion

15 hours

Nutritional requirements and Balanced Diet – Carbohydrates, Proteins, Lipids, Minerals and Vitamins. Human digestive System – Digestive glands and enzymes – Physiology of Digestion – Absorption – #Assimilation#.

UNIT II: Respiration and Circulation

15 hours

Respiration: External and Internal respiration – Respiratory organs and pigments - Transport of O₂ and CO₂ – Respiratory Quotient – Anaerobiosis – Adaptations to high altitude and diving. Circulation: Types, Composition and functions of Blood. Human heart - Cardiac Cycle and Rhythm – #ECG and Blood Pressure#.

UNIT III: Excretion and Homeostasis

15 hours

Excretion: Types and products - Human Kidney - Structure of Nephron – Ornithine cycle - Physiology of Urine formation – Dialysis. Homeostasis: Regulatory mechanisms: Osmoregulators and Osmoconformers – Osmoregulation in Crustaceans and fishes – Mechanism of Thermoregulation – #Acclimation and acclimatization#.

UNIT IV: Muscle, Nerve and Chemical Co-Ordination

15 hours

Types of muscles – Ultra structure of skeletal muscle – Mechanism of muscle contraction. Neuron: Structure and types – Transmission of nerve impulse through neuron – Synapse – Neuro muscular junction – #Reflex action and reflex arc# – Photo, Phono, Tingo and Mechanoreceptors.

UNIT V: Endocrine and Reproductive Physiology

15 hours

Endocrine glands: Types, Structure, Secretion, Functions and deficiency diseases of Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas. Human reproduction: Hormonal regulation, Menopause, #Pregnancy and Parturition#.

Self-study portion.

Text Books:

1. Rastogi, S.C., Essentials of Animal Physiology, IV Edition, New Age International (P) Ltd, Publishers, 2007.

Books for Reference:

1. R. Nagabhushanam, M.S. Kodarkar, R. Sarojini, Textbook of Animal Physiology. Second Edition, Oxford & IBH Publishing Co. PVT. LTD. 2002
2. Guyton and Hall, Text book of Medical Physiology- Elsevier Health – INR; second Edition (2016).
3. Hoar, W.S., General and Comparative Physiology (3rd Edition), Prentice Hall of India, New Delhi. 1991,
4. Ladd, C. Prosser and Frank A. Brown, Comparative Animal Physiology, W.B. Saunders Co., Philadelphia, 2002.
5. Schmit - Nelson.K.(1997) Animal Physiology Adaptation and environment, Cambridge Univ. Press.
6. Beck, Human Design, Harcourt Brace Jorandrich Inc. 1971.
7. Dawson, H. General Physiology, Little Brown Co. Boston. . 1964.
8. Echert, R. and Randall, D., Animal Physiology, CBS Publishers and Distributors,1987.
9. Prosser, CL. and Brown Fo. Comparative Animal Physiology Second Edition. WB Saunders Co Philadelphia, Toppa Co Tokyo, Japan (1961).

Web reference:

1. <https://nptel.ac.in/courses/102/104/102104042/>
2. <https://courses.lumenlearning.com>digestive system/Anatomy and Physiology>
3. <https://www.lung.ca>lung .infor>respiratory system>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
IV	20UZO4CC7	ANIMAL PHYSIOLOGY					5	5				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	√	√	√		√	√	√		√	√		
CO2	√		√	√	√	√		√	√			
CO3	√	√		√	√		√	√		√		
CO4	√	√	√				√			√		
CO5		√	√	√	√	√		√	√	√		
Number of Matches= 35, Relationship : High												

Prepared by:

Dr. A. Sadiq Bukhari

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
4	20UZO4CC8P	CORE VIII	PRACTICAL - IV ANIMAL PHYSIOLOGY	3	2	100	20	80

Course Outcomes

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

1. Analyze the physiological processes that regulates body functions.
2. Understand and evaluate the physiology of circulation, respiration and excretion.
3. Analyse the adaptations, mechanism of homeostasis in invertebrates and vertebrates.
4. Estimate the quantum of different nutrients and the determine nitrogenous waste products.
5. Analyse sugar, albumen and urea; Calculate TC and DC; BMI.

Practical

1. Human Salivary Amylase activity in relation to Temperature and pH.
2. Effects of Temperature on the ciliary activity of Freshwater Mussel and calculation of Q_{10} .
3. Identification of Nitrogenous Waste Products.
4. Total count of RBC in human blood.
5. Total count of WBC in human blood.
6. Differential count of WBC in human blood.
7. Quantitative tests for Carbohydrates, Proteins, and Lipids.
8. Simple tests for Sugar, Albumin, and Urea in Human Urine.
9. Estimation of Haemoglobin in human blood.
10. Estimation of the rate of O_2 consumption in fish with reference to body weight.
11. Measurement of Blood Pressure (BP).
12. Quantitative estimation of salt gain and salt loss by fresh water Crab.
13. Enzyme Kinetics of Acid Phosphatase activity in relation to Temperature and pH.
14. Fractionation and Characterization of human salivary proteins by column chromatography – Demo.

SPOTTERS

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

Record Note

* A record of lab work to be maintained and submitted at the time of Practical examination for valuation.

Text books:

1. Verma. P.S and Srivasthava. P.C Advanced Practical Zoology, S .Chand Publication, 2000.

Books for Reference:

1. Rastogi, S. C. Essentials of Animal Physiology. Wiley Eastern Limited. New Delhi.1979.
2. Hoar, S. Williams. General and Comparative Physiology. Prentice Hall.1987.
3. Parameswaran, R., Anantha Krishnan, T. N. Anantha Subramanian. Outlines of Animal Physiology, K. S. Viswanathan Pvt. Ltd. Chennai.
4. Singh, H. R. Animal Physiology and Related Biochemistry. SHOBAN Lal Nagin Chand and co., Educational Publishers, New Delhi.
5. Rajan .S and Selvi Christy. Environmental Procedure in Life Sciences, Anjanaa Book House, Chennai, 2012.
6. Chausgari. A.R, Text book of Practical Physiology, Paras Publication, Bangalore, 2000.

Web reference:

1. <http://www.phys.szote.u-szeged.hu/edu/angla/labprac1+2.pdf>
2. <https://www.slideshare.net/vidhyakalaivani29/animal-physiology-and-biochemistry-lab-manual-64718095>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific outcomes

Semester	Code	Title of the Paper					Hours	Credits				
IV	20UZO4CC8P	PRACTICAL - IV ANIMAL PHYSIOLOGY					3	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	√	√	√	√	√	√	√	√	√	√		
CO2		√		√	√	√	√	√		√		
CO3	√		√		√	√	√		√			
CO4	√	√		√		√		√	√	√		
CO5	√	√	√	√	√		√	√	√	√		
Number of Matches= 39, Relationship : High												

Prepared by:

Dr. R. Krishnamoorthy

Checked by:

Dr. I. Antony Joseph Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UZO4GE2	Generic Elective II	VERMICULTURE TECHNOLOGY AND ORGANIC FARMING	2	2	100	0	100

Course Outcomes

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

1. Acquire the ability to classify earthworm; define and describe the biology, collection and diversity of earthworms.
2. Describe Vermiculture technology in detail; relate the role of earthworms to soil fertility.
3. Determine the role of earthworms in waste management; interpret earthworms as farmer's friend in organic farming; review the economic importance of earthworms.
4. Indicate the significance of microorganism in earthworms (for decomposition).
5. Apply and analysis the effects of vermicompost in soil, plant growth etc...

UNIT I: Vermicomposting Agents

6 hours

Introduction to Vermiculture Technology, Definition & Scope of the Study. The habitat and diversity of earthworms, Endemic and Exotic species, Ecological classification of earthworms. Biology, collection and preservation of earthworms. Vermitechnology and Waste management, #Role of earthworms on ecology, an eco-friendly approach to sustainable agriculture#.

UNIT II: Vermitechnology

6 hours

Vermiculture Techniques, advantages of Vermiculture, vermicomposting technology, Site selection, Methods – small and large pit method, heap (bedding) method. Large scale manufacture and harvesting of vermicompost. Physio-chemical characteristics of vermicompost. Worm-casts, vermicompost, vermiwash-production techniques and their uses. Role of earthworms in soil fertility, use of vermicompost for crop production, land improvement and reclamation. #Soil quality of fallow lands#.

UNIT III: Vermicompost Properties and Organic Farming

6 hours

Role of earthworms in waste management, solid wastes an option for resource recovery. Earthworms as farmer's friend, Earthworms as bioreactors, organic farming. #Vermiculture for waste reduction, litter degradation and decomposition#. Economic importance of earthworms in food, medicine, Ayurveda and unani systems.

UNIT IV: Vermicompost Application**6 hours**

Earthworms and microorganisms. Importance of microorganisms as food for earthworms. #Dispersal of microorganisms by earthworms#. Role of intestinal microbes of earthworms on the decomposition of organic wastes.

UNIT V: Vermicomposting Potentials & Economics**6 hours**

Effect of vermicompost application on soil and plant growth, Vermicompost and organic manure and a good substitute for chemical fertilizers. Influence of pests, parasites and pathogens on Vermiculture. Remedial measures to control them. #Marketing of vermicompost products and financial support by Government and NGOs for Vermiculture#.

#.....# Self-study portion

Text Book:

1. Seethalekshmy, M. & Dr. R. Santhi. Vermitechnology, Saras Publications, Nagercoil. 2012.

Books for Reference:

1. Edwards CA & Bateer JE. Biology of Earthworms. Chapman and Hall. 1977
2. Edwards CA. Earthworm Ecology. CRC Press. 1998.
3. Sultan Ahmed Ismail,. The Earthworm book. 2nd Revised Edition. India Press, Goa, India. 2005.

Web Reference:

1. https://www.researchgate.net/publication/281632191_Vermiculture_Technology_An_Option_for_Organic_Recycling.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours	Credits			
IV	20UZO4GE2		VERMICULTURE TECHNOLOGY AND ORGANIC FARMING			2	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓		✓	✓		
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓		✓	✓	
CO4	✓	✓	✓	✓	✓		✓	✓	✓	✓
CO5	✓	✓	✓			✓	✓		✓	✓
Number of Matches= 40, Relationship : High										

Prepared by:

Dr. I Joseph A. Jerald

Checked by:

Dr. M. Aneez Mohamed

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UZO3AC5	Allied – I	GENERAL PRINCIPLES IN ZOOLOGY	4	3	100	25	75

COURSE OUTCOMES

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

- Understand the emergence and diversity of Invertebrate fauna and to realize the structural features and physiological processes in Invertebrates.
- Practice classification and taxonomy among chordates and to study the structure and function of chordate systems.
- Understand the physiological processes in human beings and role of organ systems.
- Explain the integrated functions of endocrine glands in reproduction.
- Discuss the biological processes involved in development and describe the fundamental complex processes leading to evolutionary changes.

UNIT I: Invertebrates

12 hours

Classification of Invertebrates upto phyla with salient features and suitable examples. Cockroach: #External morphology#, mouth parts, Digestive system, respiratory system, circulatory system, nervous system and reproductive system.

UNIT II: Chordates

12 hours

General classification of Chordates – salient features of chordates with suitable examples. Frog – #External features#, digestive system, respiratory system, circulatory system, Nervous system and urino-genital system.

UNIT III: Animal Physiology

12 hours

Physiology of digestion, Composition and functions of human blood, Respiration; Transport of oxygen and carbon-dioxide, Structure of neuron, nerve impulse conduction, #Structure of kidney# and nephron in Human.

UNIT IV: Endocrinology

12 hours

Endocrine glands, Structure and functions of Pituitary, Thyroid, Islets of Langerhans, Sex glands – #Menstrual cycle#.

UNIT V: Embryology & Evolution

12 hours

Gametogenesis – spermatogenesis and oogenesis, Fertilization, cleavage - cleavage patterns. Blastulation, Gastrulation in Frog.

Origin of life and evolution of cell - Theories on evolution by Lamarck, Charles Darwin & De Vries, living fossils, organic evolution, #Evidences of evolution#.

#.....# Self-Study portion

Text Book:

1. Nair,N.C., Leelavathy,S., Soundara Pandian, N., Murugan,T., Thangamani, A., Prasannakumar,S., Narayanan,L.M., and Arumugam,N., Animal Diversity Invertebrata and Chordata. Saras Publication, Nagercoil. Fifth Ed., 2013
2. Arumugam, N. and Mariakuttikan,A., Animal Physiology. Saras Publication, Nagercoil. 2011.
3. Arumugam, N, A Text Book of Embryology, Saras Publication, Nagercoil. Fourteenth Ed., 2013.
4. Arumugam, N, Organic Evolution, Saras publication, Nagercoil. 2010

Books for Reference:

1. Ekambaranatha Ayyar, Outlines of Zoology. Vol. I & II S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai,1993

WEB REFERENCE

1. <http://www.itis.usda.gov/itis/status.html>
2. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>
3. <http://www.itis.usda.gov/itis/status.html>
4. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>
5. <https://nptel.ac.in/courses/102/104/102104042/>
6. <https://courses.lumenlearning.com>digestive system/Anatomy and Physiology>
7. <https://www.lung.ca>lung .infor>respiratory system>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
III	20UZO3AC5	GENERAL PRINCIPLES IN ZOOLOGY					4	3				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	-	-	✓	✓	-	-	✓	-	✓		
CO2	✓	-	-	✓	✓	-	-	✓	-	✓		
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Number of Matches= 40, Relationship : HIGH												

Prepared By:

Dr. H.E. Syed Mohamed

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
III	20UZO3AC6P	Allied – II	PRACTICAL - GENERAL PRINCIPLES IN ZOOLOGY	3	2	100	20	80

COURSE OUTCOMES

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

1. Dissect and observe the anatomy and physiology of selected animal systems.
2. Acquire skill in blood grouping and the components of blood and nitrogenous wastes testing.
3. Classify chordates and determine the characteristics of chordates.
4. Discuss the biological processes involved in embryo development and describe the fundamental processes leading to evolutionary changes.
5. Evaluate the integrated functions of endocrine glands.

DISSECTION:

Invertebrates

Cockroach: Mouthparts, Digestive and Nervous systems.

Chordates

Frog – Pro-dissector software: Digestive, Arterial and Venous systems.

Animal Physiology

Blood Grouping

Preparation of Blood Smear and Observation of RBC and WBC.

Qualitative estimation of excretory products: Ammonia, Urea and Uric acid.

SPOTTERS:

Invertebrates

Paramecium, Obelia, Aurelia, Ephyra larva, Fasciola hepatica, Taenia solium, Nereis, Ascaris male and female, Earthworm, Prawn, Butterfly, Freshwater Mussel, Starfish.

Chordates

Shark, Frog, Snake, Pigeon, Rabbit.

Embryology

Examination of prepared slides to study the following:

Frog: Egg – cleavage – blastula – yolk plug stage

Evolution

Fossil: Nautiloid, Ammonoid

Endocrinology

Pituitary, Thyroid, Islets of Langerhans - models

RECORD

A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

Text Book:

1. Jayasurya., Arumugam, N., Nair, N.C., Leelavathy,S., Soundara Pandian,N., Murugan,T. Practical Zoology Volume - 1. Invertebrata. Saras publication, Nagercoil. 2013.
2. Jayasurya., Arumugam, N., Thangamani., Prasannakumar., Narayanan.L.M. Practical Zoology Volume -2. Saras publication, Nagercoil. 2013.
3. Jayasurya., Arumugam, N., Dulsy Fatima., Narayanan,L.M., Meyyan, R.P., Nallasingam,K., Kumaresan,V., Mani,A., Selvaraj,A.M., Mariakuttikan,A. Practical Zoology Volume -3. Cell Biology – Embryology – Animal PhysioloHy – Immunology – Ecology – Genetics – Evolution – Microbiology – Biochemistry – Biophysics. Saras Publication. 2013.

Books for Reference:

1. Nair,N.C., Leelavathy,S., Soundara Pandian, N., Murugan,T., Thangamani, A., Prasannakumar,S., Narayanan,L.M., and Arumugam,N., Animal Diversity Invertebrata and Chordata. Saras Publication, Nagercoil. Fifth Ed., 2013
2. Arumugam, N. and Mariakuttikan,A., Animal Physiology. Saras Publication, Nagercoil. 2011.
3. Arumugam, N, A Text Book of Embryology, Saras Publication, Nagercoil. Fourteenth Ed., 2013.
4. Arumugam, N, Organic Evolution, Saras publication, Nagercoil. 2010

Web Reference

1. <http://www.itis.usda.gov/itis/status.html>
2. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>
3. <http://www.itis.usda.gov/itis/status.html>
4. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
III	20UZO3AC6 P	PRACTICAL - GENERAL PRINCIPLES IN ZOOLOGY					3	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	-	-	✓	-	✓		
CO2	✓	-	-	✓	✓	-	-	✓	-	✓		
CO3	✓	-	✓	✓	✓	✓	✓	✓	✓	✓		
CO4	✓	✓	-	✓	✓	✓	✓	✓	✓	✓		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Number of Matches= 40 , Relationship : High												

Prepared By:

Dr. H.E. Syed Mohamed

Checked by:

Dr. I. Jopesh A. Jerald

Note:

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UZ04AC7	Allied – III	Commercial Zoology	5	3	100	25	75

Course Outcomes

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

1. Understand the concepts of poultry farming and vermiculture.
2. Learn the benefits and economic value of animal products from apiculture and sericulture.
3. Record the significance of Aquaculture and fish farming.
4. Classify insects vectors and pests; create awareness of spread of diseases and control methods.
5. Apply entrepreneurial skill and illustrate pest management types.

UNIT I: Poultry farming and Vermiculture

15 hours

Poultry farming: Types of fowls – Rearing methods of Broilers and Layers – Poultry nutrition – Poultry diseases (NCD, IBV). Issues and limitations of poultry farming. Vermiculture: Classification, Species of Earthworms – Life cycle of *Lampito mauritii* – Preparation of vermin bed; vermiwash; Vermicompost – Economic importance; Physicochemical parameters. #Organic farming#.

UNIT II: Apiculture and Sericulture

15 hours

Apiculture: Classification- Species - colonial structure– Biology of Honey bee –Bee hives (Newton hive, Langstroth hive) –Honey : Extraction – Nutritive and medicinal values. **Sericulture:** Classification; Species; Life cycle(*Bombyx mori*). Rearing of silk worm: Paraffin paper rearing – Box rearing. Diseases of silk worm: Protozoan (Pebrine) – Bacterial (Septicemia) - Reeling of silk – #Economic importance of silk#.

UNIT III: Aquaculture

15 hours

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

UNIT IV: Insect Vectors and Pests

15 hours

Insects pests of crops: Classification, biology nature of damage and control measures of Pests: Paddy (*Scirpophaga incertulas*), Cotton (*Helicoverpa armigera*), sugarcane (*Scirpophaga excerptalis*), Coconut (*Oryctes rhinoceros*). Insects as Vectors of Human Diseases: Classification and Biology, disease spread and control measures of Mosquito # Housefly #.

UNIT V: Pest Management

15 hours

General Principles of Insect Control: Physical, Mechanical, Chemical and Biological Control Advantages and limitations. Pesticide uses in India – Precaution in handling pesticides. Integrated Pest Management. Non-conventional Methods of Pest Control. #Organics pesticides and their advantages#

Self-study portion.

Text Book:

1. Shukla. Upadhyay., Economic Zoology, Rastogi publications, Meerut,1997

Books for Reference:

1. Ganga. G and Sulochana Chetty. J., An introduction to Sericulture (2nd edition) Oxford & IBH Publishing company. 2019.
2. Ahsan, J and Sinha, S.P. A handbook on economic zoology, S.Chand& Co., 2010.
3. James R. Gillespie., Frank B. Flanders., Modern live Stock and Poultry Production (8th Edition), ISBN-13: 978-1-4283-1808-3

Web Source:

1. https://www.agropustaka.id/wp-content/uploads/2020/04/agropustaka.id_buku_Modern-Livestock-and-Poultry-Production-8th-Edition-by-James-R.-Gillespie-Frank-B.-Flanders.pdf
2. <https://www.pdfdrive.com/poultry-fisheries-apiculture-and-sericulture-d52750733.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
IV	20UZO4AC7	Commercial Zoology					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓		✓	✓			
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓		✓	✓		
CO4	✓	✓	✓	✓	✓		✓	✓		✓	
CO5	✓		✓			✓			✓	✓	
Number of Matches= 37, Relationship : High											

Prepared by:

Dr. M. Meeramaindeen

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
IV	20UZO4AC8P	Allied – IV	PRACTICAL - COMMERCIAL ZOOLOGY	3	2	100	20	80

Course Outcomes

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

6. Understand the different functional systems of earthworm and honey bee through dissection.
7. Identify and prepare slides of fish scales and compare the appendages of prawn.
8. Classify giving reasons, draw labelled sketch and bring out their biological significance.
9. Relate the nature of damage and the life cycle of pests.
10. Report the economic importance of animal products and their significance.

Laboratory principles, Safety measures and practices.

I Experiments:

1. Dissect and display the Earth worm nervous system
2. Mounting of Earth worm: Body setae, Pineal setae.
2. Mounting of honey bee sting apparatus
3. Mounting of scales: Cycloid, Ctenoid, Placoid
4. Prawn appendages
5. Mounting the Mouth parts of Mosquito, Honey bee, House fly
6. Collection and identification of Mosquitos (Demo)

II Spotters

Species of animals used in Vermiculture- *Lampito mauritii*, *Perionyx excavatus* Apiculture – *Apis indica* ; Sericulture – *Bombyx mori* ; Aquaculture – Major carps : *Catla catla* , *Labeo rohita* and *Cirrhinus cirrhosus*: Prawn : *Macrobrachium rosembergi*: Poultry : Layers (Golden Comet) & Broilers (*Gallus gallus domesticus*). Agricultural Pest - *Scirpophaga incertulas* - *Helicoverpa armigera* - *Scirpophaga excerptalis* - *Oryctes rhinoceros*.

Animal products: Honey, Bee wax, Silk, and Hen's egg.

RECORD

A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

Text Books:

1. Jayasurya., Arumugam, N., Nair, N.C., Leelavathy,S., Soundara Pandian,N., Murugan,T. Practical Zoology Volume - 1. Invertebrata. Saras publication, Nagercoil. 2013.
2. Jayasurya., Arumugam, N., Thangamani., Prasannakumar., Narayanan.L.M. Practical Zoology Volume -2. Saras publication, Nagercoil. 2013.

Books for Reference:

1. Ganga. G and Sulochana Chetty. J., An Introduction to Sericulture (2nd edition) Oxford &

IBH Publishing company 2019.

2. Ahsan, J and Sinha, S.P. A handbook on Economic Zoology, S.Chand & Co., 2010.
3. James R. Gillespie., Frank B. Flanders., Modern live Stock and Poultry Production (8th Edition), ISBN-13: 978-1-4283-1808-3

Web Source

1. https://www.agropustaka.id/wp-content/uploads/2020/04/agropustaka.id_buku_Modern-Livestock-and-Poultry-Production-8th-Edition-by-James-R.-Gillespie-Frank-B.-Flanders.pdf
2. <https://www.pdfdrive.com/poultry-fisheries-apiculture-and-sericulture-d52750733.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
IV	20UZO4AC8P	Practical Commercial Zoology					3	2			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓		✓	✓			
CO2	✓	✓		✓	✓	✓	✓	✓	✓	✓	
CO3	✓	✓	✓	✓	✓	✓		✓	✓		
CO4	✓	✓	✓	✓	✓		✓	✓	✓	✓	
CO5	✓	✓	✓			✓	✓		✓	✓	
Number of Matches= 40, Relationship : High											

Prepared by:

Dr. M. Meeramaindeen

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5CC9	Core – IX	BIostatistics, Bioinformatics and Computer Application in Biology	6	5	100	25	75

Course Outcomes

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

11. Explain descriptive statistics
12. Describe and discuss inferential statistics in biology
13. Acquire and analyze the different biological databases and their applications
14. Evaluate and apply the tools of bioinformatics and their methods of application in molecular Biology
15. Illustrate computers and their applications in biology

BIostatistics

UNIT I: Descriptive Statistics

18 hours

Variables in biology- Statistical data: Sources, Primary data and secondary data – Collection and Tabulation of data - Representation of data: Line diagram, Bar diagram, Histogram, #Frequency Polygon#, Scatter diagram and Pie chart, Cube diagram, Box plot and line plot – Concept of Population and sample-Sample and sampling methods.

UNIT II: Descriptive and Inferential Statistics

18 hours

Measures of central tendency: Mean, Median, Quartile and Mode – Measures of dispersion: Range, #Mean deviation#, Standard Deviation and Standard Error - Moments, kurtosis and skewness, Normal distribution and confidence limits – Null hypothesis-Test of significance: Chi square test Student ‘t’ test - Probability: Addition probability and multiplication probability

Bioinformatics

UNIT III: Biological Databases

18 hours

Bioinformatics: Definition, History, Scope and Importance – Properties and significance of biological databases – symbols used in databases- Primary databases: PIR, GENBANK, and #EMBL# Secondary databases: MMDB and PDB, Composite databases: Swissprot– Sequence retrieval system – Relationship between databases.

UNIT IV: Tools of bioinformatics

18 hours

Bioinformatics tools - Classification – Sequence alignment- Features and application BLAST, FASTA, Locuslink, SRS and RasMol – Phylogenetic analysis: Phylogenetic Tree, Structure, construction and interpretation – DNA barcoding - Genomes and #proteomes#.

COMPUTER APPLICATION IN BIOLOGY

UNIT V: Computers and its Application in Biology

18 hours

Generations of Computers – Types of computers – Components of computer and properties – Software types, operating system and Hardware – Computer programming languages – computer networking: Internet and intranet - Browser anatomy and Search engines– Computer applications in biology and bioinformatics– Statistical packages and # SPSS in Biostatistics#

#.....# Self-study portion

Text Books:

1. Rastogi, V.B., Fundamentals of Biostatistics. Ane's books ltd., New Delhi. 2006.
2. Ram, B. Computer Fundamentals – Architecture and organization – Wiley Eastern Ltd. New Delhi. 1995.
3. Sundaralingam R and Kumaresan Bioinformatics, Saras Publications, Nagercoil. 2015

Books for Reference:

1. Arora, P.N., Biostatistics, Himalaya Publishing House. 1998.
2. Ramakrishnan, P., Biostatistics, Saras Publications, Nagercoil. 1996.
3. Ravikant,T., PC Software made simple, Tata McGraw Publishing Co Ltd. 1995.
4. V. Rajaraman. Fundaments of Computer, Prentice Hall of India. 1985.
5. Murthy, C.S.V., Bioinformatics, Himalaya Publishing House, Mumbai, India. 2003.

Web references:

1. <https://en.wikipedia.org/wiki/Bioinformatics>
2. https://www.roseindia.net/bioinformatics/history_of_bioinformatics.shtml
3. <https://www.coursera.org/lecture/bioinformatics-pku/history-of-bioinformatics-0i4EF>
4. <http://bioinformaticshistory.blogspot.com/>
5. <https://bioinf.comav.upv.es/courses/biotech3/theory/databases.html>
6. http://bioinformaticssoftwareandtools.co.in/bio_database.php
7. http://bioinformaticssoftwareandtools.co.in/bio_tools.php
8. <https://www.sciencedirect.com/topics/medicine-and-dentistry/dna-barcoding>
9. <https://www.toppr.com/bytes/collection-of-data/>
10. <https://statisticsbyjim.com/basics/measures-central-tendency-mean-median-mode/>
11. <https://statistics.laerd.com/statistical-guides/measures-central-tendency-mean-mode-median.php><https://www.abs.gov.au/websitedbs/a3121120.nsf/home/statistical+language+-+measures+of+central+tendency>
12. <https://www.computerscience.org/resources/computer-programming-languages/>
13. https://en.wikibooks.org/wiki/Computer_Programming
14. https://en.wikibooks.org/wiki/Statistics/Methods_of_Data_Collection

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
V	20UZO5CC9	BIostatistics, Bioinformatics and Computer Application in Biology					6	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	-	-	✓	✓	✓	-	✓	✓	
CO2	✓	✓	-	-	✓	✓	✓	-	✓	✓	
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Number of Matches= 44, Relationship : HIGH											

Prepared By:
Prof S.N. Sheik Umar Sahith

Checked by
Dr I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5CC10	Core X	GENETICS	5	5	100	25	75

Course Outcomes

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

1. Describe the basic principles of Mendelian inheritance
2. Explain the cell division & chromosome segregation and sex determination.
3. Understand and debate the various concepts in genetics, Chromosome structure.
4. Analyze the microbial genetics with special reference to bacteriophages.
5. Investigate the different kinds of disease affecting genes in Man and his welfare.

UNIT I: MENDELIAN PRINCIPLES

15 hours

Mendel's laws – #Monohybrid and Dihybrid Experiments #– Test cross and Back cross — Multiple alleles – Blood group inheritance–ABO blood group, Rh factors and Coat colour in Rabbit - Morgan and Bridges theory of linkage and crossing over –Polygenic inheritance.

UNIT II: SEX DETERMINATION

15 hours

Mechanism of sex determination – Chromosomal theory of sex determination- #Environmental determination of sex #- Sex linked inheritance and Types - Colour blindness and **Hemophilia**

UNIT III: GENE CONCEPTS

15 hours

Structure of Chromosome and Gene – # Cistron , muton, Recon # - Fine structure of gene– Gene regulation: 'Lac' and 'His' Operon- Chromosomal aberration – Euploidy, Polyploidy and Aneuploidy – Types of mutation – Chemical mutagens- Mutable and mutator genes Causes of mutation.- Mutation : Point mutation, Chemical mutagens, Gene mutation-DNA damage and DNA repair mechanism

UNIT IV: MICROBIAL GENETICS

15 hours

Introduction of microbial genetics– #-Recombination in Bacteria, Transformation, Conjugation, Sexduction and Transduction. T₄ Bacteriophage – #Life cycle of phages# – Lytic and Lysogenic cycle – Mapping of Bacterial Chromosome.

UNIT V: HUMAN GENETICS:

15 hours

Human chromosomes–Karyotype and Pedigree analysis – Syndromes: Turner, Klinefelter's, and Downs Syndromes. Inborn Errors of Metabolism and Disorders in Man: Phenylketonuria, Alkaptonuria, Albinism, #Thalassemia#, Sickle cell anemia - Genetic counseling (Eugenics and Euthenics).- Human genome project

#.....# Self-study portion

Text Book:

1. Verma. P.S. and V.K.Agarwal. Concept of Genetics, Human Genetics and Eugenics. & . S. Chand & Company Ltd, New Delhi.1998.

Reference

1. Gardner, E.J., Simmons, M.J., Snustad, D.P., Principles of genetics,8th edition, John Wiley and Sons.1991.
2. Strickberger., Genetics, 3rd edition, Prentice Hall of India.2002.
3. Benjamin Lewin., Genes VII, Oxford University Press.2000.
4. Sarin, C., Genetics, Tata Mc Graw – Hill publishing Co., Ltd., New Delhi.1990
5. Gupta PK., Genetics, Rastogi Publication, Meerut, India.).1996
6. Principles of genetics,8th edition, Garder EJ, Simmons MJ, Snustad DP,1991, John Wielely and sons
7. Genetics, 3rd edition, 2002, Strickberger, Prentice Hall of India.

Web reference

1. <http://www.dnaftb.org/1/bio.html>
2. <https://www.karger.com/Article/Fulltext/452637>
3. <https://www.toppr.com/ask/en-ae/question/explain-the-mechanism-of-sexdetermination-in-humans>
4. <https://pubmed.ncbi.nlm.nih.gov/7688132/>
5. <https://medlineplus.gov/geneticdisorders.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
V	20UZO5CC10	GENETICS					5	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓	
Number of Matches= 38, Relationship : HIGH											

Prepared By:

Dr. P. Rajasekar

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZ05CC11	CORE XI	MICROBIOLOGY	5	5	100	25	75

Course Outcomes

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

1. Describe the history, scope and applications of Microbiology.
2. Comment on the basic structure and salient features of microbe and Staining techniques.
3. Discuss the theoretical skill in culture media, sterilization and Bacterial Culture.
4. Transform the knowledge on Industrial, Agricultural and Food Microbiology
5. Assess the basic principles of medical microbiology and infectious diseases

UNIT I: CONCEPT AND CLASSIFICATION 15 hours

History, Scope and Application of microbiology- contributions of Louis Pasteur- Robert Koch-Alexander Fleming –Antonie Van Leeuwenhoek. Outline classification of microbes – Whittaker's five kingdom concept- Prokaryotes and Eukaryotes. # Concepts of Microbiology#

UNIT II: MICROBIAL CHARACTERISTICS 15 hours

Basic structure and salient features of Bacteria, Algae, Fungi, Yeast, Protozoa and Virus. Collection and isolation of Bacteria- Staining techniques: Simple Staining and Gram Staining. # Acid Fast Staining #.

UNIT III: MICROBIAL CULTURE 15 hours

Nutritional requirements - Types of media- Culture of Bacteria – Types of bacterial culture- Pure culture. Bacterial growth curve – Measurement of bacterial Growth- factors affecting Bacterial growth curve – Characteristics of Bacterial Colonies. - Disinfection: physical and chemical agents of sterilization and filtration. # Culture and handling methods #.

UNIT IV: INDUSTRIAL, AGRICULTURAL AND FOOD MICROBIOLOGY

15 hours

Industrially useful Microorganisms – Fermentation of Alcoholic beverage, Production of Biodiesel- Uses of microorganisms in Agriculture: Nitrogen fixers, Biofertilizers, Biopesticides, # Biocontrol agents #. Role of Microbes in Sewage treatment. Microorganisms as source of food: Dairy products, preservation of food, food spoilage, food poisoning– food borne diseases- fermented food products/ Concept IPR and Biosafety Guideline.

UNIT V: MEDICAL MICROBIOLOGY 15 hours

Microbial Diseases of Man – Symptoms, Modes of Transmission, Prevention and Treatment: Bacterial disease: TB and Syphilis# Tetanus and Pertussis #. Fungal disease: Cutaneous Mycoses, Systemic Mycoses and Mycotoxicosis - Vector borne disease: Malaria, Dengue and Chikungunya Viral disease: Influenza, AIDS and Corona -Microbial Analysis of Water - Safety precautions in microbiology lab.

#.....# Self-Study portion

Text Books:

1. Dubey R.C and Maheswari D.K. Text Book of Microbiology, S. Chand and Company Ltd, New Delhi. 2009.

Books for Reference:

1. Sharma,P.D., Microbiology , Rastogi Publications. 1998.
2. Pelczar, Chan and Krieg, Microbiology, Tata Mc Graw Hill Pub. Co. Ltd. 1993.
3. Ananthanarayanan, R and JayaramPanicker, C.K. Text Book of Microbiology, OrientLongman, Chennai and Hyderabad. 2000.

Web reference:

1. <https://www.moscomm.org/pdf/Ananthanarayan%20microbio.pdf>
2. <https://www.pdfdrive.com/essentials-of-medical-microbiology-e33538815.html>
3. <https://www.pdfdrive.com/medical-microbiology-e18737002.html>
4. <https://www.pdfdrive.com/review-of-medical-microbiology-and-immunology-e187714521.html>
5. <https://www.pdfdrive.com/essentials-of-medical-microbiology-e176048405.html>
6. <https://www.pdfdrive.com/medical-microbiology-d18737002.html>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours	Credits			
V	20UZO5CC11		MICROBIOLOGY			5	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	--	✓	✓
CO2	✓	--	✓	✓	--	✓	--	✓	✓	--
CO3	✓	✓	✓	✓	✓	--	✓	--	✓	✓
CO4	✓	✓	--	✓	✓	✓	✓	✓	--	✓
CO5	--	✓	✓	--	✓	✓	✓	✓	✓	✓
Number of Matches= 39, Relationship : HIGH										

Prepared By:

by:Dr.R.Krishnamoorthy

Checked

Dr. I.Jopesh A.Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5CC12	Core XII	DEVELOPMENTAL BIOLOGY	5	5	100	25	75

Course Outcomes

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

1. Describe the sequential changes from cellular organization to organ level
2. Explore the various events taking place during fertilization.
3. Apply the Organizer concepts and Induction process
4. Investigate the development of body organs in animals
5. Understand infertility and highlight the relevance and uses of modern fertility techniques

UNIT I: GAMETOGENESIS AND REPRODUCTIVE CYCLE

15 hours

Gametogenesis: Historical concepts and theories in Embryology. Spermatogenesis. Oogenesis. Structure of Sperm and ovum – Reproductive cycles - Menstrual cycle and # Estrous and #.

UNIT II: EVENTS IN FERTILIZATION

15 hours

Fertilization: Significance - Basic requirements of fertilization- Mechanism of fertilization – sperm motility, capacitation – acrosome reaction – activation of ovum – cortical reaction – metabolic activation - Amphimixis. #Parthenogenesis : Significance - Natural and artificial parthenogenesis#.

UNIT III: CLEAVAGE AND GASTRULATION

15 hours

Egg:Types of egg-Cleavage:Patterns and Plains of Cleavage - Blastulation and Blastula - Significance of Cleavage - Fate map and its construction – #Mammalian fate map#; uses of fate map - Cell lineage. Gastrulation:Morphogenetic movements – Epiboly, Emboly,Invagination, Involution, Ingression, Concrescence, Cell proliferation, Divergence .Organizer: Concepts and Induction process – Spemann and Mangold experiment.

UNIT IV: ORGANOGENESIS, GROWTH AND DIFFERENTIATION

15 hours

Neurulation: Tubulation and Neurula – Neurogenesis, Notogenesisand Mesogenesis-Development of eye and kidney in chicks. Derivatives of three germinal layers - Differentiation: Chemical basis, Genes and differentiation - Placentation in Mammals - Classification of Placenta. Regeneration: Types - #Regeneration in Planarians#.

UNIT V: TECHNIQUES IN DEVELOPMENTAL BIOLOGY

15 hours

Pregnancy tests - Abortion. Infertility – Causes of impotency (sterility) in female and Male; Artificial Insemination - IVF - GIFT - Test tube baby - Embryo Transfer. #Birth control: Methods of contraception in humans#.

#.....# Self-study portion

Text Book:

Verma, P.S. and Agarwal, V.K. (2009) Chordata Embryology, S. Chand & Company Ltd., New Delhi. 2009.

Reference

1. Dr. Subramanian. M. A, Developmental Biology, MJP publishers, (2019)
2. Subramaniam. T, Molecular Developmental Biology, Narosa Publishing House, (2008)
3. Bruce M Carlson., Foundations of Embryology. 6th edition, The McGrawHill publishing company ltd. (2007)
4. Lewis Wolpert, Principles of Development (III edition) Oxford University Press, UK. (2007)
5. Indebir Singh & G. P. Pal, Human Embryology, 8th Edition, Rajiv Beri for Macmillan India Ltd. (2007)
6. Gilbert, F.S. Developmental Biology, 8th edition, Sinauer Associates, Inc. Publishers, Massachusetts. (2006)
7. Werner A. Muller., Developmental Biology, Springer, (2005)
8. Balinsky, B.I. An Introduction to Embryology, 5th edition, Thomas Asia Pvt. Ltd, Chennai. (2004)
9. Khanna, D.R. Molecular Embryology, Discovery publishing house, New Delhi. (2004)
10. Kalthoff. Analysis of Biological Development, McGraw-Hill. (2000)
11. Austin. C. R., and Short. R. V., Embryonic and fetal development, Cambridge University Press, 1972.
12. Benjamin H. Willier & Jane M. Oppenheimer, Foundations of Experimental; Embryology, Prentice-Hall of India private Ltd (1968)

Web reference:

1. <https://teachmephysiology.com/reproductive-system/embryology/gametogenesis>.
2. <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/fertilization>.
3. https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology
4. <https://elifesciences.org/articles/15657>
5. https://www.medicalnewstoday.com/articles/165748#causes_in_men

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
V	20UZO5CC12	DEVELOPMENTAL BIOLOGY					5	5			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓	
Number of Matches= 38, Relationship : HIGH											

Prepared By:

Dr. M. Salahudeen

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZ05DE1AP	DSE – I	BIostatistics & Bioinformatics & Computer Application in Biology, Genetics, Microbiology and Developmental Biology - Practical	5	4	100	20	80

Course Outcomes

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

1. Acquire knowledge about soft wares of statistics, bioinformatics and
2. Explore the Biological applications of computers
3. Understand the Human genetics and culture methods of Drosophila.
4. Learn the Microbial Culture Staining methods
5. Explore developmental stages of frog and chick

BIostatistics, Bioinformatics and Computer Application in Biology

Measurement of the length and weight of fish or any other animal, and calculation of the mean and median values. Calculation of mean and median for leaves & mussel's shells.
EXEL: Production of bar diagram and pie chart for statistical data. Calculation of mean median and standard deviation.

Retrieval of nucleotide sequences and amino acid sequences from NCBI, EMBL, DDBJ, SWISS- PROT, PDB

Spotters: Input devices: mouse, keyboard, and scanner. Output devices: monitor, printer, CPU

GENETICS

Mendelian traits in Man

Human Genetics: Karyotypes - Pedigree analysis and - Syndromes.

Calculation of gene frequencies

Drosophila: Preparation of culture media for Drosophila

Study different stages of life cycle of Drosophila.

Male and Female identification

Observation of wild type and mutant phenotypes in Drosophila.

Verification of Mendelian laws through Drosophila / seeds – dominant, recessive and sex linked

MICROBIOLOGY

Analyses of environment water samples Isolation and culture of Bacterial pathogens (E.coli).

Preparation of herbal extract and studies on antimicrobial activities

Culture techniques of bacteria: Inoculum preparation, culture in liquid media, culture in solid media, and counting of bacteria using agar plating technique.

Gram Staining: Gram +ve and Gram–ve bacteria identification

Equipment's in Microbiology

Inoculation loop, Autoclave, Laminar flow hood and Bacteriological incubator

DEVELOPMENTAL BIOLOGY

Examination of prepared slides to study the following:

Frog: Egg – cleavage – blastula – yolk plug stage

Chick: Egg – 24hrs, 48hrs, 72 hrs

OBSERVATION RECORD * A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

Text Books:

1. Rastogi, V.B., Fundamentals of Biostatistics. Ane's books ltd., New Delhi. 2006.
2. Sundaralingam R and Kumaresan Bioinformatics, Saras Publications, Nagercoil. 2015
3. Pelczar, Chan and Krieg, Microbiology, Tata Mc Graw Hill Pub. Co. Ltd. 1993.
4. Verma, P.S. and Agarwal,V.K. (2009) Chordata Embryology, S. Chand &Company Ltd., New Delhi. 2009.
5. Dr. Subramanian. M. A, Developmental Biology, MJP publishers, (2019)

Books for Reference:

1. Arora, P.N., Biostatistics, Himalaya Publishing House. 1998.
2. Ramakrishnan, P., Biostatistics, Saras Publications, Nagercoil. 1996.
3. Sharma,P.D., Microbiology , Rastogi Publications. 1998.
4. Verma. P.S. and V. K. Agarwal. Concept of Genetics, Human Genetics and Eugenics. & . S. Chand & Company Ltd, New Delhi.1998.
5. Garder, E.J., Simmons, M.J., Snustad, D.P., Principles of genetics,8th edition, John Wiley and Sons.1991.
6. Strickberger., Genetics, 3rd edition, Prentice Hall of India.2002.
7. Dubey R.C and Maheswari D.K. Text Book of Microbiology, S. Chand and Company Ltd, New Delhi. 2009.
8. Subramaniam. T, Molecular Developmental Biology, NarosaPublishing House, (2008)
9. Bruce M Carlson., Foundations of Embryology. 6th edition, The McGrawHill publishing company ltd. (2007)

Web references:

1. <https://teachmephysiology.com/reproductive-system/embryology/gametogenesis>.
2. <https://www.moscomm.org/pdf/Ananthanarayan%20microbio.pdf>
3. <https://www.pdfdrive.com/essentials-of-medical-microbiology-e33538815.html>
4. <https://www.pdfdrive.com/medical-microbiology-e18737002.html>
5. <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/fertilization>
6. <https://en.wikipedia.org/wiki/Bioinformatics>
7. https://www.roseindia.net/bioinformatics/history_of_bioinformatics.shtml
8. <https://www.coursera.org/lecture/bioinformatics-pku/history-of-bioinformatics-0i4EF>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
V	20UZ05DE1AP	BIostatistics & Bioinformatics & Computer Application in Biology, Genetics, Microbiology and Developmental Biology- Practical					5	4				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓		
Number of Matches= 38, Relationship : HIGH												

Prepared By:

Dr. M. Meeramaideen

Jerald

Checked by:

Dr. I. Joseph A.

Note:

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5DE1B	DSE 1	BIO INSTRUMENTATION	5	4	100	25	75

Course Outcomes

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

1. Acquire knowledge on basic instruments and apparatus used in Laboratories
2. Explore the different kinds of microscope used in biological research labs
3. Apply the techniques involved in microtome sectioning and radiation counters
4. Analyze the principles and working of PCR and blotting techniques
5. Comprehend and apply the principle and uses of medical equipment

Unit I: Basic instrumentation

Hours 15

Basic instrumentation: Principle and applications of following instruments: pH meter - Centrifuge - Colorimeter - Homogenizer - Vortex mixer - Weighing balance - Haemocytometer - Haemoglobinometer#.

Unit II: Microscope and Spectrophotometer

Hours 15

Microscope - Simple and Compound microscope - Stereo microscope - Phase contrast microscope - SEM, TEM. UV Spectrophotometer and applications. Electrophoresis: AGE, PAGE - Immunoelectrophoresis.#Chromatography and applications#.

Unit III: Microtechnique and Radiation Counting System

Hours 15

Microtome - Tissue processor - Tissue sectioning techniques - Scintillation Counter - Alpha Counting System - Beta Counting System - Low Beta counting - #NaI Gamma Detector#

Unit IV: PCR & Immunological techniques

Hours 15

Principle and working methodology of Polymerase Chain Reaction (PCR) - ELISA - Western, Southern and Northern Blotting - #WIDAL - VDRL Tests#.

Unit V: Medical equipment

Hours 15

Principle and medical applications of ESR measurement, Sphygmomanometer, ECG, Pacemakers; X-ray imaging, Ultrasound imaging #CT scan and MRI imaging#

#.....# Self-study portion

Text Book:

Khandpur, R.S,. Biomedical Instrumentation, Tata McGraw Hill, New Delhi, 2004.

Book for Reference

1. Wilson, K.M. and Walker, J.M. Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, UK .2010.
2. Cooper GM. The Cell: A Molecular Approach. 2nd Edition, Sinauer Associates, Sunderland (MA), USA .2000.
3. Raja, S. Manual for Medical Laboratory Technology, AnjanaBook House, Chennai.

Web reference:

1. <https://sciencing.com/instruments-used-biology-2571.html>
2. <https://www.nationalgeographic.org/encyclopedia/microscopes/>
3. <https://www.sciencedirect.com/topics/neuroscience/microtome>
4. https://en.wikipedia.org/wiki/Polymerase_chain_reaction
5. <https://www.microsemi.com/applications/medical/medical-instrumentation>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits			
I	20UZO5DE1B	Bio Instrumentation					5	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓	
CO3	✓	-	✓	✓	-	✓	✓	✓	✓	✓	
CO4	✓	-	✓	✓	✓	✓	✓	-	✓	✓	
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓	
Number of Matches= 40, Relationship : HIGH											

Prepared By:

Dr. M. Salahudeen

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5SE2A	SEC II	APPLIED ZOOLOGY	2	2	100	--	100

Course Outcomes

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

1. Understand the classification of earthworm, vermicomposting and biowaste management
2. Describe the basics of Lac culture, Apiculture and their uses
3. Apply the knowledge on Sericulture and reap its benefits
4. Develop an Aquaculture unit
5. Manage a Dairy farm.

UNIT I: Vermiculture 6 hours

Classification of earthworm; Species of Earthworms – Life cycle of *Lampitoma mauritii*– Large Scale manufacture of Vermicompost- Vermiwash and Vermifilter – Economic importance of Earthworms – bio waste management - #Organic farming#.

UNIT II: Lac culture and Apiculture 6 hours

Classification of lac insect – species of lac insect – #host plant# – Extraction of Lac – Processing – purification - Uses of Lac: Medicinal – Industrial – Ornamental. Classification of honey bee; Species of Honey Bees - colonial structure of honey bee – Biology of Honey bee – Types of bee hives –Extraction of honey – Nutritive and medicinal value of honey – Bees wax.

UNIT III: Sericulture 6 hours

Classification; Species of *Bombyx mori*. Rearing of silk worm: Paraffin paper rearing – Box rearing – New net method – Co-operative methods. Moriculture – types of mulberry plants – planting methods. Diseases of silk worm: Protozoan – Bacterial - Viral diseases (each two) - Reeling of silk – # importance of sericulture#- Sericulture Institutes.

UNIT IV: Aquaculture 6 hours

Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed – Induced breeding – rearing methods– Fish diseases :Furunculosis, Epizootic Ulcerative Syndrome (EUS) and #Vibriosis# – Sewage fed Fish culture – Integrated Fish Farming – Fresh water Prawn culture – Ornamental fish culture – Seaweed Culture.

UNIT V: Dairy farming 6 hours

Scope of Dairy Farming -Breeds of Dairy animals (Cow, Buffalo and Goat) and their characteristics. Dairy farm: Construction Methods – #Rearing of cattle# - Raising the dairy calf, – Farm equipments (Milk machines, chaff cutter, milk cans and containers for liquid food) – Quality of Milk and Value added product of Milk.

#.....# **Self-Study portion**

Text Book:

1. Shukla.G.S. and Upadhy.V.B. Economic Zoology (Rastogi Publications), 2018.

Books for Reference:

1. Ahsan, J and Sinha, S.P. A Handbook on Economic Zoology, S.Chand & Co.2010.
2. Ghosh, GK. Beekeeping in India. APH Publishing.,1994.

3. Santhanam, P., A. R. Thirunavukkarasu and P. Perumal.,. Advances in Marine and Brackishwater Aquaculture. Springer Publisher, 2015
4. Ullal.S.R. and Narasimhanna, M.N – Central Silk Board, Govt. of India, Bombay. 1978
5. Singh – Livestock and poultry production, 2018.
7. Maine product export development authority – Freshwater fishes, Ornamental fishes, Shrimph culture – MPEDA Publication series.2019

Web Reference:

1. <https://www.pdfdrive.com/applied-and-economic-zoology-d34329308.html>
2. <https://www.pdfdrive.com/economic-zoology-e43402329.html>
3. <https://www.pdfdrive.com/applied-zoology-e39941972.html>
4. <https://sites.google.com/site/stinchotoupasno8/9789351306870-15mitbacGEnuispir51>
5. https://www.coolermaster.com/economic_zoology_pdf_of_shukla_upadhyay.pdf

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
V	20UZO5SE3A	APPLIED ZOOLOGY					2	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓	--	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	--	✓	✓	--		
CO3	✓	✓	✓	✓	--	--	✓	--	✓	✓		
CO4	✓	--	✓	✓	✓	✓	✓	✓	--	✓		
CO5	--	✓	✓	--	✓	✓	✓	✓	✓	✓		
Number of Matches= 40, Relationship : HIGH												

Prepared By:

Dr.R.Krishnamoorthy

Checked by:

Dr. I.Jopesh A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZ05SE2B	SEC II	WATER POLLUTION MANAGEMENT	2	2	100	--	100

Course Outcomes

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

1. Describe the ill effects of water pollution threatening the existence of men, animals and plants
2. Comprehend the nature of heavy metals and their existence in water and their ill effects
3. Estimate the various water quality parameters and their significance
4. Apply the methods of developing water resources and water shed management
5. Recommend pollution abatement legislations and enactments

UNIT I: Sources of Water Pollution

6 hours

Sources and Types of Water Pollution: Physical, Chemical and Biological sources. Water pollutants- oxygen demanding wastes, #Plant nutrients and synthetic organic compounds#.

UNIT II: Classification of Pollutants

6 hours

Water Pollutants: Sources of Heavy Metals as Water Pollutants- Heavy Metals and Pesticides: Classification and ill effects. Pathogens. #Classification and harmful effects#.

UNIT III: Analyses of Water Quality Parameters

6 hours

Water Quality parameters: Total solids, Suspended solids, Turbidity, Colour, #Electrical conductivity, Taste & Odour#, Temperature, Alkalinity, Hardness, Silicate, Nitrogen and Phosphate, Dissolved oxygen, BOD and COD

UNIT IV: Water Shed Management

6 hours

Water Shed Management: Concept, Characteristics and Types of Water Shed – Water Resources Development – Water Investigation – #Water Shed Management and Water Budget#.

UNIT V: Water Quality Standards

6 hours

Water Quality Standards: #Indian and International standards# – WHO, EPA, ISI, CPHEEO, CPCB, SPCBand ICMR. Environmental Laws and Water pollution Management: Water pollution, prevention and Control Act- Role of Governmental and Non-Governmental Organisation in water pollution control.

#.....# Self-Study portion

Text Books:

1. Goel, P.K and Trivedy, P. Physico-chemical analysis of water and waste water. Karad Publications, 2005.
2. P.D. Sharma, Ecology and Environment, Rastogi Publication, 2010.

Books for References:

1. G. Allen Burton, Jr., Robert Pitt. Stormwater Effects Handbook: A Textbook for Watershed Managers, Scientists, and Engineers. New York: CRC/Lewis Publishers. 2001.
2. Schueler, Thomas R. "Cars are leading Source of Metal Loads in California." Reprinted in The Practice of Watershed Protection. Center for Watershed Protection. Ellicott City, MD.2000.
3. Goel, P.K. Water Pollution - Causes, Effects and Control. New Delhi: New Age International. p. 179.2006.

4. Kennish, Michael J. Ecology of Estuaries: Anthropogenic Effects. Marine Science Series. Boca Raton, FL: CRC Press. pp. 415–17.1992.
5. Laws, Edward A.. Aquatic Pollution: An Introductory Text. New York: John Wiley and Sons. p. 430.2000

Web Reference:

1. <https://core.ac.uk/download/pdf/228540809.pdf>
2. <https://www.epa.gov/nutrientpollution/sources-and-solutions-wastewater>
3. <https://en.unesco.org/emergingpollutantsinwaterandwastewater>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
V	20UZ05SE2B	WATER POLLUTION MANAGEMENT					2	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	-	✓	✓	-	-		
CO2	✓	✓	-	✓	✓	✓	✓	✓	✓	✓		
CO3	✓	✓	✓	✓	✓	✓	-	✓	✓	-		
CO4	✓	✓	✓	✓	✓	-	✓	✓	✓	✓		
CO5	✓	✓	✓	-	-	✓	✓	-	✓	✓		
Number of Matches= 40, Relationship : HIGH												

Prepared By:

Dr.H.E. Syed Mohamed

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5SE3A	SEC - III	POULTRY SCIENCE	2	2	100	-	100

Course Outcomes:

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

1. Acquire Knowledge on Poultry industry and the general principles involved
2. Describe the Rearing of Fowl and the techniques in Chick & Duck Culture
3. Apply Poultry nutrition, the types of feeds and feeding methods
4. Comprehend Poultry diseases and curative measures
5. Develop Entrepreneurial skills and become fit to earn livelihood

UNIT I: INTRODUCTION

6 hours

Poultry industry in India - Scope and objective - Poultry breeds and classes of fowls –General principles in building Poultry house – Poultry housing: Deep litter and cage rearing – # Poultry equipment #.

UNIT II: CULTURE PRACTICE

6 hours

Rearing of Fowls – Chicken Farming – Selection of Breeds – Breeding procedure: Incubation & Hatching- Methods of rearing Growers, Layers and Broilers – Growth and management of fowls in summer and winter. Different system of fowl farming (Free range, semi intensive, folding unit, intensive) – # Duck Rearing # – Breeds of Ducks.

UNIT III: POULTRY NUTRITION

6 hours

Poultry nutrition – Food and Feeding - Nutritional requirement offowls – Composition of feed - Feed formulation – Balanced Diet- # Nutrition deficiency symptoms # – Non nutritive feed additives - Quality Control.

UNIT IV: DISEASE MANAGEMENT

6 hours

Poultry diseases - Viral Disease: Ranikhet disease and Fowl pox. Bacterial Disease: Salmonellosis and Fowl Cholera. Parasitic Diseases: Coccidiosis and Ticks – Vaccination programme – Prevention and Precaution for diseases – # Fowl health products #.

UNIT V: POULTRY PRODUCTS

6 hours

Poultry products – Composition and nutritive value of eggs – Role of egg in human nutrition – Poultry meat processing – Marketing of poultry products – # Use of feathers – Poultry manure # - Economics of Poultry Keeping.

Field visit: Plan to promote Poultry Keeping for employment venture.

#.....# **Self-Study portion**

Text books:

1. M.R. Gnanamani, Poultry Keeping, GIRI Publication, Madurai. 2003.
2. G. S. Shukla, V. B. Upadhyay, Economic Zoology, Rastogi publications, 2009.
3. Jull Morley, A, Poultry Husbandry, Tata – McGraw Hill Publ. Co New Delhi. 1971.

Books for Reference:

1. The Rearing of Pullets – Bulletin No. 54, Her Majesty’s Stationary office, London.
2. Intensive Poultry Management for Egg Production. Bulletin No. 152. Her Majesty’s Stationary office London.
3. Nutrition of the Chicken – M.L.Scott *et al.*
4. Diseases of Poultry – Biester – Oxford & IBH.

Web References:

1. https://www.brainkart.com/article/Poultry-Breeds_811/
2. <https://www.britannica.com/topic/poultry-farming>
3. <http://www.omafra.gov.on.ca/>
4. https://agritech.tnau.ac.in/animal_husbandry
5. http://apeda.gov.in/apedawebsite/SubHead_Products

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
V	20UZO5SE3A	POULTRY SCIENCE					2	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓		✓	✓		✓		
CO2	✓	✓	✓		✓	✓	✓		✓	✓		
CO3	✓	✓		✓	✓	✓		✓	✓			
CO4	✓	✓		✓	✓		✓	✓		✓		
CO5			✓			✓			✓	✓		
Number of Matches= 34, Relationship : Moderate												

Prepared by:
Dr. I Joseph A Jerald

Edited By
Dr. I Joseph A Jerald

Note:

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

Sem	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
V	20UZO5SE3B	Core – I	PISCICULTURE	2	2	100	-	100

Course Outcomes

On successful completion of the course, students will be able to

1. Define the scope and significance of aquaculture
2. Estimate and assess water quality; evaluate nutrition in aqua farming
3. Explain the breeding habits of fishes and prawn
4. Discuss the methods of rearing and disease management
5. Design aquarium and apply the use of aquarium accessories

UNIT I: Scope and Practices of Pisciculture

12 Hours

Definition, scope and significance of pisciculture – Aquaculture - Global and Indian Scenario. Important site selection for pond, pen and cage culture. Criteria for species selection. #Biosecurity#.

UNIT II: Types, Culture of Freshwater Fishes and Ornamental Fishes

12 Hours

Inland, Brackish water and Mari culture. Types of ponds- nursery, rearing and stocking. Cultivable freshwater fishes- Carps, air-breathing fishes, Tilapia and #Freshwater Prawn#. Organic farming and bio flock farming of finfish and shellfish. Species of ornamental fishes - Live bearers, Gold fish and koi, Gourami, Barbs and Tetras, angel fish, cichlids. Breeding habits, spawning, fertilization and development of eggs. Hatching, larval rearing and their health management.

UNIT III: Reservoir Fisheries and Integrated Farming

12 Hours

Major reservoirs in India, measures for increasing production from reservoirs in India. Fish and Prawn culture in ponds, cages and pens, raceways, indoor tanks, canals, silo culture, sewage-fed fish culture, monoculture, polyculture and composite fish culture. #integrated fish farming with duck#, pig, poultry, livestock and paddy field. Recirculatory aquaculture systems.

UNIT IV: Feeding, Microbial Disease, Diagnosis and Control Measures

12 Hours

Natural and supplementary feed-feeding ratio-artificial feed and feeding additives-feeding device. Microbial infections of Bacteria, Viruses, fungi and algae- pathogenicity and virulence-source of infection-morphological, physiological and sociological diagnosis-#microbiological water quality management#-application of drugs, chemicals and antibiotics.

UNIT V: Harvesting, preservation, Export, Government Agencies and Schemes

12 Hours

Harvesting methods-precautions observed during harvesting-preservation techniques-#sorting and grading the catching fishes #seafood export promotion and Government Agencies – ICAR institutes (CMFRI, CIFRI, CIBA & CIFA), MPEDA. Government schemes and incentives for promotion of entrepreneurship – Pradhan Mantri Matsya Sampada Yojana, MPEDA Schemes, Tami Nadu Government schemes and subsidies to shrimp farmers.

#.....# Self-study portion

Text Books:

1. Jhingran, V.G., 1985. Fish and Fisheries of India, Hindustan Publishing Corporation, Delhi, 666 pp.

Reference Books:

1. Trivedi, K.K. (Ed), 1986. Fisheries Development, 2000 A.D. Association of India Fisheries Industries, Oxford and I.B.H., New Delhi, 268 pp.

2. Bal, D.V. and K.V. Rao, 1984. Marine Fisheries, Tata McGraw Hill, New Delhi. 470 pp.

3. Bardah, Ryther and McLarrey, 1972. Aquaculture, John Wiley, New York, 868 pp

Web Reference:

1. <https://en.wikipedia.org/wiki/Aquaculture>

2. <https://www.thesprucepets.com/aquarium-fish-profiles-1381000>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
V	20UZO5SE3B	PISCICULTURE					2	2				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓		
Number of Matches= 38, Relationship : HIGH												

Prepared By:

Dr. K. PRABAKAR

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6CC13	Core – XIII	BIOCHEMISTRY AND BIOPHYSICS	5	5	100	25	75

Course Outcomes

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

1. Define and explain the scope and principles of Biochemistry
2. Relate and differentiate biochemical molecules and vitamins
3. Comprehend the various enzymes and their activities
4. Describe the principles and properties of light and instrumentation
5. Estimate and evaluate the working procedure and uses of bioinstrumentation

UNIT I: Basic Biochemistry

15 hours

Scope of Biochemistry – Elements of Life- Atomic structure – Chemical bonds – pH and buffers: Acid-base reactions – #Role of buffers in biological systems#. Water and its functions – Dissolved gases and their properties.

UNIT II: Classes of Biochemistry and Vitamins

15 hours

Classification-Aldoses, Ketoses, Monosaccharide, Disaccharides, Polysaccharides (homo, hetero). Proteins– Types of Aminoacids, Primary, Secondary, Tertiary Structure of Proteins. Lipids – Simple lipids, #Complex lipids#, Phospholipids, Glycolipids, Lipoproteins. Vitamins: Water and Fat soluble vitamins – source, function and deficiency diseases.

UNIT III: Enzymes and Metabolisms

15 hours

Enzymes: Classification – Characteristics – Enzyme action –Mechanism of Enzyme Action – Factors affecting enzyme activity- Energy rich compounds. Metabolisms: Types – Glycolysis - TCA cycle – #Oxidative phosphorylation#-Glycogenesis-Glycogenolysis-Glyconeogenesis

UNIT IV: Concept of Biophysics

15 hours

Introduction to Biophysics – Nature and Properties of Light –Electromagnetic spectrum – Absorption and Emission spectrum – fluorescence and phosphorescence. Bioluminescence – Bio energetics: Free energy concepts – Laws of thermodynamics – #Redox potential# – ATP.

UNIT V: Principle and application of Bio instruments

15 hours

Principle, Working Procedure and Uses of: #pH meter#, Spectrophotometry, Centrifugation, Chromatography: Paper, Thin Layer chromatography (TLC), Ion exchange chromatography, LC-MS and HPLC.

#.....# Self-study portion

Text Book:

1. Jain J.L. Fundamentals of Biochemistry. S.Chand& Co.2010.
2. Banerjee P.K. Introduction to Biophysics, , S. Chand Publishing, 2008

Books for References:

1. Frunton J.S. & S. Simmonds, G.General and R.H.Dol. Outlines of Biochemistry John Wiley & Sons. 1987.
2. Arumugam,N and Annie. Biochemistry and Biophysics – Saras Publication; Nagarcoil, 2013.
3. Ackerman, E. Biophysical Science, Prentice Hall, New Delhi. 1962.
4. Daniel, M. Basic Biophysics for Biologists, Wiley International, New Delhi. 1992.
5. Das.D. Biophysics and Biological Chemistry, Academic Publishers, Calcutta. 1996.
6. Lehninger,L. Biochemistry. W.H Freeman & Co. 1990.

Web Reference:

1. <https://en.wikipedia.org/wiki/Biochemistry>
2. <https://www.britannica.com/science/biochemistry>
3. <https://en.wikipedia.org/wiki/Biophysics>
4. <https://www.britannica.com/science/biophysics>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
VI	20UZ06CC13	BIOCHEMISTRY AND BIOPHYSICS					5	5				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓		
Number of Matches= 38, Relationship : HIGH												

Prepared by:

Dr. K. PRABAKAR

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Sem	Code	Course	Title of the	Hours	Credits	Max.	Internal	External
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			Course			marks	marks	marks
VI	20UZO6CC14	Core XIV	IMMUNOLOGY	5	5	100	25	75

Course Outcomes

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

1. Define the cells and organs of the Immune system
2. Comment on the structure and properties of Antigens and Antibodies
3. Discuss the concepts of humoral and cell mediated immune response
4. Explore the significance of the Immune system upon health
5. Familiarize and apply the basic Immunological techniques

UNIT I: CELLS AND ORGANS OF IMMUNE SYSTEM

15 hours

Scope – History - Innate immunity - Acquired immunity: Active and Passive Primary Lymphoid organs: Thymus – Bone Marrow- Secondary lymphoid organs: Spleen – Lymph node – MALT - GALT - Cells of Immune System: Lymphocytes – Types - #Macrophages# – Antigen Presenting Cells – Mast cells

UNIT II: ANTIGEN AND ANTIBODY

15 hours

Antigens: Structure - Types - Characteristics – Haptens – Immunoglobulin: Types – Structure - Functions- Biological properties – Vaccines: Common vaccines – Attenuated – Killed vaccines – Multivalent – Importance of vaccines– #Adjuvants – Characteristics – Common adjuvants#

UNIT III: CONCEPTS TO IMMUNE RESPONSE

15 hours

Role of Immune response – factors causing immune response– Types of immune response – Primary and Secondary immune response – Humoral immune response - Cell mediated Immune response – #Cytokines: Types and functions#

UNIT IV: IMMUNE SYSTEM AND DISEASES

15 hours

Major Histocompatibility Complex in man - Human Leukocyte Antigen (HLA) – Complements: Salient features & Functions – Hypersensitivity – Factors causing hypersensitivity & types – Allergy - Auto Immune diseases – Causes & types - #Immunodeficiency diseases# – Causes & types

UNIT V: IMMUNOLOGICAL TECHNIQUES

15 hours

Double and Radial immunodiffusion - Immunoelectrophoresis – Rocket – Counter current - ELISA – RIA - WIDAL – VDRL test – #ABO blood typing#– Coombs test– Hybridoma technology - Applications

#.....# Self-study portion

Text Book:

1. Chakravarty, A.K., (1993) Immunology, Tata McGraw Hill Publishing Company, New Delhi.

Books for Reference:

1. Roitt, Immunology, (3rd Edition) Crover Medical Publishing Company, London
2. Barret, J. T. (1983) Text Book of Immunology (5th Edition), The C.V. Mosly Company.
3. Richard, H.M. (1992), Immunology (2nd Edition), Williams and Wilkins, Baltimore Maryland.
4. Hidemann, W.H. (1980) Essentials of Immunology, Elsevier Science Publishing Co. Inc.
5. Weinn. D.M. and Steward, L. (1993), Immunology, Singapore Publishers Private Limited.

Web Reference:

1. <https://www.ncbi.nlm.nih.gov/books/NBK279395/>
2. <https://www.sciencedirect.com/topics/medicine-and-dentistry/organs-of-the-immune-system>
3. <https://www.immunology.org/public-information/bitesized-immunology/systems-and-processes/complement-system>
4. <https://www.immunopaedia.org.za/immunology/archive/type-i-iv-hypersensitivity-reactions/immune-complex-formation/hypersensitivity-reactions/>
5. <https://courses.lumenlearning.com/boundless-microbiology/chapter/the-major-histocompatibility-complex-mhc/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits		
VI	20UZO6CC14	IMMUNOLOGY					5	5		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	√	-	√	√	√	√	√	√	√	√
CO2	√	√	√	√	√	√	√	-	√	√
CO3	-	√	√	√	√	√	-	√	√	√
CO4	√	√	√	√	√	√	-	-	√	√
CO5	-	√	√	√	√	√	√	√	-	√
Number of Matches= 42, Relationship : High										

Prepared By:

Dr. M. Aneez Mohamed

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6CC15	CoreXV	ECONOMIC ENTOMOLOGY	5	5	100	25	75

COURSE OUTCOMES:

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

1. Identify and classify the insects and their preservation
2. Explain and interpret the beneficial and harmful insect
3. Report the various pests of agricultural crops
4. Understand and manage the pests of medical importance
5. Recommend the suitable method of pest management

UNIT I: Classification and Collection of insects

15 Hours

Classification of insects up to orders and their diagnostic characters with familiar and important examples.

Collection, preservation of Insects: - Hand picking – Insect or Butterfly net – Sweeping -Beating - Trapping – Transferring to containers – Killing Jar. Assessment of insect population

UNIT II: Beneficial Insects and Insect pests of domestic animals

15 Hours

Lifecycle and economic importance of Honeybee, Silkworm and Lac insects. Insect pollinators, predators, Weed killers and scavengers. Insect pests of domestic animals: - Cattle (horsefly, stablefly, housefly). Fowl (Shaft louse, chicken flea, Bedbug). Sheep (head maggot, sheep ked, biting louse)

UNIT III: Pest of crops

15 Hours

Biology and lifecycle of insects: paddy (Stem borer, Rice swarming caterpillar, Gallfly), sugarcane (Stem borer, leaf hopper, Cane whitefly), cotton (Spotted bollworm, Pink bollworm, Cotton Jassid), Coconut (Rhinoceros beetle, Red palm weevil, Bark borer), vegetables – Brinjal (Shoot borer, Spotted hadda beetle), Tomato (Potato tuber moth), Cabbage (caterpillar) Fruits (Mango, Citrus, Banana) Pests of stored grains - Pulses (Greasy cutworm) Plum moth Caterpillar, Red Gram (Podfly)

UNIT IV: Pests of Medical Importance

15 Hours

Pests of Medical Importance: - Biology of housefly, mosquito, human flea, human louse, sand flies. # Veterinary Pests – Buffalo fly, Cattle biting louse, Equine Botflies. #

UNIT V: Insect control

15 Hours

Principles of Insect control: physical, mechanical, chemical, biological and integrated methods of pest control, Precaution handling pesticides, # Legislative measures and Quarantine measures #

#.....# Self-study portion

Text Books:

1. D.B. Tembhare. Modern Entomology. Himalaya Publishing House, Mumbai. 2005.
2. B. Vasanthraj David & T. Kumaraswamy, Elements of Economic Entomology, Popular Book Depot, Chennai. 2000.
3. P.G Fenemore Alkaprakash, Applied Entomology, New Age International Pvt. Ltd, Publisher New Delhi, Reprint 2000.

Book for References:

1. Chandler, A.C. and Read, C.P. Introduction to Parasitology. John Wiley and Sons, New York. 1961.
2. David, B.V. and T.Kumarasami. Elements of Economic Entomology. Popular Book Depot, Chennai. 1998.
3. David, B.V. Pest Management and pesticides in Indian Scenario, Namrutha Publication. 1992.
4. Krishnan, N.T. Economic Entomology, J.J.Publications, Madurai. 1993.
5. Nayar, K.K., Ananthakrishnan, T.N and David V.D, General and applied Entomology, Tata Mc Grow Hill, New Delhi. 1990.

Web References:

1. <https://www.veterinaryentomology.org/>
2. <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/vertebrate-pests>
3. <https://www.knowledgebank.irri.org/step-by-step-production/growth/pests-and-diseases>
4. <https://onlinesciencenotes.com/sericulture-life-cycle-silkworm/>
5. books.irri.org/9712200280_content.pdf

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
VI	20UZO6CC15	ECONOMIC ENTOMOLOGY					5	5				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	-	✓	✓	✓	✓	✓	✓	✓		
CO2	✓	✓	✓	✓	✓	✓	-	✓	✓	-		
CO3	✓	✓	✓	✓	✓	✓	-	✓	✓	✓		
CO4	✓	✓	✓	-	✓	✓	✓	✓	✓	-		
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Number of Matches= 44, Relationship : HIGH												

Prepared by

Dr. M.I. Hussain Syed Bava

Checked by

Dr.I. Joseph Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6CC16	Core – XVI	ENVIRONMENTAL BIOLOGY AND EVOLUTION	5	5	100	25	75

Course Outcomes

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

1. Analyze and relate the significance of abiotic factors and their ecological effects
2. Discuss the biotic community and ecosystem dynamics
3. Investigate the different Natural Resources, Biodiversity & Conservation
4. Understand and Explain the Concept and Theories of Evolution
5. Appraise the Evolutionary Time Scale and Evolution of Man

UNIT I: ECOLOGY, ENVIRONMENT AND ECOSYSTEM

15 hours

Abiotic factors- Light, Water, Temperature and Soil and their impact on organisms. Ecosystem: Pond and River- Food Chain - Food Web -Tropic level –Energy Flow-# Ecological Pyramids: Biomass, Number and Energy#.

UNITII: SPECIES INTERACTION, POPULATION & COMMUNITY ECOLOGY

15 hours

Biotic factors - Animal relationships – Symbiosis: Commensalisms and Mutualism– Antagonism: Antibiosis, Predation, Parasitism and Competition – Intraspecific and Interspecific competition. Population Ecology – Definition – Characteristics. Community Ecology: Types – Components – Ecotone – Edge effect – Ecological niche – #Ecological succession – Concept of Climax.#

UNIT III: NATURAL RESOURCES, BIODIVERSITY & CONSERVATION

15 hours

Natural Resources - Renewable and Non-renewable - Resources Management. Wild life Conservation and Management. Biodiversity – Types – Mega diversity and hotspots with reference to India –Conservation of Biodiversity - Barcoding. Environmental Pollution: Air, Water and Land. Sewage and Solid Waste disposal and Management – Global Warming and Climate change – Green House Effect –#Ozone Layer and its significance#. Acid Rain.

UNIT IV: CONCEPT AND THEORIES OF EVOLUTION

15 hours

Evolution: Concept and Theories: Lamarckism – Darwinism – Neo-Lamarckism – Neo-Darwinism. Evidences of Evolution: Morphological and Anatomical (Homologous, Analogous and Vestigial organs), Embryological evidences, Palaeontological, Physiological and Biochemical evidences – Elemental forces of evolution: Selection, Recombination, Isolation, Migration, Mutation and Genetic drift. Patterns of Evolution: Sequential, Divergent, Microand Macroevolution, # Mimicry#.

UNIT V: EVOLUTIONARY TIME SCALE AND EVOLUTION OF MAN

15 hours

Geological time scale: Eras, Periods and Epochs – Fossils: Types and Formation – Dating of fossils. Extinction: Types, causes – Extinct animals- Living fossils – Connecting Links – Missing Links. Evolution of Man – Cultural and Biological evolution– #Future evolution#.

#.....# Self-study portion

Text Books:

1. Odum, E.P. Fundamentals of Ecology (III Edn.), Natraj Pub. Dehradun. 1996.
2. Arumugam, N. Organic Evolution, SarasPublication, Nagercoil. 2006.

Books for References:

1. Clarke, G.L. Elements of Ecology. John Wiley & Sons, New York, 3rd Edition, 1954.
2. Kendeigh, S.C. Animal Ecology. Prentice Hall. 2nd Edition, 1961.
3. Rastogi, V.B. and M.S. Jayaraj. Animal Ecology and Distribution of Animals, Kedarnath Ramnath. 1989.
4. Sharma, P.D., Ecology and Environment. Rastogi Publications. Meerut. 1990.
5. Southwick, C.H., Ecology and the quality of Environment. D. VasNostrand Co. 1976.
6. Verma, P.S. and V.K. Agarwal, Principles of Ecology. S.Chand & Co. New Delhi. 1996.
7. Savage. Evolution, Modern Biology Series, 3rd Edition, 1969.
8. Dowdeswell, P.M. The Mechanism of Evolution, Heinemann London 2nd Edition, 1956.
9. Simpson, G.G., The major features of Evolution, CUP. 1953.

Web References :

1. https://en.wikipedia.org/wiki/River_ecosystem
2. <http://www.easternlocal.com/userfiles/251/Classes/8642/animal%20relationships%20notes.pdf?id=4361>
3. <http://www.aagasc.edu.in/Unit%203%20EVS.pdf>
4. <http://sciencenetlinks.com/student-teacher-sheets/lamarck-and-darwin-summary-theories/>
5. https://www.geosociety.org/GSA/Education_Careers/Geologic_Time_Scale/GSA/timescale/home.aspx

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
VI	20UZO6CC16	ENVIRONMENTAL BIOLOGY AND EVOLUTION					5	5				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	-		
CO2	✓	✓	-	-	✓	✓	✓	-	-	✓		
CO3	✓	-	-	✓	✓	-	✓	-	-	-		
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓		
CO5	-	✓	-	✓	✓	✓	✓	-	-	✓		
Number of Matches= 32, Relationship : HIGH												

Prepared By:

Dr. A. Sadiq Bukhari

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6DE2AP	DSE II	BIOCHEMISTRY, BIOPHYSICS, IMMUNOLOGY, ECONOMIC ENTOMOLOGY, ENVIRONMENTAL BIOLOGY AND EVOLUTION - PRACTICAL	5	4	100	20	80

Course Outcomes

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

1. Acquire knowledge on the basic procedures in biochemical estimation
2. Describe the procedure and working principles in Biophysics
3. Demonstrate the immunological techniques
4. Categorize the different types of pests and the significance of beneficial insects
5. Estimate water quality parameters and examine Intertidal fauna

Biochemistry

Basic and Standardization procedures

- i) Preparation and testing of buffers: Acetate and Phosphate buffers.
- ii) Acid-base titration and determination of pH.
- iii) Measuring pH of different solutions.

Quantitative estimation of reducing sugars by Anthrone method.

Quantitative estimation of amino acids by Ninhydrin method.

Quantitative estimation of protein by Lowry *et al.* method.

Spotters: Models of Haemoglobin, ATP and TCA cycle

Biophysics

Verification of Beer Lambert's Law using Colorimeter

Separation of micromolecules by Thin layer Chromatography: Sugars and drugs

Separation of micromolecules by Paper chromatography: Amino acids

Spotters: pH meter, Spectrophotometer, Centrifuge, Electrophoresis and Colorimeter.

Immunology

Primary and Secondary Lymphoid organs in fish

Quantitative estimation of antigen by ELISA (Demonstration).

WIDAL test

Spotters: Immunoelectrophoresis –: Western blotting technique.

Economic Entomology

Productive insects – Honey Bee, Lac Insect and Silkworm

Useful insects- Pollinators, Bio-control insects

Pest of crops – Paddy, Pulses, Oil crops

Pest of animals – Fowls

Evolution

Colouration and Mimicry

Fossil: Nautiloid, Ammonoid

Environmental Biology

Estimation of pH, Dissolved Oxygen, Salinity and Calcium

Examination of Plankton: Qualitative and Quantitative

Examination of Intertidal fauna: Rocky shore, Sandy shore, Muddy shore.

Spotters: Animal association, pH meter, Secchi disc, Turbidity meter, Electrical conductivity meter.

Field Trip

Visit to Sea shore to study Intertidal fauna and their adaptations.

Submission of a Field Report is mandatory.

Record Work

A record of lab work should be maintained and submitted at the time of Practical Examination for valuation.

Text Book:

1. Jain J.L. Fundamentals of Biochemistry. S.Chand& Co.2010.

Web Reference:

1. <https://www.britannica.com/science/biochemistry>

2. <https://en.wikipedia.org/wiki/Biophysics>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits		
VI	20UZO6DE2AP	BIOCHEMISTRY, BIOPHYSICS, IMMUNOLOGY, ECONOMIC ENTOMOLOGY, ENVIRONMENTAL BIOLOGY AND EVOLUTION - PRACTICAL					5	4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO2	✓	✓	-	✓	✓	✓	✓	-	-	✓
CO3	✓	✓	-	✓	✓	✓	✓	-	-	✓
CO4	✓	✓	-	✓	✓	✓	✓	-	-	✓
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓
Number of Matches= 38, Relationship : HIGH										

Prepared by:

Dr. K. Prabakar

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal Marks	External marks
VI	20UZO6DE2B	DSE III	WILDLIFE BIOLOGY	5	4	100	25	75

Course Outcomes

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

1. Understand the importance of Wildlife resources
2. Acquire knowledge on wildlife habitats for better conservation
3. Describe the various breeding techniques
4. Evaluate the density of wildlife population
5. Apprise and assess the wildlife laws and amendments

UNIT I: WILDLIFE RESOURCES

15 Hours

Wildlife Definition – Importance - values - Causes for depletion – IUCN categories - #Red data book# - Endangered species in India.

UNIT II: WILDLIFE HABITAT

15 Hours

Wildlife conservation – need – types - *In situ and Ex situ*. Wildlife Sanctuaries - National parks – Biosphere reserves - Zoological Parks and Botanical gardens. Vedanthangal bird sanctuary, Mudumalai sanctuary, Silent Valley – Nilgiri Biosphere Reserve - Mukurthi National park – #Guindy Deer park#

UNIT III: WILDLIFE PRESERVATION & PROTECTION

15 Hours

Zoos and their importance – Types of enclosures – Food and feeding of Zoo animals – Importance of Zoo Education – #Biosphere reserves# – Breeding centres – In situ and Ex situstudies . Human animal Conflict - damages caused by wild animals and control measures

UNIT IV: WILDLIFE ECOLOGY/ CENSUS

15 Hours

Basic concepts and applications - Direct count (block count, transect methods, Point counts, visual encounter survey, waterhole survey). Indirect count (Call count, track and signs, pellet count, pugmark, camera trap, # DNA finger printing and aerial photography#

UNIT V: WILDLIFE LAWS, AMENDMENTS & MANAGEMENT

15 Hours

Wildlife Plan & Acts - Wildlife Protection Act 1972: Introduction - #Schedules# – Declaration of Wildlife Sanctuaries and National parks - Significance of NGO's in Wildlife Conservation - WWF. Wildlife management before and after implementation of Wild Life (Protection) Act, 1972 – IUCN – CITES – NBA – IBA – Project Tiger

#.....# Self-study portion

Text Books:

1. Saharia, V.B. Wildlife in India. Nataraj Publications, Dehradun. 2nd Edition, 1982.
2. Singh, S.K. Textbook of Wildlife Management 2nd Edition, 2015. CBS Pub.
3. Giles, R.H. Jr. (Ed) 1984. Wildlife Management Techniques 3rd edition. The wildlife Society, Washington. D.C. Nataraj Publishers, Dehradun. India

Books for Reference:

1. Giles, R. H. Jr (Ed). Wildlife Management Techniques. The Wildlife Society, Washington, D.C. Nataraj Publishers, Dehradun, India.1984.
2. Seshadri, B. India's Wildlife reserves, Sterling publishers, New Delhi.1986.

Web References

1. https://www.wfindia.org › endangered_species
2. http://www.wiienvis.nic.in/Database/wls_8230.aspx
3. <https://www.worldwildlife.org/stories/what-is-human-wildlife-conflict-and-why-is-it-more-than-just-a-conservation-concern>
4. <https://www.britannica.com/science/DNA-fingerprinting>
5. http://www.wiienvis.nic.in/Database/npa_8231.aspx

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code		Title of the Paper			Hours	Credits			
VI	20UZO6DE2B		WILDLIFE BIOLOGY			5	4			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓	✓	✓	-	✓	✓	✓
CO2	✓	✓	-	-	✓	✓	✓	-	-	-
CO3	✓	-	-	✓	✓	-	✓	-	-	✓
CO4	-	✓	-	✓	✓	✓	✓	-	-	✓
CO5	✓	✓	-	✓	✓	✓	✓	-	-	✓
Number of Matches= 32, Relationship : HIGH										

Prepared By:

Dr.A.SadiqBukhari

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6DE3A	DSE – III	BIOTECHNOLOGY	4	4	100	25	75

Course Outcomes

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

1. Describe the scope and importance of Biotechnology
2. Apply the concepts of Recombinant DNA technology and Cloning techniques
3. Illustrate the molecular techniques involved in Biotechnology
4. Evaluate and apply the techniques of Industrial Biotechnology
5. Analyse and appraise the mechanism of Enzymes action, immobilization and applications

UNIT I: BIOTECHNOLOGY - SCOPE AND IMPORTANCE 12 hours

Biotechnology: Definition, Scope and Importance – History of Biotechnology- Biotechnology in India- Global scenario. Biotechnology in Environment, Agriculture, #Animal Husbandry# and Medicine. Biotechnology Centres in India and Scope for future development, IPR and Patenting.

UNIT II: GENETIC ENGINEERING 12 hours

Recombinant DNA technology: Enzymes- Exonucleases, Endonucleases, Restriction enzymes, DNA Ligase, DNA Polymerase -Cloning vectors: plasmid, cosmid, artificial chromosomes and shuttle vector- Gene cloning Strategy: principles and methods- DNA cloning and #whole animal cloning#- Ethics in animal cloning.

UNIT III: MOLECULAR TECHNIQUES AND MARKERS) 12 hours

PCR, RT-PCR, RFLP, RAPD and AFLP and application of RFLP in DNA finger printing- Applications of DNA finger printing- Agarose gel electrophoresis- SDS-PAGE, Blotting Techniques, Southern Northern and Western Blotting. cDNA library- #Gene Library and Gene Bank#.

UNIT IV: INDUSTRIAL BIOTECHNOLOGY 12 hours

Fermentation: Principles, Fermenter design and Types- Process, Scale up and Downstream Processing- Production of Antibiotics, Vaccines and #Vitamins by fermentation#.

UNIT V: ENZYME BIOTECHNOLOGY 12 hours

Enzymes- Mechanism of Enzyme Action- Production in large scale- Extraction and purification- #Enzyme immobilization#- Applications.

#.....# Self study

Text Book:

1. R C Dubey, Text Book of Biotechnology, S.Chand & Company Ltd. 2006

Books for Reference:

1. Kumaresn, V. Applied Animal Biotech. Saras Publication, Nagercoil. 2009.
2. Gupta, P. K., Biotechnology and Genetics. Rastogi Publications, Meerut. 2004.

3. Brown, C.M., Campbell, I. and Priest, F.G. Introduction to Biotechnology. Blackwell Scientific Publications, U.K(1988).
4. Old, R. W and Primrose, S B., Principles of Gene Manipulation, An Introduction to Genetic Engineering, Oxford Blackwell Scientific Publications. 1989.
5. Primrose, S. B. Modern Biotechnology. Blackwell Scientific Publications, Oxford, London. 1989.
6. Prentis, S. Biotechnology New Industrial Revolution, Orbis, London. 1985.

Web reference:

1. ebookpdf.com/recombinant-dna-technology
2. www.khanacademy.org > tag > pcr
3. www.khanacademy.org > science > biology > biotech-dna-technology
4. www.vanderbilt.edu > viibre > CellCultureBasicsEU

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
VI	20UZO6DE3A	BIOTECHNOLOGY					4	4				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	√	√	√	-	√	√	√	√	√	√		
CO2	√	-	√	√	√	√	-	√	√	-		
CO3	√	-	-	-	-	√	√	-	-	√		
CO4	√	√	-	√	√	-	√	√	-	√		
CO5	-	√	√	√	√	√	-	√	√	√		
Number of Matches= 36, Relationship : High												

Prepared By:

Dr. S. Mohamed Hussain

Jerald

Checked by:

Dr. I. Joseph A.

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6DE3B	DSE – III	RECOMBINANT DNA TECHNOLOGY	4	4	100	25	75

Course Outcomes

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

1. Acquire knowledge on Recombinant DNA technology
2. Apply the concepts of enzymes involved in Recombinant DNA technology
3. Examine the cloning vectors used in Biotechnology
4. Evaluate and apply the knowledge on gene transfer methods in different organisms
5. Justify and value Genetic selection and the Screening methods

UNIT I: Introduction to Genetic Engineering 12 hours

Introduction to rDNA technology and Genetic engineering, Steps involved – a brief history of development of rDNA Technology. Isolation of DNA fragments/genes- # Mechanical shearing #, restriction endonucleases digestion.

UNIT II: Tools of Genetic Engineering 12 hours

Restriction endonucleases, DNA – dependent DNA polymerase, RNA – dependent DNA polymerase (reverse transcriptase), DNA dependent RNA polymerase, Alkaline phosphatase, Terminal transferase, # Polynucleotide kinase #, DNA ligase, S-1 nuclease.

UNIT III: Cloning vectors 12 hours

Definition, desirable characteristics in vector; cloning and expression vectors, plasmid vectors for use in prokaryotes and eukaryotes; shuttle vectors (PBR and PUC series) bacteriophage vectors (T and Mix vectors) cosmid vectors, BAC and YAC vectors, M13 vector. # Ti plasmids as vectors for plant cells #. Use of linkers & adapters

UNIT IV: Gene Transfer methods 12 hours

Transformation – Transfection and *Agrobacterium* mediated gene transfer, Electroporation, lipofection, microprojectile bombardment, micro injection, chemical mediated transformation; phage – mediated transfer, gene gun other latest methods. Cloning of genes: Construction of genomic and cDNA synthesis and libraries, Polymerase Chain Reactions-method for amplification, ESTs, #Differential display and subtractive approaches#.

UNIT V: Genetic selection and screening methods 12 hours

Genetic selection and screening methods (use of chromogenic substrates, insertional inactivation, complementation of defined mutations and other methods, reporter genes), lethal synthesis, replica plating, delayed enrichment, limited enrichment, penicillin enrichment., screening using nucleic acid hybridization, Promoter mapping, S1 nuclease mapping, Primer extension-chromosome walking, site directed mutagenesis. Application in human genes. Human genome sequencing & # human microbiome sequencing #.

#.....# **Self study**

Text Book

1. Molecular Biology of Gene VI (2007) 6 edition. James D. Watson, Tania A. Baker, Stephen P. Bell,

Reference:

1. Old, R. W and Primrose, S B., Principles of Gene Manipulation, An Introduction to Genetic Engineering, Oxford Blackwell Scientific Publications. 1989.
2. Primrose, S. B. Modern Biotechnology. Blackwell Scientific Publications, Oxford, London. 1989.
3. Prentis, S. Biotechnology New Industrial Revolution, Orbis, London. 1985.

Web reference:

1. ebookpdf.com/recombinant-dna-technology
2. www.khanacademy.org > tag > pcr

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits		
VI	20UZO6DE3B	RECOMBINANT DNA TECHNOLOGY					4	4		
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	✓	✓	-	✓	✓	✓	✓	✓	✓
CO2	✓	-	✓	✓	✓	✓	-	✓	✓	-
CO3	✓		-	-	-	✓	✓	-	-	✓
CO4	✓	✓	-	✓	✓	-	✓	✓	-	✓
CO5	-	✓	✓	-	✓	✓	-	✓	✓	✓
Number of Matches= 33, Relationship: Moderate										

Prepared By:

Dr. S. Mohamed Hussain

Checked by:

Dr. I. Joseph A. Jerald

Note:

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

Semester	Code	Course	Title of the Course	Hours	Credits	Max. marks	Internal marks	External marks
VI	20UZO6EC2	EC II	ZOOLOGY FOR COMPETITIVE EXAMINATIONS	--	4*	100	--	100

Course Outcomes

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

1. Understand the basic Structural organization of Prokaryotic, Eukaryotic cells, Plasma membrane and cytoplasm.
2. Apply the knowledge, skill, and awareness to topics like Ultra Structure of cell components.
3. Integrate the knowledge of Biomolecules and statistical knowledge.
4. Analyze the importance Human Physiology and Immune system.
5. Understand the development of gametes to entire animals

UNIT I: Invertebrate and Chordata

Non-Chordata: General organization - Classification with diagnostic features upto classes. Evolutionary relationship among taxa, symmetry.

Prochordata: Amphioxus, Balanoglossus - Ascidian retrogressive Metamorphosis, neoteny and affinities.

Chordata: General Organization - Characters, Outline, classification upto class level.

UNIT II: Cell biology and Genetics

Cell and Molecular Biology: Cellular Organelles - Structure and function. Cell division, cell cycle; Chromosomes - DNA structure and function, replication of DNA, Genetic code - RNA and protein synthesis.

Genetics: Mendelian concepts, multiple alleles, blood groups, Rh-factor. Linkage, crossing over - mutation (Natural and induced); Bio-chemical genetics – Eugenics. Human genome Project.

UNIT III: Biochemistry and Biostatistics

Bio Chemistry: Bio-molecules, Structure and role of carbohydrates, lipids, proteins and amino acids - Glycolysis and kreb's cycle - oxidation, reduction - oxidative phosphorylation - energy conservation and release, cyclic AMP, ATP; enzymes – mechanism; Hormones-classification biosynthesis and function. Bio-statistics: Mean, Median and standard deviation. Bio-informatics: DNA and Protein sequence analysis, Prediction functional structure

UNIT IV: Animal Physiology and Immunology

Physiology: With reference to mammals, digestion, nutrition, balanced diet - assimilation, intermediary/metabolism. Composition of blood -Transport of oxygen, Carbon dioxide.

Receptors- photo, phono and chemo reception. Nephron and urine formation. Endocrine glands, testis, ovary and pituitary organs and their inter relationship. Physiology of reproduction in humans, Physiology of immune response- Antigens – Immuno globulins - humoral and cell mediated immunity. T and B cells, mechanism of antibody formation - Immunodeficiency diseases; vaccination.

UNIT V: Developmental Biology

Development Biology: Gametogenesis – fertilization, Parthenogenesis, type of eggs – blastulation, cleavage and gastrulation in frog and chick. Morphogenetic movements – organizer, potency, organogenesis with reference to ear, eye, kidney, brain. Formation and fate of extra embryonic membranes in chick.

Placentation- types, functions. - metamorphosis in Frog – Regeneration. Stem cells- sources, types and their uses in human welfare, IVF, embryo transfer and cloning - Aging and senescence.

Text Books:

1. Barnes, R.D. Invertebrate Zoology, IV Edition, Holt Saunders, 1982.
2. Barrington, E.J.W. Invertebrate Structure and Function, II Ed., ELBS and Nelson. 1979.
3. Balinsky, B.L., An Introduction to Embryology, V Ed., Saunders Co., Philadelphia. 1981.
4. Strickberger, M.W., Evolution. Jones and Barlett Pub. Inc., London. 1996.

Books for Reference:

1. Kotpal, R.L., Minor Phyla., 2nd Edition, Rastogi Publications, Meerut., 2002.
2. Vasantika Kashyap., Life of Invertebrates, Vikas Publishing House Pvt., Ltd., New Delhi. 1997
3. Gilbert, S.F., Developmental Biology, II Edn., Sinamer Associates Inc. Publishers, Saunderland, Massachusetts, USA. 1995.
4. Berrill, N.J., Developmental Biology, Tata McGraw Hill, New Delhi. 1986. Clarke, G.L. Elements of Ecology. John Wiley & Sons, New York. 1954.
5. Kendeigh, S.C., Animal Ecology. Prentice Hall. 1961.

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1. <http://www.itis.usda.gov/itis/status.html>
2. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>
3. <http://www.itis.usda.gov/itis/status.html>
4. <http://www.bishop.hawaii.org/bishop/HBS/hbs1.html>
5. www.corning.com > worldwide > cls > documents > CLS-DL-CC-015
dev.biologists.org > content
6. www.reproductivefacts.org > documents > fact-sheets-and-info-booklets

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

Semester	Code	Title of the Paper					Hours	Credits				
VI	20UZO6EC2	ZOOLOGY FOR COMPETITIVE EXAMINATIONS					--	4				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)						
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	✓	✓	✓	✓	✓	-	✓	✓	-	✓		
CO2	✓	✓	✓	-	✓	✓	✓	-	✓	✓		
CO3	✓	✓	-	✓	✓	✓	-	✓	✓	-		
CO4	✓	✓	-	✓	✓	-	✓	✓	-	✓		
CO5	-	-	✓	-	-	✓	-	-	✓	✓		
Number of Matches= 34, Relationship : Moderate												

Prepared by:

Dr. M. Meeramaideen

Edited by

Dr. I Joseph A Jerald

Note:

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

