

**Course Structure & Syllabus for B.Sc. / M.Sc. / M. Phil.  
Zoology  
CBCS Pattern  
2022-2023 Academic Year onwards**

# **Z**oology



**RAJAH SERFOJI GOVERNMENT COLLEGE (Autonomous)  
THANJAVUR 613005**

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**M.Sc. Zoology**



**DEPARTMENT OF ZOOLOGY  
RAJAH SERFOJI GOVERNMENT COLLEGE (Autonomous)  
THANJAVUR 613005**

**VISION**

- To offer quality science education to inculcate living in harmony with nature and to promote scientific practices based on strong ethical principles.

**MISSION**

- Introduce modern trends in life sciences, emphasizing conservation and bioethics.
- Enhance the capacity of the students to meet the local and global needs.

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

- Graduates will accomplish professional standards in the global environment.
- Graduates will uphold integrity and human values.
- Graduates will demonstrate commitment towards sustainable development.
- Graduates will appreciate and promote pluralism and multiculturalism in working environment.

**PROGRAMME OUTCOMES (PO)**

Upon completion of the PG Degree Programme, students will be able to

- PO1:** Be capable of demonstrating comprehensive knowledge and understanding of the discipline that forms a part of an postgraduate programme of study and applying the knowledge in real life situations through critical thinking and analytical reasoning.
- PO2:** Become employable, entrepreneurs, or pursue higher education and further knowledge with scientific reasoning, problem solving capacity, communication and other generic skills and global competencies like digital literacy, ability to work in cooperation as a team.
- PO3:** Be a good citizen with multicultural competence, moral and ethical awareness, reflective thinking and leadership qualities in order to make progressive efforts to sustain environment, socio-cultural and economic fabric, and human values at the national as well as the global level.
- PO4:** Proceed with a sense of inquiry and to demonstrate capability for exploring specific areas of knowledge, for asking relevant/appropriate questions, problematising, synthesizing and articulating; and to demonstrate an ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation in the fields of research and development.
- PO5:** Become a lifelong learner through self-paced and self-directed learning aimed at intellectual development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

## PROGRAMME SPECIFIC OUTCOMES (PSO)

Students at the time of graduation will

**PSO1:** Develop higher order of knowledge in key concepts of biology at biochemical, molecular and cellular level, physiology and reproduction at organism and ecological level and the impacts of the organism on its environment.

**PSO2:** Have a deeper understanding of genetics and cytogenetics principle in the light of advancements in human genome research and genomes of other model organisms.

**PSO3:** Gain knowledge on analysis of biological, experimental and molecular data and its applications.

**PSO4:** Develop knowledge and deeper understanding on cutting edge areas along with classics of Biology.

**PSO5:** Have theoretical and practical knowledge in handling the animals and using them as model organism and build up an attitude with scientific ethics and temper.

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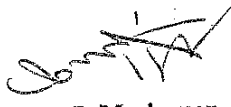
#### M. Sc. ZOOLOGY COURSE STRUCTURE


(For the Candidates admitted from the academic year 2022 -2023 onwards)

Semester	Part	Course	Subject Code	Title of the Paper	Inst. Hrs.	Credit	Exam Hrs.	Marks		Total
								Int	Ext	
I	III	CC1	A1PZO1	Animal Phylogeny and Biodiversity	6	4	3	25	75	100
	III	CC2	A1PZO2	Cell and Molecular Biology	6	4	3	25	75	100
	III	CC3	A1PZO3	Genetics	6	4	3	25	75	100
	III	CC4	A1PZO4P	Practical-I	6	4	3	40	60	100
	III	CEC1	A1PZOEL1A	Sericulture	4	4	3	25	75	100
			A1PZOEL1B	Apiculture						
			A1PZOEL1C	Biology of Insects						
	GEC1	A1PZOGE1	First Aid and Emergency Care	2	2	3	25	75	100	
<b>Total</b>					<b>30</b>	<b>22</b>				<b>600</b>
II	III	CC5	A2PZO5	Biochemistry	6	4	3	25	75	100
	III	CC6	A2PZO6	Animal Physiology	6	4	3	25	75	100
	III	CC7	A2PZO7	Developmental Biology	6	4	3	25	75	100
	III	CC8	A2PZO8P	Practical-II	6	4	3	40	60	100
	III	CEC2	A2PZOEL2A	Aquaculture	4	4	3	25	75	100
			A2PZOEL2B	Vermiculture						
			A2PZOEL2C	Medical Lab Techniques						
	GEC2	A2PZOGE2A/ A2PZOGE2B	Basics of Bee Keeping/Entrepreneurial Development	2	2	3	25	75	100	
<b>Total</b>					<b>30</b>	<b>22</b>				<b>600</b>

III	III	CC9	A3PZO9	General and Applied Entomology	6	5	3	25	75	100
	III	CC10	A3PZO10	Research Methodology	6	4	3	25	75	100
	III	CC11	A3PZO11	Environmental Biology	6	4	3	25	75	100
	III	CC12	A3PZO12P	Practical-III	6	5	3	40	60	100
	III	CEC3	A3PZOEL3A	Immunology	4	4	3	25	75	100
			A3PZOEL3B	Nanotechnology						
			A3PZOEL3C	Vector Biology						
	III	SS1	A3PZOSS1	Soft Skills-1	2	2	3	25	75	100
IV	ECC1	A3PZOECC1	Bioinformatics	-	4	-	-	-	100	
<b>Total</b>				<b>30</b>	<b>24</b>				<b>700</b>	
IV	III	CC13	A4PZO13	Evolution	6	4	3	25	75	100
	III	CC14	A4PZO14P	Practical-IV	6	4	3	40	60	100
	III	CC15	A4PZOPW	Project Work-	4	4	-	20	80	100
	III	CEC4	A4PZOEL4A	Biotechnology	6	4	3	25	75	100
			A4PZOEL4B	Public Health and Hygiene						
			A4PZOEL4C	Endocrinology						
	III	CEC5	A4PZOEL5A	Microbiology	6	4	3	25	75	100
			A4PZOEL5B	Animal Behaviour						
			A4PZOEL5C	Wildlife Management						
	III	SS2	A4PZOSS2	Soft Skills-2	2	2	3	25	75	100
IV	ECC2	A4PZOSS2	Biostatistics		4				100	
<b>Total</b>				<b>30</b>	<b>22</b>				<b>700</b>	
<b>Grand Total</b>					<b>90</b>				<b>2600</b>	

	No. of Papers	Credit
Core Courses (2 x 5 Cr) (13 x 4 Cr)	15	62
Core Elective Courses	5	20
Generic Elective Supportive Courses	2	4
Soft Skills / Skill Based	2	4
<b>Total</b>	<b>24</b>	<b>90</b>
*Extra Credit Courses	2	8

  
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CC1: ANIMAL PHYLOGENY AND BIODIVERSITY							
(for students admitted from the academic year 2022-2023 onwards)							
Credit	4	Hours/Week	6	Sub Code	A1PZO1	Semester	I
Medium of Instruction: English							CC1

**Objectives:**

The aim of this paper is to study the phylogenetic relationships of invertebrates and chordates, and to learn the values and conservation of biodiversity.

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO – 1	recall and explain the phylogeny, origin and evolution of invertebrates and their significance.	K1, K2
CO – 2	understand modern amphibians and fossil birds.	K2
CO – 3	organize the phylogeny of advanced molluscs and echinodermata.	K3
CO – 4	outline conservation of biodiversity by in situ and ex situ methods, biodiversity laws of India and wildlife protection act.	K4
CO – 5	interpret the origin of amphibians, reptiles, primates, adaptive radiation of lemuroids and evolutionary knowledge on Australopithecus.	K5

<b>Unit I</b>	<b>Phylogeny of invertebrates:</b> Protozoa-phylogenetic origin and evolution. Metazoa-origin and theories. Bilateria-origin and theories. Phylogeny of Annelida-origin and theories. Phylogeny of Arthropoda-origin and theories. Salient features of Peripatus. Trilobites- structure, life history and significance.
<b>Unit II</b>	Mollusca origin: theories and evolution. Salient features of Neopilina, Nautiloids, Ammonoids and Belemnites. Echinodermata: Origin and theories. Minor phyla: general characters, morphology, anatomy and affinities of Rotifera, Phoronida and Chaetognatha
<b>Unit III</b>	<b>Phylogeny of vertebrates:</b> Chordates: Origin and theories. Vertebrate: Origin and theories. Ostracoderms: Origin, salient features and classifications. Placoderms: origin, salient features and classification. Origin of Amphibia: terrestrialization, causes for transition from water to land, ancestors of amphibia and modern amphibia.
<b>Unit IV</b>	Reptiles-origin. Connecting link between amphibia and reptiles. Stem reptiles. Evolutionary trends in reptiles. Golden age of reptiles. Salient features of Dinosaurs. Flying reptiles. Mammal like reptiles. Origin of birds. Fossil birds (Archaeopteryx). Origin of Primates. Adaptive radiation of Lemurs, Tarsius- New world monkeys, Old world monkeys and apes, Australopithecus.
<b>Unit V</b>	<b>Biodiversity:</b> definition, types-genetic, species, ecosystem. Values of biodiversity. Biodiversity Hotspots. Threats to biodiversity. Species-IUCN Category. Endangered species of India. Conservation of biodiversity: <i>in situ</i> (afforestation, social forestry, agro-forestry, biosphere reserves, national parks and sanctuaries), <i>ex situ</i> (cryopreservation, gene banks, sperm banks, DNA banks, biotechnological strategies).

**Text Books:**

1. Alfred, J.R.B and Ramakrishna. 2004. Collection, Preservation and Identification of Animals. Zoological Survey of India Publications, Calcutta.
2. Anderson, T.A. 2001. Invertebrate Zoology (2nd edn). Oxford University Press, New Ltd.
3. Winston, J.E. 2000. Describing species: Practical Taxonomic Procedures for Biologists. Columbia University Press, Columbia, USA.
4. Young, J.Z. 1950. Life of Vertebrates. Clarendon Press, Oxford, UK

**Reference Books:**

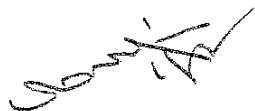
1. Kapoor, V.C.1995.Theory and Practice of Animal Taxonomy. Oxford & IBH Publishing Co. New Delhi.
2. Solbrig, O.T., Van Emden, H.M. and Van Oordt, P.G.W.J. 1995. Biodiversity and Global Change.CAB international, Wallingford, U.K.
3. Trivedi, P.C. 2004. Biodiversity Assessment and Conservation. Agrobios Publishing India.

**Web resources:**

<https://www.digitalatlasofancientlife.org/learn/animal-phylogeny/>  
<https://www.ugc.ac.in/oldpdf/modelcurriculum/chapter4.pdf>

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of Cos
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	1	3	3	3	3	3	1	3	1	2.4
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.46
Result											High



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CC2: CELL AND MOLECULAR BIOLOGY							
(for students admitted from the academic year 2022-2023 onwards)							
Credit	4	Hours/Week	6	Sub Code	A1PZO2	Semester	I
Medium of Instruction: English							CC2

**Objectives:**

To understand the structure and functions of cell organelles, nucleic acids, stem cells' characteristics and applications, and cell culture methods.

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO – 1	define and describe the Cellular transports systems	K1, K2
CO – 2	Understand Receptors and Cell signaling	K2
CO – 3	organize the Genomic structure of the cells, synthesis and functions of genes	K3
CO – 4	outline stem cells and its application	K4
CO – 5	interpret Methods of cell culture and cell lines	K5

<b>Unit I</b>	Ultra structure of eukaryotic cell. Structure and functions of membrane system, Passive & active transport, permeases, sodium potassium pump, Ca <sup>2+</sup> ATPase pumps. Lysosomal and vacuolar membrane. ATP dependent proton pumps, co transport symport, antiport, transport into prokaryotic cells, endocytosis and exocytosis.
<b>Unit II</b>	Receptors–characterization, types (cytosolic, nuclear and membrane bound) and quantification. Autocrine, paracrine and endocrine mode of action. Signal amplification – models. Biosynthesis of inositol tri phosphates, cyclic GMP and g proteins. Signal transduction - calcium ion flux and its role in cell signaling. Current models of signal amplification, phosphorylation of protein kinases, regulation of protein kinases, serine –threonine kinases, tumor necrosis factor receptor families.
<b>Unit III</b>	The law of DNA constancy. Structure and organization of chromatin. Chromosomal banding techniques. Eukaryotic genome organization (coding and non-coding sequences, Satellite DNA). DNA damage and repair
<b>Unit IV</b>	Transcription in Prokaryotes and eukaryotes-mechanism. Reverse transcription. Post transcriptional modifications and processing of mRNA. Protein Synthesis-molecular mechanism of protein synthesis. Regulation of gene expression in prokaryotes and eukaryotes.-Genetic Code. Operon concept. <b>Stem cells:</b> Types- Molecular Basis of Pluripotency - Stem Cell Niches - Mechanisms of Stem Cell Self-Renewal - Generation of Induced Pluripotent Stem Cells - Characteristics and Characterization of Pluripotent stem Cells- Application of Embryonic stem Cells.
<b>Unit V</b>	Cell line - generation of cell lines. Maintenance of stock cells. Characterization of cells. Immunochemistry - morphological analysis techniques. Cell culture - explant culture, primary culture, three dimensional culture and role of matrix in cell growth.
<b>Text Books</b>	
<ol style="list-style-type: none"> <li>1. Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, and Peter Walter. 2014. Molecular Biology of the Cell. Garland Science.</li> <li>2. Darnell J, Lodish H, Baltimore D. 1995. Molecular Cell Biology. W.H. Freeman. Pp 1152.</li> <li>3. Kimball. J.W. 1970. Cell Biology. Wesley Publishers. Pp 168.</li> </ol>	



**Reference Books**

1. De Robertis & De Robertis. 2017. Cell and Molecular Biology. 8 Ed.
2. G.M. Cooper and R.E. Hausman. 2013. The Cell. A Molecular Approach. Sinauer Associates, Inc. Publishers.

**Web resources**

<https://www.cellbio.com/education.html>


[https://www.exploringnature.org/graphics/biology/organelles\\_info\\_quiz.pdf](https://www.exploringnature.org/graphics/biology/organelles_info_quiz.pdf)


<http://education.med.nyu.edu/courses/molecular/molbio/psnotes.pdf>

[http://genome.tugraz.at/MolecularBiology/WS11\\_Chapter\\_12.pdf](http://genome.tugraz.at/MolecularBiology/WS11_Chapter_12.pdf)

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of Cos
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	1	3	3	3	3	3	1	3	1	2.4
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.46
Result											High

  
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CC3: GENETICS						
(for students admitted from the academic year 2022-2023 onwards)						
Credit	4	Hours/Week	6	Sub Code	A1PZO3	Semester I
Medium of Instruction: English						CC3

**Objectives:**

To understand the principles of Mendel's experiments, gene interaction, role of chromosomes in determining sex, chromosomal abnormalities, gene regulations, microbial and human genetics,

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	define and explain the molecular basis of gene interaction.	K1, K2
CO - 2	illustrate linkage analysis which is genetically used to identify the diseases inherited through genes.	K3, K4
CO - 3	organize the mechanism of inheritance and the genetic material and its transfer methods.	K3
CO - 4	outline diagnosis of chromosomal disorders	K4
CO - 5	evaluate genome with special reference to human genome	K5

<b>Unit I</b>	Introduction to genetics. Mendel's laws of inheritance-mono and dihybrid cross. Alleles-Genotype, Phenotype. Backcross. Testcross Epistatic And Non- Epistatic Gene interaction. Multiple alleles. Model organism of genetics. Bacteriophage, <i>E. coli</i> , <i>Drosophila</i> , <i>Caenorhabditis elegans</i> , Zebra fish
<b>Unit II</b>	Sex chromosomes. Determination of sex. Cytoplasmic inheritance. Linkage-Complete and incomplete linkage. Crossing over -mechanism. Chromosome mapping. Chromosomal abnormalities (syndrome)-Numerical changes: aneuploidy, euploidy, haploidy and polyploidy. Structural changes-deletion, duplication, translocation, inversion. Techniques in chromosome study: Karyotyping, banding, chromosome labeling, fluorescent in situ hybridization, chromosome painting
<b>Unit III</b>	DNA as the genetic material- Biochemical evidences. Fine Structure of gene- Cistron, Recon and Muton. Gene regulation in Prokaryotes (Lac Operon) and Eukaryotes - Britten and Davidson's model. Gene mutations- types (Spontaneous, Base pair substitution, Frame shift and inducible mutation).Mutagens.
<b>Unit IV</b>	Transformation. Conjugation. Transduction. Plasmids – types (PUC18, pBR322). Movable genes. Genetics of viruses. Life cycle of bacteriophage. Recombination in phage.
<b>Unit V</b>	Human chromosome- Repetitive Nucleotide Sequences in Eukaryotic Genomes - Kinetics of DNA Renaturation -Analysis of Genome Size and Repetitive Sequences by Renaturation-Eugenics, Euthenics and Euphenics. Pedigree Analysis. Human Genome Project
<b>Textbook</b>	
Benjamin Lewis, 2007. Genes IX, Jones and Bartlett Publishers, U.S.A.	
1. Peter J, Snustad, M.J. Simmons. 2015. Principles of Genetics. 7th Edition, Wiley, p648.	

**Reference Books**

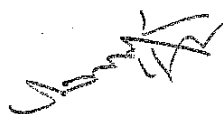
Daniel, L. Hartl., 2010. Essential Genetics: A Genomics Perspective: 5th Edition. Jones & Bartlett Publishers, El of Axel Carlson. 1985. Genetics. Tata McGraw Hill Publishing Co.

**Web resources**

<https://www.genome.gov/G2C2/resources>  
<https://projects.ncsu.edu/cals/course/gn411/net-resources.html>  
[https://archive.org/details/Concepts\\_of\\_Genetics](https://archive.org/details/Concepts_of_Genetics)

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Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	3	3	3	1	3	2	3	2.7
CO3	3	3	3	2	3	3	1	3	3	3	2.7
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.54
Result											High



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Credit	4	Hours/Week	6	Sub Code	A1PZO4P	Semester	I
Medium of Instruction: English							CC4

### Practical I

## ANIMAL PHYLOGENY & BIODIVERSITY, GENETICS, CELL & MOLECULAR BIOLOGY

(for students admitted from the academic year 2022-2023 and onwards)

### ANIMAL PHYLOGENY AND BIODIVERSITY

Spotters: Peripatus, Ammonoids, Limulus, Trilobite, Nautilus, Latimaria, Protopterus, Archaeopteryx, Sphenodon, Ant eater. Endangered species of Indian sub-continent

List of local fauna (invertebrates and vertebrates)

### GENETICS

Drosophila-Culture, Mutants, Sex Identification; Blood groups: ABO and Rh-grouping; Human Karyotyping & Chromosomal Abnormalities; Hardy-Weinberg Law & Calculation of Gene frequencies for dominant, recessive and co-dominance traits and multiple alleles.

### CELL MOLECULAR BOLOGY

1. Measurement of the size of cells and sub-cellular components by micrometer.
2. Preparations of temporary mount of Onion root tip to study the mitotic cell division.
3. Preparations of temporary mount of grasshopper testis to study the different stages of meiosis.
4. Mounting of polytene chromosome from salivary gland of chironomous larva
5. Enumeration of RBC using haemocytometer
6. Enumeration of WBC using haemocytometer/platelet counts

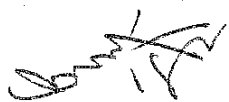
Spotters

Haemocytometer, Ocular Micrometer, Stage Micrometer, Compound Microscope

### MARKS DISTRIBUTION

Major Practical	20
Minor Practical	10
Spotters	20
Record	05
Viva-voce	05
Total	60

Visit to paleontological important sites and museum



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SERICULTURE							
(For students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	4	Sub Code	A1PZOELIA	Semester	I
Medium of Instruction: English						CEC1	

**Objectives:**

To make the students aware of the sericulture, its management, economic importance of silkworm for income generation and to create a self employment venture.


**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	describe and demonstrate the development of sericulture industry and silk producing organisms.	K1, K2
CO - 2	Understand mulberry cultivation for silkworm rearing.	K2
CO - 3	organize the life history and rearing of silkworm.	K3
CO - 4	outline marketing of cocoons	K4
CO - 5	evaluate management of silkworm diseases	K5

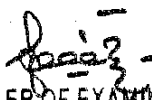
<b>Unit I</b>	Sericulture: History of Sericulture. Prospects and present status. Central Silk Board. Types of Silkworm: Mulberry ( <i>Bombyx</i> ) and Non-mulberry silkworms ( <i>Tasar, Muga and Eri</i> ). Economic importance of sericulture
<b>Unit II</b>	Moriculture: Mulberry Varieties, distribution, cultivation, irrigation. Recommended varieties for Tamil Nadu. Mulberry: propagation, leaf harvesting - leaf picking, shoot leaf harvesting & branch cutting. Mulching. Diseases of mulberry. Fungal, Bacterial, Viral and Nutritionally deficiency diseases
<b>Unit III</b>	<i>Bombyx mori</i> –Morphology, silk glands and life cycle. Silkworm rearing: equipment used for rearing-rearing racks and trays, disinfectants, bed cleaning, mounting appliances, harvesting and marketing of cocoons.
<b>Unit IV</b>	Silkworm rearing methods- Outdoor and indoor rearing- Rearing young worms-Mounting and harvesting of cocoons. Marketing the cocoons. Silk Reeling. By products of silk industries
<b>Unit V</b>	Pathology - Protozoan (Pebrine), bacterial (Flacherie, Septicemia) Viral (Infectious flacherie, Grasserie, Polyheterosis), fungal (Muscardine) and diseases of moths. Pests (Uzi fly, Dermestid beetles, Straw mite, Ant, Nematode)
<b>Text Books:</b>	
1. Aruga, H., 1994. Principles of Sericulture. A.A. Balkema, Rotterdam. p376.	
2. Ganga G and Sulochana Chetty J, (2019). Introduction to Sericulture (2 <sup>nd</sup> Edition ) Oxford and LBH Publishing Co. Pvt.Ltd., New Delhi., p301.	
<b>Reference Books:</b>	
1. Manual of Silkworm Rearing; Manual of Mulberry Cultivation by Food and Agricultural Organization (FAO), United States.	
2. Shankar, J.P.A., and R. Reddy. 2009. Sericulture. Commonwealth Publishers. Pp 272.	
<b>Web resources</b>	
<a href="https://en.wikipedia.org/wiki/Sericulture">https://en.wikipedia.org/wiki/Sericulture</a>	
<a href="http://csb.gov.in/assets/Uploads/documents/note-on-sericulture-2016-17.pdf">http://csb.gov.in/assets/Uploads/documents/note-on-sericulture-2016-17.pdf</a>	
<a href="http://csb.gov.in/publications/annual-report/">http://csb.gov.in/publications/annual-report/</a>	

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	1	3	3	3	3	3	1	3	1	2.4
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.46
Result											High



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APICULTURE							
(For students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	4	Sub Code	AIPZOEL1B	Semester	I
Medium of Instruction: English						CEC1	

**Objectives:**

To aware the commercial importance of apiculture and their products, status of apiculture in India and its importance. Medicinal value of honey

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	describe and demonstrate apiculture practices in India.	K1, K2
CO - 2	understand methods of beekeeping.	K2
CO - 3	organize the management practices in apiculture.	K3
CO - 4	categorize seasonal management of honey bees.	K4
CO - 5	evaluate honey bee diseases and their control.	K5

<b>Unit I</b>	Apiculture in India-National Honey Mission. Bee Board. Honey bees-species and types and morphology different bee types of a colony-Natural bee colonies and their yield. Properties of honey- Nutritional and Medicinal value of honey- Bee Wax Properties and uses
<b>Unit II</b>	Methods of bee keeping, beehive and its types. Bee hives – Primitive Hives- Modern hive-Lang troth hive and Newton’s hive. Bee foraging and production of honey setting up an Apiary and management-Appliances used in Apiary
<b>Unit III</b>	General management practices in bee keeping: Best management practice – definition, requirements to register, swarms and bee enquiries, hive densities, hive placement, water provisions, queens and robbing behavior, disease control, transportation of hives.
<b>Unit IV</b>	Seasonal management of honey bees: Honey bees on Canola, Spring management of bees, Wintering bees, Apiary management for winter/early spring pollination. Summer management honey production.
<b>Unit V</b>	Diseases and pests of honey bees and their management, harvesting and extraction of honey-process. Physicochemical analysis of honey.

**Text Books:**

1. JayashreeKV, Thradevi CS and Arumugam N (2015). Apiculture Saras Publication. Nagercoil, Tamilnadu.
2. Sammataro D, Avitabile A, (2011). The Beekeepers Handbook Cornell University Press.
3. Sathe TV( 2014). Fundamental of Beekeeping. Daya Publishing House, New Delhi.

**Reference Books:**

1. Sharma, P. and L. Singh. 1987. Hand Book of Bee keeping, Controller Printing and Stationery.
2. Ataur Rahman, 2017. Apiculture and India, Indian council of Agricultural Research.

**Web resources:**

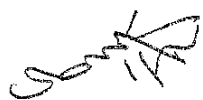
[https://aabees.org/ebooks/Honey\\_bee\\_e\\_book.pdf](https://aabees.org/ebooks/Honey_bee_e_book.pdf)

<https://www.easternapiculture.org/addons/2013/Delaney/HoneyBeeBiologyIndividual.pdf>

<http://www.sembabees.org/pdfs/biologyhoneybee.pdf>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	1	3	3	3	3	3	1	3	1	2.4
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.46
Result											High



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BIOLOGY OF INSECTS							
(For students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	4	Sub Code	AIPZOEL1C	Semester	I
Medium of Instruction: English						CEC1	

**Objectives:**

To understand the value and importance of insects, to identify the major orders and families of insects, and to know the insect pests and various insect pest management methods.

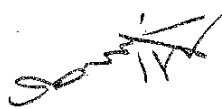
**Course outcomes**


Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	describe and infer on various classes of insects.	K1, K2
CO - 2	identify mouth parts of various insects.	K3
CO - 3	distinguish various stages of insect development.	K4
CO - 4	outline pests of animals and human beings and their control.	K4
CO - 5	evaluate beneficial insects of human beings.	K5

<b>Unit I</b>	Natural history of insects, Role of insects in Agriculture, General character and classification of insects upto order with example
<b>Unit II</b>	Mouth parts in insects-biting and chewing, chewing and lapping, piercing and sucking, sponging and siphoning types, biology of insects-silk worm, honey bees and life history
<b>Unit III</b>	Metamorphosis in insects-Ametabolous, metabolous, pests and pest control-pest of plants such as rice-rice plant hopper, stemborer, rootweevil. sugarcane pest-top borer, leafhopper, rootborer. coconut pest-red palm weevil, rhinoceros beetle, the black-headed coconut caterpillar.
<b>Unit IV</b>	Pest of animals, pest of house hold, vectors-housefly, headlouse, bedbug, mosquito, fleas, ticks and mites. control of insects-Natural, artificial and biological.
<b>Unit V</b>	Social life in insects-salient features of social life ,termitarium, economic importance of insects-Beneficial, helpful insects, medicinal value of honey. commercial value of silk and lac.
<b>Text Book:</b>	
1. Text Book of Entomology. 2022. J S Jagannathan, V Albino, Jige, Sandipan K Ramesh Babasaheb. AIB Saliha Publications, Tamil Nadu, India	
2. A Text Book of Entomology. Mathur and Upadhyay. Rama Publishing House.	
<b>Reference Book:</b>	
1. Shravan M. Haldhar and Hanuman L. Deshwas (2017) Fundamentals of Agricultural Entomology, New Vishal Publications, New Delhi.	
2. Vasantharaj David, B. and Ramamurthy, V.V. (2016). Elements of economic entomology, 8th Edition, Brillion Publishing.	
<b>Web resources:</b>	
<a href="http://agritech.tnau.ac.in/pdf/6.pdf">http://agritech.tnau.ac.in/pdf/6.pdf</a>	
<a href="http://books.irri.org/9712200280_content.pdf">http://books.irri.org/9712200280_content.pdf</a>	
<a href="http://farmer.gov.in/imagedefault/ipm/IPM%20package%20for%20Wheat.pdf">http://farmer.gov.in/imagedefault/ipm/IPM%20package%20for%20Wheat.pdf</a>	
<a href="http://oar.icrisat.org/2424/1/Pest-Control.pdf">http://oar.icrisat.org/2424/1/Pest-Control.pdf</a>	

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	1	3	3	1	3	3	3	2.6
CO3	3	3	3	3	3	3	1	3	1	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.5
Result											High

  
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FIRST AID AND EMERGENCY CARE							
(For students admitted from the academic year 2022-2023)							
Credit	2	Hours/Week	2	Sub Code	A1PZOG1	Semester	I
Medium of Instruction: English							GEC1

**Course objectives:**

To understand the role of emergency first aider, use of risk assessments for health and safety purposes, respond to accidents, sudden illnesses, poisoning and bites, and usage of first aid kits.

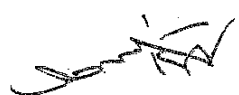
**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO – 1	describe and understand first aid room and equipments	K1, K2
CO – 2	aware what is first aid and able to examine the patient who is in need of first aid	K2, K4
CO – 3	administer first aid to an adult casualty, cardiopulmonary resuscitation to an adult.	K3
CO – 4	administer and examine first aid to wounded and bleeding patients.	K3, K4
CO – 5	administer and examine first aid to heart attack and providing oxygen therapy.	K3, K4

<b>UNIT-I</b>	Introduction-Rules of First Aid. Principles and objectives of First Aid, Examination of Patient. Assessment. Priorities of first Aid. Patient management and care.
<b>UNIT II</b>	First Aid rooms and equipments First aid kits, cleaning of wounds and dressing injury assessment
<b>UNIT III</b>	Management: Management of common illness and thermal illness. Risk assessment and risk reductions – Fainting, Anaphylaxis, Asthma, Epilepsy, Diabetes, burns and Scalds.
<b>UNIT IV</b>	Injuries: Internal and external bleeding injuries to muscles, back, chest abdomen, joints, and bones, strokes and head injury and eye irrigation. Sudden illness-poisoning, Bites and Stings
<b>UNIT V</b>	Accident reporting: Breathing emergencies, cardiac emergencies. Oxygen therapy-resuscitation, defibrillation-Heart attack. Common gastrointestinal sickness
<b>Text Book</b> John A Eastman. 2007. First Aid to the Injured-Authorized manual of St John's Ambulance ,Red Cross Road, New Delhi Abhitabh Gupta. 2003. Manual of First Aid. Jaypee Brothers, Medical Publishers Pp-441	
<b>Reference Book</b> Karesh Prasad, 2012. First Aid for Nurses. Jaypee Publishers, New Delhi	
<b>Web resources</b> <a href="https://apps.who.int/iris/bitstream/handle/10665/42295/9241545305.pdf">https://apps.who.int/iris/bitstream/handle/10665/42295/9241545305.pdf</a> <a href="https://www.shoklo-unitcom/sites/default/files/resources/laboratory_technician_training_manual_pdf">https://www.shoklo-unitcom/sites/default/files/resources/laboratory_technician_training_manual_pdf</a>	

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	3	3	3	2	2	2	2	2.6
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	2	3	3	1	3	2	3	2.6
CO5	3	3	3	2	3	3	1	3	2	3	2.6
Mean Overall Score											2.58
Result											High



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CC5: BIOCHEMISTRY							
(for students admitted from the academic year 2022-2023 onwards)							
Credit	4	Hours/Week	6	Sub Code	A2PZO5	Semester	II
Medium of Instruction: English							CC5

**Objectives:** This course will give learners, sound and broad background knowledge in basic biomolecules and clinical biochemistry.


**Course outcomes:**


Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	recall and explain classifications, structures and functions of macro and micronutrients.	K1, K2
CO - 2	identify and compare enzymes and their mode of actions.	K3, K4
CO - 3	outline metabolic disorders and diseases.	K4
CO - 4	analyze diseases associated with biomolecules.	K4
CO - 5	appraise diagnostic methods.	K5

<b>Unit-I</b>	Carbohydrates: Classification, structure, properties and functions. Glycolysis. Glycogenolysis, TCA cycle. Glycogenesis. Glyconeogenesis, HMP shunt pathway.ETP system.
<b>Unit-II</b>	Proteins: Classification based on Structure, function and solubility. Properties of protein - primary, secondary and tertiary structures. Amino acids- Structure, classification and properties. Enzymes – Classification and mode of action.
<b>Unit-III</b>	Lipids: Classification, properties - saturated and unsaturated fatty acids – steroids, cholesterol and lecithin. Vitamins. Classification. Properties. Sources. Functions. Deficiency diseases
<b>Unit-IV</b>	Blood sugars – Its maintenance, hyper and hypoglycemia. Regulation of blood glucose concentration. Diabetes mellitus – complications, secondary degenerative diseases. Laboratory diagnosis of early and latent diabetes. Glucose tolerance test. Dietary regimes in diabetes mellitus. Hypoglycemic agents. Galactosemia, fructosuria and lactose intolerance.
<b>Unit-V</b>	Hypo and hyper cholesteremia, Hypo and hyper lipoproteinemia, hypocholesteremic agents, hypertension –causes and its management. Lipid storage diseases- fatty liver & obesity. Jaundice and its types. Cirrhosis, alcoholic liver diseases. Hepatic tumors and biliary tract diseases - clinical manifestation of liver diseases. Liver functions tests.
<b>Text Book</b>	
<ol style="list-style-type: none"> <li>Jain et al. 2016.Fundamentals of Biochemistry. Chand. Co. Pvt Ltd., New Delhi.</li> <li>SVS Rana 2009. Biotechniques. Theory and Practice.Rastogi Publications, Agra.Pp 329.</li> <li>Devlin, 1997, Textbook of Biochemistry (with clinical Relationship matrix), John Wiley, USA.</li> </ol>	
<b>Reference Books</b>	
<ol style="list-style-type: none"> <li>LubertStryer. 1999. Biochemistry. WH Freeman,</li> <li>Jeremy M. Berg et al. 2015. Biochemistry. Macmillan Learning, Pp1120.</li> <li>John W. Baynes and Marek H. Dominiczak. Medical Biochemistry, 4th Edition, Saunders.</li> </ol>	
<b>Web resources</b>	
<a href="http://jpkc.gmu.cn/swhx/book/Biochemistry.pdf">http://jpkc.gmu.cn/swhx/book/Biochemistry.pdf</a> <a href="http://www.louisbolck.org/downloads/1282.pdf">http://www.louisbolck.org/downloads/1282.pdf</a> 3. <a href="http://library.aceondo.net/ebooks/Chemistry/lehninger_principles_of_biochemistry_4th.ed.pdf">http://library.aceondo.net/ebooks/Chemistry/lehninger_principles_of_biochemistry_4th.ed.pdf</a>	

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of Cos
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	2	3	3	1	3	2	3	2.6
CO3	3	3	3	3	3	3	1	3	1	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.5
Result											High

  
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CC6: ANIMAL PHYSIOLOGY							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	6	Sub Code	A2PZO6	Semester	II
Medium of Instruction: English							CC6

**Objectives:**

To expound the structure, mechanism and the physiological functions of different organ systems.

**Course outcomes:**

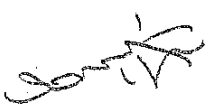
Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	recall and explain the nutrition, classification and the deficiency disease in man.	K1, K2
CO - 2	understand and organize digestive system and general digestive process in man.	K2, K3
CO - 3	understand and organize excretory system, structure of kidney and its function, and circulatory system.	K2, K3
CO - 4	understand and organize nervous system and its control over the entire body activities.	K2, K3
CO - 5	outline endocrine glands and neurosecretions in animals.	K4

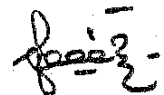
<b>Unit-I</b>	Nutrition – Definition, Classification, Carbohydrates, Proteins, Amino acids, Lipids, Fatty acids, Minerals, Vitamins, Balanced diets: Diseases of malnutrition
<b>Unit-II</b>	Digestion and absorption with special reference to man. Respiration - respiratory organs. Respiratory pigments. Mechanism of exchange of gases. Respiratory quotient.
<b>Unit-III</b>	Circulation- circulatory media, typical pattern of circulation. Structure of human heart, Types of circulatory system. Circulatory organs. Heartbeat. Cardiac cycle.
<b>Unit-IV</b>	Nervous system - Types of neurons. Propagation of nerve impulse. Synaptic transmission- Reflex action. Excretion - Excretory products in animals. Structure of nephron. Biosynthesis of urea. Mechanism of urine formation. Kidney failure in man. Transplantation - kidney stone. Homeostatic mechanism: Ionic and osmoregulation in fresh water and marine fishes.
<b>Unit-V</b>	Endocrine glands in mammals - structure, secretion (Hormones) and function of pituitary, Pineal, Thyroid, Parathyroid pancreas, Adrenal, Testis and Ovary. Neurosecretion in animals. Pheromones. Bioluminense.
<b>Text books</b>	
<ol style="list-style-type: none"> <li>1. P. B. Reddy. 2015. Text Book of Animal Physiology. Ratna Prasad Multidisciplinary Research &amp; Educational Society. Ibrahimpatnam. AP. Pp 139.</li> <li>2. Vasantika Kashyap . 2020. A Text Book Of Animal Physiology &amp; Biochemistry Paperback. Kedar Nath Ram Nath, New Delhi</li> <li>3. R. Nagabhushanam. 1978. Text Book Of Animal Physiology Oxford &amp; Ibh Publishing Company Pvt Limited</li> </ol>	
<b>Reference Books</b>	
<ol style="list-style-type: none"> <li>1. Ian Kay. 1998. Introduction to Animal Physiology. Routledge</li> <li>2. Patrick J. Butler, J. Anne Brown, D. George Stephenson. 2021. Animal Physiology. Oxford University Press</li> </ol>	
<b>Web resources</b>	
<a href="http://nptel.ac.in/courses/102104042/">http://nptel.ac.in/courses/102104042/</a> <a href="http://readfullpdf.com/download.php?book=Ba_wAAAAAMAAJ">http://readfullpdf.com/download.php?book=Ba_wAAAAAMAAJ</a>	

<https://www.saylor.org/site/wp-content/uploads/2010/11/The-Endocrine-System.pdf>  
<http://www.mesacc.edu/~pamrb40461/Bio202/Chapter18.pdf>

Relationship matrix for Course outcomes, Programme outcomes / Programme Specific Outcomes

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	2	3	3	2	2	3	1	2.5
CO3	3	3	3	2	3	3	2	2	3	1	2.5
CO4	3	3	3	2	3	3	2	2	3	1	2.5
CO5	3	3	3	3	3	3	1	3	1	3	2.6
Mean Overall Score											2.52
Result											High

  
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CC7: DEVELOPMENTAL BIOLOGY							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	6	Sub Code	S2PZO7	Semester	II
Medium of Instruction: English							CC7

**Objective:**

To understand the embryonic development and functioning of various organs as well as to know the concepts, trends and patterns of animal development.

**Course outcomes:**

Co No.	Co - Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	describe and interpret basic concepts of development of animals.	K1, K2
CO - 2	explain and organize gametogenesis.	K2, K3
CO - 3	illustrate organogenesis.	K3
CO - 4	outline metamorphosis and regeneration.	K4
CO - 5	appraise assisted reproductive techniques.	K5

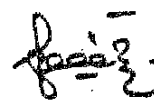
<b>Unit -I</b>	Embryology - Introduction and Theories - Preformation, Epigenesis , Baer's law, Biogenetic law, Pangenesis, Germplasm. Gametogenesis - Spermatogenesis and Oogenesis. structure of mammalian spermatozoa , Patterns of eggs , Ovulation
<b>Unit -II</b>	Fertilization - Physical , Chemical ,Cytological involved in fertilization and Physiological changes . Cleavage -Types and Patterns , Factors affecting cleavage. Fate map- Natural and artificial marking. Morphogenetic movements Partheno genesis.
<b>Unit -III</b>	Blastulation and gastrulation in frog .Organogenesis of frog - Development of eye, Ear , Heart and Kidney, Foetal membranes in chick, Organizer, Sexual cycles- classification and hormonal control of Reproductive cycles
<b>Unit -IV</b>	Placenta in mammals-classification and function, Differentiation-classification, factors causing differentiation. Metamorphosis in Insects and amphibia.
<b>Unit -V</b>	Regeneration-Types, events, factors influencing Regeneration. Neoteny-Types, factors causing and evolutionary significance, asexual reproduction, birth control. Assisted Reproductive Techniques: Test tube baby, IVF-Principles-Embryo Transfer, ICSI, GIFT, ZIFT, PROST, Ethical issues
<b>Text Book</b>	
<ol style="list-style-type: none"> <li>Gangane, S.D. and Borate, S.M. 2018. Textbook of Embryology. Thieme Publications.</li> <li>Verma P.S and Agarwal,V.K.,1994,Embryology,S.chand and company Ltd;New Delhi</li> </ol>	
<b>Reference Books</b>	
<ol style="list-style-type: none"> <li>Scott F. Gilbert. 2016. Developmental Biology. Plenum Press, New York.</li> <li>Balinsky,B.L,1970, An Introduction to Embryology, W.B.saunders company, Philadelphia and London</li> <li>Waddington,C.H,1966,Principles of development and differentiation, The Macmillan company</li> </ol>	
<b>Web resources</b>	
<a href="http://biology.kenyon.edu/courses/biol114/topic_index.html">http://biology.kenyon.edu/courses/biol114/topic_index.html</a> <a href="http://genesdev.cshlp.org/content/28/17/1859.full.pdf+html">http://genesdev.cshlp.org/content/28/17/1859.full.pdf+html</a> <a href="https://mcb.berkeley.edu/courses/mcb141/lecturetopics/Levine/Chapter21MBoG.pdf">https://mcb.berkeley.edu/courses/mcb141/lecturetopics/Levine/Chapter21MBoG.pdf</a> <a href="https://www.ncbi.nlm.nih.gov/books/NBK9971/">https://www.ncbi.nlm.nih.gov/books/NBK9971/</a>	

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	2	3	3	2	2	3	1	2.5
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.48
Result											High



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<b>CC8: Practical: II</b>							
<b>BIOCHEMISTRY, DEVELOPMENTAL BIOLOGY, AND ANIMAL PHYSIOLOGY</b>							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	6	Sub Code	A2PZO8P	Semester	II
Medium of Instruction: English						CC8	

### DEVELOPMENTAL BIOLOGY

Preparation of bull-sperm suspension and observation of live and smeared spermatozoa  
Mounting of chick blastoderm

### ANIMAL PHYSIOLOGY

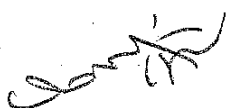
Estimation of oxygen consumption in fish  
Estimation of haemoglobin in human blood  
Salt loss and salt gain in fish  
Test for urea and sugar in urine sample  
Quantitative estimation of amylase activity  
Quantitative estimation of ammonia and urea  
Spotters: BP apparatus, Stethoscope and ECG

### BIOCHEMISTRY

1. Working principle of pH meter and measurement of pH in different samples
2. Preparation of buffers: phosphate buffer and citrate buffer.
3. Colorimetric/Spectrophotometric estimation of the following biomolecules:  
a) Proteins, b) Carbohydrates c) Lipids
4. Qualitative estimation of Urea and Uric acid
5. Separation of amino acids by Paper/Thin layer chromatography.

### MARKS DISTRIBUTION

Major Practical	20
Minor Practical	10
Spotters	20
Record	05
Viva-voce	05
Total	60



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AQUACULTURE							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	4	Sub Code	A2PZOEL2A	Semester	II
Medium of Instruction: English							CEC2

**Objectives:**

To learn, observe and understand fish biology, fish pond construction, feeding and breeding of cultivable species, major diseases of culture fishes.

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	acquire knowledge about the species selection for aquaculture.	K1
CO - 2	Understand the kinds of aquaculture, site selection, fish farm construction.	K2
CO - 3	interpret types of ponds, water quality and feed management	K3
CO - 4	outline types of culture, fish diseases.	K4
CO - 5	appraise fish preservation methods and their marketing	K5

<b>Unit I</b>	Introduction to aquaculture the Selection of species for culture –Aquatic pollution - Kinds of culture-traditional-extensive, semi-intensive, intensive. Cage culture, raceway culture, raft culture, pen culture.
<b>Unit II</b>	Site selection, preparation of fish farm, Types of ponds- Breeding pond - nursery pond, stocking pond and rearing pond. Management of physical and chemical characteristics of water quality. Natural, supplementary and artificial feeds.
<b>Unit III</b>	Types of culture-Monoculture, monosex-culture, poly culture and composite fish culture. Integrated fish farming - paddy cum fish culture and duck cum fish culture, diary cum fish culture. Sewage fed fish culture
<b>Unit IV</b>	Culture of Indian major carps – Catla, Rohu, Mrigal – Pearl and Edible oyster culture – Crustacean culture: Penaeus sp. Fish feed formulation – Live feeds – Cultivable species of mollusks and algae. Fish diseases and management: Bacterial, viral, fungal, protozoan and crustacean diseases and their symptoms and control measures.
<b>Unit V</b>	Harvesting (Gears and Crafts) and transport – Preservation techniques – Canning and Freezing – By-products of fishes – Marketing the fish to local markets and for export - Quality control and Norms of MPEDA for export of fishes
<b>Text Books</b>	
1. Devidas K Belsare . 2019. Text Book of Fish, Fisheries and Aquaculture. Independently Published. Pp.360.	
2. Patel, A. 2010. Textbook of Aquaculture. Pacific Books International.	
<b>Reference Books</b>	
1. G. Santhanakumar and A.M. Selvaraj. 2002. Concept of aquaculture, Meenam Publication, Nagercoil.	
2. Shanmugam. K, 1992. Fishery Biology and Aquaculture. Leo pathipagam, Madras.	
3. Jameson.J.D, and R.Santhanam, 1996. Fisheries College and Research Institute, Thoothukudi.	

**Web resources**

<http://www.fao.org/3/a-a1337e/a1337e04e.pdf>

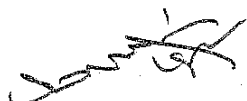
<http://pdf.shoroombooks.us/?book=0813806976>

[http://agritech.tnau.ac.in/fishery/fish\\_freshwaterprawn.html](http://agritech.tnau.ac.in/fishery/fish_freshwaterprawn.html)

**\*\*Visit to aquaculture farm and processing unit is compulsory**

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	1	1	3	3	3	3	3	3	1	2.4
CO2	3	1	3	3	3	3	3	1	3	1	2.4
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.44
Result											High



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VERMICULTURE							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	4	Sub Code	A2PZOEL2B	Semester	II
Medium of Instruction: English							CEC2

**Objectives:**

To impart knowledge on the recent trends in vermi-technology, agricultural and economic importance of earthworms.

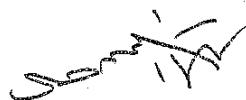
**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO - 1	describe and understand the diversity, distribution and biology of earthworms.	K1, K2
CO - 2	illustrate vermicomposting methods.	K3
CO - 3	analyse the marketing and economic importance of vermicompost.	K4
CO - 4	appraise the role of vermiculture in protecting the environment.	K5
CO - 5	evaluate the potential of vermicompost.	K5

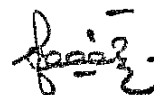
<b>Unit-I</b>	Vermiculture - classification - types-epigeic, anecic, endogeic. Diversity, distribution and biology of earthworm . Factor influencing the culture of earthworm - life cycle and adaptation. Earthworm in organic waste management.
<b>Unit-I I</b>	Vermicomposting technology- soil structure- raw material required, environmental, feeding harvesting and storage of vermicompost. Wormcasts - Vermin enrichment. Vermi Tea. Composition of vermicompost - Physical, chemical and biological characteristics of vermicast.
<b>Unit-III</b>	Small scale and Large scale vermin composing. Vermicomposting materials –Types of vermicomposting and Requirements. Advantages and Maintenance of Vermicomposting. Chemical composition of Vermicompost, Vermi wash. Uses of earthworms in animal feed industry.
<b>Unit-IV</b>	Bioremediation through Vermitechnology. Role of earthworms in sustainable agriculture - organic farming. Recycling of different wastes by vermicomposting. Earthworm in medicine. Economic importance of vermiculture.
<b>Unit-V</b>	Role of earth worms in waste management – Marketing of vermicomposting product – vermicomposting in land improvement and reclamation - NGO for vermiculture.
<b>Text book</b>	
<ol style="list-style-type: none"> <li>Somani,L.L,2008.Vermicomposting and vermiwash. Agrotech Publishing Academy, Udaipur.</li> <li>Talashilkar and Dosani, 2005. Earthworm in Agriculture. Agrobios (India), Jodhpur.</li> </ol>	
<b>Reference Books</b>	
<ol style="list-style-type: none"> <li>Edwards, C.A. and Loft, J.R., 1977. Biology of Earthworms, 3rd Edition, Chapman Publications.</li> <li>Arun K.Sharma. (2002). A Hand book of organic forming, Agrobios, Jothpur, India.</li> <li>Lee KE. (1985) “Earthworms: Their ecology and relationship with Soils and Land Use”, Academic Press, Sydney.</li> </ol>	
<b>Web resources</b>	
<a href="https://www.eawag.ch/fileadmin/domain1?Abteilungen/sandec/E-Learning/Moocs/Solid_Waste/W4?Manual_on_Farm_Vermicomposting_Vermiculture.pdf">https://www.eawag.ch/fileadmin/domain1?Abteilungen/sandec/E-Learning/Moocs/Solid_Waste/W4?Manual_on_Farm_Vermicomposting_Vermiculture.pdf</a>	
<b>**Visit to vermiculture unit is compulsory</b>	

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of COs
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	1	3	3	1	3	3	3	2.6
CO3	3	3	3	3	3	3	1	3	1	3	2.6
CO4	1	3	3	3	3	3	1	1	1	3	2.2
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.42
Result											High



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MEDICAL LABORATORY TECHNIQUES							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	4	Sub Code	A2PZOEL2C	Semester	II
Medium of Instruction: English							CEC2

**Objectives:**

To produce medical laboratory technologist equipped with skills in performing various laboratory analyses related to human diseases.

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO – 1	understand the basic idea about clinical laboratory and its ethics.	K2
CO – 2	illustrate the maintenances of clinical laboratory and safety precautions.	K3
CO – 3	outline the principles and handling of various laboratory instruments.	K3
CO – 4	illustrate chemical reagent preparations.	K3
CO – 5	appraise various diagnostic methods.	K5

<b>Unit-I</b>	Infrastructure and requirements of a basic laboratory - Ethics of medical laboratory personnel- The use of the laboratory-Organization of clinical laboratory and role of medical laboratory technician - Symbols of reagents and chemicals – Laboratory accidents and safety measures-First Aid and treatment for superficial wounds, burns, chemical poisoning, infections by microbial specimens – Record keeping and reporting – Types of sterilisation
<b>Unit-II</b>	Common Laboratory Equipment: Structure, working principles and applications of Compound Microscope, Centrifuge, Colorimeter, Incubator, Hot Air Oven, Water Bath, Autoclave, Laminar Air Hood, Microtome and ELISA Reader– Laboratory glasswares, their uses, handling and care.
<b>Unit-III</b>	Buffer and pH - Preparation of reagents: Normal, percent and Molar solution-normal saline- Methods of measuring liquids-Modern Laboratory set up-Quality control: Accuracy, Precision, and Reference values. Routine Examination of Urine: Collection procedure, preservation of urine, polyuria, albuminuria, melituria, biliruria and haematuria - physical, biochemical and microbiological examinations
<b>Unit-IV</b>	Capillary and venous blood collection - Phlebotomy -Sampling errors-Preservatives and anticoagulants. Haematological investigations: Principle, procedure and interpretations of blood grouping and Rh-Typing, Hb, ESR, PCV & MCV, BT & CT, RBC count, TC & DC, peripheral smear for diagnosis of Malarial parasites and Microfilaria & abnormalities of RBCs and platelet counting.
<b>Unit-V</b>	Biochemical tests in Blood: Principle, procedure and interpretations of sugar (Fasting, post prandial and random), urea, creatinine and bilirubin investigations. Serological examinations: WIDAL, VDRL, Rh factor, HIV (ELISA and Western Blotting), Coombs test. Auto analyser
<b>Text Books:</b>	
1. J Ochei and Kolhatkar, 2002. Medical laboratory science theory and practice, Tata McGraw-Hill,	
2. Kanai L. Mukherjee, 2007, Medical laboratory technology Vol.1.Tata McGraw Hill	
<b>Reference Books:</b>	
1. Fischbach, 2005. Manual of lab and diagnostic tests, Lippincott Williams Wilkins, New York.	



2. Gradwohls, 2000. Clinical laboratory methods and diagnosis. (ed) Ales C. Sonnenwirth and Leonard Jarret, M.D.B.I., New Delhi.

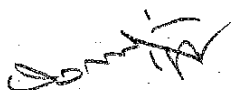
**Web resources:**

<https://apps.who.int/iris/bitstream/handle/10665/42295/9241545305.pdf>

[https://www.shoklo-unitcom/sites/default/files/resources/laboratory\\_technician\\_training\\_manual\\_pdf](https://www.shoklo-unitcom/sites/default/files/resources/laboratory_technician_training_manual_pdf)

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of Cos
CO1	3	1	3	3	3	3	3	1	3	1	2.4
CO2	3	3	3	1	3	3	1	3	3	3	2.6
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	1	3	3	1	3	3	3	2.6
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.48
Result											High



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BASICS OF BEEKEEPING							
(For students admitted from the academic year 2022-2023)							
Credit	2	Hours/Week	2	Sub Code	A2PZOG2-A	Semester	2
Medium of Instruction: English						GEC2	

**Course objective:**

Entrepreneur motivation for practicing apiculture as cottage industry.

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO – 1	acquire knowledge and understand different species of honey bees.	K1, K2
CO – 2	demonstrate the equipments and managements of beekeeping.	K3, K4
CO – 3	identify honey bee-products.	K3
CO – 4	differentiate honey bees, and handle the bees.	K4
CO – 5	culture the honey bees and maintain the bee colony.	K6

UNIT-I	History of bee keeping: Definition, Bee keeping in worldwide, In India. Traditional bee keeping, Modern beekeeping, Urban or backyard beekeeping. Role of Central Honey Bee Research & Training Institute. National Bee Board
UNIT II	Honey bee species and identification: Introduction to honey bee; Origin, systematics and distribution; Types of honey bees, Species of honey bees. Bee identification.
UNIT III	Social organization in honey bees: Colony life and social organization – Queen, drone, worker. Annual biological cycle of the bee colony.
UNIT IV	Basic requirements for starting bee keeping: Getting Started in Beekeeping. General management practices in bee keeping: Best management practice – definition, requirements to register, swarms and bee enquiries, hive densities, hive placement, water provisions, queens and robbing behavior, disease control, transportation of hives.
UNIT V	Bee products – An introduction, honey, pollen, royal jelly, bees wax, propolis & venom, Significance of bee products. Value added honey products. Properties of honey products, Nutrients and composition of honey, Acid content and flavor effects. Types of value added honey products.

**Text Books**

1. Hem Raj. 2020. Text Book of Apiculture. S. Vinesh & Co
2. Kumar Ashok. 2022. Understanding Apiculture. Discovery Publishing Pvt.Ltd. p318.
3. D K Belsare, Rakesh Kumar Singh, Dr Mrs Shashikala D Belsare and Mr Ravindra Aliai Deshmukh, R. 2019. Textbook of Apiculture (Beekeeping). Himalaya Publishing House.

**Reference Book**

1. D Elumalai, C Mohan, B Poovizhiraja and R Ramamoorthy. 2021. Principles And Practices of Apiculture. Jaya Publishing House


**MOOCs Swyam Courses-**


Vocational : Bee keeping ::<https://www.classcentral.com/course/swyam-vocational-bee-keeping-17839/course/swyam-vocational-bee-keeping-17839>

Beekeeping parts, tools, & equipment : <https://www.classcentral.com/course/youtube-beekeeping-parts-tools-equipment-59050/course/youtube-beekeeping-parts-tools-equipment-59050>

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	Mean Score of Cos
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	2	3	3	1	3	2	3	2.6
CO3	3	3	3	1	3	3	1	3	3	3	2.6
CO4	3	3	3	3	3	3	1	3	1	3	2.6
CO5	1	3	3	3	3	1	1	1	1	1	1.8
Mean Overall Score											2.42
Result											High

  
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ENTREPRENEURIAL DEVELOPMENT							
(For students admitted from the academic year 2022-2023)							
Credit	2	Hours/Week	2	Sub Code	A2PZOG2-B	Semester	II
Medium of Instruction: English				GEC2			

**Course objective:**

Entrepreneur motivation for practicing apiculture as cottage industry.

**Course outcomes:**

Co No.	Co – Statements	Cognitive Levels
	<i>On successful completion of this course, students will be able to</i>	
CO – 1	Describe and understand the characteristics for entrepreneurial and the role of emerging economic development	K1, K2
CO – 2	Identify and categorizing the financial assistance render by the financial institutions	K3, K4
CO – 3	analyze rural entrepreneurs	K3
CO – 4	Appraise women entrepreneurs	K4
CO – 5	Assess the avenues in biological sectors	K6

UNIT I	Concept of entrepreneurship-meaning-definition-characteristics-functions-role of entrepreneur in economic development-classification of entrepreneurs-factors affecting entrepreneurial growth-entrepreneurial development programmes
UNIT II	Project-Project Appraisal-Project Formulation-Project Identification-Source of ideas-Preliminary Evaluation and Testing Ideas
UNIT III	Licensing Procedure for startup and industrial unit-Procedure to small and Women Entrepreneurs-Import and export substitutes oriented items
UNIT IV	Incentives and subsidies- state and central governments-backward areas-promotion and consultancy services-role of financial institutions
UNIT V	Bio-entrepreneur-areas and avenues-marketing – challenges and opportunities

**Text Books:**

A Textbook of Entrepreneurship Development. 2014. K. L. Dangi, S.S. Sisodia, P.S. Chauhan and Yogita Ranawat. Agrotech Publishing Academy

**Reference Book:**

Entrepreneurship Development: Text & Cases. 2011. B. Janakiram and M. Rizwana. Excel Books.

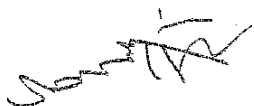
**MOOCs Swayam Courses:**

<https://onlinecourses.swayam2.ac.in>


<https://www.my-mooc.com/en/categorie/entrepreneurship>

**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
											Mean Score of Cos
CO1	3	2	2	3	3	3	3	2	3	1	2.5
CO2	3	3	3	2	3	3	1	3	2	3	2.6
CO3	3	3	3	3	3	3	1	3	1	3	2.2
CO4	1	3	3	3	3	3	1	1	1	3	2.2
CO5	1	3	3	3	3	3	1	1	1	3	2.2
Mean Overall Score											2.42
Result											High

  
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