AUXILIUM COLLEGE (Autonomous), Gandhi Nagar, Vellore-632006.

(Accredited by NAAC with A^+ Grade in the 4^{th} cycle)

TANSCHE - OUTCOME BASED EDUCATION

M.Sc. ZOOLOGY

(Effective for those admitted from the Academic Year 2024 - 2025)

Vision of the Department:

- To co-exist without tampering nature
- Helping the students to understand the formation and functioning of living organisms
- Imparting knowledge about the various technologies in life sciences
- Creating awareness to conserve the environment

Objectives of the Department:

- Helping the students to understand the diversity, formation and functioning of living organisms.
- Creating awareness to conserve and coexist with the nature.
- To know one's position, role and sustenance in environment.
- To provide a platform for the various interdisciplinary/ research oriented/ advanced higher education in LIFE SCIENCES.
- Preparing the students for economic independency through self-employment.

Eligibility for admission to M.Sc. Zoology:

A candidate who (1) has passed B.Sc. Degree Examination of this University with Zoology as the Main Subject of study or (2) an Examination of other Universities accepted by the Syndicate as equivalent thereto shall be permitted to appear and qualify for M. Sc. Degree Examination of this University in this Course of study in the affiliated Colleges / Department of this University.

Highlights of the Revamped Curriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application-oriented content wherever required.

- The Core subjects include latest developments in the education and scientific front, practical training, catering to the needs of stakeholders with research aptitude.

- The curriculum is designed to strengthen the industry-academia interface and provide more job opportunities for the students.
- Skill Enhancement Courses are precisely focused on imparting skill-sets for imparting employability and entrepreneurial skills

- Human Rights Course is bound to make students responsible citizens and sensitive human beings

- Online course helps to initiate self-learning and instill the value of life-long learning in students

- The Internship during the First year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

- Project with viva-voce component in the fifth semester enables the students to apply their conceptual knowledge to practical situations. Such innovative provisions of the industrial training/project/internships will give students an edge over the counterparts in the job market.

- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective and Skill Enhancement Courses, covering conventional topics to the application oriented.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I, II, III & IV	**Core Courses in Zoology**	Instil confidence among students Create interest for the subject Students get a stronger footing in the subject
II, III & IV	**Skill Enhancement papers** (Discipline centric/ Generic / Entrepreneurial)	Industry ready graduates Skilled human resource Students are equipped with essential skills to make them employable
		Entrepreneurial skill training will provide an opportunity for independent livelihood Generates self – employment Create small scale entrepreneurs Skill training to girls leads to women empowerment
		Discipline centric skill will improve the technical knowhow of solving real life problems
II, III, IV	**Elective papers-** An open choice of topics categorized under Generic and Discipline Centric	Strengthening the domain knowledge Introducing the stakeholders to the state-of art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature Emerging topics related to industry are introduced to facilitate advanced learning in the respective domains
II Year Vacation activity	**Internship / Industrial Training**	Practical training at the Industry/ Chemical Companies/Educational institutions, enable the students gain professional experience and become responsible citizens.
IV Semester	**Project with Viva – voce**	Self-learning is enhanced Application of the concept to real situation is conceived resulting in tangible outcome
Skills acquired from the Courses		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

TANSCHE- BASED PROGRAMME STRUCTURE FOR M.Sc. ZOOLOGY

(Effective for those admitted from the Academic Year 2024 - 2025)

Structure of the Course and Scheme of Examinations

Sem	Category	Course Code	Title	No. of Hours	Credit	Exam Hours		Marks
						Th	Pr	
I	Core - I	PCZOA24	Structure and Function of Invertebrates	6	5	3	-	40+60
	Core - II	PCZOB24	Comparative Anatomy of Vertebrates	6	5	3	-	40+60
	Core Practical- I	PCZOC24	Lab Course in Invertebrata & Vertebrata	6	4	-	4	40+60
	Elective Course – I/II	PEZOA24/ PEZOB24	1. Molecules and their interaction relevant to Biology/ 2. Animal care	5	3	3	-	40+60
	Elective Course – III/IV	PEZOC24/ PEZOD24	3. Biostatistics/ 4. Animal Husbandry	5	3	3	-	40+60
		PNHRA24	Human Rights	1	-	-	-	-
			Value Education	1	-	-	-	-
			Total	**30**	**20**			**500**
II	Core - III	PCZOD24	Cellular and Molecular Biology	6	5	3	-	40+60
	Core - IV	PCZOE24	Developmental Biology	6	5	3	-	40+60
	Core Practical II	PCZOF24	Lab Course in Cell Biology and Developmental Biology	6	4	-	4	40+60
	Elective Course – V/VI	PEZOE24/ PEZOF24	5. Economic Entomology/ 6. Pet Keeping	4	3	3	-	40+60
	Elective Course – VII/VIII	PEZOG24/ PEZOH24	7. Research Methodology/ 8. Radiation Biology	4	3	3	-	40+60
	Skill Enhancement Course-I	PSZO124	SEC: Poultry Farming	2	2	3	-	40+60
		PNHRA24	Human Rights	1	2			40+60
		POZO24	Online Course	-	1	-	-	
			Value Education	1	-			-
			Total	**30**	**25**			**700**

III	Core - V	PCZOG24	Genetics	5	4	3	-	40+60
	Core -VI	PCZOH24	Evolution	5	4	3	-	40+60
	Core -VII	PCZOI24	Animal Physiology	6	4	3	-	40+60
	Core VIII (Industry Module)	PCZOJ24	Medical Laboratory Techniques	5	4	3	-	40+60
	Core Practical III	PCZOK24	Lab Course in Physiology, Genetics and Evolution.	3	3	-	4	40+60
	Elective Course– IX/X	PEZOI24/ PEZOJ24	9. Stem cell biology/ 10. Biophysics	3	3	3	-	40+60
	Skill Enhancement Course-II	PSZO224	SEC: Dairy Farming	2	2	3	-	40+60
	Internship	PIZO24	Internship	-	2	-	-	40+60
			Value Education	1	-			-
			Total	**30**	**26**			**800**
IV	Core -IX	PCZOL24	Immunology	5	4	3	-	40+60
	Core -X	PCZOM24	Ecology	5	4	3	-	40+60
	Core Practical IV	PCZON24	Lab Course in Ecology, Immunology and Animal Behaviour	3	3		4	40+60
	Project with Viva Voce - XI	PCZOO24	Project	10	7	-		40+60
	Elective Course- XI/XII	PEZOK24/ PEZOL24	11. Aquaculture/ 12. General Psychology	3	2	3	-	40+60
	Skill Enhancement Course-III	PSZO324	SEC: Animal Behaviour	3	2	3	-	40+60
			Value Education	1	-			-
	Extension Activity (30hrs)	PXTEN24	Extension Activity	-	1			-
			Total	**30**	**23**			**600**
	Total	**(Total 90 + HR 2 + Ext 1+ Online 1)**		**120**	**94**			**2600**

- Any one course of the following to be completed during III semester (15 hours teaching and 15 hours activities):
  - i) Teaching and Research Aptitude
  - ii) Artificial Intelligence Tools
  - iii) Entrepreneur Skill
  - iv) Photography

Consolidated Semester wise and Component wise Credit distribution

Course	Hours/Week				Total Credits
	Sem I	Sem II	Sem III	Sem IV	
Core (Including Practical and Project)	18	18	24	23	67
Major Electives	10	10	5	6	23
Human Rights	1	1	-	-	2
Value Education	1	1	1	1	-
Extension	-	-	-	-	1
Online Course	-	-	-	-	1
Total	**30**	**30**	**30**	**30**	**94**

Methods of Evaluation						
S. No.	**Category**	**Assessment Tool**	**Maximum Marks**	**Exam Theory**	**Weightage**	
1	Core Courses / Generic & Discipline Specific Electives	I Continuous Assessment (ICA)	50	1 ½ h		40
		II Continuous Assessment (IICA)	50	1 ½ h	35	
		Innovative Component (IC)	5	-	5	
		End Semester Examination	100	3 h		60
2	Foundation Course / Professional Competency SEC/	I Continuous Assessment (ICA)	30	1 h	35	40
		II Continuous Assessment (IICA)	30	1 h		
		Innovative Component (IC)	5	-	5	
		End Semester Examination	60	2 h		60
3	HR	Continuous Assessment (IICA)	25	1 h		
		Innovative Component (IC)	25	-		40
		End Semester Examination	60	2 h		60

Activity-based Assessment for Skill Enhancement Courses:

Activity 1 for Unit I: (Nature of Activity) – 20 marks
Activity 2 for Unit II: (Nature of Activity) – 20 marks
Activity 3 for Unit III: (Nature of Activity) – 20 marks
Activity 4 for Unit IV: (Nature of Activity) – 20 marks
Activity 5 for Unit V: (Nature of Activity) – 20 marks

Nature of Activity – Field visit/Industrial visit/Project (individual or group)/Exhibits/Model making/Hands on training/Lab practice/Product making/Extempore/Block and Tackle/Debate/Report writing/Case study/Interpretation of data or results/Transcription/Quiz (LMS)/Problem solving/ Designing/Role play/Start-up proposal/Research proposal/Poster presentation/Oral presentation (live or video recorded)/Survey (Field or Online)/Group discussion/Problem solving/Problem formulation/Interviews/Concept mapping/Mind mapping /Promoting public awareness etc.

Record of Assessment will be maintained by the course instructors and verified by the Head of the department.

Cognitive Levels of Assessment	
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, short summary or overview
Application (K3)	Suggest idea/concept with examples, suggest formulae, Solve problems, Observe, Explain
Analyze (K4)	Problem-solving questions, finish a procedure in many steps, Differentiate between various ideas, Map knowledge
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations

PROGRAMME OUTCOMES (PO):

On completion of the UG Programme, students will be able to:

PO1: Attain an in-depth knowledge in the respective domains augmented through self-learning.

PO2: Assimilate and apply principles and concepts towards skill development and employability.

PO3: Apply critical and scientific approaches to address problems and find solutions.

PO4: Develop research skills through multi/inter/trans-disciplinary perspectives.

PO5: Integrate issues of social relevance in the field of study.

PO6: Persist in life-long learning for personal and societal progress.

PROGRAMME SPECIFIC OUTCOMES (PSO):

On completion M.Sc. Zoology Programme, students will be able to

PSO1: Have in-depth knowledge on animal diversity from acellular to multicellular level of organization and apply the learnt concepts in all the fields of Zoology.

PSO2: Demonstrate expertise in practical procedures and handling laboratory equipments/ instruments. Effective communicator, novel thinker to address the emerging needs.

PSO3: Be abled leaders with team spirit, analytical thinking and completion of work in academic, on-field and research areas.

PSO4: Gain ability to develop research aptitude/creative thinking in contemporary and current fields of interest.

PSO5: Conduct their duty with at most honesty and adhere to ethical protocols. On the whole, be agents of social transformation to up bring their society at large.

PSO6: Be technically sound in applying the Information technology and will be lifelong learners in updating to the current advancements in their respective fields.

PSO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
PSO1	H	H	H	H	H	H
PSO2	H	H	H	H	H	H
PSO3	H	H	H	H	H	H
PSO4	H	H	H	H	H	M
PSO5	H	H	H	H	H	H
PSO6	H	H	H	H	H	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="8">STRUCTURE AND FUNCTION OF INVERTEBRATES</td></tr>
<tr><td>Paper No. 1</td><td colspan="8">Core-I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">PCZOA24</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>6</td><td></td><td colspan="3">-</td><td colspan="3">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To enlighten the students with the taxonomical classification of invertebrates in relation to their functional morphology.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I 18 Hours - (K1, K2, K3, K4, K5)
1.1. Structure and function in invertebrates.
1.2. Principles of Animal taxonomy.
1.3. Species concept.
1.4. International code of zoological nomenclature.
1.5. Taxonomic procedures.
1.6. New trends in taxonomy.</td></tr>
<tr><td></td><td colspan="8">UNIT II 18 Hours - (K1, K2, K3, K4, K5)
2.1. Organization of coelom: Acoelomates; Pseudocoelomates.
2.2. Coelomates: Protostomia and Deuterostomia.
2.3. Locomotion: Flagella and ciliary movement in Protozoa.
2.4. Hydrostatic movement in Coelenterata.
2.5. Hydrostatic movement in Annelida.
2.6. Hydrostatic movement in Echinodermata.</td></tr>
<tr><td></td><td colspan="8">UNIT III 18 Hours - (K1, K2, K3, K4, K5)
3.1. Nutrition and Digestion: Patterns of feeding and digestion in lower metazoan.
3.2. Filter feeding in Polychaeta, Mollusca and Echinodermata.
3.3. Respiration: Organs of respiration-gills.
3.4. Organs of respiration-lungs and trachea.
3.5. Respiratory pigments.
3.6. Mechanism of respiration.</td></tr>
<tr><td></td><td colspan="8">UNIT IV 18 Hours - (K1, K2, K3, K4, K5)
4.1. Excretion: Organs of excretion-coelom, coelomoducts.
4.2 Nephridia and Malphigian tubules.
4.3. Mechanisms of excretion.
4.4. Mechanisms of osmoregulation.
4.5. Nervous system- Primitive nervous system- Coelenterata and Echinodermata.
4.6. Advanced nervous system- Annelida, Arthropoda (Crustacea and lnsecta) Mollusca (Cephalopoda).</td></tr>
<tr><td></td><td colspan="8">UNIT V 18 Hours – (K1, K2, K3, K4, K5)
5.1. Invertebrate larvae: Larval forms of free living invertebrates.
5.2. Larval forms of parasites.
5.3. Strategies Evolutionary significance of larval forms.
5.4. Concept of Minor Phyla.
5.5. Organization and general characters of Minor Phyla.
5.6. Significance of Minor Phyla.</td></tr>
</table>

Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1.Barnes, R. D. 1974. Invertebrate Zoology, (Second Edition), Holt-Saunders International Edition, pp-1024. 2.Barnes, R. S. K., P. Calow, P. J. W. Olive, D. W. Golding, J. J. Spicer. 2013. The Invertebrates: A Synthesis. Third Edition. John Wiles & Sons Inc., Hoboken. New Jersey, New Delhi. 3.Dechenik, J. A. 2015. Biology of Invertebrates (Seventh Edition). Published by McGraw Hill Education (India) Private Limited, pp-624.
Reference Books	1.Barrington, E. J.W. 1979. Invertebrate Structure and Function. The English Language Book Society and Nelson, pp-765.
Website and e-learning source	http://www.earthlife.net/begin. http://faunaofindia.nic.in https://www.civilserviceindia.com

Course Outcomes:

On completion of the course, the students should be able to

CO1: Analyze the taxonomic status of Invertebrates, its origin and Evolution. (K1, K2, K3, K4, K5)

CO2: Acquires the knowledge on the systemic and functional morphology of various groups of invertebrate. (K1, K2, K3, K4, K5)

CO3: Examine the digestive and respiratory system of various classes of invertebrates. (K1, K2, K3, K4, K5)

CO4: Analyze the nervous and excretory system of various classes of invertebrates. (K1, K2, K3, K4, K5)

CO5: Integrate the evolutionary significance of larval forms and minor phyla. (K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	H	H
CO2	H	M	M	H	H	H
CO3	H	M	M	H	H	H
CO4	H	M	M	H	H	H
CO5	H	M	M	H	H	H
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	M
CO3	H	H	H	H	H	M
CO4	H	H	H	H	H	M
CO5	H	H	H	H	H	M

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">COMPARATIVE ANATOMY OF VERTEBRATES</td></tr>
<tr><td>Paper No.2</td><td colspan="7">Core-II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td>Course Code</td><td>PCZOB24</td></tr>
<tr><td>Semester</td><td>I</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>6</td><td></td><td colspan="3"></td><td colspan="2">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• Exemplifying the vertebrate origin and the intermediary position of prochordates between invertebrates and vertebrates.
• Acquires knowledge on evolution, adaptive radiation, efficiency of mammals and evolutionary changes that occurred in the life of vertebrates.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (18 hours) (K1, K2, K3, K4, K5)
1.1: Origin of vertebrates.
1.2: Concept of Protochordata.
1.3: Concept of Protochordata.
1.4: The nature of vertebrate morphology.
1.5: Definition, scope and relation to other disciplines.
1.6: Importance of the study of vertebrate morphology.</td></tr>
<tr><td></td><td colspan="7">UNIT II (18 hours) (K1, K2, K3, K4, K5)
2.1: Origin and classification of vertebrates.
2.2: Vertebrate integument and its derivatives.
2.3: Development, general structure and functions of skin and its derivatives.
2.4: Glands, scales.
2.5: Horns, claws, nails.
2.6: Hoofs, feathers and hairs.</td></tr>
<tr><td></td><td colspan="7">UNIT III (18 hours) (K1, K2, K3, K4, K5)
3.1: General plan of circulation in various groups.
3.2: Blood; Evolution of heart.
3.3: Evolution of aortic arches and portal systems.
3.4: Respiratory system: Characters of respiratory tissue.
3.5: Internal and external respiration.
3.6: Comparative account of respiratory organs.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (18 hours) (K1, K2, K3, K4, K5)
4.1: Skeletal system: Form.
4.2: Function, body size.
4.3: Skeletal elements of the body.
4.4: Comparative account of jaw suspensorium.
4.5: Vertebral column; Limbs and girdles.
4.6: Evolution of Urinogenital system in vertebrate series.</td></tr>
</table>

	UNIT V (18 hours) (K1, K2, K3, K4, K5) 5.1: Sense organs: Simple receptors. 5.2: Organs of Olfaction and taste; Lateral line system, Electroreception. 5.3: Nervous system: Comparative anatomy of the brain in relation to its functions. 5.4: Comparative anatomy of spinal cord. 5.5: Nerves-Cranial 5.6: Peripheral and Autonomous nervous systems.
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Yong, J. Z. 1981. The life of Vertebrates, English language Book society, London, pp-645. 2. Romer, A.S. 1971. The Vertebrate body, W.B.S. Saunders, Philadelphia, pp-600.
Reference Books	1. Waterman, A.J. 1972. Chordate Structure and Function, MacMillan Co., New York, pp.587. 2. Parker T. J. and W. A. Haswell. 1962. A text book of Zoology, Vol. 2, Vertebrates, 7th Edition, Mac Millan Press, London, pp-750. 3. Ekambaranatha Ayyar and T. N. Ananthakrishnan. 2009. Manual of Zoology, Vol – II, S. Viswanathan Pvt. Ltd. Chennai. 4. Kotpal, 2019. R.L. Modern Text Book of Zoology Vertebrates, 4th Edition, Rastogi Publications, Meerut, pp-968.
Website and e-learning source	https://www.swayamprabha.gov.in/index.php/program/archive/9 http://www.earthlife.net/begin. http://faunaofindia.nic.in https://www.civilserviceindia.com

Course Outcomes:

On completion of the course, the students should be able to

CO1: Remember the general concepts and major groups in animal classification, origin, structure, functions and distribution of life in all its forms. (K1, K2, K3, K4, K5)

CO2: Describe the development, general structure and functions of skin. (K1, K2, K3, K4, K5)

CO3: Acquire in-depth knowledge in comparative account of circulatory and respiratory system in vertebrates. (K1, K2, K3, K4, K5)

CO4: Study the Skeletal system and urinogenital system in vertebrate series. (K1, K2, K3, K4, K5)

CO5: Able to know about the sense organs and nervous system. (K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	L	H	H	L	M
CO2	H	L	H	H	L	M
CO3	H	L	H	M	L	M
CO4	H	L	H	H	L	/M
CO5	H	L	H	H	L	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	M	M	L	M
CO2	H	M	M	M	L	M
CO3	H	L	M	M	L	M
CO4	H	L	M	M	L	M
CO5	H	L	M	M	L	M

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">LAB COURSE IN INVERTEBRATA AND VERTEBRATA</td></tr>
<tr><td>Paper No.3</td><td colspan="7">Core Practical I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core Practical</td><td>Year</td><td>I</td><td>Credits</td><td>4</td><td>Course Code</td><td>PCZOC24</td></tr>
<tr><td>Semester</td><td>I</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td></td><td colspan="3">6</td><td colspan="2">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• Understanding the different systems in invertebrates & vertebrates.
• Learning about various animal species, their phylogenetic affinities and their adaptive features
• Imparting conceptual knowledge about the salient features and functional anatomy.
• Developing the skill in mounting techniques of the biological samples.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Major: Dissections:
1. Invertebrata: Digestive system- Prawn, Cockroach and Sepia
Nervous system – Prawn, Cockroach and sepia

2. Chordata: 9th and 10th Cranial nerves of Shark
Arterial system of Shark
Digestive system of fish
Urinogenital system of fish

3. Minor: Mounting:
Appendages of Prawn
Mouth parts – Cockroach, Mosquito, House fly, Honey bee
Sting of Honey Bee
Brain of frog and calotes (Museum Specimen)

4. Study of museum specimen and slides:
1. Entamoeba histolytica
2. Paramecium
3. Euplectella
4. Gorgonia
5. Alcyonium
6. Hydra
7. Liver fluke
8. Cercaria larva
9. Tape worm -Scolex
10. Ascaris
11. Mysis larva
12. Hippa
13. Peripatus
14. Dentalium
15. Brittle star
16. Amphioxus
17. Ascidia
18. Petromyzon
19. Arius
20. Hippocampus,</td></tr>
</table>

	21. Trygon 22. Exocetes 23. Tetrodon 24. Echeneis, 25. Acipenser 26. Axolotl Larva 27. Ambystoma. 28. Hyla 29. Draco. 30. Chaemeleon 31. Krait 32. Dryophis 33. Python 34. Chelonia – carapace 35. Kingfisher 36. Owlet 37. Peacock 38. Ant eater 39. Platypus 40. Mangoose 41. Spotters of endemic species- Laughing thrush, Grey headed bulbul. 42. Endangered species of India- Red crowned roofed turtle, Javan rhinoceros. 43. Zoo geographical realms: -Holartic realm-Hoary bat, Elk -Paleotropical realm- Hyena, Gibbon -Notogaean realm- Flying fox, Bandicoot -Antartic realm – Leopard seal, Orca 44. Hotspots of Tamil Nadu- Western Ghats- Lion tailed macaque, Dwarf Malabar Pufferfish, Nilgiri Langur. 45. Endemism- Komodo dragon, Kangaroo, Kiwi
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and otherstobesolved (To be discussed during the Tutorial hours)
Recommended Text	1. Lal, S.S. 2009. Practical Zoology, Rastogi Publications, pp-484. 2. Iuliis G. D. and D. Pulerà, 2007. The Dissection of Vertebrates: A Laboratory Manual. Academic Press, Imprint of Elsevier Publication, pp-416. 3. Verma, P.S. 2000. Manual of Practical Zoology: Chordates, S. Chand Publishing Company, pp-528 4. Yong, J. Z. 1981. The life of Vertebrates, English language Book society, London, pp-645. 5. Romer, A.S. 1971. The Vertebrate body, W.B.S. Saunders, Philadelphia, pp-600.

Reference Books	1. Preeti, G., and C. Mridula, 2000. Modern Experimental Zoology, Indus International Publication. 2. Sinha, J., A. K. Chatterjeee, P. Chattopadhya. 2011. Advanced Practical Zoology, Arunabha Sen Publishers, pp-1070. 3. Waterman, A.J. 1972. Chordate Structure and Function, MacMillan Co., New York, pp.587. 4. Parker T. J. and W. A. Haswell. 1962. A text book of Zoology, Vol. 2, Vertebrates, 7th Edition, Mac Millan Press, London, pp-750. 5. Ekambaranatha Ayyar and T. N. Ananthakrishnan. 2009. Manual of Zoology, Vol – II, S. Viswanathan Pvt. Ltd. Chennai. 6. Kotpal, 2019. R.L. Modern Text Book of Zoology Vertebrates, 4th Edition, Rastogi Publications, Meerut, pp-968.
Website and e-learning source	https://www.swayamprabha.gov.in/index.php/program/archive/9 http://www.earthlife.net/begin. http://faunaofindia.nic.in https://www.civilserviceindia.com

Course Outcomes:

On completion of the course the student will be able to…

CO1: Acquire knowledge about the digestive, Nervous system of Invertebrates.(K1, K2, K3, K4, K5)

CO2: Acquire knowledge about the Nervous and circulatory system of vertebrates.(K1, K2, K3, K4, K5)

CO3: Prepare Mountings of Mouthparts and Honey bee Sting(K1, K2, K3, K4, K5)

CO4: Display prawn appendages(K1, K2, K3, K4, K5)

CO5: Identify and describe the biological significance, structure and function of invertebrates and vertebrates. (K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	M	H	H	M	H
CO5	H	H	H	H	M	H

CO/PSO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	H	M	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	M	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">ELECTIVE I: MOLECULES AND THEIR INTERACTION RELEVANT TO BIOLOGY</td></tr>
<tr><td>Paper No. 15A</td><td colspan="7">Elective Course- I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOA24</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>5</td><td></td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To comprehend the molecular design of life introduces the most important classes of biological macromolecules like proteins, carbohydrates, lipids and presents the basic concepts of catalysis and enzyme action.
• Acquire knowledge on stabilizing interactions in biomolecules and bioenergetics.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (15 hours) (K1, K2, K3,K4,K5)
1.1: Basics of biochemistry, Structure of atoms.
1.2: Molecules and chemical bonds - Types of bonds-covalent-ionic- hydrogen. 1.3 Principles of biophysical chemistry – pH, Buffer.)
1.4: Acid- Base balance, Henderson Hasselbach equation.
1.5: Biological importance of Buffers.
1.6: Acidosis and Alkalosis.</td></tr>
<tr><td></td><td colspan="7">UNIT II (15 hours) (K1,K2,K3,K4,K5)
2.1: Biomolecular interactions and their properties.
2.2: Carbohydrates- Structure. Classification
2.3: Metabolism- Glycogenesis, Glycogenolysis, Gluconeogenes.
2.4: Lipids- Structure and Classification, Biosynthesis and oxidation of fatty acids .
2.5: Proteins: Classification of Proteins based on the structure, properties.
2.6: Metabolism- Deamination, Transamination, Transmethylation.</td></tr>
<tr><td></td><td colspan="7">UNIT III (15 hours) (K1,K2,K3,K4,K5)
3.1: Bioenergetics and enzymology.
3.2: Bioenergetics, glycolysis.
3.3: Oxidative phosphorylation, coupled reaction, group transfer.
3.4: Biological energy transducers - Principles of catalysis.
3.5: Enzymes and enzyme kinetics, enzyme regulation.
3.6: Mechanism of enzyme catalysis, isoenzymes.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (15 hours) (K1,K2,K3,K4,K5)
4.1: Structural conformation of proteins and nucleic acids.
4.2: Conformation of proteins - Ramachandran plot, secondary.
4.3: Tertiary and quaternary structure.
4.4: Domains; motifs and folds.
4.5: Conformation of nucleic acids (A-, B-, Z-DNA).
4.6: t-RNA, micro-RNA.</td></tr>
</table>

	UNIT V (15 hours) (K1,K2,K3,K4,K5) 5.1: Stabilizing interactions in biomolecules. 5.2: Stability of protein. 5.3: Nucleic acid structures. 5.4: Hydrogen bonding, covalent bonding. 5.5: Hydrophobic interactions. 5.6: Disulfide linkage.
Extended Professional Component (is a part of internal component only ,not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Berg, J. M., J. L. Tymoczko and L. Stryer 2002. Biochemistry. 5th Ed., W.H. Freeman & Co., New York, pp-1050. 2. Kuchel P.W. and G. B. Ralston. 2008. Biochemistry. McGraw Hill (India) Private Limited, UP, pp-580. 3. McKee T. and J. R. McKee. 2012. Biochemistry: The Molecular Basis of Life. (7th Edition). Oxford University Press, US, pp-793. 4. Nelson D.L. and M.M. Cox. 2012. Lehninger's Principles of Biochemistry. (6th Edition). W. H. Freeman Publishers, New York, pp-1158. 5. Satyanarayana U. and U. Chakrapani, 2006. Biochemistry. (3rd Edition). Books and Allied (P) Ltd. Calcutta, pp-695.
Reference Books	1. Buchanan, B.B., W. Gruissem and R.L. Jones. 2015. Biochemistry and Molecular Biology of Plants. John Wiley and Sons Ltd., UK, pp-1280. 2. Murray, R.K., D.K. Granner, P.A. Mayes and V.W. Rodwell. 2003. Harper's Illustrated Biochemistry (26th Edition), The McGraw-Hill Companies, Inc., USA, pp-704. 3. Palmer, T. 2004. Enzymes. Affiliated East-West Press Pvt. Ltd., New Delhi, pp-416. 4. Voet D. and J.G. Voet. 2011. Biochemistry. (4th Edition). John Wiley & Sons (Asia) Pvt. Ltd., pp-1428
Website and e-learning source	https://pdb101.rcsb.org/browse/biomolecules https://www.mdpi.com/journal/biomolecules https://open.lib.umn.edu/humanbiology/chapter/4-1-biological-molecules/

Course Outcomes:
On completion of the course, the students should be able to

CO1: Acquire knowledge about the basics of biochemistry**.** (K1,K2,K3,K4,K5)

CO2: Understand the biomolecular interactions, structure, and function of biomolecules. (K1,K2,K3,K4,K5,K6)

CO3: Appraise the bioenergetics, classification, properties and mode of enzyme action. (K1,K2,K3,K4,K5)

CO4: Understand the complexity of the structural conformation of proteins and nucleic acids.(K1,K2,K3,K4,K5)

CO5: Familiarize the stabilizing interactions in biomolecules.(K1,K2,K3,K4,K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	M

H-HIGH (3):M-MODERATE (2): L-LOW-(1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	M	H	H	L	L
CO2	M	M	H	H	L	H
CO3	M	H	H	H	L	H
CO4	M	H	H	H	L	H
CO5	M	H	H	H	L	H

Title of the Course	**ELECTIVE II: ANIMAL CARE**						
Paper No.15 B	**Elective Course II**						
Category	**Core**	**Year**	**I**	**Credits**	**3**	**Course Code**	**PEZOB24**
		Semester	**I**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	5	**-**	**-**			**5**	
Objectives of the course	To impart special knowledge on animals and their relationship. To learn to examine sick animals, and understand how diagnostic procedures are applied for determining diseases. To learn about animal psychology; innate behaviour and survival.						
Course Outline	**UNIT I (K1, K2, K3, K4 & K5)** 1.1: Animal Care- Scope. 1.2: Animal feeding: Types of feeders. 1.3: Nutritional requirements; Vitamins, Minerals. 1.4: Choosing and Preparing Food. 1.5: Quantity and timing of feeding. 1.6: Supplements.						
	UNIT II (K1, K2, K3, K4 & K5) 2.1: Animal Accommodation. 2.2: Housing Requirements. 2.3: Bedding Materials. 2.4: Fixtures and Fittings. 2.5: Cleaning and maintaining. 2.6: Waste disposal.						
	UNIT III (K1, K2, K3, K4 & K5) 3.1: Animal Health: Disease prevention 3.2: Common diseases of Dogs, Cats and Rabbits. 3.3: Endoparasites and Ectoparasites. 3.4: Signs of Ill Health. 3.5: First Aid procedures. 3.6: Remedies.						
	UNIT IV (K1, K2, K3, K4 & K5) 4.1: Handling, restraining and moving animals. 4.2: Need for handle, restrain and move animals. 4.3: Personal protective equipment. 4.4: Handling equipment. 4.5: Restraint equipment. 4.6: Reducing stress.						
	UNIT V (K1, K2, K3, K4 & K5) 5.1: Animal Behaviour; Normal Behaviour; Emotions. 5.2: Abnormal Behaviour. 5.3: Stereotypic Behaviour. 5.4: Observing Behaviour- Methods and Recording. 5.5: Avoiding/ Reducing Abnormal Behaviour. 5.6: Environmental Enrichment.						

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	Staff of ACS distance education. Animal feed and nutrition- ISBN NO: 979-0-9942948. Dr. Pitcarins complete guide to natural health for dogs and cat. Published by Rodale books 2005.
ReferenceBooks	Carol Ekarius -Animal housing Julie Massoni, Health pets naturally published in 2014 Martin Goldstein, The Nature of Animal Healing. Published by Ballantine books, 1999. D. Broom, Domestic animal behavior and welfare published by CABI, 2007.
Website and e-learning source	https://olaw.nih.gov https://www.academia.edu http://www.sanjaygandhianimalcarecentre.org

Course Outcomes:

On completion of the course the student will be able to…

CO1: Expand knowledge on animal feeding. **(K1, K2, K3, K4 & K5)**

CO2: Acquire knowledge on requirements for animal accommodation. **(K1, K2, K3, K4, K5)**

CO3: Recognize sick animals and diagnostic procedures to determine the disease. **(K1 - K5)**

CO4: Apply their knowledge in handling, restraining and transporting animals. **(K1 - K5)**

CO5: Explain animal psychology, innate behavior and survival. **(K1, K2, K3, K4 & K5)**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

H-HIGH (3):M-MODERATE (2): L-LOW-(1)

Title of the Course	**ELECTIVE III: BIOSTATISTICS**						
Paper No. 16 A	**ELECTIVE Course-III**						
Category	**Elective**	**Year**	**I**	**Credits**	**3**	**Course Code**	**PEZOC24**
		Semester	**I**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	**1**	**-**			**5**	
Objectives of the course	To understand the basic concepts of biostatistics and its application in research. To acquire skills to perform various statistical analyses using modern statistical techniques and software.						
Course Outline	**UNIT I (15 hours) (K1, K2, K3, K4 & K5)** 1.1: Introduction, scope and application of statistics. 1.2: Primary and secondary data, classification and tabulation of biological data: Types and applications. 1.3: Variables: Definition and Types. 1.4: Frequency Distribution. 1.5: Graphic methods: Frequency Polygon and Ogive Curve. 1.6: Diagrammatic representation: Histogram, bar diagram, pictogram and pie chart						
	UNIT II (15 hours) (K1, K2, K3, K4 & K5) 2.1: Measures of central tendency: Mean for continuous and discontinuous Variables. 2.2: Median for continuous and discontinuous variables. 2.3: Mode for continuous and discontinuous variables. 2.4: Measures of dispersion: Range, Variation. 2.5: Standard deviation. 2.6: Standard Error and Coefficient of Variation.						
	UNIT III (15 hours) (K1, K2, K3, K4 & K5) 3.1: Probability: Definition and Events 3.2: Types and Rules. 3.3: Probability - Addition and Multiplication Theorem. 3.4: Probability Distribution: Properties, Application of Normal Distribution. 3.5: Binomial Distribution. 3.6: Poisson Distribution.						
	UNIT IV (15 hours) (K1, K2, K3, K4 & K5) 4.1: Hypothesis Testing. 4.2: Student 't' test – paired sample and mean difference 't' tests. 4.3: Correlation: Types - Karl Pearsons Co-efficient. 4.4: Rank Correlation, Significance test for correlation coefficients. 4.5: Regression analysis: Computation of biological data. 4.6: Calculation of Regression Co-efficient.						

	UNIT V (15 hours) (K1, K2, K3, K4 & K5) 5.1: Chi- Square Test. 5.2: Applications of Chi-Square test in Biology. 5.3: ANOVA – (Analysis of Variance)- Introduction 5.4: One - Way ANOVA 5.5: Two - Way ANOVA 5.6: Data analysis with comprehensive statistical software using Statistical Package for the Social Sciences (SPSS).
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Negi K. S.2012 Methods in Biostatistics AITBS Publication. 2. Gurumani N. 2005 An Introduction to Biostatistics and Revised Edition. MJP Publishers. 3. Palanichamy, S. and Manoharan, M. 1990. Statistical Methods for Biologists, Palani Paramount Publications, Tamil Nadu, pp-264.
ReferenceBooks	1. Visweswara Rao K 1996 –Biostatistics- Jaypee Publication New Delhi. 2. Ronald N, Forthofer, Eun Sul Lee Michael Hernadez 2007 – Biostatistics-An Imprint of Elsevier. 3. Das N G 2009 Statistical Methods-Tata McGraw-Hill Publishing Company-New Delhi. 4. Bernard Rosner – Fundamentals of Biostatistics 5th edition – Duxbury Thomson Learning,USA 2000. 5. Clifford Blair R., Richard A. Taylor – Biostatistics for the Health Sciences – (Indian edition)Dorling Kindersley India Pvt. Ltd., New Delhi 2009. 6. Bailey, N. T. J. Statistical Methods in Biology (Third Edition), Cambridge University Press, Cambridge, pp-255. 1994. 7. Wayne W. Daniel. Biostatistics: A Foundation for Analysis in the Health Sciences, John Wiley & Sons Inc, USA, pp-443.
Website and e-learning source	https://www.statistics.com

Course Outcomes:

On completion of the course, the students should be able to

CO1: Classify and tabulate the data and present them diagrammatically and graphically. (K1, K2, K3, K4 & K5)

CO2: Explain and perform Measures of central tendency and standard deviation. (K1,K2,K3,K4,K5)

CO3: Describe statistical probability. (K1, K2, K3, K4 & K5)

CO4: Compute Correlation, Regression and Student 't' test. (K1, K2, K3, K4 & K5)

CO5: Compute Chi square Test and ANOVA. (K1, K2, K3, K4 & K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	M
CO3	H	H	H	H	H	M
CO4	H	H	H	H	H	M
CO5	H	H	H	H	H	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	M	H	H	H	M
CO2	L	M	H	H	H	M
CO3	L	M	H	H	H	M
CO4	L	M	H	H	H	M
CO5	L	M	H	H	H	M

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="8">ELECTIVE: ANIMAL HUSBANDARY</td></tr>
<tr><td>Paper No. 16B</td><td colspan="8">Elective Course IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">PEZOD24</td></tr>
<tr><td>Semester</td><td>I</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td colspan="2">Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>5</td><td colspan="2">-</td><td colspan="2">-</td><td colspan="2">5</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To know about the care and management of livestock.
• To learn the correct method of feeding, breeding, housing and health care of livestock.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I Cattle Industry in South India (K1, K2, K3, K4 & K5)
1.1: Cattle – Importance, Classification.
1.2: Population and Food Supply, Suitable Environment, Rainfall and Soil.
1.3: Suitability for Tracts and Farming Types.
1.4: Grazing conditions, Communal, Fore Stand Private Grazing.
1.5: Fodder Cultivation.
1.6: Cattle Rearing.</td></tr>
<tr><td></td><td colspan="8">UNIT II Important Breeds of Cattle in South India (K1, K2, K3, K4 & K5)
2.1: Breed characters: Kangayam, Ogole.
2.2: Mysore and Alambadi breeds.
2.3: Barghur cattle, Jellicut animals
2.4: Tanjore polled cattle.
2.5: Buffaloes.
2.6: South Indian Breeds.</td></tr>
<tr><td></td><td colspan="8">UNIT III Methods of Breeding (K1, K2, K3, K4 & K5)
3.1: In – breeding, line – breeding.
3.2: Out – crossing with other species and breeds.
3.3: Grading – up, Selection – Individuality.
3.4: Parentage, offspring influence.
3.5: Improvement of cattle in South India.
3.6: Hurdles in grading – up.</td></tr>
<tr><td></td><td colspan="8">UNIT IV Principles of Feeding (K1, K2, K3, K4 & K5)
4.1: Use of food, nutrients, nutritive ratio.
4.2: Starch equivalent, energy value, feeding standard.
4.3: Rations, roughages and concentrates.
4.4: Schedule of rations, some feeding hints.
4.5: Composition of feeding stuffs.
4.6: Digestibility coefficient of important feeds.</td></tr>
<tr><td></td><td colspan="8">UNIT V Management of Cattle (K1, K2, K3, K4 & K5)
5.1: Housing, Providing Drinking Water.
5.2: Grooming and washing.
5.3: Providing exercise.
5.4: Care of Sick Animals.
5.5: Vaccination.
5.6: Training Young Stock.</td></tr>
</table>

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	Animal Husbandry Department, Madras, Administration report for the year 1949 – 50. Ind. Council of Agric., Res., New Delhi, Survey of cattle breeds in India, Bull., 24 (1934), 27 (1939) and 54 (1942).
ReferenceBooks	Kellner, C., The Scientific Feeding of Animals. Maaynard, L.A., Animal Nutrition. Newyork, McGraw- Hill Book Company, 1947. Pincher. C., The Breeding of farm Animals. Penguin Books, Ltd., Great Britain, 1946. Sen. K.C., Cattle "Nutritive Value of Indian Feeds", ICAR Miscellaneous Bull., No.23 (1952).
Website and e-learning source	https://www.oercommons.org https://www.dairyglobal.net https://www.farmingindia.in/dairy-farming

Course Outcomes:

On completion of the course, the students should be able to

CO1: Explain the management of livestock. **(K1, K2, K3, K4 & K5)**

CO2: Expand the knowledge to differentiate special breeds of cattle. **(K1, K2, K3, K4 & K5)**

CO3: Elucidate different methods of breeding. **(K1, K2, K3, K4 & K5)**

CO4: Summarize on the nutritive feeding practice of cattle. **(K1, K2, K3, K4 & K5)**

CO5: Provide intensive ideas on management of cattle. **(K1, K2, K3, K4 & K5)**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	M	H	H	H	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	M	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

<table>
<tr><td>Title of the Course</td><td colspan="8">CELLULAR AND MOLECULAR BIOLOGY</td></tr>
<tr><td>Paper No.4</td><td colspan="8">Core III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">PCZOD24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>5</td><td>1</td><td colspan="3">-</td><td colspan="3">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To understand the fine structure of genetic material, functional modifications and their regulation.
• To know the chromosomal basis of genetic disorders, development and differentiation.</td></tr>
<tr><td></td><td colspan="8">Unit I 18 Hours - (K1, K2, K3, K4, K5)
1.1 General features of the cell: Basic structure of prokaryotic
1.2 Basic structure of eukaryotic cells
1.3 Protoplasm and deutroplasm
1.4 Cell organelles
1.5 Cell theory
1.6 Diversity of cell size and shapes</td></tr>
<tr><td></td><td colspan="8">Unit II 18 Hours - (K1, K2, K3, K4, K5)
2.1 Cellular organization: Membrane structure and functions - Structure of model membrane, lipid bilayer and membrane proteins diffusion
2.2 Osmosis, ion channels, active transport, ion pumps
2.3 Mechanism and regulation of intracellular transport, electrical properties of membranes
2.4 Structure and functions of Intracellular organelles: Nucleus, mitochondria, Golgi bodies
2.5 Lysosomes, endoplasmic reticulum, peroxisome
2.6 Plastids, vacuoles and chloroplasts</td></tr>
<tr><td></td><td colspan="8">Unit III 18 Hours - (K1, K2, K3, K4, K5)
3.1 Cell division and Cell cycle: Mitosis
3.2 Meiosis, their regulation, steps in cell cycle and control of cell cycle
3.3 Molecular biology of cell: Structure of DNA and RNA
3.4 Process of DNA replication
3.5 Transcription and translation in pro- and eukaryotic cells
3.6 Genetic maps</td></tr>
<tr><td></td><td colspan="8">Unit IV 18 Hours - (K1, K2, K3, K4, K5)
4.1 Cell communication and cell signaling: Membrane- associated receptors for peptide
4.2 Receptors for steroid hormones
4.3 Signaling through G-protein coupled receptors
4.4 Signal transduction pathway
4.5 General principles of cell communication: extracellular space and matrix
4.6 Interaction of cells with other cells and non-cellular</td></tr>
</table>

.	**Unit V 18 Hours -** (K1, K2, K3, K4, K5) 5.1 Cancer cells: Characteristic features of normal and cancer cells 5.2 Carcinogens: types and cancer induction 5.3 Metastasis 5.4 Oncogenes and tumor suppressor genes 5.5 Apoptosis 5.6 Therapeutic interventions of uncontrolled cell growth
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved. (To be discussed during the Tutorial hours)
Recommended Text	1.Robert P. Wagner - Introduction to modern genetics- John Wiley and sons, Inc, 1980. 2.P. K. Gupta .2005. Cell and Molecular Biology. Publisher, Rastogi Publications.
Reference Books	1. Karp, G. 2010. Cell Biology (Sixth Edition), John Wiley & Sons, Singapore, pp-765. 2. Lodish, H., C. A. Kaiser, A. Bretscher, *et al*., 2013. Molecular Cell Biology (Seventh Edition), Macmillan, England, pp-1154 3. De Robertis, E.D.P. and E. M. F. De Robertis Jr, 1987. Cell and Molecular Biology. Info-Med, Hong Kong, pp-734 4. Abbas, A. K., A. H. Lichtman and S. Pillai, 2007, Cell and Molecular Immunology (Sixth Edition), Saunders, Philadelphia, pp-566 5. Loewy, A.G., P. Siekevitz and J. R. Menninger, *et al*., 1991, Cell Structure and Function (Third Edition), Saunders, Philadelphia, pp-947 6. Watson, J. D., N.H. Hopkins, J.W. Roberts, *et al*., 1987, Molecular Biology of the Gene (Fourth Edition), Benjamin/Cummings, California, pp-1163 7. Han, S. S. and J. Holmstedt. 1979, Cell Biology, McGraw Hill, pp-319 8. Alberts, B., A. Johnson, J. Lewis, *et al*., 2015, Molecular Biology of the Cell (Sixth Edition), Garland Science, New York, pp-1342.
Website and e-learning source	https://www.britannica.com https://www.microscopemaster.com https://ghr.nlm.nih.gov https://www.genetics.org

Course Outcomes:

On completion of the course, the students should be able to

CO1: Gain knowledge about general concepts of cell and molecular biology. (K1, K2, K3, K4, K5)

CO2: Acquire in-depth knowledge about Cellular organization. . (K1, K2, K3, K4, K5)

CO3: Obtain comprehensive knowledge on DNA, RNA structure and understand their transcription and translation concepts.. (K1, K2, K3, K4, K5)

CO4: Importance of chemical signals at the molecular level resulting in modulation of response. (K1, K2, K3, K4, K5)

CO5: Understand the onset of various diseases including cancer (K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO 3	PSO 4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	M	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H

CO/PSO	PSO					
	PSO1	PSO2	PSO 3	PSO 4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	M	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">DEVELOPMENTAL BIOLOGY</td></tr>
<tr><td>Paper No.5</td><td colspan="7">Core Course-IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">5</td><td rowspan="2">Course Code</td><td rowspan="2">PCZOE24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>6</td><td></td><td colspan="2"></td><td colspan="2">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• Define the concepts of embryonic development.
• To learn the process of gametogenesis, cleavage and gastrulation, embryonic membrane and placenta in various animals.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (18 hours) (K1,K2,K3,K4,K5)
1.1: Pattern of animal development: Chief events in animal development.
1.2: History of thoughts and conceptual developments.
1.3: Gametogenesis: Origin of germ cells, spermatogenesis - Sperm morphology in relation to the type of fertilization.
1.4: Oogenesis - Oogenesis in insects and amphibians.
1.5: Composition and synthesis of yolk in invertebrates (insects and crustaceans) and vertebrates.
1.6: Genetic control of vitellogenin synthesis in amphibians.</td></tr>
<tr><td></td><td colspan="7">UNIT II (18 hours) (K1,K2,K3,K4,K5)
2.1: Fertilization: Sperm aggregation, Sperm activation, Chemotaxis.
2.2: Sperm maturation and capacitaion in mammals, Acrosome reaction. Sperm – egg interaction.
2.3: Sperm entry into the egg - Egg activation - Intracellular calcium release.
2.4: Cortical reaction - Physiological polyspermy.
2.5: Fusion of male and female pronuclei - Post fertilization metabolic activation.
2.6: Parthenogenesis.</td></tr>
<tr><td></td><td colspan="7">UNIT III (18 hours) (K1,K2,K3,K4,K5)
3.1: Cleavage and gastrulation: Pattern of embryonic cleavage.
3.2: Mechanisms of cleavage, mid blastula transition.
3.3: Determinate and regulatory embryos, Factors affecting gastrulation.
3.4: Mechanisms and types of gastrulation in respective animal embryos – Chick and Mammals.
3.5, Fate maps – Chick and Mammals.
3.6: Epigenesis and preformation – Formation of primary germ layers.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (18 hours) (K1,K2,K3,K4,K5)
4.1: Embryonic Development; Embryonic development of birds, formation of extra embryonic membranes in mammalian.
4.2: Organogenesis - Development of endodermal, mesodermal and ectodermal derivatives in Chick and Mammals.
4.3: Embryonic Induction and neurulation in Chick and Mammals.
4.4: Formation and migration of neural crest cells in Chick and Mammals.
4.5: Types of neural crest cells and their patterning - primary and secondary neurulation.</td></tr>
</table>

	4.6: Gene and development; Anterior- posterior axis in determination in Drosophila.
	UNIT V (18 hours) (K1, K2, K3,K4,K5) 5.1: Post embryonic development metamorphosis- Endocrine control of metamorphosis in amphibian. 5.2: Endocrine control of moulting and growth in amphibian. 5.3: Neoteny and pedogenesis. Regeneration: Formation of ectodermal cap and regeneration blastema – Types of regeneration in Planaria. 5.4: Regenerative ability in different animal groups, Factors stimulating regeneration. 5.5: Biochemical changes associated with regeneration, Aging and senescences. 5.6: Biology of senescences- cause of aging- mechanism involved in apoptosis.
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Wilt, F.H. and N.K. Wessel. 1967. Methods in Developmental Biology, Thomas Y Crowell, New York. 2. Slack J.M.W. 2012. Essential Developmental Biology (3rd Edition), Wily-Blackwell Publications, USA, pp-496. 3. Mari-Beffa, M. and J. Knight. 2005. Key Experiments in Practical Developmental Biology, Cambridge University Press, UK, pp-404.
Reference Books	1. Balinsky, B. I. 1981. Introduction to Embryology (5th Edition), CBS College Publishers, New York, pp-782. 2. Gilbert. S. F. 2006. Developmental Biology, 8th Edition, INC Publishers, USA, pp-785. 3. Berrill, N.J. 1974. Developmental Biology, Tata Mc-Graw Hill Publications, New Delhi, pp-535. 4. Tyler, M.S. 2000. Developmental Biology - A Guide for Experimental Study, Sunderland, MA, pp-208. 5. Subramoniam, T. 2011. Molecular Developmental Biology (2nd Edition), Narosa Publishers, India, pp-364.
Website and e-learning source	www.easybiologyclass.com › developmental-biology-e www.studocu.com › document › lecture-notes › view ocw.mit.edu › courses › 7-22-developmental-biology-f.

Course Outcomes:

On completion of the course, the students should be able to

CO1: Acquire knowledge about the chief events in animal development. (K1,K2,K3,K4,K5)

CO2: Describe fertilization and post fertilization metabolic activation. (K1,K2,K3,K4,K5)

CO3: Acquire in-depth knowledge of cleavage and gastrulation in various animals. (K1,K2,K3,K4,K5)

CO4: Study the embryonic development and organogenesis. (K1,K2,K3,K4,K5)

CO5: Able to know the Post embryonic development and metamorphosis. (K1,K2,K3,K4,K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	H	M	M	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	H	L	L
CO2	M	M	H	H	L	M
CO3	M	H	H	H	L	M
CO4	M	H	H	H	L	M
CO5	M	M	H	H	L	M

<table>
<tr><td>Title of the Course</td><td colspan="7">LAB COURSE IN CELL BIOLOGY AND DEVELOPMENTAL BIOLOGY.</td></tr>
<tr><td>Paper No.6</td><td colspan="7">Core Practical II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core Practical</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">PCZOF24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td></td><td colspan="3">6</td><td colspan="2">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">Practical course aims at demonstrating significant cellular and molecular biological principles,
Quantitative and analytical approaches that enable the students to translate the theoretical foundation in cell biology, developmental biology, research methodology and entomology into practical understanding.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Cell Biology and Research Methodology
1. Electrophoresis – Agarose gel - SDS PAGE
2. Isolation of DNA
3. Isolation of RNA
4. Paper Chromatography
5. Gel/ Affinity Chromatography- Demonstration
6. Histochemical staining technique of Carbohydrates, Protein and Lipids
7. Estimation of Urea - DAM Method
8. Estimation of Cholesterol - ZAC’S Method
9. Estimation of Glucose – Ortho Toluidine Method
10. Estimation of Protein – Biuret Method
11. Lab Visit

Spotters: Cell Biology and Developmental Biology
a) Microscope- Compound, Fluorescent, TEM, SEM
b) Blastula and Gastrula of Frog
c) T.S of Testis – T.S. of Ovary – Graffian Follicles (mammals)
d) Placentation – Placenta of Shark and Sheep
e) Embryo of Mammals – Sheep and Pig Bat, human foetus,
f) Developmental stages in Chick – 18 hours, 24hrs, 48hrs, and 72hrs
g) Entomology - Insect Pests:

1. Pest of sugarcane – Euetheola humilis, Chilio infuscatellus
2. Pest of cotton – Dysdercus koenigii, Aphis gossypii
3. Pest of paddy – Sogatella furcifera, Leptocorisa varicornis
4. Pest of coconut- Oryctes rhinoceros, Rhyncophorus ferrugineus
5. Pest of Wheat- Meromyza Americana, Triticum vulgare
6. Pest of Fruits- Batocera rufamaculata, Papilio demoleus
7. Pest of vegetables- Epilachna vigintioctopunctata, Leucinodes orbonalis
8. House hold pest- Ctenolepisma saccharina, Anthrena pimpinella
9. Stored products pest- Sitophilus oryzae, Leptocorisa varicornis
10. Collection of Insects and preservation Techniques- Insect box</td></tr>
</table>

Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	6. Lal, S.S. 2009. Practical Zoology, Rastogi Publications, pp-484. 7. Iuliis G. D. and D. Pulerà, 2007. The Dissection of Vertebrates: A Laboratory Manual. Academic Press, Imprint of Elsevier Publication, pp-416. 8. Verma, P.S. 2000. Manual of Practical Zoology: Chordates, S. Chand Publishing Company, pp-528 9. Yong, J. Z. 1981. The life of Vertebrates, English language Book society, London, pp-645. 10. Romer, A.S. 1971. The Vertebrate body, W.B.S. Saunders, Philadelphia, pp-600.
Reference Books	7. Preeti, G., and C. Mridula, 2000. Modern Experimental Zoology, Indus International Publication. 8. Sinha, J., A. K. Chatterjeee, P. Chattopadhya. 2011. Advanced Practical Zoology, Arunabha Sen Publishers, pp-1070. 9. Waterman, A.J. 1972. Chordate Structure and Function, MacMillan Co., New York, pp.587. 10. Parker T. J. and W. A. Haswell. 1962. A text book of Zoology, Vol. 2, Vertebrates, 7th Edition, Mac Millan Press, London, pp-750. 11. Ekambaranatha Ayyar and T. N. Ananthakrishnan. 2009. Manual of Zoology, Vol – II, S. Viswanathan Pvt. Ltd. Chennai. 12. Kotpal, 2019. R.L. Modern Text Book of Zoology Vertebrates, 4th Edition, Rastogi Publications, Meerut, pp-968.
Website and e-learning source	https://www.swayamprabha.gov.in/index.php/program/archive/9 http://www.earthlife.net/begin. http://faunaofindia.nic.in https://www.civilserviceindia.com

Course Outcomes:

On completion of the course the student will be able to…

CO1: Apply basic concepts of instrumentation. (K1, K2, K3, K4, K5)

CO2: Gain skills in techniques of chromatography, electrophoresis and spectroscopy. (K1, K2, K3, K4, K5)

CO3: Demonstrate Histochemical staining techniques. (K1, K2, K3, K4, K5)

CO4: Summarize the insect pest and their control measures. (K1, K2, K3, K4, K5)

CO5: Acquire interest in the field of research. (K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	H
CO3	H	H	L	H	M	H
CO4	H	M	M	H	M	H
CO5	H	H	H	H	M	H

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	M	L	M
CO2	H	H	H	L	M	H
CO3	H	H	H	M	M	L
CO4	H	H	H	H	M	H
CO5	H	M	H	H	L	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">ELECTIVE: ECONOMIC ENTOMOLOGY</td></tr>
<tr><td>Paper No.17A</td><td colspan="7">Elective course-V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOE24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td></td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">To enlighten the students with adequate scientific details on taxonomy, classification and life of insects, importance of insects in human life.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I 12 hours- (K1,K2,K3,K4,K5)
1.1: Overview of insects and insect taxonomy.
1.2: Insect taxonomy.
1.3: Insects and their biological success.
1.4: Man, and Insects.
1.5: Basic concepts in Insect Taxonomy.
1.6: Insect Classification.</td></tr>
<tr><td></td><td colspan="7">Unit 2: 12 Hours - (K1,K2,K3,K4,K5)
2.1: Beneficial insects: Silkworms - types, life history
2.2: Disease management and rearing methods.
2.3: Types of honey bees, life history, social organization (colonies and caste system)
2.4: Honey bee care and management of bee hive.
2.5: Lac insects-life history, lac cultivation
2.6: Pollinators, predators, parasitoids, scavengers, weed killers, soil-builders.</td></tr>
<tr><td></td><td colspan="7">Unit 3: 12 Hours - (K1,K2,K3,K4,K5)
3.1: Destructive insects: Insect pests – definition; Categories of pests.
3.2: Types of damage to plants by insects.
3.3: Causes of pest outbreak .
3.4: Economic threshold level
3.5: Biology of the insect pests - Pests of paddy, cotton, sugarcane.
3.6: Vegetables, coconut and stored grains cereals</td></tr>
<tr><td></td><td colspan="7">Unit 4: 12 Hours - (K1,K2,K3,K4,K5)
4.1: Pest management/Control strategies: Methods and principles of pest control.
4.2: Natural control, Artificial control
4.3 : Merits and demerits or limitations of these methods in pest control.
4.4: Development and uses of pest resistant plant varieties
4.5: Integrated pest management concept
4.6: Integrated pest management practice.</td></tr>
<tr><td></td><td colspan="7">Unit 5:12 Hours - (K1, K2, K3, K4, K5)
5.1: Vector biology.
5.2: Vectors of veterinary.
5.3: Public health importance
5.4: Mosquitoes as potential vectors of human diseases, Control measures.
5.5: Insect vectors of Animals – Mites, Ticks.
5.6: Organic methods of domestic pest management.</td></tr>
</table>

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	1. Ayyar, L.V. R. 1936. Hand book of Economic Entomology for South India. Narendra Publishing House. New Delhi, pp- 528. 2. Vasantharaj David, B. and V.V. Ramamurthy. 2016. Elements of Economic Entomology, Eighth Edition, Brillion Publishing, New York, pp-400. 3. 3.Ross. H.H. 1965. A Text Book of Entomology, John Wiley & Sons Inc., New York, pp-746.
ReferenceBooks	1. Chapman, R.F., S.J. Simpsonand A.E.Douglas. 2012. The Insects: Structure and Function, Fifth Edition, Cambridge University Press, pp-959. 2. Imms, A.D., O.W.Richards and R.G. Davies (Eds.) IMMS' General Textbook of Entomology, Volume I: Structure, Physiology and Development, pp-418; Volume 2: Classification and Biology, pp-934, Springer Netherlands. 3. Daly, H.V., J.T. Doyen and P.R. Ehrlich. 1978. Introduction to Insect Biology and Diversity. Mc Graw-Hill Kogakusha Ltd., Tokyo, pp-564. 4. Hill, D.S. 1974. Agricultural Insect Pests of the Tropics and Their Control. Cambridge University Press, New York, pp-746. 5. Krishnaswami, S. 1973. Sericulture Manual, Vol. I & II, Silkworm rearing, FAO Agricultural Science Bulletin, Rome. 6. Mani, M.S. 1982. General Entomology. Oxoford & IBH Publishing Co., pp-912. 7. Wigglesworth, V.B. 1972. The Principles of Insect Physiology, ELBS & Chapman and Hall, London, pp-827.
Website and e-learning source	http://www.entosocindia.org https://www.entsoc.org https://entomology.cals.cornell.edu

Course Outcomes:

On completion of the course, the students should be able to

CO1: Discuss taxonomy, classification and life of insects in the animal kingdom.(K1, K2, K3, K4 & K5)

CO2: Explain life cycle, rearing and management of diseases of beneficial insects.(K1, K2, K3, K4 & K5)

CO3: Discuss the type of harmful insects, life cycle, damage potential and management of pests including natural pest control(K1, K2, K3, K4 & K5)

CO4: Explain insects which act as vectors causing diseases in animals and human.(K1, K2, K3, K4 & K5)

CO5: Discuss the importance of insects in human life. (K1, K2, K3, K4 & K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	L	L	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	L	H
CO5	H	H	H	L	L	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	H	L	H	H	M	H
CO3	H	L	H	H	M	H
CO4	H	L	H	H	M	H
CO5	H	L	H	H	M	H

<table>
<tr><td>Title of the Course</td><td colspan="7">PET KEEPING</td></tr>
<tr><td>Paper No.17 B</td><td colspan="7">Elective Course VI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOF24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>4</td><td>-</td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To gain an extensive foundation for a career in the pet industry.
• To develop a career or business working with animals in breeding and supplying pets, orsupplying services or products to pet owners.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (K1, K2, K3, K4 & K5)
1.1: Animal Care: laws and licenses.
1.2: Animal Charities and Societies (RSPCA, WSPA, Blue Cross).
1.3: Pet trading
1.4: Pet care needs -feeding, watering, shelter.
1.5: Containment, fencing, caging and protection.
1.6: Maintaining health and hygiene.</td></tr>
<tr><td></td><td colspan="7">UNIT II (K1, K2, K3, K4 & K5)
2.1: Dogs: Selection – breeds
2.2: Training – positive reinforcement for puppies.
2.3: Adult training; Reappraise basic training; teaching old dog new tricks.
2.4: Illness- first aid on spot diagnosis- vomiting and diarrhea, poisoning.
2.5: Cuts, grazes, wounds and burns.
2.6: Breaks and fractures; shock.</td></tr>
<tr><td></td><td colspan="7">UNIT III (K1, K2, K3, K4 & K5)
3.1: Cat: Breeds (Lang Haired, Semi Long Haired, Short Haired, Oriental).
3.2: Allergies-containment.
3.3: Breeding.
3.4: New born Kittens.
3.5: Care for sick cat signs of illness, temperature.
3.6: Common ailments, skin disorders -ticks.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (K1, K2, K3, K4 & K5)
4.1: Birds: Selection
4.2: Breeds (canaries, finches, budgerigars, small parrots).
4.3: Containment -Aviaries, selection, design and size
4.4: Management-feeding -watering- Grooming (Wing trim, beak trim, nail trim).
4.5: Caring for sick bird.
4.6: Signs of illness and common ailments.</td></tr>
<tr><td></td><td colspan="7">UNIT V (K1, K2, K3, K4 & K5)
5.1: Selection - Types of fish -Tropical, Marine, Cold water.
5.2: Costs, size, Equipment.
5.3: Tanks, Ponds, Pumps, Aquarium, Night Lights.
5.4: Water Quality - changing water.
5.5: Feed -Pelleted, Live Feed.
5.6: Illness - Fungal, Bacterial Parasites.</td></tr>
</table>

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	Shane Bateman, The First aid companion for dogs & cats published by Rodale books, 2001. Alan Edwards, The ultimate Encyclopedia of cats, cat breeds & cat care; published by south water, 2012.
ReferenceBooks	Sheldon L. Gerstenfeld, V.M.D, The Bird Care Book, published by Da Capo Lifelong books,1989. David E. Boruchowitz, The simple Guide to freshwater Aquariums, published By TFHpublications, inc. 2001. Gary A Gallerstein, D.V.M. The complete Pet Bird owner's Handbook published by AvianPublications, 2003.
Website and e-learning source	www.bluecrossofindia.org www.peta.org https://www.britannica.com/animal/pet

Course Outcomes:

On completion of the course, the students should be able to

CO1: Analyze the present status of maintaining pets and its needs. **(K1, K2, K3, K4 & K5)**

CO2: Interpret on varied dog breeds and train them. **(K1, K2, K3, K4 & K5)**

CO3: Identify cat breeds and trace the diseased cat and treat them. **(K1, K2, K3, K4 & K5)**

CO4: Expand knowledge on best choices of bird breed for business. **(K1, K2, K3, K4 & K5)**

CO5: Elucidate commercially important fishes and understand the construction and requirement for setting aquarium to become an entrepreneur. **(K1, K2, K3, K4 & K5)**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	M	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	M	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	M	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

<table>
<tr><td>Title of the Course</td><td colspan="7">ELECTIVE: RESEARCH METHODOLOGY</td></tr>
<tr><td>Paper No. 18 A</td><td colspan="7">Elective Course-VII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOG24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>4</td><td></td><td colspan="3">-</td><td colspan="2">4</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To enable the students to understand the principles and methods of various instruments used in biology and to prepare them to use these techniques in their own research.
• To understand the research methods and the preparation of research manuscripts and the role of journals and e-journals in research.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (12 hours) (K1,K2,K3,K4,K5)
1.1: Good laboratory practice (GLP).
1.2: pH.
1.3: Electrodes.
1.4: pH meter.
1.5: Colorimeter.
1.6: Spectrophotometry.</td></tr>
<tr><td></td><td colspan="7">UNIT II (12 hours) (K1,K2,K3,K4,K5)
2.1: Light Microscopy.
2.2: Bright field.
2.3: Phase contrast.
2.4: DIC & Fluorescence microscopy.
2.5: Wide field and
2.6: Confocal microscopy</td></tr>
<tr><td></td><td colspan="7">UNIT III (12 hours)(K1,K2,K3,K4,K5)
3.1: Scientific Method and its goals.
3.2: Research process.
3.3: Criteria of good research.
3.4: Research problem.
3.5: Criteria for selecting the problem.
3.6: Necessity of defining the problem.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (12 hours) (K1,K2,K3,K4,K5)
4.1: Research Design - Meaning and needs of research design.
4.2: Important concepts relating to research design.
4.3: Sampling design - Steps in sampling design.
4.4: Characteristics of good sampling design.
4.5: Selection of tools - criteria for selection of tools – different types of tools
4.6: Research methods – Survey - experimental, exploratory - case study.</td></tr>
</table>

	UNIT V (12 hours) (K1,K2,K3,K4,K5) 5.1: Pubmed, Google Scholar. 5.2: Computer aided techniques for data analysis. 5.3: SPSS software. 5.4: Data presentation and power point presentation. 5.5: Reference collection – preparation of thesis. 5.6: Preparation of scientific paper for publication in a Journal.
ExtendedProfessionalComponent(isapartofinternalcomponentonly,nottobeincludedintheexternalexamination questionpaper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/JAM/TNPSCandotherstobesolved (To be discussed during the Tutorial hours)
Recommended Text	1. Chandler, D.E. and Roberson R.W. 2009. Bioimaging: Current Concepts in Light and Electron Microscopy, Jones and Bartlet Publishers, Sudbury, MA, USA, pp440. 2. Engelbert, B. 1960. Radioactive Isotopes in Biochemistry, Elsevier Applied Science, pp-376. 3. Wolf, G. 1964. Isotopes in Biology, Academic Press, pp-173. 4. Srivastava, B. B. 2005. Fundamentals of Nuclear Physics, Rastogi Publications, pp-500. 5. Pantin, C. F. A. 1948. Microscopical Techniques, Cambridge University Press, London.
Reference Books	1. Day R.A. 1994 - How to Write and Publish a Scientific Paper - Cambridge University Press, London. 2. Palanichamy S. and Shanmugavelu M. 1997 - Research Methods in Biological Sciences –Palani Paramount Publications, Tamil Nadu, India. 3. Milton J.S.,1992-Statistical Methods in Biological and Health Sciences-McGrawHill Inc., York. 4. Gurumani N. 2006 - Research Methodology for Biological Sciences - MJP Publishers, Chennai. 5. Kothari C.R. 2010- Research Methodology- New Age International Publishers. 6. Sybesma C., 1989, Biophysics-An Introduction, Kluwer Academic Publisher. 7. Thomas F. Weiss, 1995, Cellular Biophysics I and II, MIT press. 8. Yeargers E.K, 1992, Basic Biophysics for Biology, CRC press. 9. Narayanan P. 2000- Essentials of Biophysics- New Age International Publishers.
Website and e-learning source	https://research-methodology.net https://study.com/academy https://ncu.libguides.com

Course Outcomes:

On completion of the course, the students should be able to

CO1: Able to understand the good laboratory practice. (K1, K2, K3, K4, K5)

CO2: Able to integrate the theoretical knowledge of microscopy. (K1, K2, K3, K4, K5)

CO3: Discuss the research process and research problem. (K1, K2, K3, K4, K5)

CO4: Acquire knowledge about the research design and sampling design. (K1, K2, K3, K4, K5)

CO5: Explain the preparation of scientific paper for publication in a journal. (K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	H	L
CO2	H	H	H	H	M	H
CO3	H	H	H	M	H	L
CO4	H	H	H	H	M	H
CO5	H	H	H	H	M	M

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	H	M	L
CO2	M	H	H	M	L	M
CO3	M	M	H	H	L	M
CO4	M	H	H	H	L	M
CO5	M	M	H	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">ELECTIVE: RADIATION BIOLOGY</td></tr>
<tr><td>Paper No.18 B</td><td colspan="7">Elective Course VIII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOH24</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture
4</td><td colspan="2">Tutorial
-</td><td colspan="2">Lab Practice
-</td><td colspan="2">Total
4</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To understand the radiation protection.
• To learn about the application of radiation in treatments.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (K1, K2, K3, K4 & K5)
1.1: Definition, Scope and Significance of Radiation Biology.
1.2: General Classification of Radiation.
1.3: Ionizing Radiation, Linear Energy Transfer
1.4: Radiation Dose and Units.
1.5: Principles of Radiation Dosimetry.
1.6: Direct and Indirect Effects.</td></tr>
<tr><td></td><td colspan="7">UNIT II (K1, K2, K3, K4 & K5)
2.1: Radiations lesions in DNA, radiobiological effect on cell.
2.2: Radiation sensitizers and protectors.
2.3: Effect of Radiation on Human Health.
2.4: Long term radiation risks from low radiations doses.
2.5: Radiation Induced Cancer.
2.6: Radiation effects in the developing embryo and fetus, radiation induced heritable diseases.</td></tr>
<tr><td></td><td colspan="7">UNIT III (K1, K2, K3, K4 & K5)
3.1: Radiation Quantities Exposure, Absorbed Dose.
3.2: Equivalent Dose, Effective Dose.
3.3: Cellular Response to Radiation Indirect and Direct Action.
3.4: Time scale of radiation effects.
3.5: DNA damage and Chromosomal Aberrations.
3.6: Radioprotectors and Radiosensitizers.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (K1, K2, K3, K4 & K5)
4.1: Time-scale of effects in Radiation Biology.
4.2: Response of normal and malignant tissues to radiation exposure.
4.3: Radiation Carcinogenesis.
4.4: Risk estimates for radiation-induced cancer.
4.5: Radiation-induced sterility.
4.6: Hereditary effects of radiation.</td></tr>
<tr><td></td><td colspan="7">UNIT V (K1, K2, K3, K4 & K5)
5.1: Whole-Body Radiation Effects Acute radiation syndrome.
5.2: Treatment of radiation accident victims.
5.3: Radiation Protection.
5.4: Radio Therapy.
5.5: Risk estimates in Humans.
5.6: Precautions and Safety Measures in Handling Radioisotopes</td></tr>
</table>

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	Physics and Radiobiology of Nuclear Medicine - Gopal B. Saha. – Springer III edition 2006. Radiation and Man - H. C. Jain - National Book trust, India. – 1994.
ReferenceBooks	Essentials of Radiation Biology and Protection – Steve Forshier edition 2. Life Sciences and Radiation – J. Kiefer - Springer 2004. An Introduction to Radiobiology, 2nd edition (1998), A. H. W. Nias, Wiley Blackwell, ISBN13: 978-0471975908. Radiation Biology 3.1. Fliedner, T. M., Friesecke, I. & Beyrer, K., 2001. Medical management of radiation accidents– manualon the acute radiation syndrome.British Institute of Radiology Supplement. Hall, E. J, Giaccia A. J. 2006. Radiobiology for the radiologist, Philadelphia, Pa: Lippincott Williams & Wilkins. International Commission on Radiological Protection, 2006: Low dose extrapolation of radiation-related cancer risk, ICRP publication.
Website and e-learning source	https://www.utoledo.edu https://www.ncbi.nlm.nih.gov https://www.astro.org

Course Outcomes:

On completion of the course, the students should be able to

CO1: Apply the fundamentals of radiation biology. **(K1, K2, K3, K4 & K5)**

CO2: Explain the effects of Radiation on DNA and its effects. **(K1, K2, K3, K4 & K5)**

CO3: Analyze the radiation exposure and response. **(K1, K2, K3, K4 & K5)**

CO4: Asses the role of radiation in carcinogenesis. **(K1, K2, K3, K4 & K5)**

CO5: Explain radio therapy, protection and precaution in using radioisotopes. **(K1- K5)**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	L	H
CO2	H	H	H	H	M	H
CO3	H	H	H	H	M	M
CO4	H	H	H	H	M	H
CO5	H	H	M	H	M	M
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	H	M	H	L	M
CO2	H	H	M	H	L	H
CO3	H	H	H	H	M	M
CO4	H	H	M	H	M	H
CO5	H	H	H	H	M	H

<table>
<tr><td>Title of the Course</td><td colspan="8">SEC: POULTRY FARMING</td></tr>
<tr><td>Paper No.21</td><td colspan="8">SKILL ENHANCEMENT COURSE- I</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">PSZO124</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>2</td><td></td><td colspan="3">-</td><td colspan="3">2</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To learn the types of breeds and housing methods for successful poultry keeping.
• To guide and motivate self employment.</td></tr>
<tr><td></td><td colspan="8">UNIT I (6 hours) (K1, K2, K3, K4, K5)
1.1 General introduction to poultry farming- Definition of Poultry
1.2 Breeds of fowls - Desi Breeds & Exotic Breeds
1.3 Principles of poultry housing
1.4 Poultry houses
1.5 Systems of poultry farming</td></tr>
<tr><td></td><td colspan="8">UNIT II (6 hours) (K1, K2, K3, K4, K5)
2.1 Management of chicks
2.2 Management of growers
2.3 Management of layers
2.4 Management of Broilers
2.5 Preparation of project report for banking and insurance</td></tr>
<tr><td></td><td colspan="8">UNIT III (6 hours) (K1, K2, K3, K4, K5)
3.1 Poultry feed management
3.2 Principles of feeding
3.3 Nutrient requirements for different stages of layers
3.4 Nutrient requirements for broilers
3.5 Feed formulation and Methods of feeding</td></tr>
<tr><td></td><td colspan="8">UNIT IV(6 hours) (K1, K2, K3, K4, K5)
4.1 Poultry diseases-viral (two each); symptoms, control and management
4.2 Bacterial (two each); symptoms, control and
4.3 Fungal (two each); symptoms, control and management
4.4 Parasitic (two each); symptoms, control and management
4.5 Vaccination programme</td></tr>
<tr><td></td><td colspan="8">UNIT V(6 hours) (K1, K2, K3, K4, K5)
5.1 Selection, care and handling of hatching egg
5.2 Egg testing.
5.3 Methods of hatching.- Brooding and rearing ,Sexing of chicks.
5.4 Farm and Water Hygiene
5.5 Recycling of poultry waste.</td></tr>
<tr><td colspan="4">Extended Professional Component(isapart of internal component only, not to be included in the external examination
Question paper)</td><td colspan="5">Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved.
(To be discussed during the Tutorial hours)</td></tr>
</table>

Recommended Text	1) Jayasurya, Arumugam N. – Economic Zoology- Saras Publication, Nagercoil, 2013. 2) Nilotpal Ghosh- Poultry Science and Practice- A Textbook- CBS Publishers and Distributors Pvt. Ltd. 2015.
Reference Books	1.Gnanamani M.R. – Modern Aspects of Commercial Poultry Keeping – Ezhil offset printers, Madurai- 2010 2. Tomar B.S. and Neera Singh- Economic Zoology- Emkay publications, Delhi- 2004. 3. Shukla G.S. and Upadhyay V.B. –Economic Zoology- Rastogi Publications, Meerut- 1997.
Website and e-learning source	https://thepoultrysite.com https://www.poultryworld.net http://www.agritech.tnau.ac.in

Course Outcomes:

On completion of the course, the students should be able toCO1

CO1:. Acquire Knowledge the essentials and maintenance of a good house (K1, K2, K3, K4,K5)

CO2: Gain knowledge on Management of chicks (K1, K2, K3, K4,K5)

CO3: . Discuss the feeding requirements and its management (K1, K2, K3, K4),K5

CO4: Identify Poultry diseases and vaccination Schedule (K1, K2, K3, K4,K5)

CO5: Identify Poultry diseases and vaccination Schedule.(K1, K2, K3, K4,K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	L	L	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	L	H
CO5	H	H	H	L	L	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	H	L	H	H	M	H
CO3	H	L	H	H	M	H
CO4	H	L	H	H	M	H
CO5	H	L	H	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">GENETICS</td></tr>
<tr><td>Paper No.7</td><td colspan="7">Core V</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td rowspan="2">PCZOG24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To acquire knowledge about microbial genetics
• Learn the structure and function of chromosome and chromosomal basis of genetic disorders.</td></tr>
<tr><td></td><td colspan="7">Unit I (15 hours) (K1, K2, K3, K4, K5)
1.1 Structure, properties and functions of genetic materials: DNA as the genetic Material
1.2 Basic structure of DNA and RNA
1.3 Alternate and unusual forms of DNA
1.4 Physical and Chemical properties of nucleic acid
1.5 Base properties, denaturation and renaturation
1.6 Tm and cot values, hybridization</td></tr>
<tr><td></td><td colspan="7">Unit II (15 hours) (K1, K2, K3, K4, K5)
2.1 Genetic code - Methods of deciphering the genetic code
2.2 General features of the genetic code
2.3 Chromosomal genetics: Molecular structure of chromosomes
2.4 Variation in chromosome number and structure
2.5 Chromosome nomenclature
2.6 Chromosomal syndromes</td></tr>
<tr><td></td><td colspan="7">Unit III (15 hours) (K1, K2, K3, K4, K5)
3.1 Microbial Genetics: Genetics of Virus
3.2 Viral chromosome, Lytic cycle
3.3 Lysogenic cycle
3.4 Bacterial genetics -Bacterial genome
3.5 Gene transfer mechanisms in bacteria and virus conjugation
3.6 Transduction and transformation</td></tr>
<tr><td></td><td colspan="7">Unit IV (15 hours) (K1, K2, K3, K4, K5)
4.1 Recombinant DNA technology: Recombinant DNA technology
4.2 Tools for Recombinant DNA Technology
4.3 Vectors - types
4.4 Techniques used in recombinant DNA technology - generation of DNA fragments
4.5 Restriction endonucleases
4.6 DNA modifying enzymes, Ligases</td></tr>
</table>

	Unit V (15 hours) (K1, K2, K3, K4, K5**)** 5.1 Introduction of rDNA into host cell 5.2 Calcium chloride mediated gene transfer 5.3 *Agrobacterium* mediated DNA transfer, electroporation, microinjection 5.4 Liposome fusion, particle gun bombardment - Selection and screening of transformed cells - Expression of cloned gene 5.5 Application of rDNA technology in human welfare – Environment 5.6 Application of rDNA technology -Medicine and Agriculture
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved. (To be discussed during the Tutorial hours)
Recommended Text	1. Brooker, R. J. 2014. Genetics: Analysis and Principles. 5th Edition, McGraw Hill Publisher, pp-880. 2. Russell, P.J. 2005. Genetics: A Molecular Approach (2nd Edition). Pearson/Benjamin Cummings, San Francisco, pp-850.
Reference Books	1.Griffiths, A. J. F., H. J. Muller, D. T. Suzuki, R. C. Lewontin and W. M. Gelbart. 2012. An Introduction to Genetic Analysis. 11th Edition, W. H. Greeman. New York. 2. Snustad, D.P., Simmons, M.J. 2015. Principles of Genetics, John Wiley Publications, pp-784. 3. Watson, J. D., T. A. Baker, S. P. Bell, Alexander Gann, Michael Levine, Richard Losick. 2003. Molecular Biology of the Gene, (5th Edition). Cold Spring Harbor Laboratory Press, pp-912. 4. Klug, W. S. and M. R. Cummings, C. A. Spencer. 2005. Concepts of Genetics, Benjamin - Cummings Publishing Company. 5. Harti, D. L. 2002. Essential Genetics, A Genomic Perspective, Jones & Bartlet. 6. Krebs, J. E., E.S. Goldstein, S.T. Kilpatrick. 2018. Lewin's Genes XII, Jones & Bartlet Publisher, pp-613. 7. Watson, J. D., T. A. Baker S. P. Bell, A. Cann, M. Levine and R. Losick, 2014. Molecular Biology of Gene 7th Edition, Pearson Education RH Ltd. India.
Website and e-learning source	https://www.britannica.com https://www.microscopemaster.com https://ghr.nlm.nih.gov https://www.genetics.org

Course Outcomes:

On completion of the course the student will be able to…

CO1: To understand structure of genetic material DNA & RNA molecules.. (K1, K2, K3, K4, K5)
CO2:. To gain knowledge about Genetic code. (K1, K2, K3, K4, K5)
CO3: To achieve insight of Microbial Genetics. (K1, K2, K3, K4, K5)
CO4: To gain information about rDNA technology. (K1, K2, K3, K4, K5)
CO5: To understand the application of rDNA application. (K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO 3	PSO 4	PSO5	PSO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO 3	PO 4	PO5	PO6
CO1	H	H	H	H	H	H
CO2	H	H	H	M	H	H
CO3	H	M	H	H	H	H
CO4	H	H	H	H	M	H
CO5	H	H	H	H	H	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

Title of the Course	**EVOLUTION**						
Paper No.8	**Core VI**						
Category	**Core**	**Year**	**II**	**Credits**	**4**	**Course Code**	**PCZOH24**
		Semester	**III**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	5	**-**	**-**			**5**	
Objectives of the course	• To comprehend the scientific concepts of animal evolution through an understanding of its evidences, its mechanics, process and products.						
Course Outline	**UNIT I (15 hours)** (K1, K2, K3, K4, K5) 1.1. Emergence of evolutionary thoughts. 1.2. Lamarck and Darwin – concepts of variation, adaptation. 1.3. Struggle, fitness and natural selection. 1.4. Mendelism. 1.5. Spontaneity of mutations. 1.6. The evolutionary synthesis.						
	UNIT II (15 hours) (K1, K2, K3, K4, K5) 2.1. Origin of cells and unicellular evolution-Origin of basic biological molecules. 2.2. Concept of Oparin and Haldane. 2.3. Experiment of Miller (1953). 2.4. The first cell-Evolution of prokaryotes. 2.5. Origin of eukaryotic cells. 2.6. Evolution of unicellular eukaryotes.						
	UNIT III (15 hours) (K1, K2, K3, K4, K5) 3.1. Paleontology and evolutionary history: The evolutionary time scale 3.2. Eras, periods and epoch. 3.3. Major events in the evolutionary time scale. 3.4. Origins of unicellular organisms. 3.5. Origins of multi cellular organisms. 3.6. Stages in evolution -Homo sapiens.						
	UNIT IV (15 hours) (K1, K2, K3, K4, K5) 4.1. Molecular evolution: Molecular divergence 4.2. Molecular tools in phylogeny. 4.3. Classification and identification of molecular tools. 4.4. Protein and nucleotide sequence analysis. 4.5. Origin of new genes and proteins. 4.6. Gene duplication and divergence.						
	UNIT V (15 hours) (K1, K2, K3, K4, K5) 5.1. The mechanisms: Population genetics Populations, Gene pool, Gene frequency. 5.2. Hardy-Weinberg Law - concepts and rate of change in gene frequency through natural selection, migration and random genetic drift. 5.3. Adaptive radiation, Isolating mechanisms. 5.4. Speciation - Allopatricity and Sympatricity. 5.5. Convergent evolution - Sexual selection. 5.6. Co-evolution - Altruism and evolution.						

Extended Professional Component (is a part of internal component only ,not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	1.Strickberger. M. W. 2000. Evolution. Third Edition, Jones Bartlett Publishers, pp-722. 2.Hall B. K. and B. Hallgrimsson. 2014. Strickberger's Evolution. Fifth Edition, Bartlett Learning, An Ascend Learning Company, pp-642. 3.Barton, N.H., D. Briggs, J.A. Eisen David, D.B. Goldstein and N.H. Patel. 2007. Evolution. Cold Spring Harbor Laboratory Press, pp-833.
Reference Books	1.Bergstrom, C. T. and L. A. Dugatkin. 2012. Evolution, Second MEDIA Edition. W.W. Norton & Company, International Student Edition, pp-756. 2.Jobling, M., E. Hollox, M. Hurles, T. Kivisild and C. T. Tyler Smith. 2014. Human Evolutionary Genetics. Second Edition. Garland Sciences, London, pp-650. 3.Veer Bala Rostogi, 2018. Organic Evolution (Evolutionary Biology), Thirteenth Edition Vinoth Kumar Jain, Scientific International (Pvt.) Ltd, New Delhi, pp-590.
Website and e-learning source	https://www.flipkart.com/books/evolution~contributor/pr?sid=bks http://www.evolution-textbook.org/ https://onlinelibrary.wiley.com/journal/15585646 http://darwin-online.org.uk/

Course Outcomes:

On completion of the course, the students should be able to

CO1: To understand the concept of evolution. It provides a comprehensive account of evidences to support concept of evolution and different theories for exploring the mechanism of evolution. (K1, K2, K3, K4, K5)

CO2: Study the origin of eukaryotic cells; Evolution of unicellular eukaryotes; anaerobic metabolism, photosynthesis and aerobic metabolism. (K1, K2, K3, K4, K5)

CO3: Understand the major events in the evolutionary time scale; Origins of unicellular and multi-cellular organisms. (K1, K2, K3, K4, K5)

CO4: Comprehend the origin of new genes and proteins; Gene duplication and divergence. (K1, K2, K3, K4, K5)

CO5: Appreciate the concepts and rate of change in gene frequency through natural selection, migration and random genetic drift. (K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	H	H
CO2	H	M	M	H	H	H
CO3	H	M	M	H	H	H
CO4	H	M	M	H	H	H
CO5	H	M	M	H	H	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">ANIMAL PHYSIOLOGY</td></tr>
<tr><td>Paper No.9</td><td colspan="7">Core VII</td></tr>
<tr><td>Category</td><td>Core</td><td>Year</td><td>II</td><td>Credits</td><td>4</td><td>Course Code</td><td>PCZOI24</td></tr>
<tr><td></td><td></td><td>Semester</td><td>III</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td>5</td><td>1</td><td colspan="3">-</td><td colspan="2">6</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To enable students to understand the Structural and functional aspects of systems, the basic
• To learn enzymes and Gastrointestinal hormones and the functions of hormones in the body.</td></tr>
<tr><td></td><td colspan="7">Unit I 18 Hours - (K1, K2, K3, K4, K5)
1.1 Blood and circulation: Blood corpuscles, haemopoiesis and formed elements
1.2 Plasma function, blood volume, blood volume regulation
1.3 Blood groups, haemoglobin, immunity, haemostasis
1.4 Cardiovascular system: Comparative anatomy of heart structure, myogenic heart, specialized tissue.
1.5 ECG – its principle and significance, cardiac cycle, heart as a pump
1.6 Blood pressure, neural and chemical regulation</td></tr>
<tr><td></td><td colspan="7">Unit II 18 Hours - (K1, K2, K3, K4, K5)
1.1 Respiratory system: Comparison of respiration in different
1.2 Anatomical considerations
1.3 Transport of gases
1.4 Exchange of gases
1.5 Waste elimination-Neural regulation of respiration
1.6 Chemical regulation of respiration</td></tr>
<tr><td></td><td colspan="7">Unit III 18 Hours - (K1, K2, K3, K4, K5)
3.1 Nervous system: Neurons, action potential
3.2 Gross neuro-anatomy of the brain and spinal cord
3.3 Central nervous system
3.4 Peripheral nervous system
3.5 Neural control of muscle tone and posture.
3.6 Sense organs: Vision, hearing and tactile response</td></tr>
<tr><td></td><td colspan="7">Unit IV 18 Hours - (K1, K2, K3, K4, K5)
4.1 Digestive system: Digestion, absorption, energy balance, BMR
4.2 Excretory system: Comparative physiology of excretion, kidney
4.3 Urine formation, urine concentration
4.4 Waste elimination, micturition
4.5 Regulation of water balance, blood volume, blood pressure
4.6 Electrolyte balance, acid-base balance</td></tr>
<tr><td></td><td colspan="7">Unit V 18 Hours - (K1, K2, K3, K4, K5)
5.1 Endocrinology and reproduction: Endocrine glands
5.2 Basic mechanism of hormone action
5.3 Hormones and diseases
5.4 Reproductive processes, gametogenesis, ovulation, neuroendocrine regulation
5.5 Thermoregulation: Comfort zone, body temperature- physical, chemical
5.6 Neural regulation-Acclimatization: Stress and adaptation</td></tr>
</table>

Extended Professional Component(isapart of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved. (To be discussed during the Tutorial hours)

Recommended Text	1. Hoar, W.S. 1999. General and comparative physiology, prentice Hall, New Delhi. 2. Guyton, A. 2001. Textbook of Medical physiology, Tenth Edition, W.B. Saunders, London.
Reference Books	1. Lohar, P.S. 2005. Endocrinology: Hormones Human Health, MJP Publishers Chennai. 2. Elaine N. Marieb, 2006. Human Anatomy and Physiology, Sixth Ed. Dorling Kindersley. (India) Pvt. Ltd. 3. Herkat P.C. and Mathur P.N. 1976. – Textbook of Animal Physiology – S. Chand Co. Pvt. Ltd., New Delhi. 4. Haris G.W. and Donovan B.T., 1968. The Pituitary Gland- S. Chand and Co. 5. Turner, C.D. and Bangara J.T. 1986 General Endocrinology- Saunders International Student Edition, Toppan Company Limited Tokyo, 6. Barrington E.J.W. 1985, An introduction to General and Comparative Endocrinology- Claredon press Oxford.
Website and e-learning source	https://www.physoc.org/explore-physiology https://www.physiology.org https://www.innerbody.com/htm

Course Outcomes:

On completion of the course, the students should be able to

CO1: Attain in-depth knowledge about Blood and circulation (K1, K2, K3, K4, K5)

CO2: Understand respiration and the adaptation at extreme conditions (K1, K2, K3, K4, K5)

CO3: Obtains comprehensive knowledge about the muscular and nervous system function and regulation. (K1, K2, K3, K4, K5)

CO4: Understand the digestive system and interaction of complex metabolic pathway. (K1, K2, K3, K4, K5)

CO5: Obtain knowledge on endocrine system its function and regulation in reproduction (K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO 3	PSO 4	PSO5	PSO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	M	H	H
CO5	H	H	H	H	H	H

Title of the Course	**MEDICAL LABORATORY TECHNIQUES**						
Paper No.10	**Core VIII - Industry Module**						
Category	**Core Course-IX**	**Year**	**II**	**Credits**	**4**	**Course Code**	**PCZOJ24**
		Semester	**III**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	5					**5**	
Objectives of the course	• To understand the protocols and procedures to collect clinical samples for blood analysis and to study human physiology • Acquire knowledge about the characteristics of clinical samples and demonstrate skill in handling clinical equipments. • To comprehend the hematological and histological parameters of biological samples.						
Course Outline	**UNIT I (15 hours) (**K1,K2,K3,K4,K5) 1.1: Laboratory safety. 1.2: Toxic chemicals and biohazards waste- biosafety level. 1.3: Good laboratory practice. 1.4: Hygiene and health issue. 1.5: Physiology effect of alcohol, tobacco, smoking & junk food & its treatn 1.6: Biomedical waste management.						
	UNIT II (15 hours) (K1,K2,K3,K4,K5) 2.1: Composition of blood and their function- collection of blood & lab procedu haemopoiesis. 2.2: Types of anaemia- mechanism of blood coagulation. 2.3: Bleeding time- clotting time. 2.4: Determination of hemoglobin-erythrocyte sedimentations rate- packed cell volume- Total count of RBC & WBC- Differential count WBC- blood grouping typing- haemostasis. 2.5: Bleeding disorder of man - Haemolytic disease of newborn. 2.6: Platelet count, reticulocytes count, Absolute Eosinophil count.						
	UNIT III (15 hours) (K1,K2,K3,K4,K5) 3.1: Definition and scope of microbiology 3.2: Structure and function of cells 3.3: Parasites - Entamoeba- Plasmodium- Leishmania and Trypanosome. 3.4: Computer tomography (CT scan). 3.5: Magnetic Resonance imaging – flowcytometry. 3.6: Treadmill test - PET.						
	UNIT IV (15 hours) (K1,K2,K3,K4,K5) 4.1: Cardiovascular system- Blood pressure – Pulse. 4.2: Regulation of heart rate. 4.3: Cardiac shock. 4.4: Heart sounds. 4.5: Electrocardiogram (ECG) - significance - ultra sonography. 4.6: Electroencephalography (EEG).						

	UNIT V(15 hours) (K1,K2,K3,K4,K5) 5.1: Handling and labeling of histology specimens. 5.2: Tissue processing - processing of histological tissues for paraffin embedding.) 5.3: Block preparation. 5.4: Microtomes – types of microtome- sectioning, staining - staining methods - vital staining – mounting. 5.5: Problems encountered during section cutting and remedies. 5.6: Frozen section techniques- freezing microtome.
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Godker, P. B. and Darshan, P, Godker, 2011. Text book of medical Laboratory Technology, Mumbai. 2. Guyton and Hall, 2000. Text Book of medical Physiology, 10th edition, Elseiner, New Delhi. 3. Mukerjee, K.L, 1999. Medical Laboratory Technology-Vol,I,II,III. Tata MC GrawHill, New Delhi. 4. Sood, R, 2009. Medical Laboratory technology, Methods and interpretation
Reference Books	1. Manoharan,A, and Sethuraman, 2003. Essential of Clinical Heamatology, Jeypee brothers, New Delhi. 2. Richard, A, McPherson, Mathew, R, Pincus, 2007. Clinical and management by laboratory methods, Elsevier, Philadelphia.Published by Tata McGraw-Hill Education Pvt. Ltd., 3. Ochei. J., A. Kolhatkar (2000). Medical Laboratory science: Theory and practice, Published by Tata McGraw-Hill Education Pvt. Ltd, First edition.
Website and e-learning source	https://www.indiaeducation.net https://www.encyclopedia.com https://medicallabtechnicianschool.org

Course Outcomes:

On completion of the course, the students should be ablet o

CO1: Gain knowledge in laboratory practices, hygiene and health issue. (K1, K2, K3, K4, K5)
CO2: Understand about blood composition and basic hematology techniques. (K1, K2, K3, K4, K5)
CO3: Acquire knowledge of pathology of diseases caused by parasites. (K1, K2, K3, K4, K5)
CO4: Attain proficiency in diagnosis techniques of cardiovascular system. (K1, K2, K3, K4, K5)
CO5: Acquire skills to handling and labeling of histology specimens. (K1, K2, K3, K4, K5)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	M	H	H	H	L	M
CO2	M	H	H	H	L	M
CO3	H	M	M	H	M	H
CO4	M	H	H	H	M	H
CO5	M	H	H	H	L	H

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	M	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	L	H

<table>
<tr><td>Title of the Course</td><td colspan="7">LAB COURSE IN PHYSIOLOGY, GENETICS AND EVOLUTION</td></tr>
<tr><td>Paper No.11</td><td colspan="7">Core Practical III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core Practical</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">PCZOK24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td></td><td colspan="3">3</td><td colspan="2">3</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• Practical course aims at demonstrating significant cellular and molecular biological principles,
• Quantitative and analytical approaches that enable the students to translate the theoretical foundation in cell biology, developmental biology, research methodology and entomology into practical understanding.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Physiology
a) Estimation of RQ in Fish with reference to temperature.
b) Salt loss and Salt gain in fish.
c) Study of Human salivary amylase activity in relation to temperature
d) Study of Human salivary amylase activity in relation to pH
e) Oxygen consumption by fish in relation to body weight
f) Estimation of digestive enzyme activity in Cockroach
GENETICS:
a. Giant chromosome - polytene chromosomes 1. Chironomous Larva (Slide),
2. Lampbrush chromosomes - chart
b. Identification of a functional gene in the given nucleotide sequence.
c. Karyotyping using human metaphase chromosome plates: Identification of syndromes: (i) Down (ii) Klinefelter (iii) Turner
d. Study on Inborn errors of metabolism using Chromosomal Charts.
Lipid metabolism - Tay-Sachs and Niemann-Pick
Protein metabolism - PKU and Alkaptonuria
Carbohydrate metabolism - Galactosemia and Pompe’s disease
Evolution:
Spotters/ Charts/ Slides
a) Evolutionary importance of Peripatus, Limulus, Tornaria
b) Adaptations – Arboreal - Squirrel, Fossorial- Rat, Cursorial- Ostrich and Aerial- Bat
c) Cryptic coloration -Leaf and stick insects
d) Batesian mimicry - Monarch and Viceroy butterflies.
e) Study of Paleontological Fossils - Trilobites, Ammonites, Seymouria, Nautilus.</td></tr>
<tr><td colspan="4">Extended Professional Component (is a part of internal component only, not to be included in the external examination
Question paper)</td><td colspan="4">Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/JAM/TNPSCandotherstobesolved
(To be discussed during the Tutorial hours)</td></tr>
</table>

Recommended Text	1. Lal, S.S. 2009. Practical Zoology, Rastogi Publications, pp-484. 2. Iuliis G. D. and D. Pulerà, 2007. The Dissection of Vertebrates: A Laboratory Manual. Academic Press, Imprint of Elsevier Publication, pp-416. 3. Verma, P.S. 2000. Manual of Practical Zoology: Chordates, S. Chand Publishing Company, pp-528 4. Yong, J. Z. 1981. The life of Vertebrates, English language Book society, London, pp-645. 5. Romer, A.S. 1971. The Vertebrate body, W.B.S. Saunders, Philadelphia, pp-600.
Reference Books	1. Preeti, G., and C. Mridula, 2000. Modern Experimental Zoology, Indus International Publication. 2. Sinha, J., A. K. Chatterjeee, P. Chattopadhya. 2011. Advanced Practical Zoology, Arunabha Sen Publishers, pp-1070. 3. Waterman, A.J. 1972. Chordate Structure and Function, MacMillan Co., New York, pp.587. 4. Parker T. J. and W. A. Haswell. 1962. A text book of Zoology, Vol. 2, Vertebrates, 7th Edition, Mac Millan Press, London, pp-750. 5. Ekambaranatha Ayyar and T. N. Ananthakrishnan. 2009. Manual of Zoology, Vol – II, S. Viswanathan Pvt. Ltd. Chennai. 6. Kotpal, 2019. R.L. Modern Text Book of Zoology Vertebrates, 4th Edition, Rastogi Publications, Meerut, pp-968.
Website and e-learning source	https://www.swayamprabha.gov.in/index.php/program/archive/9 http://www.earthlife.net/begin. http://faunaofindia.nic.in https://www.civilserviceindia.com

Course Outcomes:

On completion of the course the student will be able to…

CO1: Analyze physiological parameters. (K1, K2, K3, K4, K5)

CO2:. Identify functional gene in given sequence (K1, K2, K3, K4, K5)

CO3: Describe karyotyping. (K1, K2, K3, K4, K5)

CO4: Identify and explain various inborn errors of metabolism. (K1, K2, K3, K4, K5)

CO5:. Compare the evolutionary significance, mimicry and adaptation in animals (K1, K2, K3, K4, K5)

CO/PSO	**PSO**					
	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	M	H	H
CO5	H	H	H	H	H	H

CO/PO	**PO**					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	M	H

Title of the Course	**ELECTIVE: STEM CELL BIOLOGY**						
Paper No.19 A	**Elective Course - IX**						
Category	**Elective**	**Year**	**II**	**Credits**	**3**	**Course Code**	**PEZOI24**
		Semester	**III**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	3		**-**			**3**	
Objectives of the course	• Understand the basics of stem cells and its applications						
Course Outline	**UNIT I: 9 Hours** (K1, K2, K3, K4, K5) 1.1. Introduction to stem cell biology-Stem cell definition. 1.2. Origin and hierarchy, stem cell properties. 1.3. Identification and Characterization of stem cell. 1.4. Potency and differentiation, niche of stem cell. 1.5. Overview of different stem cell types-embryonic stem cells, adult stem cells. 1.6. Induced pluripotent stem cells.						
	UNIT II: 9 Hours (K1, K2, K3, K4, K5) 2.1. Embryonic stem (ES) cell- Characterization and properties of ES cells. 2.2. Pluripotency and self-renewal of ES cells. 2.3. Molecular mechanisms regulating pluripotency and maintenance of the stem state. 2.4. Progressive differentiation of ES cells into ectoderm lineage organs (skin, brain and nerve) 2.5. Mesoderm lineage organs (heart, kidney, muscle, bone and blood) 2.6. Endoderm lineage organs (lung, liver, stomach, pancreas and intestine).						
	UNIT III: 9 Hours (K1, K2, K3, K4, K5) 3.1. Adult stem cells: Mesenchymal stem cells (MSCS)- Sources and properties (plasticity, homing and engraftment) 3.2. MSCS- potency and characterization 3.3. Haematopoietic stem cells (HSCS) 3.4. HSCS -sources, properties, potency and characterization 3.5. Steps involved in production of induced pluripotent stem cells (IPSCS) 3.6. Role of Yamanaka factor in iPSCs.						
	UNIT IV: 9 Hours (K1, K2, K3, K4, K5) 4.1. Stem cell and aging: aging theory. 4.2. Cell cycle. 4.3. Telomere and telomerase. 4.4. Senescence of stem cell; role of stem cell in aging. 4.5. Tissue repair. 4.6. Regeneration of adult stem cell.						
	UNIT V:9 Hours (K1, K2, K3, K4, K5) 5.1. Current stem cell therapies. 5.2.A dvantages and disadvantages of ES cells. 5.3. Adult stem cells (MSCS and HSCS) therapy. 5.4. Ethical concern on stem cell therapy. 5.5. Current stem cell therapy for various diseases, Clinical outcome of stem cell therapy. 5.6. State of clinical trials in adult stem cells for various diseases.						

Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, fromvariouscompetitiveexaminationsUPSC/JAM/TNPSCandotherstobesolved (To be discussed during the Tutorial hours)

Recommended Text	1. Quesenberry, P.J., G.S. Stein, B. Forget and S. Weissman. 2001. Stem Cell Biology and Gene Therapy, Wiley Publishers, pp-584. 2. Sell, S. and Totowa, N.J. 2004. Stem Cells Handbook, Humana Press, pp-534. 3. Sullivan, S., C. A. Cowan and K. Eggan. 2007. Human Embryonic Stem Cells: The Practical Handbook, Wiley Publishers, pp-424. 4. Battler, A., and Leo, J. 2007. Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, Springer Publication, pp-422.
Reference Books	1.Kiessling, A.A. 2006. Human Embryonic Stem Cells (Second Ed.), Jones & Barlett Publishers. 2.Lanza, R. and A. Atala. 2005. Essentials of Stem Cell Biology. Academic Press, pp-712. 3.Turksen, K. 2004. Adult Stem Cells. Humana Press, Inc, pp-429. 4.Lanza, R. et al. 2004. Handbook of Stem Cells: Embryonic/Adult and Fetal Stem Cells (Vol. 1 & 2). Academic Press, pp-1626. 5.Institute of Medicine, 2002. Stem cells and the future of regenerative medicine. National Academy Press, pp-112. 6.Marshak, D., R.L. Gardener and D. Gottlieb. 2001. Stem Cell Biology, Cold Spring Harbour Monograph Series, 40, pp-550. 7.Booth, C. 2003. Stem Cell Biology and Gene Therapy, Cell Biology International, Academic Press.

Course Outcomes:

On completion of the course, the students should be able to

CO1: Understand the basic knowledge of stem cells and their origin. (K1, K2, K3, K4, K5)

CO2: Differentiating the embryonic and adult stem cells. (K1, K2, K3, K4, K5)

CO3: Differentiating the Mesenchymal and Haematopoietic stem cells. (K1, K2, K3, K4, K5)

CO4: Comprehensive understanding of aging, repair and regeneration of stem cells. (K1, K2, K3, K4, K5)

CO5: Understand and apply the current stem cell therapies for their research. (K1, K2, K3, K4, K5).

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	H	H
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	M	H	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	H	H
CO5	H	M	H	H	H	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

Title of the Course	**ELECTIVE: BIOPHYSICS**						
Paper No.19 B	**- Elective Course X**						
Category	**Core**	**Year**	**II**	**Credits**	**3**	**Course Code**	**PEZOJ24**
		Semester	**III**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	3	**-**	**-**			**3**	
Objectives of the course	• To impart knowledge on the basic principles of biophysics. • To employ different advanced Methodologies in Research.						
Course Outline	**UNIT I (K1, K2, K3, K4 & K5)** 1.1: Basic concepts of Biophysics- Atoms, Atoms and elements. 1.2: Molecules and Components. 1.3: Structure of Atoms, Isotopes, Hydrogen Ion Concentration. 1.4: Mole and Mole Concept. 1.5: Normality, Buffers, Stability. 1.6: Redox potential and examples of Redox potential in biological systems.						
	UNIT II (K1, K2, K3, K4 & K5) 2.1: Thermodynamics of biological system- First and Second Law of Thermodynamics. 2.2: Activation energy biological system as open non equilibrium system. 2.3: Concepts of energy unavailable energy. 2.4: Entropy. 2.5: Enthalpy, Negative Entropy. 2.6: Application of biological system thermodynamics of active and passive transport						
	UNIT III (K1, K2, K3, K4 & K5) 3.1: Membrane Conductivity- Active Transport Mechanism. 3.2: Factors-Biological Significance- Characterization. 3.3: Biological Importance. 3.4: Techniques used in Diffusion, Osmosis, Emulsions. 3.5: Colloids, Dialysis. 3.6: Velocity and Surface Tension.						
	UNIT IV (K1, K2, K3, K4 & K5) 4.1: Principle and application of sensors. 4.2: Laser beam in Biomedical field –applications of Lasers in therapies and diagnosis. 4.3: Magnetic Resonance Imaging (MRI), Computer Topography (CT) scan. 4.4: Ultrasound in interaction with tissues and application in therapeutics. Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyograph (EMG). 4.5: Flow Cytometry and Cell Sorting. 4.6: Autoradiography –types and techniques used and Evaluation of radiogram.						
	UNIT V (K1, K2, K3, K4 & K5) 5.1: Chromatography-Adsorption, Partition, Principle, Experimental set up, Methodology and Applications of Gel-Permeation Chromatography. 5.2: Gas Liquid Chromatography.						

	5.3: Electrophoresis principle, factors affecting the migration of substances and supporting media immune electrophoresis. 5.4: Slab Gel electrophoresis. 5.5: Spectroscopy –Atomic Emission Spectroscopy, Atomic Absorption Spectroscopy. 5.6: Electron Spin Spectroscopy.
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	D.A. Skoog *et.al.*, Principles of Instrumental Analysis., 5th edition Saunders College Publication,1998. Daniel M. Basic Biophysics for Biologist Agro Botanical Publishers India 1989.
ReferenceBooks	De Robertis E.D.P and De Robertis E.M.F Cell and Molecular biology VIII Edition Lippincott Williams and Wilkins Philadelphia 2006. Khandpur R.S. Handbook of Biomedical Instrumentation, McGraw Hill Publishing Co.Ltd.2003. Kudesia V.P., Sawhey S.S Instrumental Method of Chemical Analysis Pragathi Prakashan Meerut. Palanichamy S and Shunmugavelu M Principles of Biophysics Palani Paramount Publication 1996. Subramanian M A Biophysics Principles and Techniques MJP Publishers Chennai. Thiravia Raj Biophysics Biophysics Saras Publication 1995. Vatsala Piramal Biophysics Dominant Publishers and Distributors 2006.
Website and e-learning source	https://bioeng.berkeley.edu https://www.vanderbilt.edu https://worldwidescience.org

Course Outcomes:

On completion of the course, the students should be able to

CO1: Recall the basic concepts of Biophysics. **(K1, K2, K3, K4 & K5)**

CO2: Describe and apply the law of thermodynamics of the biological system and concepts of energy **(K1, K2, K3, K4 & K5)**

CO3: Explain the membrane conductivity and transport. **(K1, K2, K3, K4 & K5)**

CO4: Explain the principle techniques and application of lasers in biomedical field. **(K1- K5)**

CO5: Discuss the working principle, instrumentation and applications of bio-analytical instruments. **(K1, K2, K3, K4 & K5)**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	H	M	L	M
CO2	H	H	H	L	M	H
CO3	H	H	H	M	L	M
CO4	H	H	M	H	M	H
CO5	H	H	H	M	L	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	L	H	M	H
CO2	H	H	M	H	L	H
CO3	H	H	H	H	L	H
CO4	H	H	M	H	M	H
CO5	H	H	M	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="8">SEC: DIARY FARMING</td></tr>
<tr><td>Paper No.22</td><td colspan="8">SKILL ENHANCEMENT COURSE- II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">PSZO224</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>2</td><td></td><td colspan="3">-</td><td colspan="3">2</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To enlighten the students with various practices in Dairy farming, status of India in global market.</td></tr>
<tr><td>Course Outline</td><td colspan="8">UNIT I (6 hours) (K1, K2, K3, K4, K5)
1.1: Introduction to Dairy Farming, Advantages of dairying
1.2: Classification of breeds of cattle-Indigenous and exotic breeds
1.3: Selection of dairy cattle. Breeding-artificial insemination
1.4: Dairy cattle management
1.5: General Anatomy</td></tr>
<tr><td></td><td colspan="8">Unit 2: (6 hours) (K1, K2, K3, K4, K5, K6)
2.1: Construction of Model Dairy House
2.2: Types of Housing
2.3: Different Managemental Parameters
2.4: Winter Management
2.5: Summer Management</td></tr>
<tr><td></td><td colspan="8">Unit 3: (6 hours) (K1, K2, K3, K4, K5, K6)
3.1: Feedstuffs available for livestock- Roughages -Concentrates - Energy rich concentrates.
3.2: Protein rich concentrates - Mineral Supplements - Vitamin Supplements
3.3: Feed additives
3.4: Feeding management - Calves Feeding
3.5: Feeding of adults - Feeding of pregnant dairy animals - Feeding pregnant heifer.</td></tr>
<tr><td></td><td colspan="8">Unit 4: (6 hours) (K1, K2, K3, K4, K5, K6)
4.1: Milk-Composition of milk.
4.2: Milk spoilage.
4.3: Pasteurization.
4.4: Role of milk and milk products in human nutrition
4.5: Dairying as a source of additional income and employment.</td></tr>
<tr><td></td><td colspan="8">Unit 5:(6 hours) (K1, K2, K3, K4, K5, K6)
5.1: Contagious disease - Common Bacterial – Protozoal Diseases.
5.2: Helminth and Viral Diseases.
5.3: Parasitic Infestation.
5.4: Vaccination.
5.5: Biosecurity.</td></tr>
<tr><td colspan="4">Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination
question paper)</td><td colspan="5">Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved
(To be discussed during the Tutorial hours)</td></tr>
</table>

Recommended Text	1.The Veterinary Books for Dairy Farmers by Roger W. Blowey. 2. Hand Book of Dairy Farming by Board Eiri. 3. Handbook of animal husbandry TATA, S.N ed., ICAR 1990 4. Prabakaran, R. 1998. Commercial Chicken production. Published by P. Saranya, Chennai. 5. Hafez, E. S. E., 1962. Reproduction in Farm Animals, Lea & Fabiger Publisher.
Reference Books	1. James. N. Marner, 1975. Principles of dairy processing, wiley eastern limited, New Delhi. 2. Baradach, JE. Ryther. JH. and, MC larney WO., 1972. Aquaculture. The farming and Husbandry of Freshwater and Marine Organisms. Wiley InterScience, NewYork.
Website and e-learning source	https://agritech.tnau.ac.in/farm_enterprises/Farm%20enterprises_%20Dairy%20unit.html. https://www.google.co.in/search?tbo=p&tbm=bks&q=inauthor:%22Tata,+S.N.,+ed%22

Course Outcomes:

On completion of the course, the students should be able to

CO1: Discuss various practices in Dairy farming .(K1, K2, K3, K4, K5)

CO2 : Discuss needs for Dairy farming (K1, K2, K3, K4, K5)

CO3: Explain techniques and practices needed for Dairy farming.(K1, K2, K3, K4, K5)

CO4: Discuss difficulties in Dairy farming and be able to propose plans against it.(K1, K2, K3, K4, K5)

CO5 : Explain status of India in global market.(K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	L	L	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	L	H
CO5	H	H	H	L	L	H
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	H	L	H	H	M	H
CO2	H	L	H	H	M	H
CO3	H	L	H	H	M	H
CO4	H	L	H	H	M	H
CO5	H	L	H	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="8">INTERNSHIP</td></tr>
<tr><td>Paper No.24</td><td colspan="8">SUMMER INTERNSHIP (Carried out in I Year Summer Vacation)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Internship</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">PIZO24</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td>-</td><td>-</td><td colspan="3">-</td><td colspan="3">-</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">• To explore alternatives prior to graduation.
• To integrate theory and practice.
• To develop work habits and attitudes necessary for work environment.
• To build a record of work experience.</td></tr>
<tr><td>Course Outline</td><td colspan="8">Each student shall be required to prepare the report based on training undergone by her. The report should demonstrate the capability of the students in studying and performing activities in totality.</td></tr>
<tr><td></td><td colspan="8">Evaluation Pattern
● Each student should undergo the training separately.
● The mode of evaluating the student will consist of two parts. One on the basis of report writing and the other will be through Viva Voce. The valuation will be by the internal examiner
● 60 marks will be awarded for report writing and 40 marks for overall review
● Each student should find a reputed place to carry out her investigation with the approval of the department.
● After completing her training, the student should get an Attendance Certificate from the institution.</td></tr>
<tr><td colspan="9">Course Outcomes:

On completion of the course, the students should be able to

CO1. Identify work in the Life science field. (K1, K2, K3, K4, K5, K6)
CO 2. Develop communication, interpersonal and other critical skills for employability. (K1, K2, K3, K4, K5, K6)
CO 3. Realize the importance of professionalism in the workplace. (K1, K2, K3, K4, K5, K6)
CO 4. Gain ethical experience in organizational culture. (K1, K2, K3, K4, K5, K6)
CO 5. Ability to identify the diverse needs and global issues for sustainable growth.(K1, K2, K3, K4, K5, K6)</td></tr>
</table>

<table>
<tr><td>Title of the Course</td><td colspan="7">IMMUNOLOGY</td></tr>
<tr><td>Paper No.12</td><td colspan="7">Core IX</td></tr>
<tr><td>Category</td><td>Core</td><td>Year
Semester</td><td>II
IV</td><td>Credits</td><td>4</td><td>Course Code</td><td>PCZOL24</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>4</td><td>1</td><td colspan="3">-</td><td colspan="2">5</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To understand the importance of cells in immune system.
• To understand the application of immunology in the treatment of diseases</td></tr>
<tr><td></td><td colspan="7">UNIT I (15 hours) (K1, K2, K3, K4, K5)
1.1 Introduction to Immunology: An overview; Scope of immunology, recognition of self and non-self as a basic functional feature of immune system
1.2 Concepts of external and internal defense systems; External (first line / innate) defense system: components, distribution, salient functions
1.3 Internal (second line / acquired) immune system: Cellular and humoral immune components- distribution, salient functions-primary and secondary immune responses
1.4 Immune tissues / organs: types, anatomical location, structure and development
1.5 Lymphocyte traffic during development; Types of immunity: innate and acquired – Types, functional features
1.6 Concept of adaptive immunity</td></tr>
<tr><td></td><td colspan="7">UNIT II (15 hours) (K1, K2, K3, K4, K5)
2.1 Antigens: Definition Characteristic features
2.2 Antigens classification
2.3 Antigenicity versus immunogenicity
2.4 Adjuvants
2.5 Adjuvants: types
2.6 Adjuvants applications</td></tr>
<tr><td></td><td colspan="7">UNIT III (15 hours) (K1, K2, K3, K4, K5)
3.1 Major effector components of cellular immune system: Lymphocytes - types, morphology, clones
3.2 Sub-populations, distribution, B and T cell receptors,B and T cell epitopes
3.3 Toll-like receptors
3.4 Antigen presenting cells: antigen processing and presentation
3.5 MHC molecules
3.6 MHC Immunologic significance</td></tr>
</table>

	UNIT IV (15 hours) (K1, K2, K3, K4, K5) 4.1 Major effector components of humoral immune system: Antibodies - Primary structure, classification, variants and antigen-antibody interactions 4.2 Monoclonal antibodies: definition, production and applications; Antibody engineering and its applications 4.3 Complement system - Components, three major activation pathways 4.4 Immune functions including anaphylaxis and inflammation 4.5 Cytokines - Definition and salient functional features, Interleukins: definition, types (lymphokines and monokines), and functions 4.6 Interferons - Origin, types and functions
	UNIT V (15 hours) (K1, K2, K3, K4, K5) 5.1 Diseases and immune responses: Hypersensitivity: definition, Types I to IV and immune manifestations) 5.2 Auto-immune diseases: onset, spectrum of diseases, and major immune responses 5.3 Immunodeficiency diseases: types including SCID and consequences 5.4 Viral (HIV), bacterial (tuberculosis) 5.5 Parasitic (malaria) diseases: etiology, host immune responses and evasion by pathogens. 5.6 Vaccines: types, preparations, efficacies and recent developments.
Extended Professional Component(isapart of internal component only, not to be included in the external examination Question paper)	Questions related to the above topics, from various competitive examinations UPSC/JAM/TNPSC and others to be solved. (To be discussed during the Tutorial hours)
Recommended Text	1.Kuby, J. 1997. Immunology. W. H. Freeman & Co., New York, pp-670. 2. Male, D. J. Brostoff, D. B. Roth and I. Roitt. 2006. Immunology (7^{th} edition), Mosby / Elsevier, Philadelphia, pp-472 3. Abbas, A. K and A. H. Lichtman. 2007. Cellular and Molecular Immunology (6^{th} edition), W. B. Saunders, Philadelphia, pp-564. 4. Coica, R. Sunshine, G. 2015. Immunology (Seventh Edition), Wiley Blackwell, UK, pp-406.
Reference Books	1. Ebert J.D. 1970 - Interacting Systems - Holt Reinhart and Winston, Inc., New York and Chicago. 2.Grant P. 1978 - Biology of Developing Systems - Holt Reinhart and Winston, Inc., New York and Chicago. 3. Saunders J.W. 1982 - Developmental Biology - McMillan Co., London. 4. Nagabhushanam R., Sarojini R., 2002 - Invertebrate Embryology - Oxford IBA Publishing Co. 5. Tyagi Rajiv and Shukla A.N., 2002 - Development of Fishes - Jaya Publishing House, New Delhi. 6. Gibert Scott F. 2003 - Developmental Biology - Sinamer Associates Inc Saunderland Massachusets, U.S.A.

	7. Oppenheimer S.B. 1980 - Introduction to Embryonic Development - Allyn and Bacon, Inc., U.S.A. 8. Richard A. Goldsby Thomas Kindt T., Barbara A Osborne, 2000 - Kuby Immunology – Freeman
Website and e-learning source	https://embryology.med.unsw.edu.au http://www.embryology.ch https://www.immunology.org https://www.ncbi.nlm.nih.gov

Course Outcomes:

On completion of the course, the students should be ablet o

CO1: Obtain knowledge about defense systems (K1, K2, K3, K4, K5)

CO2: Attain knowledge about Antigen applications (K1, K2, K3, K4, K5)

CO3: Understand the various forms of components of cellular immune system. (K1, K2, K3, K4, K5)

CO4: Obtain knowledge about Antibodies and immune response. (K1, K2, K3, K4, K5)

CO5: Understand the importance immune responses in various diseases. (K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO 3	PSO 4	PSO5	PSO6
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H

CO/PO	PO					
	PO1	PO2	PO 3	PO 4	PO5	PO6
CO1	H	H	H	H	H	M
CO2	H	H	H	H	H	H
CO3	H	H	H	H	H	H
CO4	H	H	H	H	H	H
CO5	H	H	H	H	H	H
H-HIGH (3): M-MODERATE (2): L-LOW-(1)						

Title of the Course	**ECOLOGY**						
Paper No.13	**Core Course X**						
Category	**Core**	**Year**	**II**	**Credits**	**4**	**Course Code**	**PCZOM24**
		Semester	**IV**				
Instructional hours per week	**Lecture**	**Tutorial**	**Lab Practice**			**Total**	
	4	**1**	**-**			**5**	
Objectives of the course	• To enlighten the students with adequate knowledge about ecosystem, various community and population, solid waste management.						
Course Outline	**Unit 1: (15 hours)** (K1,K2,K3,K4,K5) 1.1: The Environment: Physical environment; biotic environment. 1.2: Biotic and abiotic interactions. 1.3: Habitat and niche: Concept of habitat and niche; niche width and overlap. 1.4: Fundamental and realized niche. 1.5 Resource partitioning. 1.6: Character displacement.						
	Unit 2: (15 hours) (K1,K2,K3,K4,K5) 2.1: Population ecology: Characteristics of a population; population growth curves 2.2:Population regulation. 2.3: Life history strategies (*r* and *K* selection) 2.4: Concept of metapopulation-demes and dispersal, interdemic extinctions. 2.5: Age structured populations. 2.6: Action taken to control population explosion.						
	Unit 3: (15 hours) (K1,K2,K3,K4,K5) 3.1: Species interactions: Types of interactions, interspecific competition. 3.2: Herbivory, carnivory, pollination, symbiosis. 3.3: Community ecology: Nature of communities 3.4:Community structure and attributes. 3.5: Levels of species diversity and its measurement; edges and ecotones. 3.6: Ecological succession: Types; mechanisms; changes involved in succession; concept of climax.						
	Unit 4: (15 hours) (K1,K2,K3,K4,K5) 4.1: Ecosystem: Structure and function. 4.2: Energy flow and mineral cycling (CNP) 4.3: Primary production and decomposition. 4.4: Structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). 4.5: Biogeography: Major terrestrial biomes; theory of island biogeography. 4.6: Biogeographical zones of India.						

	Unit 5: (15 hours) (K1,K2,K3,K4,K5) 5.1: Applied ecology: Environmental pollution. 5.2: Global environmental change; biodiversity-status. 5.3: Monitoring and documentation; major drivers of biodiversity change. 5.4: Biodiversity management approaches - Waste management. 5.5: Conservation biology: Principles of conservation, major approaches to management. 5.6: Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Sharma, P.D. 2009. Ecology and Environment, Rastogi Publication, India, pp-616. **2.** Calabrese, E.J. 1978. Pollutants and High-Risk Groups, John Wiley, pp-286. 3. Raven, P.H. and L.R. Berg, G.B. Johnson, 1993. Environment, Saunders College Publishing, pp-579. 4. Cunningham, W. P. and B. W. Saigo, 1999. Environmental Science, McGraw Hill Boston, 5th Edition. 5. Online courses.nptel.ac.in / noc 19 - g e 23/preview 6. Class central.com/course/swayam -ecology - and environment – 14021.
ReferenceBooks	1. Odum, E.P. 1893. Basic Ecology, Saunders & Co., Philadelphia, pp-383. 2. Barthwl, R.R. 2002. Environmental Impact Assessment, New Age International Publishers, New Delhi, India, pp-425. 3. United Nations Environment Programme (UNEP). 1995. Global Biodiversity Assessment, Cambridge University Press, pp-1140.
Website and e-learning source	https://www.quora.com https://environmentalandecology.com https://ecologyandsociety.org https://academic.oup.com

Course Outcomes:

On completion of the course, the students should be able to

CO1: Explain ecosystem, biotic communities and utilizing the energy processing(K1,K2,K3,K4,K5)

CO2: Discuss various community and population and population control(K1,K2,K3,K4,K5)

CO3: Explain fundamentals of climatic conditions and its impact on environment(K1,K2,K3,K4,K5)

CO4: Explain nature of pollution and the ways for its control/reduction(K1,K2,K3,K4,K5)

CO5: Discuss Impact of environmental studies on solid waste management (K1,K2,K3,K4,K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	L	L	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	L	H
CO5	H	H	H	L	L	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	H	L	H	H	M	H
CO3	H	L	H	H	M	H
CO4	H	L	H	H	M	H
CO5	H	L	H	H	M	H
H-HIGH (3): M-MODERATE (2): L-LOW-(1)						

<table>
<tr><td>Title of the Course</td><td colspan="7">LAB COURSE IN ECOLOGY, IMMUNOLOGY AND ANIMAL BEHAVIOUR</td></tr>
<tr><td>Paper No.14</td><td colspan="7">Core Practical IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core Practical</td><td>Year</td><td>III</td><td>Credits</td><td>3</td><td>Course Code</td><td>PCZON24</td></tr>
<tr><td>Semester</td><td>IV</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td></td><td></td><td colspan="3">3</td><td colspan="2">3</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• Practical course aims at demonstrating significant cellular and molecular biological principles,
• Quantitative and analytical approaches that enable the students to translate the theoretical foundation in cell biology, developmental biology, research methodology and entomology into practical understanding.</td></tr>
<tr><td>Course Outline</td><td colspan="7">I. ENVIRONMENTAL BIOLOGY

1. Estimation:
a) Estimation of dissolved Oxygen
b) Estimation of CO_2
c) Estimation of Salinity
d) Estimation of Carbonates and Bicarbonates
e) Estimation of Chromium
f) Estimation of Nitrites

2. Study of different fauna with special reference to the adaptations:
a) Study of Sandy shore fauna
b) Study of Muddy shore fauna
c) Study of Rocky shore fauna

4. Visit to water treatment plant.

II. IMMUNOLOGY:
a) Immunoelectrophoresis – chart
b) Immunodiffusion - chart
c) Antigen and Antibody reaction – ABO Blood grouping
d) Differential count of WBC
e) Pregnancy test

III. ANIMAL BEHAVIOUR:
1.Animal Association
a.) Parasitism
i) Ectoparasites – Ticks, Mites
ii) Endoparasites – Taenia solium, Ascaris lumbricoides
b.) Mutualism – Termites and Trichonympha, Sea Anemone and Hermit Crab
c) Commensalisms – Shark and Echeneis, Whale and Barnacles</td></tr>
</table>

	2.A)Parental Care in Fish – Hippocampus, Male ring- tailed Cardinals, Gouramis B) Parental Care in Amphibians – Midwife toad, Icthyophis, Marsupial frog.
Extended Professional Component (is a part of internal component only, not to be included in the external examination Question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/JAM/TNPSCandotherstobesolved (To be discussed during the Tutorial hours)
Recommended Text	1. Lal, S.S. 2009. Practical Zoology, Rastogi Publications, pp-484. 2. Iuliis G. D. and D. Pulerà, 2007. The Dissection of Vertebrates: A Laboratory Manual. Academic Press, Imprint of Elsevier Publication, pp-416. 3. Verma, P.S. 2000. Manual of Practical Zoology: Chordates, S. Chand Publishing Company, pp-528 4. Yong, J. Z. 1981. The life of Vertebrates, English language Book society, London, pp-645. 5. Romer, A.S. 1971. The Vertebrate body, W.B.S. Saunders, Philadelphia, pp-600.
Reference Books	1. Preeti, G., and C. Mridula, 2000. Modern Experimental Zoology, Indus International Publication. 2. Sinha, J., A. K. Chatterjeee, P. Chattopadhya. 2011. Advanced Practical Zoology, Arunabha Sen Publishers, pp-1070. 3. Waterman, A.J. 1972. Chordate Structure and Function, MacMillan Co., New York, pp.587. 4. Parker T. J. and W. A. Haswell. 1962. A text book of Zoology, Vol. 2, Vertebrates, 7th Edition, Mac Millan Press, London, pp-750. 5. Ekambaranatha Ayyar and T. N. Ananthakrishnan. 2009. Manual of Zoology, Vol – II, S. Viswanathan Pvt. Ltd. Chennai. 6. Kotpal, 2019. R.L. Modern Text Book of Zoology Vertebrates, 4th Edition, Rastogi Publications, Meerut, pp-968.
Website and e-learning source	https://www.swayamprabha.gov.in/index.php/program/archive/9 http://www.earthlife.net/begin. http://faunaofindia.nic.in https://www.civilserviceindia.com

Course Outcomes:

On completion of the course the student will be able to…

CO1: Perform practical procedures in ecology. (K1, K2, K3, K4, K5)

CO2:. Describe the adaptive features of animals with reference to their habitat (K1, K2, K3, K4, K5)

CO3: Discuss water treatment through water treatment plant visits. (K1, K2, K3, K4, K5)

CO4: Explain immunological importance of WBC and principle on antigen antibody reaction in ABO grouping. (K1, K2, K3, K4, K5)

CO5:. Discuss animal association and parental care .(K1, K2, K3, K4, K5)

CO/PSO	PSO					
	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	H	H	H	M	M
CO2	H	H	H	H	M	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	H	M
CO5	H	M	H	H	H	M

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	H	M	H
CO2	H	H	H	H	M	M
CO3	H	H	H	H	L	M
CO4	H	H	H	H	H	M
CO5	H	H	H	H	M	M

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">PROJECT</td></tr>
<tr><td>Paper No.30</td><td colspan="7">PROJECT WITH VIVA VOCE</td></tr>
<tr><td>Category</td><td>Project</td><td>Year
Semester</td><td>II
IV</td><td>Credits</td><td>7</td><td>Course Code</td><td>PCZOO24</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture
-</td><td>Tutorial
-</td><td colspan="3">Lab Practice
-</td><td colspan="2">Total
10</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To explore alternatives prior to graduation.
• To integrate theory and practice.
• To develop work habits and attitudes necessary for research environment.
• To build a record of research experience.</td></tr>
<tr><td>Course Outline</td><td colspan="7">Each student shall be required to do a project and prepare the report on the basis of the investigation carried out by her in an institution / research centers or organization.
The student is expected to identify a problem based on her area of interest and provide solutions and suggestions.
The report should demonstrate the capability of the students in analysing and evaluating the problem and to create original approach in providing solutions to the problem. Viva-Voce Examinations will be conducted on the basis of the report and presentation.
Each student shall be required to prepare the report, that demonstrate the capability of the students in studying and performing activities in totality.</td></tr>
<tr><td></td><td colspan="7">EVALUATION PATTERN
• Each student should undergo the training separately.
• The mode of evaluating the student will consist of two parts. One on the basis of the report writing and the other will be through Viva-Voce.
• The valuation of the report writing will be done by the Internal Examiner while for the oral i.e. Viva-Voce Examination an External Examiner will be called for.
• 60 marks will be awarded for the report writing and 40 marks for the Oral (Viva Voce) Examination.</td></tr>
<tr><td colspan="8">Course Outcomes:

On completion of the course, the students should be able to

CO1. Identify work in the Life science field. (K1, K2, K3, K4, K5, K6)
CO 2. Develop communication, interpersonal and other critical skills for employability. (K1, K2, K3, K4, K5, K6)
CO 3. Realize the importance of professionalism in the research institutions. (K1, K2, K3, K4, K5, K6)
CO 4. Gain ethical experience in Research culture. (K1, K2, K3, K4, K5, K6)
CO 5. Ability to identify the diverse needs and global issues for sustainable growth. (K1, K2, K3, K4, K5, K6)</td></tr>
</table>

<table>
<tr><td>Title of the Course</td><td colspan="7">ELECTIVE: AQUACULTURE</td></tr>
<tr><td>Paper No.20 A</td><td colspan="7">ELECTIVE COURSE - XI</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOK24</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td rowspan="2">Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="2">Total</td></tr>
<tr><td>3</td><td></td><td colspan="3"></td><td colspan="2">3</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">Students will understand the basic concepts in Aquaculture.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (9 hours) (K1, K2, K3 & K4)
1.1 Importance of aquaculture- Present status, prospects and scope in India.
1.2 1.2 Freshwater aquaculture- Brackishwater aquaculture- Mariculture - Metahaline culture in India.
1.3 Types of fish culture -Types of fish ponds for culture practice. Topography, site selection - water quality - soil condition and quality –
1.4 Structure and construction design and layout - inlet and outlet. Water quality management for aquaculture.
1.5 Control of parasites, predators and weeds in culture ponds.
1.6 Fish farm implements - Secchi disc - aerator - pH meter - tools for hypophysation - feeding trays – Fishing gears used in aqua farming.</td></tr>
<tr><td></td><td colspan="7">UNIT II (9 hours) (K1, K2, K3 & K4)
2.1 Procurement of seed from natural resources- collection methods and Segregation.
2.2 Hatchery technology for major carps and freshwater prawn.
2.3 Artificial seed production - Breeding under control conditions, induced breeding technique, larval rearing, packing and transportation
2.4 Commercial substitute for pituitary extracts.
2.5 Classification of fish feed- Artificial feed Types, Feed - formulation - Feeding methods.
2.6 Live feed- Microalgae, Rotifer, Artemia and their culture.</td></tr>
<tr><td></td><td colspan="7">UNIT III (9 hours) (K1, K2, K3 & K4)
3.1.Shrimp hatchery technology - Hatchery design, brood stock management, spawning, larval rearing, Shrimp developmental stages, algal culture, Packing and transportation.
3.2. Shrimp culture technology - extensive culture methods semi- intensive – Intensive culture methods - Biofloc technology.
3.3 Culture operations (water quality, feed and health management) - harvesting, preservation and marketing.

3.4. Brackish water fish culture. Edible and Pearl oyster culture - pearl production.
3.5. Crab culture. Economic importance of Lobster, Sea urchin and Sea cucumber - their by-products.
3.6 Types of Seaweeds - species and methods of culture – by-products</td></tr>
</table>

	UNIT IV (9 hours) (K1, K2, K3 & K4) 4.1 Fish and Shrimp diseases and health management – infectious diseases. 4.2. Bacterial, Fungal, Viral, Protozoan 4.3 Non-infectious - environmental 4.4. Nutritional diseases. 4.5. Diseases diagnosis, prevention, and control measures. 4.6. Central aquaculture research organizations- CMFRI, CIBA, CIFT, CIFA, CIFE, MPEDA and its activities.
	UNIT IV (9 hours) (K1, K2, K3 & K4) 5.1. Types of ornamental freshwater fishes 5.2. Types of ornamental marine fishes 5.3. Breeding behavior and biology, Oviparous, Ovo-viviparous 5.4. Breeding behavior and biology Viviparous fishes. 5.5. Setting and maintenance of freshwater Aquarium tanks. 5.6 Setting and maintenance of marine Aquarium tanks.
Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)
Recommended Text	1. Das M. C. and Patnaik, P. N. (1994) Brackish water culture. Palani paramount Publications, Palani, T. N. 2. Day, F (1958). Fishes of India , VoL I and Vol. II. William Sawson and Sons Ltd., London. 3. Jhingran, V. G. (1991). Fish and Fisheries of India. Hindustan Publishing Co., India 4. Maheswari. K. (1983) Common fish disease and their control. Institute of Fisheries Education, Powarkads (M.P).
ReferenceBooks	1. Pillay, T. V. R. (1990). Aquaculture: Principles and Practices. Blackwell Scientific Publications Ltd. 2. Santhanam, R. (1990). Fisheries Science. Daya Publishing House. 3. Sinha, V.R. P. and Srinivastava, H. C. (1991). Aquaculture Productivity. Oxford and IBH Publications CO., Ltd., New Delhi. 4. Yadav, B. N. (1997). Fish and fisheries.Daya Publishing house, New Delhi.
Website and e-learning source	http://www.cifa.nic.in http://agritech.tnau.ac.in http://aquaculturetraining.com.au http://www.oftri.org https://aimlta.org https://www.mccc.edu https://researchguides.austincc.edu

Course Outcomes:

On completion of the course, the students should be able to

CO1: Acquire knowledge on the fish farm practices and maintenance. (K1, K2, K3, K4,K5)

CO2: Obtain knowledge about different hatchery methods, culture of Prawn and various feeds (K1, K2, K3, K4, K5)

CO3: Gains knowledge about culture of Shrimp, Crab and types of sea weeds. (K1, K2, K3, K4, K5)

CO4: Identifies the different fishes diseases, diagnosis and their management strategies. Understands Ornamental fishes and central aquaculture organizations (K1, K2, K3, K4, K5)

CO5: Acquires knowledge about the breeding biology of fishes.(K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	L	L	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	L	H
CO5	H	H	H	L	L	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	H	L	H	H	M	H
CO3	H	L	H	H	M	H
CO4	H	L	H	H	M	H
CO5	H	L	H	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">GENERAL PSYCHOLOGY</td></tr>
<tr><td>Paper No.20B</td><td colspan="7">Elective Course XII</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">PEZOL24</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>3</td><td>-</td><td colspan="3">-</td><td>3</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">• To understand, predict and control behavior.
• To learn the causes of abnormal behavior.
• To minimize the intensity of real-life problems</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I (K1, K2, K3, K4 & K5)
1.1: Psychology -Meaning- Scope.
1.2: Branches.
1.3: Application of Psychology in Family.
1.4: Education, Health, Self-Development.
1.5: Research in Psychology, Research Challenges.
1.6: States of Consciousness.</td></tr>
<tr><td></td><td colspan="7">UNIT II (K1, K2, K3, K4 & K5)
2.1: The Concept of Self.
2.2: Personality – Definition- Structure of personality.
2.3: Dynamic Nature of Personality
2.4: Personality development- Theories of Personality.
2.5: Psychoanalytic Method.
2.6: Personality Evaluation</td></tr>
<tr><td></td><td colspan="7">UNIT III (K1, K2, K3, K4 & K5)
3.1: Social Psychology – Aim – Scope- Methods.
3.2: Nature and Need of Social Behavior.
3.3: Sequence of social development- Infancy, Childhood.
3.4: Social Maturity, Social Norm.
3.5: Role and Status- Social Interaction.
3.6: Socialization.</td></tr>
<tr><td></td><td colspan="7">UNIT IV (K1, K2, K3, K4 & K5)
4.1: Psychopathology- Abnormal Behavior.
4.2: Models- Diagnosing and Classifying Disorders.
4.3: Neuroses- Psychoses- Schizophrenia.
4.4: Personality Disorders.
4.5: Prevalence of Mental Disorders.
4.6: Anxiety Disorder.</td></tr>
<tr><td></td><td colspan="7">UNIT V (K1, K2, K3, K4 & K5)
5.1: Forensic Psychology- Family Court- Civil Court- Criminal Court.
5.2: Child Abuse Evaluations, Termination of Parental Rights.
5.3: Adoption Readiness Evaluation.
5.4: Personal Injury Evaluations.
5.5: Psychological factors in Physical Trauma, Sexual Harassment.
5.6: Alcohol Abuse and Drug Abuse.</td></tr>
</table>

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discussed during the Tutorial hours)

Recommended Text	Ernest R Hilgard, Richard C Atkinson and Rita L Atkinson – Introduction to Psychology 6th Edition- Oxford & IBH Publishing Co. Pvt. Ltd. 1975 Chaube S.P. Social Psychology- Second Revised Edition- Lakshmi Narain Agarwal Educational Publishers, Agra- 3. 1995.
ReferenceBooks	Robert S. Feldman – Psychology and Your Life - Tata McGraw Hill Education Pvt. Ltd. New Delhi- 2012 Lester D Crow and Alice Crow- Child Development and Adjustment- Surjeet Publication- 2008 Saundra K Ciccarelli, Noland White J. – Psychology- Pearson 5th Ed. 2017 Kaila H. L. – Introduction to Psychology – AITBS Publishers-India 2008.
Website and e-learning source	https://ocw.mit.edu https://libguides.humboldt.edu https://www.oercommons.org

Course Outcomes:

On completion of the course the student will be able to…

CO1: Explain Psychology and its branches. **(K1, K2, K3, K4 & K5)**

CO2: Define concept of self and describe the theories of Personality. **(K1, K2, K3, K4 & K5)**

CO3: Discuss the need of social psychology. **(K1, K2, K3, K4 & K5)**

CO4: Explain Psychopathology. **(K1, K2, K3, K4 & K5)**

CO5: Apply the knowledge of psychology in different areas like forensic, family, court etc. **(K1, K2, K3, K4 & K5)**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	M	H	H
CO2	H	M	M	H	H	H
CO3	H	H	H	M	H	H
CO4	H	H	H	M	M	H
CO5	H	H	M	M	H	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	L	M	M	H	M	M
CO2	L	M	H	H	H	M
CO3	L	M	H	M	H	H
CO4	L	M	M	H	M	M
CO5	L	M	M	H	H	M

H-HIGH (3): M-MODERATE (2): L-LOW-(1)

<table>
<tr><td>Title of the Course</td><td colspan="7">SEC: ANIMAL BEHAVIOUR</td></tr>
<tr><td>Paper No.23</td><td colspan="7">SKILL ENHANCEMENT COURSE- III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">SEC</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">2</td><td rowspan="2">Course Code</td><td rowspan="2">PSZO324</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td>Total</td></tr>
<tr><td></td><td>3</td><td></td><td colspan="3"></td><td>3</td></tr>
<tr><td>Objectives of the course</td><td colspan="7">Students will understand the basic concepts in Animal Behaviour.</td></tr>
<tr><td>Course Outline</td><td colspan="7">UNIT I 9 Hours (K1, K2, K3, K4, K5)
1.1 Genetic material, Genes and chromosomes, Genetic variation
1.2 Single and Polygenic inheritance of behaviour, Heritability of behaviour
1.3 Natural selection and behaviour,
1.4 Frequency distribution of phenotypes, Darwinian fitness
1.5 Evolution of adaptive strategies.</td></tr>
<tr><td></td><td colspan="7">UNIT II 9 Hours (K1, K2, K3, K4, K5)
2.1 Sexual selection, Altruism, Sexual strategy
2.2 social organization
2.3 Animal perception, Neural control of behaviour
2.4 Sensory processes and perception
2.5 Visual adaptations to unfavourable environments</td></tr>
<tr><td></td><td colspan="7">UNIT III 9 Hours (K1, K2, K3, K4, K5)
3.1 Coordination and Orientation
3.2 Homeostasis and Behaviour, Physiology and Behaviour in changing environments
3.3 Animal Learning, Conditioning and Learning
3.4 Biological aspects of learning
3.5 Cognitive aspects of learning.</td></tr>
<tr><td></td><td colspan="7">UNIT IV 9 Hours (K1, K2, K3, K4, K5)
4.1 Instinct and learning, Displacement activities
4.2 Ritualization and Communication, Decision making behaviour in Animals
4.3 Complex behaviour of honey bees, Evolutionary optimality, Mechanism of Decision making.
4.4 The mentality of Animals: Languages and mental representation, non-verbal communication in human, mental images
4.5 Intelligence, tool use and culture, Animal awareness and Emotion.</td></tr>
<tr><td></td><td colspan="7">UNIT V 9 Hours (K1, K2, K3, K4, K5)
5.1 Organization of circadian system in multicellular animals
5.2 Concept of central and peripheral clock system; Circadian pacemaker system in invertebrates with particular reference to Drosophila
5.3 Photoreception and photo- transduction; Molecular bases of seasonality
5.4 The relevance of biological clocks for human welfare - Clock function (dysfunction)
5.5 Human health and diseases - Chronopharmacology, chronomedicine, chronotherapy.</td></tr>
</table>

Extended Professional Component (isa part of internal component only, not to beincluded in theexternal examination question paper)	Questions related to the above topics, from various competitive examinationsUPSC/JAM /TNPSC and others to be solved (To be discused during the Tutorial hours)

Recommended Text	1. David McFarland, 1985.Animal Behaviour, Longman Scientific & Technical, UK.576pp. 2. Harjindra Singh, 1990. A Text Book of Animal Behaviour, AnomolPublication, 293pp. 3. Hoshang S.Gundevia and Hare Goving Singh, 1996. Animal Behaviour,S.Chand&Co, 280pp. 4. Shukla, J. P 2010, Fundamentals of Animal Behaviour, Atlantic, 587pp. 5. Vinod Kumar, 2002. Biological Rhythms. Narosa Publishing House, Delhi.
Reference Books	1. Michael D. Breed and Janice Moore, 2012. Animal Behaviour, Academic Press, USA, 359pp. 2. Aubrey Manning and Martin Stamp Dawkins, 2012. An Introduction to Animal Behaviour, 6th Edition, Cambridge University Press, UK. 458pp. 3. Davis E.Davis, 1970. Integral Animal Behaviour, Mac Millan Company,London, 118pp. 4. Jay, C. Dunlap, Jennifer, J. Loros, Patricia J. De Coursey (ed). 2004. Chronobiology Biological time Keeping, Sinauer Associates Inc, Publishers, Sunderland, MA.
Website and e-learning source	https://www.ncbs.res.in/content/animal-behaviour https://bit.ly/3i6wUxR https://www.behaviour.univie.ac.at/ https://www.ru.nl/bsi/

Course Outcomes:

On completion of the course, the students should be able to

CO1: Acquires understanding on the genetic basis and evolutionary history of behaviour.(K1, K2, K3, K4, K5)

CO2: Obtains understanding on sexual selection, social organization, neural and sensory perception of behaviour. (K1, K2, K3, K4, K5)

CO3: Analyze and differentiate the innate, learned, cognitive behavior, and various mating systems. (K1, K2, K3, K4, K5)

CO4: Obtain understanding about communication, decision making and language of animals.(K1, K2, K3, K4, K5)

CO5: Gain knowledge about the molecular basis of rhythm, biological clock, Human health and diseases.(K1, K2, K3, K4, K5)

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	H	H	L	L	H
CO2	H	H	H	L	L	H
CO3	H	H	H	L	L	H
CO4	H	H	H	L	L	H
CO5	H	H	H	L	L	H

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	H	L	H	H	M	H
CO2	H	L	H	H	M	H
CO3	H	L	H	H	M	H
CO4	H	L	H	H	M	H
CO5	H	L	H	H	M	H

H-HIGH (3): M-MODERATE (2): L-LOW-(1)