TUMKUR UNIVERSITY

Syllabus for

B.Sc. ZOOLOGY (UG)

CHOICE BASED CREDIT SYSTEM (CBCS)

Framed According to the National Educational Policy (NEP 2020)

I – X SEMESTERS

To implement from the academic year 2021-22

Syllabus for B.Sc., Hons in Zoology

Name of the Degree Program: **B. Sc., Hons**
Discipline Core: **Zoology**
Starting year of implementation: **2021-22**

Progressive Certificate, Diploma, Bachelor Degree or Bachelor Degree with Honours Provided at the End of Each Year of Exit of the Four-year Undergraduate Programme/ Five-year Integrated Master's Degree Programme

INTRODUCTION

The learning outcomes-based curriculum framework for B.Sc. degree in Zoology is structured to offer a broad outline within which a Zoology program could be developed. The course is upgraded keeping in mind the aspirations of students, changing nature of the subject as well as the learning environment. The NEP-2020 offers an opportunity to affect paradigm shift from a teacher-centric to student- centric higher education system in India. It caters skill based education where the graduate attributes are first kept in mind to reverse-design the programs courses and supplementary activities to attain the graduate attributes and learning attributes. Outcomes-based curriculum framework for a degree in B.Sc. (Honours) Zoology is intended to provide a comprehensive foundation to the subject and to help students develop the ability to successfully continue with further studies and research in the subject while they are equipped with required skills at various stages. Effort has been made to integrate use of recent technology and use of MOOCs to assist teaching-learning process among students. The framework is designed to equip students with valuable cognitive abilities and skills so that they are successful in meeting diverse needs of professional careers in a developing and knowledge-based society. The curriculum framework takes into account the need to maintain globally competitive standards of achievement in terms of the knowledge and skills in Zoology and allied courses, as well develop scientific orientation, spirit of enquiry problem solving skills and human and professional values which foster rational and critical thinking in the students.

GRADUATE ATTRIBUTES IN B.Sc. (Hons.) ZOOLOGY

Some of the characteristic attributes a graduate in Zoology should possess are:

- Disciplinary knowledge and skills:
- Skilled communication:
- Critical thinking and problem solving capacity:
- Logical thinking and reasoning:
- Team Spirit & Leadership Quality:
- Digital efficiency:
- Ethical awareness / reasoning:
- National and international perspective:
- Lifelong learning

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FLEXIBILITY

- NEP 2020 is very flexible so that leaners will have the ability to choose their learning trajectories and programmes and thereby choosing their own path in life according to their talents and interest.

- The programmes are flexible enough to allow liberty to students in designing them according to their requirements. Students may choose a single Major, one Major with a Minor, and one Major with two Minors. Teacher Education or Vocational courses may be chosen in place of Minor/s. below listed are the various options students may choose from.

- One Major subject/discipline, Two Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities.

- One Major and one Minor subject/discipline along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities

- Two Major subject/disciplines along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses, including Extracurricular Activities (subject to fulfilling the requirements as stated in 3.i and 3.ii).

- One Major subject/discipline and one Vocational course along with Languages, Generic Electives, Ability Enhancement and Skill Development and courses including Extracurricular Activities.

- One Major Discipline and One Education Discipline along with Languages, Generic Electives, Ability Enhancement and Skill Development Courses including Extracurricular Activities.

PROGRAM OBJECTIVES (POs) IN ZOOLOGY

- The Programme offers both classical as well as modern concepts of Zoology in higher education.
- It enables the students to study animal diversity in both local and global environments.
- To make the study of animals more interesting and relevant to human studies more emphasis is given to branches like behavioral biology, evolutionary biology and economic Zoology.
- More of upcoming areas in cell biology, genetics, molecular biology, biochemistry, genetic engineering and bioinformatics have also been included.
- Equal importance is given to practical learning and presentation skills of students.
- The lab courses provide the students necessary skills required for their employability.
- Skill enhancement courses in classical and applied branches of Zoology enhance enterprising skills of students.
- The global practices in terms of academic standards and evaluation strategies.
- Provides opportunity for the mobility of the student both within and across the world.

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- The uniform grading system will benefit the students to move across institutions within India to begin with and across countries.
- It will also enable potential employers in assessing the performance of the candidates across the world.

Credit distribution for the course

*In lieu of the research Project, two additional elective papers/ Internship may be offered.

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SEMESTER WISE CURRICULUM STRUCTURE OF COURSES

Semester	Name of the course/credits	What all program outcomes the course addresses (not exceeding 3 /course)	Pre- requisite course(s)	Concurrent course	Pedagogy	Assessment
1 SemesterA1 Major course	Cytology, Genetics and Infectious Diseases (4)	1. The structure and functions of animal cell, cell organelles, cell- cell interactions, process of reproduction leading to new organisms. 2. The principles of inheritance, Mendel's laws and the deviations. 3. Inheritance of chromosomal aberrations in humans by pedigree analysis in families.	Student must have studied Biology or equivalent subjects in Class 12.	Lab on Cell Biology and Genetics (2)	Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Problem Solving/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
1 Semester OE1 Open Elective course	1.Economic Zoology (3) 2.Exploring the brain: Structure and function(3) 3. Human physiology(3)	1. Acquaint the knowledge about basic procedure and methodology of integrated animal rearing. 2. Students can start their own business i.e. self- employments. 3. Get employment in different sectors of Applied Zoology	Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Problem Solving/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
SEC 1 Skill Enhancement course	Sec 1 digital fluency 1.Vermiculture (2) 2. SERICULTURE(2)		Student must have Studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Problem Solving/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,

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2 Semester A2 Major course	Biochemistry and Physiology (4)	1. In depth understanding of structure of biomolecules like proteins, lipids and carbohydrates. 2. The thermodynamics of enzyme catalyzed reactions. 3. To know various physiological processes of animals.	Student must have studied Biology or equivalent subjects in Class 12.	A2 Lab on Biochemistry, Physiology and Hematology (2)	Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
2 Semester OE2 Open Elective course	4.Parasitology (3) 5 Vectors, Diseases and management (3) 6. Food Nutrition and health (3)		Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
2 Skill Enhancement course	Environmental Studies (2)	1. Sericulture is an agro-based industry which gives economic empowerment to the students. 2. Sericulture may be taken up as a small scale industry by the small farmers and unemployed youth. 3. Get jobs inteaching	Student must have studied Biology or equivalent subjects in Class 12.		Lectures/Videos/ Seminar/Case study/Project/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
EXIT OPTION WITH CERTIFICATE (50 CREDITS)						

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3. A3 Major Core Course	Molecular Biology Bioinstrumentation & Techniques in Biology(4)	Certificate Course in Zoology	Lab on Molecular Biology, Bioinstrumentation & Techniques in Biology(2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/ Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
3B3 Minor Core Course	Comparative Anatomy and Microanatomy (4)	Certificate Course in Zoology	Lab on Comparative Anatomy and Microanatomy (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
3OE-3 Open Elective course	7.Golbal Climate Change (3) 8.Environmental microbiology(3)	Certificate Course in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
3 Semester Skill Enhancement course	SEC 3 Artificial Intelligence Apiculture (2)	Certificate Course in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,

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4 A4 Major Core curse	Gene Technology, Immunology and Computational Biology (4)	Certificate Course in Zoology	Lab on Genetic Engineering And Counselling (2)	Lectures/Videos / Seminars/Case study/Project/ Groupdiscussion/Visit to industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
4 B4 Minor Core Course	Cell Biology and Genetics (4)	Certificate Course in Zoology	Lab on Cell Biology and Genetics (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
4 Sem OE 4 Open Elective Course	9.Animal Behavior (3) 10.Biodevrsity Conservation and sustainable development 11.Systtteeematicsss and evolutionary biology	Certificate Course in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
4 Semester Skill Enhancement course	**Constitute of India (2)** Poultry	Certificate Course in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
5 A5 Major Core Course	Non-Chordates and Economic Zoology (4)	Diploma in Zoology	Lab on Non- Chordates and Economic Zoology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
5 A6 Major Core Course	Chordates and Comparative Anatomy (3)	Diploma in Zoology	Lab on Chordates (Virtual Dissection) and Comparative Anatomy (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
5 B5 Minor Core Course	Animal Physiology and Animal Biotechnology (3)	Diploma in Zoology	Lab on Animal Physiology and Animal Biotechnology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment.	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy.

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5 DSEC1	Vocational -1 Aquatic Biology (3)	Diploma in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy.
5 SEC 3 Skill Enhanceme nt course	Cyber Security Integrated Animal Rearing (2)	Diploma in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
6 A7 Major Core Course	Evolutionary and Developmental Biology (3)	Diploma in Zoology	Lab on Evolutionary and Developmental Biology (2)	Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Institute/Formative Assessment/ Summative Assessment.	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy.
6 A8 Major Core Course	Environmental Biology, Wildlife management and Conservation (3)	Diploma in Zoology	Lab on Environmental Biology, Wildlife management and Conservation (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
6 B6 Minor Core Course	Animal Behavior (3)	Diploma in Zoology	Lab on Animal Behaviour (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment.	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy.
DSEC	Vocational-2 Entomology-3 Internship (2)	Diploma in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
6 Skill Enhancement Course	SEC 4 Professional Communication n Ornamental Fish Culture (2)	Diploma in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
7 A9 Major Core Course	Ethology (3)	Degree in Bachelor Of Science in Zoology	Lab on Ethology @2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
7 A8 Major Core Course	Evolution and Zoogeography (3)	Degree in Bachelor Of Science in Zoology	Lab on Evolution and Zoogeography (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Zoo/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,

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7 A9 Major Core Course	Genetics and Computation al Biology (3)	Degree in Bachelor Of Science in Zoology	Lab on Advanced Genetics and Computational Biology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
7	Research methodology (3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to research lab/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
7 DSEC	Zoology E-1 (3) Radiation Biology	DegreeinBachelorOf Science inZoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
7 DSEC	Zoo Management Zoology E-2 (3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
8 A12 Major Core Course	Immunology and Stem Cell Biology (3)	Degree in Bachelor Of Science in Zoology	Lab on Immunology and Stem Cell Biology (2)	Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
8 A13 Major Core Course	Advanced Molecular Biology and Biostatistics (3)	DegreeinBachelorOf Science inZoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
8 A 14 Major Core Course	Genomics and Proteomics (3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
8	RESEARCH PROJECT (6)	Degree in Bachelor Of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
8DSEC1	*Anyone of the below 4 choice* E-3 Neurosciences (3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
8DSEC2	E-3 Parasitology(3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,

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8DSEC3	E-3 Animal Experimentation and Ethics(3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
8DSEC4	E-3 Behavioral Biology(3)	Degree in Bachelor Of Science in Zoology		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
9 A15 Major Core Course	Animal Biotechnology and Genetic Engineering (3)	Degree in Bachelor of Science Honors	Lab on Animal Biotechnology and Genetic Engineering (2)	Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
9 A 16 Major Core Course	Microanatomy Histochemistry and Histopathology (3	Degree in Bachelor of Science Honors	Lab on Microanatomy, Histochemistry and Histopathology (2)	Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
9 A 17 Major Core course	Molecular Endocrinology (3)	Degree in Bachelor of Science Honors	Lab on Molecular Endocrinology (2)	Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Lab/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
9 A18	Research methodology (3)of 7th Sem) Applied Zoology(In Place of	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
9DSEC1	E-1 Animal Biotechnology (3)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
9DSEC2	E-1 Toxicology (3)	Degree in Bachelor of Science Honors		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
9 Skill Enhancement Course	Cattle Farming (3)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/ Evaluation/ Analysis of result/ Application of Heutagogy,
10 A 19 Major	Physiology of Reproduction (3)	Degree in Bachelor of Science Honors	Lab on Reproductive Physiology (2)	Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment /Evaluation/ Analysis of result/ Application of Heutagogy,

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10 A 20 Major	Developmental Biology (3)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
10 A 21 Major	Chronobiology (3)	Degree in Bachelor of Science Honors		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Lab/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
10 A 22	Nano Biotechnology (3)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
10 DSEC 1	RESEARCH PROJECT Or Any two DSEC Or INTERNSHIP (6)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
10 DSEC 2	E-3 Insect Vector& Diseases (3)	Degree in Bachelor of Science Honors		Lectures/Videos / Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
10 DSEC 3	E-3 Human Physiology (3)	Degree in Bachelor of Science Honors		Lectures/Videos/ Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy
10 DSEC 4	E-3 Food, Nutrition & Health (3)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,
10 Skill Enhancement	E-3 Animal Breeding Techniques (3)	Degree in Bachelor of Science Honors		Lectures/Videos /Seminars/Case study/Project/ Group discussion/Visit to Industry/Formative Assessment/ Summative Assessment	Formative and Summative Assessment/Evaluation/ Analysis of result/ Application of Heutagogy,

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I Semester B.Sc., Zoology
Core Course Content

Course Title/ Code: **Cytology, Genetics and Infectious Diseases**	Course Credits: **4**
Course Code: **ZOODSC01**	L-T-P per week: 4-0-0
Total Contact Hours: **56**	Duration of ESA: 3 Hours

Core Course prerequisite: To study Zoology in undergraduate, student must have studied Biology or equivalent subject in Class 12.

Course Outcomes (COs):

At the end of the course the student should be able to understand:

1. The structure and function of the cell organelles.
2. The chromatin structure and its location.
3. The basic principle of life, how a cell divides leading to the growth ofan
4. Organism and also reproduces to form a new organism.
5. How a cell communicates with its neighboring cells?
6. The principles of inheritance, Mendel's laws and the deviations.
7. How environment plays an important role by interacting with genetic factors.
8. Detect chromosomal aberrations in humans and study of pedigree analysis.

Course Articulation Matrix: Mapping of Course Outcomes (COs) withProgram Outcomes (POs)

Course Outcomes (COs)/ ProgramOutcomes (POs)	CO T1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency	X										
II Critical thinking	X										
III Analytical reasoning	X										
IV Research skills	X										
V Team work	X										

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X'in the intersection cell if a course outcome addresses a particular program outcome.

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Semester I- Zoology
Core Course I Content

Content	Hours
Unit I	14
Chapter 1. Ultra structure and Function of Cell Organelles I in Animal Cell • Plasma membrane: Chemical composition—Fluid mosaic model. • Endomembrane system: protein targeting and sorting, transport, endocytosis andexocytosis, types of cell junctions.	
Chapter 2. Structure and Function of Cell Organelles II in Animal Cell • Cytoskeleton: microtubules, microfilaments, intermediatefilaments. • Mitochondria: Structure, oxidative phosphorylation; electron transport system. • Peroxisome and Ribosome: structure and function.	
Unit II	14
Chapter 3. Nucleus and Chromatin Structure • Structure and function of nucleus in eukaryotes • Chemical structure and base composition of DNA and RNA • DNA supercoiling, chromatin organization, structure of chromosomes • Types of DNA andRNA	
Chapter 4. Cell cycle, Cell Division and Cell Signaling • Cell division: mitosis and meiosis • Introduction to Cell cycle and its regulation, apoptosis • Signal transduction: intracellular 11 signaling and cell surface receptors, via G-protein linked receptors. • Cell-cell interaction: - cell adhesion molecules, cellular junctions	
Unit III	14
Chapter 5. Mendelism and Sex Determination • Basic principles of heredity: Mendel 's laws- monohybrid cross and di hybrid cross • Incomplete Dominance • Genetic Sex-Determining Systems, Environmental Sex Determination, • Chromosomal Sex Determination and mechanism in *Drosophila melanogaster.* • Sex-linked characteristics in humans and dosagecompensation.	
Chapter 6. Extensions of Mendelism, Genes and Environment • Extensions of Mendelism: Multiple Alleles, Gene Interaction. • The Interaction Between Sex and Heredity: Sex-Influenced and Sex-Limited Characteristics • Cytoplasmic Inheritance- Genetic Maternal Effects. • Interaction between Genes and Environment. • Inheritance of ContinuousCharacteristics.	
Unit IV	14
Chapter 7. Human Chromosomes and Patterns of Inheritance • Patterns of inheritance: autosomal dominance, autosomal recessive, X-linked recessive, X-linked dominant. • Chromosomal anomalies: Structural and numerical aberrations with examples. • Human karyotyping and Pedigree analysis.	

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Chapter 8. Infectious Diseases • Introduction to human pathogenic organisms- viruses, bacteria, fungi, protozoa and helminthes worms. • Structure, life cycle, pathogenicity, including diseases, causes, Symptoms and control of common parasites: *Trypanosoma, Giardia and Wuchereria.*	

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson(2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby-Kuby Immunology. W HFreeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13TH Edition. Wiley Blackwell (2017).
9. Principles of Genetics by B. D. Singh
10. Cell-Biology by C. B. Pawar, Kalyani Publications
11. Economic Zoology by Shukla and Upadhyaya

Pedagogy: Written Assignment/Presentation/Project /Term Papers/ Seminar

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ZOOLOGY CORE LAB COURSE CONTENT

Semester
I

Course Title: Cell Biology & Cytogenetic Lab	Course Credits:**2**
Course Code: ZOO**DSC01P**	L-T-P per week: 0-0-4
Total Contact Hours**: 56**	Duration of ESA: 3 Hours

Course Outcomes (COs):

At the end of the course the student should be able to:

1. To use simple and compound microscopes.
2. To prepare stained slides to observe the cell organelles.
3. To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
4. The chromosomal aberrations by preparing karyotypes.
5. How chromosomal aberrations are inherited in humans by pedigree analysis in families. The antigen-antibody reaction.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC P1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency	X										
II Critical thinking	X										
III Analytical reasoning	X										
IV Research skills	X										
V Team work	X										

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X 'in the intersection cell if a course outcome addresses a particular program outcome.

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Lab Course Content

List of labs to be conducted	56 hrs.
1. Understanding of simple and compound microscopes. 2. To study different cell types such as buccal epithelial cells, striated muscle cells using Methylene blue/any suitable stain (virtual/ slide/slaughtered tissue). 3. To study the different stages of Mitosis in root tip of *Allium cepa*. 4. To study the different stages of Meiosis in grasshopper testis (virtual/ slides). 5. To check the permeability of cells using salt solution of different concentrations. 6. Study of parasites in humans (e.g. Protozoans, Helminthes in compliance withexamples being studied in theory) permanent micro slides. 7. To learn the procedures of preparation of temporary slides (fish scale) and permanent slides, with available mounting material (sex comb of Drosophila/insect mouth parts). 8. Study of life cycles of *Drosophila* sp. (from Cultures or Photographs). 9. Preparation of polytene chromosomes (Chironomus larva or Drosophila larva). 10. Preparation of human karyotype and study the chromosomal structural and numerical aberrations from the pictures provided. (Virtual/optional). 11. To prepare family pedigrees. 12. https://www.vlab.co.in 13. https://zoologysan.blogspot.com 14. www.vlab.iitb.ac.in/vlab 15. www.onlinelabs.in 16. www.powershow.com	

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby- Kuby Immunology. W HFreeman (2007).
6. Kesar, Saroj and Vasishta N.2007 Experimental Physiology: Comprehensive Manual. Heritage Publishers,New Delhi.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

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OPEN ELECTIVE COURSE CONTENT

Semester : I

Course Title: **Economic Zoology** Course Code: ZOO**OEC01**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours

Course Outcomes (COs):

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

1. Gain knowledge about silkworms rearing and their products.
2. Gain knowledge in Bee keeping equipment and apiary management.
3. Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.
4. Acquaint knowledge about the culture techniques of fish and poultry.
5. Acquaint the knowledge about basic procedure and methodology of Vermiculture.
6. Learn various concepts of lac cultivation.
7. Students can start their own business i.e. self-employments.
8. Get employment in different applied sectors

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) /Program Outcomes (POs)	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11	CC 12
I Core competency	X											
II Critical thinking	X											
III Analytical reasoning	X											
IV Research skills	X											
V Team work	X											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark= X' in the intersection cell if a course outcome addresses a particular program outcome.

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Course Content

Content	Hrs
Unit I	14
Chapter 1. Sericulture: • History and present status of sericulture in India • Mulberry and non-mulberry species in Karnataka and India • Mulberry cultivation • Morphology and life cycle of *Bombyx mori* • Silkworm rearing techniques: Processing of cocoon, reeling • Silkworm diseases and pest control **Chapter 2. Apiculture:** • Introduction and present status ofapiculture • Species of honey bees in India, life cycle of *Apis indica* • Colony organization, division of labour andcommunication • Bee keeping as an agro based industry; methods and equipments: indigenous methods, extraction appliances, extraction ofhoney from the comb and processing • Bee pasturage, honey and bees wax and their uses • Pests and diseases of bees and their management	
Unit II	14
Chapter 3. Live Stock Management: • **Dairy:** Introduction to common dairy animals and techniques of dairy management • Types, loose housing system and conventional barn system; advantages and limitations of dairy farming • Establishment of dairy farm and choosing suitable dairy animals-cattle • Cattle feeds, milk and milk products • Cattle diseases • **Poultry:** Types of breeds and their rearing methods • Feed formulations for chicks • Nutritive value of egg and meat • Disease of poultry and control measures **Chapter 4. Aquaculture:** • Aquaculture in India: An overview and present status and scope of aquaculture • Types of aquaculture: Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture	

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Chapter 5. Fish culture:

- Common fishes used for culture.
- Fishing crafts and gears.
- Ornamental fish culture: Fresh water ornamental fishes- biology, breeding techniques
- Construction and maintenance of aquarium: Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality. Control of snail and algal growth.
- Modern techniques of fish seed production

Chapter 6. Prawn culture:

- Culture of fresh and marine water prawns.
- Preparation of farm.
- Preservation and processing of prawn, export of prawn.

Chapter 7. Vermiculture:

- Scope of vermiculture.
- Types of earthworms.
- Habit categories - epigeic, endogeic and anecic; indigenous and exotic species.
- Methodology of vermicomposting: containers for culturing, raw materials required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of Vermicompost.
- Advantages of vermicomposting. Diseases and pests of earthworms.

Chapter 8. Lac Culture:

- History of lac and its organization, lac production in India. Life cycle, host plants and strains of lac insect.
- Lac cultivation: Local practice, improved practice, propagation of lac insect, inoculation period, harvesting of lac.
- Lac composition, processing, products, uses and therapists

Text Books & Suggested Readings:

1. Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling.
3. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., (2000). Mulberry Silk
5. Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, Kindle Edition.
7. Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers
8. Yadav Manju (2003). Economic Zoology, Discovery Publishing House.
9. Jabde Pradip V (2005). Textbook of applied Zoology, Discovery Publishing House, New Delhi.
10. Cherian &Ramachandran Bee keeping in-South Indian Govt. Press, Madras.
11. Sathe, T.V. Vermiculture and Organic farming.
12. Bard. J (1986). Handbook of Tropical Aquaculture.
13. Santhanam, R. A. Manual of Aquaculture.
14. Zuka. R.1 and Hamiyn (1971). Aquarium fishes and plants
15. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture.
16. Animal Disease- Bairagi K. N. Anmol Publications Pvt.Ltd 2014
17. Economics Of Aquaculture - Singh (R.K.P) - Danika Publishing Company 2003
18. Applied and Economic Zoology (SWAYAM) web https://swayam.gov.in/nd2_ceC20_ge23/preview

Course Books published in English and Kannada may be prescribed by the Universities and Colleges

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

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Open Elective Course Content

Semester: I

Course Title: **Exploring the Brain: Structure and Function** Course Code: **ZOOOEC02**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours
Formative Assessment Marks: **40**	Summative Assessment Marks:**60**
Model Syllabus Authors:	

Course Outcomes (COs):

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

1. Appreciate the scope of neurosciences and latest advances in the field
2. Understand the important components of nervous system
3. Learn about the evolution and behavioral adaptations of brain
4. Familiarize the neuroimaging techniques and their significance
5. Know about neurotransmitters and mechanism of neurotransmission
6. Get an insight regarding a good brain health management

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	OE 1	OE 2	OE 3	OE 4	OE 5	OE 6	OE 7	OE 8	OE 9	OE 10	OE 11	OE 12
I Core competency		X										
II Critical thinking		X										
III Analytical reasoning		X										
IV Research skills		X										
V Team work		X										

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

Content	Hrs
Unit I Scope of Neuroscience. Brain structure	**14**
Chapter 1 • Introduction to Neuroscience and its scope. Early and 19th century views of the Brain. • Latest advances in Neuroscience today. Brain cells, types: Neurons – types and structure; • Glia- types and structure; Neuronal circuit.	
Unit II Evolution and development of brain	**14**
Chapter 2 • Evolution and Adaptation of Brain: Theories of brain evolution. • Evolution of brain in vertebrates and associated behavioral adaptation. **Chapter 3** • Organization and development of brain in human. Divisions of the brain. • Structure- function relationship. • Neuroimaging- CT and MRI	
Unit III Neurotransmitters, mechanism of neurotransmission and Managing brain health	**14**
Chapter 4 • Neurotransmitters and neurotransmission: Noradrenergic, serotonergic, dopaminergic and cholinergic system. • Mechanism of neurotransmission and drug action. Learning and memory. Types, mechanism, disorders **Chapter 5** • Structural and chemical changes. Functional changes. Maintenance of healthy brain. • Brain disorders: Neurodegenerative diseases- Epilepsy, Stroke, Alzheimer's, Parkinsons.	

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• Neuropsychiatric disorders- Anxiety, Depression, Mood disorders, Schizophrenia.	

Text Books

Suggested Readings:

1. Squire, L. et al. (2003) Fundamental Neuroscience, Academic Press.
2. Kandel, E. (2000) Principles of Neural Science, McGraw Hill

Course Books published in English and Kannada may be prescribed by the Universities and College

References

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	**20**
Written Assignment/Presentation/Project / Term Papers/Seminar	**15**
Class performance/Participation	**05**
Total	**40**

Open Elective Course Content

Semester: **I**

Course Title: **Human Physiology** Course Code: **ZOOOEC03**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours
Formative Assessment Marks: **40**	Summative Assessment Marks:**60**
Model Syllabus Authors:	

Course Outcomes (COs):

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

1. Develop an insight into the function of organ systems in humans.
2. Gain knowledge of metabolic mechanisms involved in management of homeostasis in the body.
3. Understand the process of digestion and its control Develop understanding in muscle structure and contraction mechanism
4. Learn the process of respiration and transport of gases
5. Understand kidney structure and regulation of urine formation
6. Understand function of endocrine glands and formation of gametes.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	OE 1	OE 2	OE 3	OE 4	OE 5	OE 6	OE 7	OE 8	OE 9	OE 10	OE 11	OE 12
I Core competency			X									
II Critical thinking			X									
III Analytical reasoning			X									
IV Research skills			X									
V Team work			X									

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Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

Content	Hrs
Unit I How are processes of digestion and excretion accomplished in man	**14**
Chapter 1 • Digestive glands: Structure and function. • Digestion and absorption of nutrients: carbohydrates, fats and proteins. • Neural and hormonal control of digestion. **Chapter 2** • Excretory system: Functional anatomy of kidney. • Mechanism of excretion and regulation of urine formation	
Unit II An overview of muscular function and respiration in man	**14**
Chapter 3 • Structure of smooth, skeletal and cardiac muscles. • Mechanism of muscle contraction. • Neuromuscular junction. **Chapter 4** • Respiration: Ventilation, External and internal respiration. • Transport of carbon dioxide and oxygen in blood and tissues. • Factors affecting gaseous transport	
Unit III Endocrine and reproductive physiology	**14**
Chapter 5 • Cardiovascular functions in man • Structure of heart. Coordination of heartbeat; control of heart beat (neural and hormonal) • Blood cells and blood vessels. Cardiac cycle. ECG. Lymph and lymph vessels **Chapter 6** • Structure and function of endocrine glands viz., pituitary, thyroid, parathyroid, pancreas, adrenal, ovaries and testes. • Processes of spermatogenesis and oogenesis. • Fertilization and implantation. • Menstrual cycle. Pregnancy and Parturition.	

Text Books

Suggested Readings:

1. Tortora, G.J. and Derrickson, B.H. (2009) Principles of Anatomy and Physiology (12th edition) John Wiley and Sons, Inc.
2. Widmaier, E.P., Raff, H. and Strang, K.T. (2008) Vander's Human Physiology (9thedition) McGraw Hill.
3. Guyton, A.C. and Hall, J.E. (2011) Textbook of Medical Physiology (12th edition) Harcourt Asia Pvt. Ltd/ W.B. Saunders Company.
4. Marieb, E. (1998) Human Anatomy and Physiology (4th edition) Addison-Wesley.
5. Kesar, S. and Vashisht, N. (2007) Experimental Physiology, Heritage Publishers.

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Course Books published in English and Kannada may be prescribed by the Universities and College References

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	**20**
Written Assignment/Presentation/Project / Term Papers/Seminar	**15**
Class performance/Participation	**05**
Total	**40**

Skill Enhancement Course in

Zoology Course Content

Semester: I

Course Title: Vermiculture **Course Code: ZOOSEC01**	**Course Credits: 2**
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs.

Course Outcomes (COs):

At the end of the course the student:

1. Understands the importance of earthworms in maintaining soil quality.
2. Learns that the vermicomposting is an effective organic solid waste management method.
3. Gets acquainted with the importance of earthworms in agro-based economic activity.
4. Vermicomposting leads to organic farming and healthy food production.
5. Vermicomposting may be taken up as a small scale industry by the farmers and unemployed youth.
6. Get jobs in teaching institutions or vermiculture units as technicians.
7. Learn the concept of vermicomposting as bio fertilizers thus student can become an entrepreneur after completion of the course.
8. Best opportunity for self-employment and lifelong learning with farmers.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

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Course Outcomes (COs) / Program Outcomes (POs)		VEC5ZOO P1	2	3	4	5	6	7	8	9	10	11	12
i	Core competency.	X											
ii	Critical thinking.	X											
iii	Analytical reasoning.	X											
iv	Research skill.	X											
v	Team work.	X											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X' in the intersection cell if a course outcome addresses a particular program outcome.

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Course Content

List of labs to be conducted		56Hrs
1	Collection of native earth worm species to study habit and habitat.	
2	Keys to identify different species of earth worm.	
3	Externals and Life cycle of ***Eisenia fetida*** and ***Eudrilus eugeniae.***	
4	Dissection of digestive and reproductive system.	
5	Study of vermicomposting equipments and devices.	
6	Preparation of vermi beds and their maintenance.	
7	Study of different vermicomposting methods.	
8	Harvesting, separation of worms, packaging, transport and storage of Vermicompost.	
9	Vermi-wash collection and processing.	
10	Small scale earth worm farming for home gardens and studying the effect of Vermicompost on garden plants.	
11	Budget and cost scenario of vermiculture (Project).	
12	Diseases and natural enemies of earth worms and their control measures.	
13	Role of vermitechnology in environmental protection.	
14	Economics and Marketing of Vermicompost and vermi wash.	
15	Visit to vermiculture farm to acquaint with latest techniques.	

Text Books and references

1. Bhatt J.V. & S.R. Khambata (1959) -Role of Earthworms in Agriculture, Indian Council of Agricultural Research, New Delhi
2. Edwards, C.A. and J.R. Lofty (1977) -Biology of Earthworms| Chapman and Hall Ltd., London.
3. Lee, K.E. (1985) -Earthworms: Their ecology and Relationship with Soils and Land Use| Academic Press, Sydney.
4. Dash, M.C., B.K. Senapati, P.C. Mishra (1980) — Verms and Vermicomposting| Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, Jyoti Vihar, Orissa.
5. Kevin, A and K.E. Lee (1989) — Earthworm for Gardeners and Fisherman| (CSIRO, Australia, Division of Soils)
6. Satchel, J.E. (1983) -Earthworm Ecology| Chapman Hall, London.
7. Wallwork, J.A. (1983) -Earthworm Biology| Edward Arnold (Publishers) Ltd. London.

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Pedagogy

1. Demonstration
2. Assignment
3. Group discussion
4. Field visit
5. Use of Audio-Visual aids.

Skill Enhancement

Course Content

Course Title: Sericulture Course Code: ZOOSEC02	Course Credits: 2
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs.

Course Outcomes (COs)

At the end of the course the student acquires the following knowledge:

1. Sericulture is an agro-based industry which gives economic empowerment to the students.
2. Sericulture may be taken up as a small scale industry by the small farmers and unemployed youth.
3. Get jobs in teaching profession, silk board and other Govt. institutions as technicians.
4. Student can be self-employed after successful completion of the course.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Course Outcomes (COs) / Program Outcomes (POs)	VEC5ZOO P1	VEC5ZOO P2	3	4	5	6	7	8	9	10	11	12
i Core competency.		X										
ii Critical thinking.		X										
iii Analytical reasoning.		X										
iv Research skill.		X										
v Team work.		X										

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X' in the intersection cell if a course outcome addresses a particular program outcome.

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Course Content

List of Lab to be conducted		42 Hrs
1	Morphology and taxonomy of mulberry.	
2	Rising of saplings – cutting preparation, planting and maintenance of nursery.	
3	Agronomical practices in mulberry cultivation-weeding, manuring, irrigation and harvesting.	
4	Diseases and pests of mulberry.	
5	Silk producing insects – non mulberry and mulberry silk worms.	
6	Life cycle and morphology of ***Bombyx mori.***	
7	Dissection of digestive system and silk glands of ***Bombyx mori.***	
8	Silk worm rearing equipments.	
9	Rearing process – incubation, chawki rearing, late age worm rearing, mounting and harvesting of cocoons.	
10	Silk worm diseases and pests – Grasserie, Flacherie, Muscardine, Pebrine, Uzi fly and Beetles.	
11	Grainages – production of silk worm eggs.	
12	Physical and commercial characteristics of cocoons.	
13	Reeling and weaving process – stiffling, cooking, brushing, reeling and re-reeling, different types of looms.	
14	Visit to mulberry farm and sericulture center.	
15	Economics of silk production (Project)	

Text Books and References

1. Govindan, R., Narayanswami,T.K and Devaiah, M.C.1998,Principles of silk worm pathology.Ser Publishers,Banglore.
2. Tazima, Y.1964 -The genetics of the silk worml Logos Press Ltd. London.
3. Tazima Y 1978 the silk worm an important laboratory tool Kodnasha Ltd. Tokyo.
4. Ganga G, SulochanaChetty J An introduction to sericulture Oxford and IBH Publishing Co.Pvt. Ltd. NewDelhi.
5. Ullal and Narasimhanna Hand book of practical sericulture.
6. FAO Mannuals on sericulture vol. 1-4.
7. Tazima Y 1958 Silkworm egg CSB Publication, Bombay.
8. Yashimoro Tanaka 1964 Sericology CSB Publication, Bombay.

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Pedagogy

1. Demonstration
2. Assignment
3. Group discussion
4. Field Visit.
5. Use of Audio-Visual aids.

Proposed Course content under New Education Policy – Year 2021-22

For II Semester BSc

Zoology Core Course Content

Course Title: **Biochemistry and Physiology**	Course Credits: **4**
Course Code: ZOO**DSC02**	L-T-P per week: **4-0-0**
Total Contact Hours: **56**	Duration of ESA: **3Hours**

Course outcomes:

The student at the completion of the course will learn:

1. To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates.
2. How simple molecules together form complex macromolecules.
3. To understand the thermodynamics of enzyme catalyzed reactions.
4. Mechanisms of energy production at cellular and molecular levels.
5. To understand various functional components of an organism.
6. To explore the complex network of these functional components.
7. To comprehend the regulatory mechanisms for maintenance of function in the body.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC 1	CC T2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency		X									
II Critical thinking		X									
III Analytical reasoning		X									
IV Research skills		X									
V Team work		X									

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X'in the intersection cell if a course outcome addresses a particular program outcome.

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CORE COURSE CONTENT:

Content	Hours
Unit 1	**14**
Chapter 1. Structure and Function of Biomolecules: • Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). • Lipids (saturated and unsaturated Fatty acids, Tri-acyl glycerols, Phospho lipids, Glycolipids and Steroids) • Structure, Classification and General Properties of a-amino acids; Essentialand non-essential amino acids, Levels of organization in proteins; Simple and conjugate proteins.	
Chapter 2. Enzyme Action and Regulation • Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme reaction. • Isozymes; Mechanism of enzyme action. Clinical use of Isoenzymes. • Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Equation of Michaela's -Mendon, Concept of Km and V max, Enzyme inhibition. • Allosteric enzymes and their kinetics; Regulation of enzyme action.	
Unit 2	**14**
Chapter 3. Metabolism of Carbohydrates and Lipids • Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway Glycogenolysis and Glycogenesis Lipids- Biosynthesis of palmiticacid; Ketogenesis, • β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms	
Chapter 4. Metabolism of Proteins and Nucleotides • Catabolism of amino acids: Transamination, Deamination, Urea cycle, Nucleotides and vitamins • Peptide linkages	

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Unit 3	14
Chapter 5. Digestion and Respiration in humans • Structural organization and functions of gastrointestinal tract and associated glands. • Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Physiology of trachea and Lung. • Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it. • Control of respiration.	
Chapter 6. Circulation and Excretion in humans • Components of blood and their functions; hemopoiesis • Blood clotting: Blood clotting system, Blood groups: Rh-factor, ABO and MN • Structure of mammalian heart • Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation • Structure of kidney and its functional unit; Mechanism of urine formation	
Unit 4	**14**
Chapter 7. Nervous System and Endocrinology in humans • Structure of neuron, resting membrane potential(RMP) • Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse • Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal; hormones secreted by them. • Classification of hormones; Mechanism of Hormone action.	
Chapter 8. Muscular System in humans • Histology of different types of muscle; Ultra structure of skeletal muscle; • Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus	

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Suggested Readings:

I. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)

2. Zubay et al: Principles of Biochemistry: WCB (1995)

3. Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004)

4. Murray et al: Harper 's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford UniversityPress

5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTELtd. /W.B.Saunders Company. (2006).

6. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley& sons (2006).

7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).

8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).

9. Chatterjee CC Human Physiology Volume l & 2, 11Th edition, CBS Publishers (20 I6).

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

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Zoology Semester II Core Course Lab Content

Course Title/Code: **Biochemistry and Physiology**	Course Credits: **2**
Course Code: ZOODSC02P	L-T-P per week: 0-0-4
Total Contact Hours: **56**	Duration of ESA: 3 Hours

Course Outcomes (COs):

At the end of the course the student should be able to understand:
Basic structure of biomolecules through model making.
Develop the skills to identify different types of blood cells.
Enhance basic laboratory skill like keen observation, analysis and discussion.
Learn the functional attributes of biomolecules in animal body.
Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC P1	CC P2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency		X									
II Critical thinking		X									
III Analytical reasoning		X									
IV Research skills		X									
V Team work		X									

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X'in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

List of labs to be conducted	Hours
1. Preparation of models of nitrogenous bases- nucleosides and nucleotides. 2. Preparation of models of amino acids and dipeptides. 3. Preparation of models of DNA and RNA. 4. Qualitative analysis of Carbohydrates, Proteins and Lipids. 5. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid. 6. Separation of amino acids or proteins by paper chromatography.	20
7. Determination of the activity of enzyme (Urease)-Effect of [S] and determinationof Km and Vmax. 8. Determination of the activity of enzyme (Urease) - Effect of temperature and time. 9. Action of salivary amylase under optimum conditions. 10. Quantitative estimation of Oxygen consumption by fresh water Crab. 11. Quantitative estimation of salt gain and salt loss by fresh water.	15
12. Estimation of Hemoglobin in human blood using Sahli's hemoglobin meter.	15

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SCHEME OF PRACTICAL EXAMINATION

13. Counting of RBC in blood using Hemocytometer. 14. Counting of WBC in blood using Hemocytometer. 15. Differential staining of human blood corpuscles using Leishman stain. 16. Recording of blood glucose level by using glucometer.	
Virtual Labs(Suggestive sites) https://www.vlab.co.in https://zoologysan.blogspot.com www.vlab.iitb.ac.in/vlab www.onlinelabs.inwww.powershow.com https://vlab.amrita.eduhttps://sites.dartmouth.edu	06

Text Books

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet & Voet: Biochemistry Vols 1 & 2: Wiley (2004)
4. Murray et al: Harper 's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt AsiaPTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume 1 & 2, 11th edition, CBS Publishers (2016).

Web References:

- Mammalian Physiology– www.biopac.com

Pedagogy: Lectures, Presentations, videos, Virtual Labs, Assignments, Tests, Individual or group Field oriented Project Report on or visit to a research institute.

TOPICS RECOMMENDED FOR SEMINAR/PROJECT REPORT

1. Biochemical pathways, their evolutionary background and regulation.
2. Blood groups and their importance.
3. Vital enzymes for human body.
4. Essential and nonessential amino acids.
5. Important body lipids.
6. Significance of animal proteins.
7. Role of carbohydrates in animal body.
8. Nature of proteins and nurture of animal body.
9. Role of lipids in structural and functional organization of body.

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Course Title: **Parasitology** Course Code: ZOO**OEC04**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours

Course Outcomes (COs):

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

- Know the stages of the life cycles of the parasites and infective stages.
- Develop ecological model to know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system.
- Develop skills and realize significance of diagnosis of parasitic infection and treatment.
- Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.
- Develop their future career in medical sciences and related administrative services.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) /Program Outcomes (POs)	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11	CC 12
I Core competency				X								
II Critical thinking				X								
III Analytical reasoning				X								
IV Research skills				X								
V Team work				X								

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark ='X' in the intersection cell if a course outcome addresses a particular program outcome.

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Open Elective Course Content

Semester: **II**

Course Title: **Vectors, Diseases and Management** Course Code: **ZOOOEC05**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours
Formative Assessment Marks: **40**	Summative Assessment Marks: **60**
Model Syllabus Authors:	

Course Outcomes (COs):

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

1. Know basics of vector biology.
2. Have understanding about the favorable breeding conditions for the vectors.
3. Develop an insight into the common vector-borne diseases and their Etiology.
4. Study importance of host- parasite relationship.
5. Learn evolution of vector bionomics and its effect in the management of diseases.
6. Strategies to manage vectors.
7. Get awareness of integrated pest management and public health.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	OE 1	OE 2	OE 3	OE 4	OE 5	OE 6	OE 7	OE 8	OE 9	OE 10	OE 11	OE 12
I Core competency					X							
II Critical thinking					X							
III Analytical reasoning					X							
IV Research skills					X							
V Team work					X							

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

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Content	Hrs
Unit I Vector and vector bionomics	14
Chapter 1 • Introduction; types and morphological peculiarities of vectors such as mosquitoes, flies, fleas, lice, bugs, ticks and mites. • Host-vector relationship; Primary and secondary vector concept. Vectorial capacity. Chapter 2 • Vector bionomics-larval habitats and host biting preferences, human and animal biting indices. • Evolution of vector bionomics and its effect on disease transmission. Vector incrimination. Chapter 3 • Human practices and the occurrence of pests.	
Unit II Disease vectors and the causes of disease outbreaks	14
Chapter 4 • Salient features of the vectors belonging to Diptera, Siphonaptera, Siphunculata, Hemiptera, Arachnida, Blattaria, Acarina (families Ixodidae and Argasidae) etc. Chapter 5 • Role of non-blood sucking flies in myiasis; of blood sucking flies in transmission of plague and typhus; of lice (body, head, pubic) in transmission of typhus, relapsing and trench fevers, Vagabond's disease and Phthiriasis; of bugs in transmission of Chaga's disease. • Brief account of mites and the associated diseases. Chapter 6 • Population biology, Factors affecting abundance, Density dependence and independence, how do people cause outbreak?	
Unit III Vector management strategies, Emerging concepts and approaches to vector management	14
Chapter 7 • Control of vector flies by screening, fly traps, electrocution, poison baits and outdoor residual sprays. • Chemical control. Efficacy of synthetic pyrethroids, residual spray of insecticides, treated bed nets/curtains and fumigations. • Biological control by natural parasites and predators. Biological control of mosquitoes by the use of viruses, bacteria, fungi, parasites, nematodes and larvivorous fishes. • Sterile insect technique, Eradication, Other genetic approaches, Pheromones/allele chemicals, Attract-and –kill, Mating disruptors, alarm pheromones and oviposition disruptors. Chapter 8	

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• Legislation and regulation, methods of sampling and monitoring, sampling plan, allocation of sampling units. Exclusion and routes of entry. • Controlled atmosphere, risk assessment, integrated control/ IPM approach, damage thresholds estimation, forecasting, increasing agro ecosystem resistance, pesticide selection. • Eradication versus control and up to what limits IPM should be adopted. Decision support.	

Recommended readings

1. Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK.
2. Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge University Press, UK.
3. Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria and other Insect Vector borne Diseases. Wiley-Blackwell.
4. Belding, D.L. (1942). Text book of Clinical Parasitology. Appleton-Century Co., Inc., New York.
5. Roy, D.N. and Brown, A.W.A. (2004). Entomology. Biotech Books, Delhi.

Course Books published in English and Kannada may be prescribed by the Universities and College

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit.

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	**20**
Written Assignment/Presentation/Project / Term Papers/Seminar	**15**
Class performance/Participation	**05**
Total	**40**

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Open Elective Course Content

Semester: **II**

Course Title: **Food, Nutrition and Health** Course Code: **ZOOOEC06**	Course Credits:3
Total Contact Hours: **42**	Duration of ESA: 3 Hours
Formative Assessment Marks: **40**	Summative Assessment Marks:**60**
Model Syllabus Authors:	

Course Outcomes (COs):

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Outcomes (COs) / Program Outcomes (POs)	**OE 1**	**OE 2**	**OE 3**	**OE 4**	**OE 5**	**OE 6**	**OE 7**	**OE 8**	**OE 9**	**OE 10**	**OE 11**	**OE 12**
I Core competency						X						
II Critical thinking						X						
III Analytical reasoning						X						
IV Research skills						X						
V Team work						X						

Course Content

Content	**Hrs**
Unit I Nutrition and dietary nutrients	**14**
Chapter1 • Basic concept of Food: Components and nutrients. • Concept of balanced diet, nutrient requirements and dietary pattern for different groups viz., adults, pregnant and nursing mothers, infants, school children, adolescents and elderly people.	
Unit II Nutritional Biochemistry	**14**
Chapter 2 • Macronutrients. Carbohydrates, Lipids, Proteins- Definition, Classification, their dietary source and role. Chapter 3 • Micronutrients. Vitamins- Water-soluble and Fat-soluble vitamins- their sources and importance. Important minerals viz., Iron, Calcium, Phosphorus, Iodine, Selenium and Zinc: their biological functions.	
Unit III Malnutrition, nutrient deficiency diseases and diseases caused by microorganisms	**14**
Chapter 4 • Definition and concept of health: Common nutritional deficiency diseases- Protein Malnutrition (e.g., Kwashiorkor and Marasmus). • Vitamin A deficiency, Iron deficiency and Iodine deficiency disorders- their symptoms, treatment, prevention and government initiatives. Chapter 5	

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• Life style dependent diseases- hypertension, diabetes mellitus, and obesity their causes and prevention. Social health problems- smoking, alcoholism, narcotics. • Acquired Immuno Deficiency Syndrome (AIDS): causes, treatment and prevention. Other ailments viz., cold, cough, and fever, their causes and treatment. Chapter 6 • Food hygiene: Potable water- sources and methods of purification at domestic level. • Food and Water-borne infections: Bacterial diseases: Cholera, Dysentery; Typhoid fever, Viral diseases: Hepatitis, Poliomyelitis etc., • Protozoan diseases: Amoebiasis, Giardiasis; • Parasitic diseases: Taeniasis and Ascariasis their transmission, causative agent, sources of infection, symptoms and prevention. Chapter 7 • Causes of food spoilage and its prevention.	

Suggested Readings:

1. Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed; New Age International Publishers
2. Srilakshmi, B. (2002). Nutrition Science; New Age International (P) Ltd.
3. Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) Ltd.
4. Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO.
5. Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford & IBH Publishing Co. Pvt Ltd.
6. Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill.
7. Lakra, P. and Singh M.D. (2008). Textbook of Nutrition and Health; First Ed; Academic Excellence.
8. Manay, M.S. and Shadaksharaswamy, M. (1998). Food-Facts and Principles; New AgeInternational (P) Ltd.
9. Gibney, M.J. et al. (2004). Public Health Nutrition; Blackwell Publishing.

Course Books published in English and Kannada may be prescribed by the Universities and College References

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	**20**
Written Assignment/Presentation/Project / Term Papers/Seminar	**15**
Class performance/Participation	**05**
Total	**40**

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Content	42 Hrs
Unit – 1	
Chapter 1. General Concepts • Introduction, Parasites, parasitoids, host, zoonosis • Origin and evolution of parasites • Basic concept of Parasitism, Symbiosis, Phoresy, commensalisms and mutualism • Host-parasite interactions and adaptations • Life cycle of human parasites • Occurrence, mode of infection and prophylaxis **Chapter 2. Parasitic Platyhelminthes** • Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • *Fasciolopsis buski* • *Schistosoma haematobium* • *Taenia solium* • *Hymenolepis nana* **Chapter 3. Parasitic Protists** • Study of morphology, life cycle, pathogenicity, prophylaxis and control *measures* of • *Entamoeba histolytica* • *Giardia intestinalis*	14
• *rypanosoma gambiense* • *Plasmodium vivax*	
Unit – 2	14
Chapter 4. Parasitic Nematodes • Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • *Ascaris lumbricoides* • *Ancylostoma duodenale* • *Wuchereria bancrofti* • *Trichinella spiralis* • Nematode plant interaction; Gall formation **Chapter 5. Parasitic Arthropods** • Biology, importance and control of • Ticks (Soft tick *Ornithodoros*, Hard tick *Ixodes*) • Mites (*Sarcoptes*) • Lice (*Pediculus*) • Flea (*Xenopsylla*) • Bug (*Cimex*) • Parasitoid (Beetles) **Chapter 6. Parasitic Vertebrates** • Cookicutter Shark • Hood Mocking bird and Vampire bat and their parasitic behavior and effect on host	
Unit – 3	14

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Chapter 7. Molecular diagnosis & clinical parasitology	
• General concept of molecular diagnosis for parasitic infection • Advantages and disadvantages of molecular diagnosis • Fundamental • Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the basis of marker molecules like G.intestinalis, B. coli, E. histolytica, L. donovani, Malarial parasiteusing • ELISA, RIA • Counter Current Immuno electrophoresis (CCI) • Complement Fixation Test (CFT) PCR, DNA, RNA probe	

Suggested Readings:

- Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications.
- E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition.
- Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology ofDisease. Taylor and Francis Group.
- Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
- Meyer, Olsen & Schmidt's Essentials ofParasitology, Murray, D. Dailey, W.C. BrownPublishers.
- K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBSnP.
- Gunn, A. and Pitt, S.J. (2012). Parasitology: an Integrated Approach. WileyBlackwell.
- Noble, E. R. and G.A.Noble (1982) Parasitology: The biology of animal parasites. V th Edition, Lea &Febiger.
- Paniker, C.K.J., Ghosh, S. [Ed} (2013). Paniker's Text Book of Medical Parasitology. Jaypee, New Delhi.
- Parija,S.C.Textbookofmedicalparasitology,protozoology&helminthology(Textand color Atlas),II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
- Roberts, L.S and Janovy, J. (2009). Smith & Robert's Foundation of Parasitology. 8th. Edn. McGraw Hill.
- Bogitsh, B. J. and Cheng, T. C. (2000). Human Parasitology. 2nd Ed. Academic Press, New York.
- Chandler, A. C. and Read. C. P. (1961). Introduction to Parasitology, 10th ed. John Wiley and Sons Inc.
- Cheng, T. C. (1986). General Parasitology. 2nd ed. Academic Press, Inc. Orlando. U.S.A.
- Schmidt, G. D. and Roberts, L. S. (2001). Foundation of Parasitology. 3rd ed. McGrawHill Publishers.
- Schmidt, G. D. (1989). Essentials of Parasitology. Wm. C. Brown Publishers.
- John Hyde (1996) Molecular Parasitology Open University Press.
- J Joseph Marr and Miklos Muller (1995) Biochemistry and Molecular Biology of Parasites 2nd Edn A P.

Course Books published in English and Kannada may be prescribed by the Universities andCollege

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Interaction, virtual lab, Lab visit

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