



Savitribai Phule Pune University, Pune
(Formerly, University of Pune)

4 Year Bachelor Degree Program in Zoology
(Faculty of Science & Technology)

To be implemented from Academic Year 2024 - 2025

Revised Syllabi for B. Sc. Zoology

As per National Education Policy (2020) for

F. Y. B. Sc. Zoology (Semester I & II)

(for Colleges Affiliated to Savitribai Phule Pune University, Pune)

Framed by

BOARD OF STUDIES IN ZOOLOGY

Savitribai Phule Pune University,

Ganeshkhind, Pune – 411 007

❖ Aims and Objectives :

- Focus is on building concepts in biological sciences and enabling them to apply their experimental knowledge in various sectors of life sciences specifically in animal biology.
- Specifically, this programme aims at enhancing the professional competencies and skills.
- Analyze complex interactions among various animals of different phyla, their distribution and their relationship with the environment.
- Helps to understand the physiological, biochemical, molecular and genetic principles of animals and their surroundings.
- Empower learners by enabling them with communication, professional and life skills.
- This course provides an advanced knowledge of modern biology and help to develop a range of generic skills that are relevant to wage employment, self-employment and entrepreneurship.

❖ Program outcomes (POs) :

The curriculum is designed after a long thinking and interacting process with various components of the stakeholders. After successful completion of B. Sc. Zoology Major program students will be able to gain the basic, applied and research based knowledge pertaining to the various branches of Animal sciences.

1. Knowledge and skills on the topic :

- i. In-depth knowledge of the major concepts, theoretical principles and experimental skills of zoology and its various fields, including biodiversity, anatomy, physiology, biochemistry, bio-nanotechnology, ecology, evolutionary biology, cell biology, molecular biology, immunology, genetics, as well as some other areas of applied research such as wildlife conservation and management, beekeeping, sericulture, vermiculture, neuroscience, aquatic biology, fisheries science, animal breeding, bioinformatics and research methodology, etc.
- ii. Interdisciplinary knowledge of life sciences, environmental sciences, and related biochemical sciences.
- iii. Learn about the various techniques, tools, and computer software used to analyze the forms and functions of animals.

2. Skillful communication : Ability to communicate complex zoological information effectively and efficiently.

- 3. Critical thinking and problem-solving skills :** The ability to rationally analyze and solve animal science issues without relying on hypotheses and guesswork.
- 4. Logical thinking and reasoning :** Ability to search for solutions and solve them logically by experimenting and processing the data manually or by using softwares.
- 5. Team spirit and leadership qualities :** Ability to identify and mobilize the resources required for the project and management of the project responsibly while adhering to ethical scientific concern and bio-safety protocols.
- 6. Digital efficiency :** Ability to use computers and other tools for biological simulations, calculations, appropriate bio-statistical software, and research tools to locate, retrieve, and evaluate zoology-related data.
- 7. Ethical awareness and reasoning :** Avoid unethical behaviour such as data falsification, forgery or deception, plagiarism and value environmental and sustainability issues.
- 8. Lifelong learning :** Capable of independent, self-directed learning with the aim of personal and social development.
- 9. Entrepreneurship qualities :** Develop entrepreneurship qualities as this course contains almost all branches of applied zoology. One can establish a start up project by learning various courses.
- 10. Advanced education :** Students will be able to develop their mind with some advanced and superior knowledge, research outcomes and also the new as well as easy system of education. This will make them more reliable and capable in the world to lead the nation.

❖ **Program Specific Outcomes (PSOs) :**

- PSO 1 :** After completion of this course students will be able to contribute as policy makers in biodiversity conservation, animal preservation and environment protection.
- PSO 2 :** Equip with the knowledge of animal classification and diversity, ecology and economic importance of animals.
- PSO 3 :** Acquire the advanced concepts in insect rearing and various animal breedings for the food security of human beings.
- PSO 4 :** Inculcate the traditional knowledge of using various animal based products in human healthcare system.
- PSO 5 :** Adapt scientific research techniques in various applied branches of Zoology for sustainable development.
- PSO 6 :** Perform procedures as per laboratory standards in the areas of Taxonomy,

Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Toxicology, Entomology, Sericulture, Biochemistry, Fish biology, Animal breeding and Clinical Pathology.

PSO 7 : Zoology course also provide a knowledge of applied subjects to develop various skills to make a career and become an entrepreneur in the field of aquatic biology, sericulture, apiculture, vermiculture, prawn culture, dairy management, animal breeding and management, wildlife conservation and management, wildlife photography etc.

PSO 8 : Analyze the relationships among animals, plants, and microbes.

PSO 9 : Understand and analyze the ecological and evolutionary significance of different taxa of animals.

PSO 10 : Analyze the mechanisms involved in life processes up to the molecular level.

PSO 11 : Gains knowledge about research methodologies, effective communication and skills of problem solving methods.

PSO 12 : Contributes the knowledge for Nation building.

❖ **Course Title :**

- B. Sc. Zoology Major (03 years) / B. Sc. Honours in Zoology (04 years) / B. Sc. Honours in Zoology with Research (04 years).
- Revised syllabus as per the National Education Policy (NEP), 2020 for the Colleges Affiliated to Savitribai Phule Pune University, Pune.

❖ **Faculty : Science and Technology**

❖ **Preamble :**

Zoology is a significant branch of study in the Basic Sciences, which covers every facet of animal biology. Animals and organisms almost occupy every habitat available to them, and they are indivisible part of all ecosystems, food chains and food webs.

The goal of the National Education Policy 2020 (NEP 2020) is to prepare students for lifelong learning by giving them leadership skills, values, and knowledge. Goal 4 (SDG4) of the 2030 Agenda for Sustainable Development, which India adopted in 2015, aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by 2030, which is in line with the global agenda for development in education.

The University Grants Commission (UGC) has decided to implement the National Education Policy (NEP), 2020, by revising the curriculum across the nation. At SPPU, the Board of Studies in Zoology has updated the curriculum to include the policies and procedures mentioned in the NEP, 2020, which is going to be implemented from the academic year 2024 - 2025 in the colleges affiliated to Savitribai Phule Pune University. It covers a wide variety of fascinating subjects. The NEP aims to integrate general (academic) education, vocational education, skill based education and experiential learning to improve the effectiveness and holistic nature of education. The objective of NEP 2020 is to foster academic excellence, ease smooth academic mobility, and augment the global competitiveness of Indian students by instituting a credit structure and course framework that are both nationally and internationally equivalent. The NEP offers a comprehensive, multidisciplinary education program that will support students' intellectual, scientific, social, physical, emotional, moral, and ethical growth.

Students can select their areas of interest due to the curriculum's flexibility, which improves their employment opportunities. For students' development, the NEP 2020 guarantees adaptable curriculum framework and a course-based result strategy.

In reaction to the swift progress in science and technology as well as the changing perspectives in diverse fields of basic and applied Zoology, the Board of Studies in Zoology at SPPU, Pune framed the first year B. Sc. Zoology curriculum, which not only surpasses the confines of conventional academia but also transcends traditional academic boundaries. Students will have the freedom to tailor their course to interests and to specialise or maintain breadth in their studies. The range of research and transferable skills they will learn will enhance their employability as a graduate.

The students admitted for Zoology degree will acquire extensive disciplinary knowledge in the related branches of Zoology. The curriculum is not only designed to make the students capable of securing their career in Life science industries but also become capable of becoming potential entrepreneurs by starting their own business such as Vermiculture, Sericulture, Apiculture, Pet breeding and management, Dairy management, Aquarium management, Pest management, Laboratory animal breeding and management, Fishery management and marketing, Toxicology, etc. At the end of the program, students can possess skills that will give them a competitive advantage in pursuing higher studies in India and abroad as well as seeking a job. In an educational framework based on the learning outcomes

of the program, students are able to define and explain the main concepts of the life sciences. They will be familiar with a variety of biological instruments and appropriate laboratory techniques, impart biological knowledge in oral and written form, and identify the relationship between structure and function at all levels : molecular, cellular, tissue, organic, systemic, and organizational.

Students should be able to identify, classify, and distinguish a variety of non-chordate and chordate organisms based on their basic morphological, anatomical, biochemical, and molecular characters. They can also describe the economic, environmental, and medical importance of different animals in human life. This program inspires curiosity and awareness among students to learn more about the diversity of animals, and also pursue wildlife exploration as a career option. Procedural knowledge of animal identification and classification as well as various skill based courses will provide the students with professional advantages for seeking employment in teaching, research, and taxonomy in various public and private organizations. Students can apply scientific methods for answering questions in biology by formulating testable hypotheses, collecting data related to those hypotheses, and analyzing that data to evaluate the extent to which their scientific work supports their hypotheses.

The world's present scenario of drastic changes in the climatic conditions has resulted in total uncertainties of sustainable agricultural production and food security for human beings. Zoology will be the most promising branch for providing food and protein security for the ever increasing population in future as many insects, organisms and animals are important part of the human diet worldwide.

❖ Program Duration and Exit Options :

- The UG Program is of four years divided in eight semesters. Student may leave the program after third year if, they prefer to receive a three year graduate degree.
- If the student decides to exit after first year, they will receive a UG Certificate, if they decide to exit after Second year; they will receive a UG Diploma. This will also depend on the total required credits they had earned.
- Re-entry within three years to finish the degree program is allowed for those who had left with a UG Certificate or UG Diploma.
- A student must earn minimum 22 credits and a maximum 26 credits in each semester.

- The minimum number of credits required to be earned for award of Undergraduate Certificate / Undergraduate Diploma / Bachelor Degree / Bachelor's Degree with Honors in Zoology / Bachelor's Degree with Honors in Zoology with Research are as follows –

Sr. No.	Type of Award	Exit Stage	Mandatory Credits to be obtained
1.	Undergraduate Certificate in Zoology	After successful completion of First year i. e. Semester I & II	44
2.	Undergraduate Diploma in Zoology	After successful completion of Second year i. e. Semester III & IV	88
3.	Bachelor of Science in Zoology Major	After successful completion of Third year i. e. Semester V & VI	132
4.	Bachelor of Science in Zoology (Honors)	After successful completion of Fourth year i. e. Semester VII & VIII	176
5.	Bachelor of Science in Zoology (Honors) with Research	After successful completion of Fourth year i. e. Semester VII & VIII	176

❖ Eligibility Criteria :

- The criteria for F. Y. B. Sc. Zoology admission will be 10 + 2 passed students / MCVC / Diploma courses related to Animal Sciences / Life Sciences etc.
- Other conditions will be as prescribed by Savitribai Phule Pune University, Pune / Government of Maharashtra.

❖ Fee Structure :

As per the norms laid down by Savitribai Phule Pune University, Pune.

❖ Course Implementation criteria :

Each semester consisting of 15 weeks = 12 weeks for Actual Teaching + 3 weeks for Continuous Internal Evaluation.

I. Two Credits of the Theory = 30 clock hours (Actual Teaching of 2 hours per week + 3 hours for continuous internal evaluation which may consists of short questions, class tests, field visits, tutorials, Problem solving sessions, practice, group discussion, assignments, unit tests, seminars, quiz, M. C. Q., project work etc.

II. Two Credits of Practical = 60 clock hours.

❖ **Examination Pattern :**

➤ **Theory Paper of 02 Credits –**

- Internal Exam (15 Marks) + University Theory Exam (35 Marks) = 50 Marks.
- Duration : For Internal exam = 40 Minutes and For University Exam = 02 hours.

➤ **Practical Paper of 2 Credits –**

- Internal Exam (15 Marks) + University Practical Exam (35 Marks) = 50 Marks.
- Duration : For Internal exam = 40 Minutes and For University Exam = More than 04 hours.

❖ **Assessment Method (For each Semester) :**

The examinations will be conducted after completion of each semester, both for Theory as well as Practical courses. Total marks for 2 credit course examination will be 50.

❖ **Award of Class / Grade and A. T. K. T. Rules :**

As per the norms and conditions laid down by SPPU, Pune.

❖ **Important Instructions :**

- There should be at least a short (1 day) and Distant (2-3 days) Study tour / Field visit / Industrial visit / Institutional visit per year.
- Tours are the part of curriculum and are mandatory to each student, failing which they will not be considered eligible to claim the marks assigned in the practical examination.
- The student has to submit the followings at the time of practical examination : Certified Journal, Certified Study tour report / Field visit report and Any other prescribed for the course.

❖ Question paper pattern for Theory (2 Credit courses) :

The students will have to solve the question paper of 35 marks. Including optional questions, The paper setter should set the paper on entire syllabus for total 61 marks,.

N. B. : All questions are compulsory.

Max. Time : 2 Hours.

Q. 1) Answer any five of the followings in one sentence - 05 Marks

- Attempt any five from six questions.

Q. 2 (a) Attempt any one of the following - 06 Marks

- Attempt any one from the two questions.

Q. 2 (b) Attempt any one of the following - 04 Marks

- Attempt any one from the two questions.

Q. 3 (a) Solve any one of the following - 06 Marks

- Solve any one from the two questions.

Q. 3 (b) Solve any one of the following - 04 Marks

- Solve any one from the two questions.

Q. 4) Write notes on (Any four) - 10 Marks

- Attempt any four from six questions.

Credit Framework for Under Graduate (UG)

Level / Difficulty	Semester	Credits Related to Major					Minor	GE/OE	SEC	AEC	VEC	CC	Total
		Major Core	Major Elective	VSC	IKS	FP / OJT / CEP							
Vertical (V)		V - 1		V - 4	V - 5	V - 6	V - 2	V - 3	V - 4	V - 5	V - 5	V - 6	
4.5 / 100	I	4 (T) + 2 (P)	0	2 (T)	2 (T)	0	0	2 (T) + 2 (P)	2 (T/P)	2 (T)	2	2	22
	II	4 (T) + 2 (P)	0	2 (P)	0	0	2 (T)	2 (T) + 2 (P)	2 (T/P)	2 (T)	2	2	22
Exit Option : Award of UG Certificate in Major with 44 credits and an additional 4 credit score NSQF Course / Internship or Continue with Major and Minor													
5.0 / 200	III	6 (T) + 2 (P)	0	2 (T)	0	2 (FP)	2 (T) + 2 (P)	2 (T)	0	2	0	2	22
	IV	6 (T) + 2 (P)	0	0	0	2 (CEP)	2 (T) + 2 (P)	2 (P)	2 (T/P)	2	0	2	22
Exit Option : Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credit score NSQF Course / Internship or Continue with Major and Minor													
5.5 / 300	V	6 (T) + 4 (P)	2 (T) + 2 (T/P)	2 (P)	0	2 (FP / CEP)	2 (T) + 2 (P)	0	0	0	0	0	22
	VI	6 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	4 (OJT)	2 (T) + 2 (P)	0	0	0	0	0	22
Total 3 Years		48	8	8	2	10	18	12	6	8	4	8	132
Exit Option : Award of UG Degree in Major with 132 credits or Continue with Major and Minor													
6.0 / 400	VII	6 (T) + 2 (P)	2 (T) + 2 (T/P)	0	0	4 (RP)	4 (RM) (T)	0	0	0	0	0	22
	VIII	6 (T) + 2 (P)	2 (T) + 2 (T/P)	0	0	8 (RP)	0	0	0	0	0	0	22
Total 4 Years		68	16	8	2	22	22	12	6	8	4	8	176
Four Year UG honours with Research Degree in Major and Minor with 176 Credits													
6.0 / 400	VII	10 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	0	4 (RM)	0	0	0	0	0	22
	VIII	10 (T) + 4 (P)	2 (T) + 2 (T/P)	0	0	4 (OJT)	0	0	0	0	0	0	22
Total 4 Years		76	16	8	2	14	22	12	6	8	4	8	176
Four Year UG Honours Degree in Major and Minor with 176 Credits													

Credit Structure for F. Y. B. Sc. Zoology, Semester – I

Semester	Courses	Course Code	Course Title	Credits
I	Major Core	ZOO 101 MJ	Genetics (T)	2
		ZOO 102 MJ	Medical Zoology (T)	2
		ZOO 103 MJP	Practicals in Genetics & Medical Zoology (P)	2
	Major Elective		-----	0
	VSC (Vocational Skill Courses) (Any One from the Basket)	ZOO 121 VSC	Vermiculture Management (T)	2
		ZOO 122 VSC	Dairy Management (T)	2
	IKS (Indian Knowledge System)	ZOO 101 IKS	Ancient Indian Zoology (T)	2
	FP/OJT/CEP (Community Engagement Service)		-----	0
	Minor		-----	0
	GE/OE (Generic/ Open elective)	OE 101 ZOO	Apiculture (T)	2
		OE 102 ZOOP	Apiculture (P)	2
	SEC (Skill Enhancement Courses) (Any One from the Basket)	SEC 101 ZOO	Advanced Animal Breeding & Management (T)	2
		SEC 102 ZOO	Wildlife Tourism (T)	2
	AEC (Ability Enhancement Courses)	AEC 101 ENG	Communication & Soft skills (T)	2
	VEC (Value Education Course)	VEC 101 ENV	Global Environment Issues (T)	2
	CC (Cocurricular Courses) (Any One from the Basket)	CC 101 PE	Fitness & Wellness (T)	2
		CC 102 PE	Indian Health Sciences (T)	2
Total				22

Credit Structure for F. Y. B. Sc. Zoology, Semester – II

Semester	Courses	Course Code	Course Title	Credits
II	Major Core	ZOO 151 MJ	Cell Biology (T)	2
		ZOO 152 MJ	Biomedical Techniques (T)	2
		ZOO 153 MJP	Practicals in Cell Biology & Biomedical Techniques (P)	2
	Major Elective		-----	0
	VSC (Vocational Skill Courses) (Any One from the Basket)	ZOO 171 VSCP	Vermiculture Management (P)	2
		ZOO 172 VSCP	Dairy Management (P)	2
	IKS (Indian Knowledge System)		-----	0
	FP/OJT/CEP (Community Engagement Service)		-----	0
	Minor	ZOO 191 MN	Wildlife Conservation & Management (T)	2
	GE/OE (Generic/ Open elective)	OE 151 ZOO	Sericulture (T)	2
		OE 152 ZOOP	Sericulture (P)	2
	SEC (Skill Enhancement Courses) (Any One from the Basket)	SEC 151 ZOO	Pet Breeding & Management (T)	2
		SEC 152 ZOOP	Wildlife Photography (P)	2
	AEC (Ability Enhancement Courses)	AEC 151 AM	Aquarium Management (T)	2
	VEC (Value Education Course)	VEC 151 IC	Introduction to Indian Constitution (T)	2
CC (Cocurricular Courses)	CC 151 PE	Health & Yoga (T)	2	
Total				22



SEMESTER - I

ZOO 101 MJ : Genetics						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Major Core	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

- CO1 :** Apply Mendelian genetic principles to predict outcomes of genetic crosses, interpret pedigrees and understand the basics of genetic inheritance.
- CO2 :** Describe the molecular structure of DNA, its replication process, and how genetic information is transcribed and translated into proteins.
- CO3 :** Understand the causes of genetic variations including mutations, genetic recombination and genetic drift.
- CO4 :** Recognize and explain the inheritance patterns and molecular basis of common genetic disorders, including both Mendelian and complex traits.
- CO5 :** Successfully solve genetic problems using Punnett squares, probability calculations and pedigree analysis.
- CO6 :** Understand the role of genetic variation and natural selection in the process of evolution.
- CO7 :** Analyze and discuss the applications and ethical considerations of modern genetic technologies.
- CO8 :** Read and evaluate scientific literature related to genetics, demonstrating the ability to Analyze and synthesize information from research articles.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	<p>Recapitulation of Mendelian Genetics :</p> <p>1.1 Mendel's work: Selection of Experimental plant.</p> <p>1.2 Mendelian inheritance: Laws of heredity and their practical applications (Monohybrid cross and Dihybrid cross).</p> <p>1.3 Test cross and back cross.</p>	02
2.	<p>Gene Interaction :</p> <p>2.1 Concept of gene Interaction: Intra-allelic interactions and Inter-allelic interactions.</p> <p>2.2 Intra-allelic interactions: Dominance and Co-dominance.</p> <p>2.3 Inter-allelic interactions: Co-dominance and incomplete dominance (concept of epistasis, complimentary factors (9 : 7), supplementary factors (9 : 3 : 4), inhibitory factors (13 : 3), duplicate dominant genes (factors) (15 : 1).</p> <p>3.4 Lethal genes in <i>Mus musculus</i>.</p>	03
3.	<p>Multiple alleles :</p> <p>3.1 Concept and characteristics.</p> <p>3.2 ABO blood group system, Inheritance of Rh antigen, Bombay blood group, Erythroblastosis foetalis, Medicolegal importance of these systems.</p>	03
4.	<p>Chromosomes :</p> <p>4.1 Introduction: Morphology and types of chromosomes (based on the position of centromere and involvement in sex determination).</p> <p>4.2 Chromatin, its structure and its types (Euchromatin and Heterochromatin).</p> <p>4.3 Giant chromosomes (Polytene chromosome and Lamp brush chromosomes).</p> <p>4.4 Chromosomal aberrations: Structural (Deletion, duplication, inversion and translocation) and Numerical (Euploidy, monoploidy, polyploidy- autopolyploidy & allopolyploidy and aneuploidy- monosomy, nullisomy, trisomy).</p>	04

5.	<p>Linkage and Recombination :</p> <p>5.1 Introduction: Sutton-Boveri chromosome theory of inheritance.</p> <p>5.2 Crossing over and chiasma formation.</p> <p>5.3 Types of linkages: complete and incomplete.</p>	04
6.	<p>Sex determination :</p> <p>6.1 Genetically controlled sex determination: (Heterogametic males: XX - XY & XX - XO systems, Heterogametic females: ZZ - ZW system), Genetic balance system in <i>Drosophila</i>.</p> <p>6.2 Parthenogenesis and Gynandromorphism.</p>	03
7.	<p>Sex-linked inheritance :</p> <p>7.1 Sex-linked inheritance: characteristics, types (X- linked, Y-linked, and XY-linked).</p> <p>7.2 Examples of Sex-linked inheritance: Hemophilia, Colour blindness, and Hypertrichosis.</p> <p>7.3 Sex Influenced Inheritance: Pattern baldness.</p>	04
8.	<p>Human genetics :</p> <p>8.1 Karyotyping: Study of human karyotype (chromosome arrangement and numbering according to chromosome size and type based on position of centromere).</p> <p>8.2 Sex chromosomal abnormalities in man – Klinefelter's syndrome, Turner syndrome</p> <p>8.3 Inborn errors of metabolism (Alkaptonuria, Phenylketonuria, Albinism).</p>	04
9.	<p>Applied genetics :</p> <p>9.1 Introduction to Genetic counselling.</p> <p>9.2 Introduction to DNA-finger printing.</p> <p>9.3 Introduction to Transgenic animals.</p>	03

Suggested Readings :

1. Genetics: Verma, P S. and Agrawal, V K., S. Chand and Co., New Delhi
2. Fundamentals of Genetics: B.D. Singh, Kalyani Publishers, New Delhi.
3. Principle of Genetics: Sinnott, Dunn and Dobzhansky, Tata McGraw Hill Edition, New Delhi.

4. Genetics: Gupta, P K., Rastogi Publication, Meerut.
5. Genetics: Sarin, C., Tata McGraw Hill, New Delhi.
6. Principles of Genetics: Gardner, EJ., Simmons, MJ. and Snustad, DP. John Wiley and Sons.
7. Cytology and Genetics : Dyansagar VR., Tata McGraw Hill Pub. Co. Ltd., New Delhi.

ZOO 102 MJ : Medical Zoology						
Year : I				Semester : I		
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Major Core	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

- CO1 :** Students will be able to understand basic concepts of medical parasitology.
- CO2 :** Students will be able to learn morphology, life history, mode of infection, pathogenicity, prophylaxis and treatments of protozoan and helminth parasites.
- CO3 :** Students will be able to learn scientific approach or techniques used in clinical Laboratories to investigate various diseases and will be skilled to work in research laboratories.
- CO4 :** Students will be able to understand the human immune system and its response to the pathogen.
- CO5 :** Students will be able to explain various modes of transmission of parasites by insects and their control measures.
- CO6 :** Student will gain common knowledge about medical imaging techniques and their use in diagnosing the various diseases.
- CO7 :** Students will be able to explain different investigating techniques.
- CO8 :** Students will be able to understand different microbial diseases in humans.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction of parasitology : 1.1 Parasitology. 1.2 Medical Protozoology. 1.3 Medical Helminthology. 1.4 Medical Entomology. 1.5 Parasite. 1.6 Host. 1.7 Vector. 1.8 Symbiosis, Commensalism, Parasitism. 1.9 Zoonosis	03
2.	Parasitic diseases : Study of morphology, life history, mode of infection, pathogenicity, prophylaxis and treatments of the following : 2.1 Protozoa: <i>Plasmodium vivax</i> and <i>Toxoplasma gondii</i> . 2.2 Platyhelminthes : <i>Taenia solium</i> and <i>Fasciola hepatica</i> .	10
3.	Epidemic diseases : Occurrence, causative organism, symptoms and eradication programs of the following: 3.1 Typhoid. 3.2 Cholera. 3.3 Small pox.	03
4.	Vector borne human diseases : 3.1 Dengue. 3.2 Chicken guinea. 3.3 Filariasis. 3.4 Viral Influenza. 3.5 Scabies. 3.6 Tick typhus	05
5.	Human immune system : 5.1 Definition of antigen and antibody.	04

Unit No.	Name of the Topic	Lectures Allotted
	5.2 Concept of immunity. 5.3 Self and Non-self-recognition of antigen. 5.4 Active and Passive immunization. 5.5 Innate and Adaptive immunity (Humoral and Cell mediated immune response).	
6.	Investigations and treatments of human physiological disorders : 6.1 Angiography. 6.2 Angioplasty. 6.3 Dialysis. 6.4 Colour doppler. 6.5 Biopsy.	03
7.	Microbial diseases in human : Causative organism and clinical features of the following: 8.1 Tuberculosis. 8.2 Hepatitis. 8.3 AIDS.	02

Suggested Readings :

1. Baker, F.J. and Silverton, R.E. (1985) Introduction to Medical Laboratory Technology, (6th ed), Butler worth and Co. Ltd.
2. Chatterjee, K.D. (1995), Parasitology, Protozoology and Helminthology (12th ed).
3. Cheesborough, M. (1987), Medical Laboratory Technology for Tropical countries (2nd ed), Butler worth and Co., Ltd.
4. Garcia, L.S. (2001), Diagnostic Medical Parasitology, (4th ed), ASM Press Washington.
5. Kimball, J.W. (1986), Introduction of Immunology, Mac Millian Publishing Co., New York.
6. Kuby, J. (2000), Immunology, W.H. Freeman & Co., USA.
7. Rathod A.K., Deshmukh N.Z., Kumar D. and Goswami R. (2015), Applied and Economic Zoology, Astral International (P) Ltd. New Delhi
8. Roitt, I. (1984), Essential Immunology, Blackwell Scientific Publications, Oxford.
9. Talib, V.H. (1999), Essential Laboratory Manual, Mehta Publishers, New Delhi.

ZOO 103 MJP : Practical in Genetics and Medical Zoology						
Year : I				Semester : I		
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practical per week	Internal Assessment	Semester End Exam	Total
Major Core	02	60	01	15	35	50

Course Outcomes :**After completion of this course, students should be able to :**

- CO1 :** Understand morphology, life history, mode of infection and pathogenicity, prophylaxis and treatments of protozoan and helminth parasites.
- CO2 :** Learn scientific approach or techniques used in clinical laboratories to investigate various diseases and will be skilled to work in research laboratories.
- CO3 :** Understand the human immune system and its response to the pathogen.
- CO4 :** Calculate and interpret monohybrid and dihybrid ratios based on hypothetical data.
- CO5 :** Use collected data to understand the inheritance patterns of Mendelian traits.
- CO6 :** Identify and describe the chromosomal composition of a normal human karyotype.
- CO7 :** Perform blood typing and interpret blood group results.
- CO8 :** Learn various vector borne as well as protozoan diseases and their control measures.

Detailed Syllabus :

Five practicals from the following list should be conducted (Inclusive of the compulsory practicals).

Unit No.	Title of the Practical	Practical Allotted
Practicals in Genetics		
1.	Study of monohybrid ratio and dihybrid ratio by providing hypothetical data and deducing the applicability of Mendelian laws (three examples of each ratio). (E)	1 P
2.	Study of Mendelian genetic traits in human beings (tongue rolling, widow's peak, attachment of ear lobes, and PTC tasters/non-tasters) using collected data from a limited population. (E)	1 P

Unit No.	Title of the Practical	Practical Allotted
3.	Preparation of normal human karyotype from picture of metaphase chromosomal spread. (Compulsory) (E)	1 P
4.	Study of blood groups in Humans. (ABO and Rh). (E) (Compulsory)	1 P
5.	Study of facultative heterochromatin from humans: Barr Body (buccal cells) / Drumstick (Neutrophils). (E) (Compulsory)	1 P
6.	Preparation of culture media and maintenance of <i>Drosophila</i> culture. (E)	2 P
7.	Study of <i>Drosophila</i> : External characters and sexual dimorphism. (D)	1 P
8.	Study of <i>Drosophila</i> mutants (any two examples of eye and wing mutants). (D)	2 P
Practicals in Medical Zoology		
9.	Study of life history, mode of infection, pathogenicity, prophylaxis and treatment of <i>Plasmodium vivax</i> and <i>Toxoplasma gondii</i> (D)	2 P
10.	Study of life history, mode of infection, pathogenicity, prophylaxis and treatment of <i>Taenia solium</i> and <i>Fasciola hepatica</i> (D)	2 P
11.	Examination of blood for presence / absence of the parasite. (E)	1 P
12.	Study of vectors: Mosquito (<i>Aedes</i> , <i>Culex</i> , <i>Anopheles</i>), Sand fly, Rat flea and Body louse (D)	2 P
13.	Principle of X-ray, MRI and CT scan (D)	1 P
14.	Principle and working of dialysis. (D)	1 P
15.	Measurements of blood pressure under normal and stressed condition. (E)	1 P

ZOO 121 VSC : Vermiculture Management						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
(VSC) Vocational Skill Course	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

CO1 : Acquire a critical knowledge on the role of earthworms in making organic matter from biodegradable wastes.

CO2 : Understand the biology of some important species of earthworms used in vermiculture.

CO3 : Acquire skills in production of vermicompost.

CO4 : Explain benefits and problems with vermiculture and vermicompost.

CO5 : Become an entrepreneur by culturing earthworms.

CO6 : Acquire a knowledge about life cycle of earthworm.

CO7 : Understand economics importance of earthworm.

CO8 : Identify enemies and diseases of earthworm.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction to vermiculture : 1.1 Definition, history and it's importance in maintenance of soil structure. 1.2 Role of vermiculture in four R's of recycling (Reduce, Reuse, Recycle and Restore) 1.3 The matter and humus cycle (product, qualities) of earthworm. 1.4 Transformation process in organic matter.	05
2.	Types of earthworms : 2.1 Types of earthworms - Epigenic, Endogenic and Anecic. 2.2 Indigenous species of earthworms. 2.3 Exotic species of earthworms. 3.4 Useful species of earthworm: <i>Eisenia fetida</i> , <i>Eudri luseugeniae</i> , <i>Lumbricus rubellus</i> , <i>Perionyx excavates</i> etc.	05
3.	Biology of Earthworm (<i>Eisenia foetida</i> or <i>Eudrilus eugeniae</i>) : 3.1 Systematic position, External Morphology, Habit & Habitat. 3.2 Life cycle of <i>Eisenia foetida</i> or <i>Eudrilus eugeniae</i> . 3.3 Digestive system of <i>Eisenia foetida</i> or <i>Eudrilus eugeniae</i> . 3.4 Reproductive system of <i>Eisenia foetida</i> or <i>Eudrilus eugeniae</i> .	06

4.	Vermicomposting : 4.1 Small scale farming for house gardens. 4.2 Conventional commercial composting / Large scale earthworm farming -Pit system, Heap system, Bricksy stem, Kadapas lab method. 4.3 Earthworm - Feeding and Maintenance. 4.4 Vermicompost harvest, processing and packaging. 4.5 Vermi-wash preparation, composition, collection & uses.	09
5.	Enemies and diseases of Earthworms : 5.1 Enemies of Earthworm – Ants, Birds, Rats, Snakes, Toads. 5.2 Diseases of Earthworm – Bacterial, Protozoan, Fungal.	03
6.	Economic importance and marketing : 6.1 Economic importance of earthworms, vermicompost and vermiwash. 6.2 Vermicompost as business / marketing of Vermicompost, Employment opportunities.	02

Suggested Readings :

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. Wallwork, J. A. (1983) "Earthworm Biology" Edward Arnold (Publishers) Ltd. London.
5. Kevin, A and K. E. Lee (1989) "Earthworm for Gardeners and Fisherman" (CSIRO, Australia, Division of Soils).
6. The Complete Technology Book on Vermiculture and Vermicompost. by NPCS board. Asis Specific Business Press.
7. Singh K, Nath G, Shukla RC and Bhartiya DK (2014) Textbook of Vermicompost: Vermiwash and Biopesticides.
8. Panda H (2022) Vermiculture and Vermicompost (Earthworm) with Manufacturing Process, Machinery Equipment Details & Plant Layout.

ZOO 122 VSC : Dairy Management						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
VSC (Vocational Skill Courses)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to:

CO1 : Farming aspects in livestock so as to prepare themselves for future prospectus.

CO2 : Study of various diseases & disorders in livestock.

CO3 : Processing of market milk in dairy plant.

CO4 : Understand methods of manufacture and uses of standardized special milk.

CO5 : Learn methods of manufacture and uses of special milk of plants/vegetable origin:.

CO6 : Understand chemical composition, properties, and applications of the dairy products.

CO7 : Aware about purity of dairy products.

CO8 : Explore a small scale dairy business.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	General Management Practices in Dairy Farming : 1.1 Grooming. 1.2 Drying off. 1.3 Control of bad habits. 1.4 Castration. 1.5 Dehorning. 1.6 Trimming. 1.7 Shoeing. 1.8 Identification marks. 1.9 Removing extra teats. 1.10 Shearing.	05
2.	Cattle and Buffalo Management : 2.1 Housing of Cattle & Buffalo.	07

	<p>2.2 Calf Management.</p> <p>2.3 Heifer Management.</p> <p>2.4 Management of Pregnant and Lactating Cow & Buffalo.</p> <p>2.5 Care and Management of Cross – breed Cows.</p> <p>2.6 Care and Management of Breeding buffalo.</p>	
3.	3.1 Factors affecting quality and quantity of milk, Adulteration of Milk, Packaging and Packaging material.	03
4.	<p>Disease of Lactating cow :</p> <p>4.1 Mastitis.</p> <p>4.2 Dystokia.</p> <p>4.3 Milk fever.</p> <p>4.4 Prolaps.</p> <p>4.5 Ketosis.</p>	04
5.	<p>Dairy Processing :</p> <p>5.1 Milk collection, transportation, grading, weighing and cooling of milk.</p> <p>5.2 Strainer and Straining of milk.</p> <p>5.3 Filter and Filtration of milk.</p> <p>5.4 Clarifier and clarification of milk.</p> <p>5.5 Cream separator and separation.</p> <p>5.6 Standardization.</p> <p>5.7 Pasteurization : History, formulation standards types, FDV, Regeneration efficiency.</p> <p>5.8 Homogenization : Single & double stage homogenization.</p> <p>5.9 Theory of homogenization, Homogenizer valve, homogenization efficiency.</p> <p>5.10 Sterilization : Bottle, UHT, aseptic packaging.</p>	07
6.	<p>Dairy Products :</p> <p>6.1 Cream : Definition, Nutritive value.</p> <p>6.2 Butter : Definition, nutritive value.</p> <p>6.3 Cheese : Definition, nutritive value.</p> <p>6.4 Dried Milk Products : butter milk powder, whey powder, cream powder, milk powder.</p>	04

Suggested Readings :

1. A Text book of Animal Husbandry by - G. C. Banarjee
2. A Text Book of Animal Science by - Dr. A. U. Bhikane and Dr. S. B. Kawitkar
3. Advances of animal Husbandry, The I. C. A. R. publication.
4. Animal Husbandry & Dairy Science by. Jagdish Prasad.
5. Dairy India Year Book – 2007 by - P.R. Gupta
6. Handbook of Veterinary Physician by V.A. Sarpe
7. Farm Animal Management and feeding practices in India by Thomas.
8. Outlines of Dairy Technology by Sukumar De.
9. Dairy Processing by Earl.
10. Dairy Technology and Engineering by H.G. Kessler
11. Dairy Plant Engineering and Management by Tuffel Ahmed.
12. Textbook of Dairy Plant Layout & Design by Lalat Chander,
13. Principles of Dairy Chemistry by Jenners and Pattern.
14. Dairy Chemistry by M.M. Rai.
15. Dairy Microbiology by K.C. Mahanta.
16. Dairy management in India – Madan Mohan.
17. Text Book of Animal Husbandry – G.C. Banerjee.
18. Principles and practices of Dairy Farm – Jagdish Prasad.

ZOO 101 IKS : Ancient Indian Zoology						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
IKS (Indian Knowledge System)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : Understand natural fauna history of India.

CO2 : Understand Pre-historic to Indus valley civilization of tradition of animal conservation.

CO3 : Learn names and kinds of birds and animals during the Vedic period to Maurya Dynasty.

CO4 : Understand ecosystems of ancient India.

CO5 : Understand Environmental and wildlife conservation issues.

CO6 : Understand establishment of Wildlife institutes in India.

CO7 : Understand history of Wildlife protection acts in India.

CO8 : Understand evolution of Ancient Indian history.

Detailed Syllabus :

Unit No.	Name of The Topic	Lectures Allotted
1.	1.1 Introduction to natural fauna history of India.	01
2.	2.1 Brief information about Shalihotra, Palakapya, Bhoja, Paramar, Hamsadev.	02
3.	3.1 Pre-historic to Indus valley civilization of tradition of animal conservation. 3.2 Names and kinds of birds and animals during the Vedic period to Maurya Dynasty. 3.3 Animal killing as major sports during Mughal and colonial period.	05
4.	Wide ecosystem of India : 4.1 Trans-Himalaya, Himalaya, Desert, Semi-arid, Western Ghats, Deccan Plateau, Gangetic plains, Coastal India, Islands (Andaman and Nicobar).	10
5.	5.1 Environmental and wildlife conservation issues with reference to hunting during colonial India. 5.2 Contribution of Dr. Salim Ali, Dr. Hora's contribution to Indian Ichthyology, Satpura Hypothesis.	05
6.	6.1 Establishment of Wildlife Institute of India, Zoological Survey of India, Its Branches, its role, responsibility, and present-day research. 6.2 Wildlife protection act in India with Information on various schedules.	06
7.	Indian Museums.	01

Suggested Readings :

1. Mandala, V. R. (Ed.). (2018). Shooting a Tiger : Big-game hunting and conservation in colonial India. Oxford University Press.
2. Ramakrishna, Raghunathan, C., & Sivaperuman, C. (2010). Status Survey on *Trochus Niloticus* (Linnaeus, 1767) in Andaman and Nicobar Islands. Zoological Survey of India.
3. Verma, S. P. 1999. Mughal Painter of Flora and Fauna Ustad Mansur. Abhinav Publications.
4. Study and Practice of Wild Life Laws in India: Concepts, Acts, Rules and Notifications (Revised and Updated, 2020 edition).
5. Environmental issues in India: A Reader By Mahesh Rangarajan, Pearson Education India publisher.
6. Science & Conservation of Wildlife Populations By K. Ullas Karanth, Nataraj Publisher.

Web Link :

1. <https://en.wikipedia.org/wiki/Shalihotra>
2. <https://en.wikipedia.org/wiki/Bhoja>
3. https://en.wikipedia.org/wiki/Paramara_dynasty
4. <https://www.wisdomlib.org/definition/hamsadeva>

OE 101 ZOO : Apiculture						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
GE/OE	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

CO1 : Students will know about different species of honey bees and their diseases and enemies.

CO2 : Students will gain skill of rearing honey bees.

CO3 : Students will be able to apply knowledge of bee economy in setting up their own apiary and they can be entrepreneur in this field.

CO4 : Acquire knowledge about different species and casts of the honey bees.

CO5 : Aware about economic importance of honey bees.

CO6 : Identify role of honey bees in nature and in agricultural productivity.

CO7 : Understand the basics about beekeeping tools, equipment, and managing beehives.

CO8 : Acquire knowledge about distribution of species of honey bees.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	1.1 An Introduction to apiculture. 1.2 Systematic Position, habit, habitat, distribution, marks of identification and nesting behavior of <i>Apis dorsata</i> , <i>Apis indica</i> , <i>Apis florea</i> and <i>Apis mellifera</i> . 1.3 Life cycle of honey bee, colony organization and division of labour.	07
2.	2.1 Bee behavior and communication - Round dance and Wag-tail dance. 2.2 Artificial bee rearing (apiary) : Beehives (Langstroth), Beekeeping and seasonal management. 2.3 Bee keeping equipments – Comb foundation sheet, Honey extractor, Uncapping knife, Smoker, Hive tool, Overall, Bee veil, Bee gloves, High boots, Bee brush, D. B. feeder. 2.4 Methods of extraction of honey. (Indigenous and Modern)	10
3.	3.1 Enemies of honey bee : Wax moth, Wax beetle, Wasps, Ants, Birds (Green bee eater, King crow), Amphibians and Mammals. 3.2 Bee diseases : Protozoan (Nosema), Bacterial (American foul brood), Viral (Sac brood), Fungal (Chalk brood). 3.3 Control and preventive measures of Bee diseases.	07
4.	4.1 Bee Economy : Products of apiculture industry and its uses - honey, bees wax, propolis, pollen, bee venom, royal jelly. 4.2 Bee pollination and management. 4.3 Entrepreneurship in Apiculture.	06

Suggested Readings :

1. Prost P. J. (1962) Apiculture, Oxford and IBH, New Delhi. ISBN No – 9781898298052.
2. Bisht D. S. (1984) Apiculture, Indian council of Agricultural Research, New Delhi.
3. Singh S. (1982) Beekeeping in India, Indian council of Agricultural Research, New Delhi.
4. Bees and Bee keeping in India, D.P. Abrol, Kaluani Publications.
5. Bees their vision, chemical senses & language-1950, Cornel University Press- By Fon firsh, & Karl.
6. The Social Behaviour of the Bees, 1974 : By Missioner C.D.
7. Beekeeping in India, 1962,82, Sardar Singh, ICAR, New Delhi.
8. Bees and Bee Keeping Science, Prentice & World Resources, 1990 – Eva Crane, Heinemann Newnes, Oxford, UK.
9. The Hive and the Honey Bee 1992 (Revised Edition), J. Graham, Dadint & Sons Inc., Hamilton, USA.

OE 101 ZOOP : Apiculture						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practicals per week	Internal Assessment	Semester End Exam	Total
GE/OE	02	60	01	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

- CO1 :** Students will know about different species of honey bees and their diseases and enemies.
- CO2 :** Understand the knowledge about life stages of honey bee
- CO3 :** Students will be able to apply knowledge of bee economy in setting up their own apiary and they can be entrepreneur in this field.
- CO4 :** Acquire knowledge about different species and casts of the honey bees.
- CO5 :** Aware about economic importance of honey bees.
- CO6 :** Identify role of honey bees in nature and in agricultural productivity.

CO7 : Understand the basics about beekeeping tools, equipment, and managing beehives.

CO8 : Students will gain skill of rearing honey bees.

Detailed Syllabus :

Unit No.	Title of the Practical	Practical Allotted
1.	Study of honey bee species. (<i>Apis dorsata</i> , <i>Apis indica</i> , <i>Apis florea</i> , <i>Apis mellifera</i>)	2 P
2.	Study of life cycle of honey bee.	1 P
3.	Study and identification of caste in honey bee.	2 P
4.	Study of Langstroth box. (Modern bee hive)	2 P
5.	Study of bee keeping equipments.	2 P
6.	Temporary mounting of legs, sting apparatus, wings and mouth parts of worker bee.	2 P
7.	Estimation of reducing sugars from honey.	2 P
8.	Study of honey bee diseases - Protozoan (Nosema), Bacterial (American foul brood), Viral (Sac brood), Fungal (Chalk brood).	1 P
9.	Specimen study of honey bee predators and enemies: Wasps, Frogs / Toads, Bee eating birds (Green bee eater / King crow), Pine Marten, Bear.	2 P
10.	Study of economic importance of bee products : Honey, pollen, propolis, bee wax, royal jelly, bee venom.	1 P
11.	Compulsory visit to Apiary / Apiculture Institute and submission of report.	3 P

SEC 101 ZOO : Advanced Animal Breeding & Management						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
SEC (Skill Enhancement Course)	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

CO1 : Apply knowledge in animal breeding laboratories.

CO2 : Describe the animal procurement.

CO3 : Understand the housing of laboratory animals.

CO4 : Use different types of feeds for laboratory animals.

CO5 : Understand hygiene of animal breeding.

CO6 : Understand the sanitization practices.

CO7 : Describe different types of breeding methods.

CO8 : Understand the role of Zoologist along with Veterinary doctor in animal breeding.

Detailed Syllabus :

Unit No.	Name of the topic	Lectures Allotted
1.	Introduction to Animal breeding : Scope and importance.	02
2.	Animal Procurement : 2.1 Selection criteria – Vendor development, on site selection. 2.2 Genealogy (History of parents etc.), Genetic information, pathological testing.	02
3.	Housing : 3.1 Segregation on the basis of Genus and Species. 3.2 Quarantine, rejected, sick bays, treatment bays and hospitals. 3.3 Areas for invasive & non-invasive procedures – Autopsy room & O.T. 3.4 Feed storage and food preparation rooms. 3.5 Drug store and dispensary. 3.6 Instruments - clean & dirty, equipments & miscellaneous items storage areas. 3.7 Classified areas - Requirements, types, hot zones. 3.8 Bedding : Types, materials of construction, change-over period, sterilization. 3.9 Areas for disposal of carcass, incinerators, burials or extra-	03

	institutional facility.	
4.	<p>Feeding :</p> <p>4.1 Types of feeds as per nutritional values – small & large animals.</p> <p>4.2 Need for formulations as per recommended daily doses.</p> <p>4.3 Modes of feeding.</p> <p>4.4 Nutritional values.</p>	03
5.	<p>Hygiene :</p> <p>5.1 Brief knowledge about diseases of animals, how they spread & prevention.</p> <p>5.2 Prophylactic and therapeutic regimens.</p> <p>5.3 Personnel hygiene : Maintaining self hygiene.</p>	03
6.	<p>Sanitization :</p> <p>6.1 Cleaning : Levels of clean conditions.</p> <p>6.2 Difference between cleaning, sanitization, disinfection and sterilization.</p> <p>6.3 Types of cleaning of dirty and clean areas, working rooms, classified areas, equipment & instruments.</p> <p>6.4 Precautions while breeding.</p>	04
7.	<p>Breeding :</p> <p>7.1 Breeding room in animal house & its requirements.</p> <p>7.2 Types of breeding – methods of mating.</p> <p>7.3 Breeding and grooming rooms.</p> <p>7.4 Health monitoring during breeding period.</p> <p>7.5 Pregnancy check-ups, Segregation of pregnant and nursing mothers.</p> <p>7.6 Nutritional requirements during breeding and pregnancy.</p>	04
8.	<p>Veterinary Healthcare :</p> <p>8.1 Role of Zoologist along with Veterinary doctor.</p> <p>8.2 Diagnostic tools, periodic, pre & post-experimental health check - ups using pathological tests,</p> <p>8.3 Management of sick, injured animals.</p> <p>8.4 Disease control – Treatments for infectious diseases, vaccinations, parasitic, vermin controls.</p>	05

	8.5 Prophylactic and Therapeutic treatments.	
9.	A compulsory visit to Animal breeding and Management Institute.	04

Suggested Readings :

1. Applied Nutrition Livestock - Poultry Rabbits And Laboratory Animals by D. V. Reddy, 3rd Edition, Oxford & IBH Publication, 1905.
2. Principles of Animal Nutrition and Feed Technology by D. V. Reddy, 3rd Edition, Oxford & IBH Publication, 2018.
3. Veterinary Pathology by G. A. Satry, P. Ramarao, 7th Edition, CBS Publisher, 2019.
4. Animal Genetics and Breeding by Arun Kumar Tomar, Sukhvir Singh Tomar, Rajbir Singh, Daya Publishing House, 2020.
5. Animal Breeding by Rana Vikram Singh, Bio-Green Books Publisher, 2021.

SEC 102 ZOO : Wildlife Tourism						
Year: I			Semester: I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
SEC (Skill Enhancement Courses)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : Understand what it means to be a naturalist

CO2 : Conduct interpretive nature experiences at different sites across habitats in India

CO3 : Ensure ethical and guided nature experiences

CO4 : Study Indian biodiversity: flora and fauna

CO5 : Create adequate interest to influence visitors towards sustainable lifestyles

CO6 : Assess and Mitigate Risks

CO7 : Maintain Safe, Healthy and Hygienic Practices

CO8 : Follow and Maintain Green Practices

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction to Wildlife Tourism : 1.1 Components of Tourism. 1.2 Types of Tourism. 1.3 Scope and importance of wild life tourism in India. 1.4 Impacts of Wild Life Tourism – Positive Impacts & Negative Impact. 1.5 Tourism industry practices in ecotourism.	04
2.	Indian biodiversity : Major Flora and Fauna in brief 2.1 Peninsular India. 2.2 Indian Desert. 2.3 Tropical Rain Forest Region. 2.4 Coastal area and Coral Reef – Maritime Zone & Islands.	06
3.	Interpretive nature experiences at different habitats : 3.1 Different habitats in the country. 3.2 Resources required for an effective nature experience. 3.3 Information of the local terrain, weather, seasonality. 3.4 Recce before trail. 3.5 Basic fitness levels and medical conditions required from guests for the nature activity.	06
4.	Ethical and responsible guiding : 4.1 Rules and regulations laid out by governing bodies of each work site- core forest, buffer, lodge premise, etc. 4.2 Ethical principles of nature tourism in general and about particular location. 4.3 Knowledge about local nature related folklore / beliefs.	04
5.	Risk Assessment : 5.1 Safety measures to be followed for insect bites and animal attacks. 5.2 Safety emergency evacuation plan and protocols during vehicle breakdowns and natural calamities such as landslides, flood etc. 5.3 Emergency evacuation plan and protocols during health-related	06

	emergencies. 5.4 How to conduct risk assessment during nature trails.	
6.	Wild Life Tourism Concepts and Range of Activities : 6.1 General Wild Life Watching and Viewing 6.2 Trekking, Jungle Safari : Elephant Safari, Tiger Safari, Bird Watching. 6.3 Visiting Zoos and Aquaria.	04

Suggested Readings :

1. A Naturalist's Guide To The Butterflies of India, Paperback – Peter Smetacek, 2016.
2. A Naturalist's Guide to the Reptiles of India Paperback – Indraneil Das, Abhijit Das , 2017.
3. A Naturalist's Guide To The Trees & Shrubs Of India Paperback – Pradeep Sachdeva, 2014.
4. Birds of the Indian Subcontinent Paperback – Richard Grimmett, Carol Inskipp, Tim Inskipp, 2016.
5. Ecotourism Development in India : Communities, Capital and Conservation - Foundation Books
6. Ecotourism and Sustainable Development - Martha Honey, Island Press, Washington DC, 1999.
7. Ecotourism and Sustainable Development: Who Owns Paradise? - Martha Honey, Island Pr (November 1998).
8. Global Ecotourism Policies and Case Studies - Michael Luck and Torsten Kirstges (Channel View Publications, 2002).
9. Green Travel Guide - Greg Neale, 2nd edition 1999.
10. Indian Mammals Paperback – Vivek Menon, 2023.
11. Indian Snakes: A Field Guide – Khaire Neelimkumar, 2015.
12. Pocket First Aid and Wilderness Medicine: Essential for expeditions: mountaineers, hillwalkers and explorers - jungle, desert, ocean and remote areas (Techniques) - Jim Duff, Ross Anderson.
13. Principles & Practices of Ecotourism - Krishna Kumar Mishra, 2022.
14. Rethinking Tourism and Ecotravel - Deborah McLaren, Kumarian Press, Connecticut, USA, 1997.

15. The Book of Indian Reptiles and Amphibians (Bombay Natural History Society) – BNHS (Daniel J.C.).
16. World Travel: A Guide to International Ecojourneys - Christopher P. Baker, Brian Jackman, Dwight Holing, Bent Davidson, Jeremy Hart, Dwight Holing, Christopher P. Baker, Warner Books (August 1996).

AEC 101 ENG : Communication & Soft Skills						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
AEC (Ability Enhancement Course)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : Acquaint with good oral and written communication skills in English language.

CO2 : Familiarize with the functional aspects of English language.

CO3 : Equip with communicative competence and language skills required for professional communications.

CO4 : Enhance writing skills by teaching the learners, the techniques of effective writing in English.

CO5 : Equip with essential soft skills and professional competencies required for professional career.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Basic Language Skills : Grammar 1.1 Sentence structures : Subject + Verb, Subject + Verb + Object. 1.2 Subject - Verb agreement. 1.3 Tenses. 1.4 Vocabulary.	05

Unit No.	Name of the Topic	Lectures Allotted
2.	<p>Formal Writing Skills :</p> <p>2.1 Letters : Job applications (solicited and unsolicited) with bio data, Applications for duplicate documents (I-cards / marksheet, etc.)</p> <p>2.2 Emails : Job acceptance and joining, complaints, requests for references, request for sponsorship.</p>	08
3.	<p>Skills in English speaking :</p> <p>3.1 Public speaking in English : Introduction, characteristics of an effective speech, analysis of model speeches, drafting and presenting a speech in formal and informal gatherings.</p> <p>3.2 Conversation in English : Opening a conversation, introducing oneself in various contexts, introducing others formally and informally, building a conversation, leaving and closing a conversation, conversation in groups in various situations.</p> <p>3.3 Speaking at an Event : Anchoring / compering an event, introducing guests / speakers / dignitaries, proposing a vote of thanks.</p>	11
4.	<p>Foundations of Soft skills :</p> <p>4.1 Soft Skills as Essential Life Skills : Meaning, definition, types, and scope of soft skills, prospects and significance of developing soft skills, differentiating skills, knowledge, attitudes, and beliefs, understanding technical, human and conceptual skills.</p> <p>4.2 Soft Skills in Career Prospects : Exploring the role of soft skills in career success, implications and benefits of incorporating soft skills, coordinating conceptual and practical aspects of soft skill development, human values and work ethics as integral soft skill.</p>	06

Suggested Readings :

1. Bellare, Nirmala. Reading & Study Strategies. Books. 1 and 2. Oxford University Press, 1997,1998.
2. Bellare, Nirmala. Easy Steps to Summary Writing and Note-Making. Amazon Kindle Edition, 2020.
3. Business English, Pearson, 2008.
4. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for

- Business English. Cambridge University Press, 1994.
- Das, Bikram K., et. al. An Introduction to Professional English and Soft Skills. Cambridge University Press India Pvt. Ltd., 2010.
 - Das, Yadjnaseni & R. Saha (eds.) English for Careers. Pearson Education India, 2012.
 - Fluency in English - Part II, Oxford University Press, 2006.
 - Kumar, Sanjay and Pushpalata. Communication Skills. Second Edition. New Delhi, 2011. Oxford University Press, 2015.
 - Rutherford, Andrea J. Basic Communication Skills for Technology: Second Edition. Delhi: Pearson Education, 2007.
 - Sadanand, Kamlesh & S. Punitha. Spoken English: A Foundation Course. (Part 1 & 2). Orient Black Swan. 2009.
 - Taylor, Grant. English Conversation Practice. 1967. Tata McGraw - Hill, 2013
 - Turton, Nigel D. A B C of Common Grammatical Errors. 1995. Macmillan India Ltd., 1996.
 - Vas, Gratian. English Grammar for Everyone. Mumbai, Shree Book Centre, 2015.

WEB LINKS :

- <http://networketiquette.net/>
- <https://public.wsu.edu/~brians/errors/>
- http://users3.ev1.net/~pamthompson/body_language.htm
- <http://www.albion.com/netiquette/corerules.html>
- http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/1535_questionanswer/page15.shtml
- <http://www.colostate.edu/Depts/Speech/rccs/theory44.html>
- <http://www.dailywritingtips.com/>

VEC 101 ENV : Global Environmental Issues						
Year : I				Semester : I		
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Value Education Course (VEC)	02	30	02	15	35	50

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

CO1 : Students will gain knowledge about various global environmental issues such as global warming, greenhouse gases, ozone depletion, loss of biodiversity etc.

CO2 : Students will learn about the environmental impacts of climate change.

CO3 : Students will realize the importance of environmental protection.

CO4 : Students will be forced to think about 'Action to be taken', to bring a check over various environmental issues.

CO5 : Analyse current environmental issues.

CO6 : Discuss different environmental issues with the society.

CO7 : Appreciate the importance of ethical behaviour related to environment.

CO8 : Communicate the concept of sustainable development.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction to Global Environmental Problems : 1.1 Climate Change. 1.2 Greenhouse Gases. 1.3 Global Warming. 1.4 Photochemical Smog. 1.5 Ozone depletion. 1.6 Acid Rain. 1.7 Ocean Acidification. 1.8 Loss of Biodiversity. 1.9 Natural Disasters. 1.10 Over Population.	08
2.	Global Problems due to Anthropogenic activities : 2.1 Waste Sources, Characteristics, and Classification of waste. 2.2 Solid waste- collection, storage, segregation- transportation and disposal methods. 2.3 Effect of plastic waste on Environment (Oceans, Animals etc.), Status of plastic waste in India. 2.4 Hazardous waste.	07

	<p>2.5 Radioactive waste.</p> <p>2.6 Waste management- Waste minimization programs - Reuse and recycle of organic waste, paper, glass, rubber, management of Plastic waste, e - waste management, zero waste management.</p>	
3.	<p>Major Global Problems due to Anthropogenic activities :</p> <p>3.1 Air Pollution : Natural and Anthropogenic sources, Effects of air pollution on Vegetation, animals and plants, Prevention and control measures.</p> <p>3.2 Noise Pollution : Sources, Effects of Noise pollution- physic chemical, social, psychological (Names of at least two diseases caused by noise pollution in man- Hearing disability, Hypertension) Prevention and control measures</p> <p>3.3 Water Pollution : Sources and types, Eutrophication of water bodies, impact of eutrophication on aquatic organisms, Prevention and control measures for marine and coastal pollution.</p>	07
4.	<p>Disasters :</p> <p>4.1 Correlation of climate change and natural disasters -Earthquakes, 4. 1 Floods, Tsunamis, Cyclones, Droughts.</p> <p>4.3 Environmental disaster due to man-made activities : Minamata, Itai- itai disease.</p> <p>4.4 London smog, Bhopal gas tragedy.</p>	03
5.	<p>Brief introduction of National and International Organizations involved in Global issues :</p> <p>5.1 United Nations Framework Conventions on Climate Change (UNFCCC).</p> <p>5.2 Intergovernmental Panel on Climate Change (IPCC).</p> <p>5.3 International Union for Conservation of Nature (IUCN)</p> <p>5.4 United Nations Environment Programme (UNEP).</p> <p>5.5 World Wild Fund for Nature (WWF).</p>	05

Suggested Readings :

1. Ecology and Environment - P.D. Sharma, Rastogi Publications, 13th Edition, (2018).
2. Environmental studies - Benny Joseph, Tata McGraw- Hill, 2nd Edition, (2009).
3. Environmental Education - Nagarajan and Sivakumar. P, Ram Publishers, Chennai,

(2002).

4. A text book of Environment - Agarwal. K. M. Sikdar. P. K. and Deb. S. C, Mac MillerIndia Ltd., Calcutta, (2002).
5. Solid Waste management in Developing countries – Indian National Scientific documentation centre- Bhide and Sundaresan, New Delhi, (2000).
6. CPHEEO Manual on solid waste management.
7. WHO Manual on solid waste management.

CC 101 PE : Fitness and Wellness						
Year : I			Semester : I			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Co- curricular	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

- CO1** : Students will be able to learn and understand the meaning of wellness fitness.
- CO2** : After completion of course, students will be able to understand the use of technology for monitoring the fitness.
- CO3** : Student will be able to apply healthy and better lifestyle.
- CO4** : After completion students will be able to acquire skill and able to co-relate scientific study with the health and fitness.
- CO5** : Students will get familiar with modern techniques, role of AI in fitness / wellness.
- CO6** : Students will be aware of their fitness.
- CO7** : Students will be able to control their adverse lifestyle.
- CO8** : Students will understand importance of wellness for life.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Fitness Profile, Development And Maintenance of Following : 1.1 Definition & meaning of fitness. 1.2 Components of physical fitness: Strength, Speed, Endurance, Co-ordination, Flexibility. 1.3 Principles of physical fitness. 1.4 Benefits of fitness programme. 1.5 Weight management (role of diet & exercise in maintenance of ideal weight).	06
2.	Wellness : 2.1 Meaning & definition of wellness. 2.2 Components of wellness (physical wellness, emotional wellness, social wellness, spiritual wellness, intellectual, Nutritional wellness). 2.3 Benefits of wellness. 2.4 Components of lifestyle: healthy diet, physical activity, socialization, proper sleep, personal hygiene. 2.5 Yogic practices for achieving health and fitness. 2.6 Meditation, anger management and stress management. 2.7 Role of meditation and stress management in the promotion of health and wellness.	12
3.	Health Management : 3.1 Sedentary lifestyle & health risk. 3.2 Role of exercise & workout. 3.3 Role of AI in fitness goal, Modern wearable technology (activity belt, smart watch, smart.exercise & yoga mats, smart mobiles). 3.4 Factors leading to eating disorders. 3.5 Hazards of substance abuse - smoking, alcohol & tobacco. 3.6 Adoption of spirituality principals & their remedial measures.	10
4.	Common Diseases : Obesity, Rickets, Diabetes and Hypertension.	02

Suggested Readings :

1. Activity and Health by Cloude Bouchard, Steven N. blair & William L. Haskell

2. Physical activity & Mental Health by Angela Clow and Sarah Edmunds 2013
3. Physical WHO Manual.
4. AYUSH Manual.
5. Bob Anderson , Stretch Yourself for Health and Fitness UBSPD, 2002
6. Dennis K. Flood , Practical Math for Health Fitness, New Delhi 1996
7. Corbin C.B, G.J. Welk, W.R. Corbin and K.A. Welk (2008). Fitness & Wellness Concepts.

CC 101 PE : Indian Health Science						
Year : I				Semester : I		
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Indian Knowledge System (IKS)	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

- CO1 :** Understand the fundamental principles of Indian health systems such as Ayurveda and Yoga.
- CO2 :** Practical implementation of health principles to correct the intake of our food, air, water and sun light to achieve perfect health.
- CO3 :** Understand traditional way of cleansing the body regularly, strengthening body with Yogic exercises, maintaining the internal balance to prevent diseases.
- CO4 :** Understand our unique Mind Body Constitution and choosing the right life style suitable to maintain the internal balance.

Detailed Syllabus :

Unit No.	Name of The Topic	Lectures Allotted
1.	Understanding human body : 1.1 Introduction to Ayurveda, the Knowledge of Life. 1.2 Health and treatment aspects in Ayurveda. 1.3 Influence of Pancha Maha Bhuta on Internal environment of	08

	Human being, understanding composition of Human body through the concept of Dosha, Dhatu & Mala. 1.4 Understanding Prakruthi, the Mind –Body Constitution.	
2.	Understanding the communication between body & Mind : 2.1 Establishing communication between body and mind by understanding the language of body. 2.2 Understanding the concept of Agni, Koshta, Saraand Ojas and their relevance in enhancing our immunity to protect from various infections. 2.3 Looking at the world through the lenses of Dravya, Guna and Karma. 2.3 Applying the principle of Samanya and Vishesha in every aspect of life to achieve perfect health.	08
3.	Introduction to Health Regimen : 3.1 Understanding Swasthavritta, the healthy regimen to maintain state of well being. 3.2 Dinacharya, the Daily regimen including Daily detoxification, exercise, Intake of Food, Water, Air and Sunlight, work and ergonomics, 3.3 Rest and sleep hygiene. 3.4 Ritucharya, the seasonal regimen, Sadvritta and the concept of social wellbeing, understanding trividha upastambhas, three pillars to health. 3.5 Concept of Shadrasa in choosing appropriate nourishment to the body and mind.	10
4.	Introduction to Nutrition : 4.1 Definition, Meaning and Principles of Nutrition. 4.2 Concepts of balanced diet. 4.3 Understanding diet therapy. 4.4 Eating for weight management.	04

Suggested Readings :

1. BKSI Yengar, Light on Yoga : The Classic Guide to Yoga by the World's Foremost Authority, Thronson publication, 2006.

2. Dr. Deepak Chopra, Perfect Health Revised and Updated : The Complete Mind Body Guide, Harmony publication, 2001.
3. The Ashtanga Hridaya
4. The Charaka Samhita
5. The Gheranda Samhita
6. The Hatha yoga pradipika
7. The Patanjali yoga sutras
8. The Susruta Samhita
9. Swamy Satyananda Saraswati, Asana, Pranayama, Mudra and Bandha, Bihar School of Yoga, 2002.
10. Vasant lad, Ayurveda, the Science of Self-healing: A Practical Guide: Science of Self-healing, lotus press, 1984.
11. Hema Singh : Become your own Nutritionist. A mini encyclopedia on food and nutrition, Notion Press media Pvt. Ltd. 2021.
12. C. Gopalan et.al. Nutritive Value of Indian Foods: ICMR- National Institute of Nutrition.



END OF THE SEMESTER - I

SEMESTER - II

ZOO 151 MJ : Cell Biology						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Major Core	02	30	02	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

CO1 : Demonstrate the knowledge of cell diversity.

CO2 : Explain the cell membrane and its dynamics.

CO3 : Analyze cell – cell interactions.

CO4 : Understand nuclear structure.

CO5 : Understand cell organelles.

CO6 : Explain cell division and its types.

CO7 : Explain mitochondria and its functions.

CO8 : Understand cytoskeleton and its functions.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Overview of Cells : 1.1 Prokaryotic (<i>E. coli</i>) and Eukaryotic (Plant & Animal) cells, 1.2 Principle of light and compound microscope. 1.3 Micrometry. 1.4 Types of Stain : Acidic, basic and neutral.	03
2.	Plasma Membrane : 2.1 Models of plasma membrane. 2.2 Transport across membranes : Active and Passive transport, Facilitated transport, endocytosis, exocytosis. 2.3 Cell – Cell Junction structures and functions : Tight junctions,	06

	Adherent junctions, Gap junctions, Desmosomes and Hemi desmosomes.	
3	Nucleus : 3.1 Structure of Nucleus. 3.2 Ultra-structure of nuclear envelope. 3.3 Nuclear Pore Complex. 3.4 Ultra-structure of Nucleolus.	04
4.	Cell organelles with reference to their structure and functions : 4.1 Endoplasmic Reticulum. 4.2 Golgi Complex. 4.3 Lysosomes. 4.4 Ribosome. 4.5 Peroxisomes.	05
5.	Mitochondria : 5.1 Ultra-structure of Mitochondria. 5.2 Nature of Mitochondria. 5.3 Functions of Mitochondria.	02
6.	Cytoskeleton (with reference to structure and function) : 6.1 Micro tubules. 6.2 Micro filaments. 6.3 Intermediate filaments.	03
7.	Cell Division : 7.1 Cell cycle. 7.2 Mitosis. 7.3 Meiosis.	07

Suggested Readings :

1. Cell Biology : Verma, PS. And Agrawal, VK., S. Chand and Co., New Delhi
2. Alberts, B Bray, D., Lewis, J., Raff, M., Roberts, K., Watson, J.D., Molecular Biology of the Cell, Gerl and Publ. Inc., New York, 1998, 2008.
3. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G.P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
4. Cooper, G.M. and Hausman, R. E. (2009). The Cell : A Molecular Approach. V

- Edition. ASM Press and Sunderland, Washington, D. C. ; Sinauer Associates, M A.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
 - Karp, G. (2010). Cell and Molecular Biology : Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
 - Powar, C.B.: Cell Biology, Himalaya Publishing House, Bombay, 1999.

ZOO 152 MJ : Biomedical Techniques						
Year : I				Semester : II		
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Major Core	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

- CO1** : Acquire basic understanding and scope of biomedical techniques.
- CO2** : Understand safety protocols, ethical standards, professional conduct and best practices.
- CO3** : Understanding of various types of instruments commonly used in laboratories.
- CO4** : Know about the biomedical instrument, its functioning, and its principles of operation.
- CO5** : Apply immunological techniques for the detection of antigens, antibodies, and immune responses in disease diagnosis.
- CO6** : Understand serological concepts and principles and apply these techniques to diagnose infectious diseases, autoimmune disorders, and other clinical conditions.
- CO7** : Understand and perform hematological tests and diagnose common hematological disorders.
- CO8** : Analyze and interpret urine analysis data.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction and Scope of Biomedical Techniques.	01

2.	Lab Safety Techniques and Sterilization.	01
3.	Laboratory Instruments : Introduction, Principle & Brief working of : 3.1 Microscopy – Simple and Compound microscope. 3.2 Centrifugation. 3.3 Chromatography. 3.4 Spectroscopy. 3.5 Electrophoresis. 3.6 Microtomy.	10
4.	Biomedical Instruments : Introduction, Principle & Brief working of : 4.1 Electrocardiography (ECG). 4.2 Ultrasound / Sonography. 4.3 Polymerase Chain Reaction (PCR).	05
5.	Immunological Techniques : 5.1 Factors affecting Antigen – Antibody reactions. 5.2 Primary binding tests - Immunofluorescence tests, Enzyme linked immunosorbent assay (ELISA), Radioimmunoassay (RIA).	02
6.	An introduction to Serological Techniques : 6.1 Materials necessary for basic serological tests. 6.2 Collection, preparation and preservation of serological specimens. 6.3 Shipment of serological specimens. 6.4 Complement inactivation. 6.5 Dilution and Serial dilution. 6.6 Determination of Endpoint titer.	03
7.	Hematological Techniques : Brief Introduction of the followings : 7.1 Blood Collection. 7.2 Anticoagulants. 7.3 Preparation of Blood Smears. 7.4 Staining of Blood Smears. 7.5 Hemocytometry. 7.6 Differential Leucocyte Count. 7.7 Reticulocyte Count.	05

	7.8 Hemoglobin estimation.	
8.	Urine analysis : 8.1 Collection of urine sample. 8.2 Preservation of urine sample. 8.3 Types of Examination in Routine Urinalysis in brief - Physical Examination of urine, Chemical Examination of urine Microscopic Examination of Urine.	03

Suggested Readings :

1. Bioprocess engineering basic concepts, Second Edition, by Michael L. Shuler & Fikret Kargi, 2002 published by Prentice Hall PTR.
2. Biotechnology procedures and experiments handbook, S. Harisha, Infinity Science Press 2007.
3. Principles and techniques of biochemistry and molecular biology, Seventh Edition, Keith Wilson and John Walker, Cambridge University Press, 2010.

ZOO 153 MJP : Practicals in Cell Biology and Biomedical Techniques						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practical per week	Internal Assessment	Semester End Exam	Total
Major Core	02	60	01	15	35	50

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

- CO1 :** Understand principles and workings of simple, compound light and electron microscopes.
- CO2 :** Acquire the skills to accurately measure microscopic objects using micrometry.
- CO3 :** Prepare temporary stained slides of onion root tips for mitosis.
- CO4 :** Estimate Haemoglobin using Sahli's haemoglobinometer.
- CO5 :** Perform RBC count in blood by using hemacytometer.
- CO6 :** Study of human blood smear to observe different types of blood cells.
- CO7 :** Study of principle & working of Spectrophotometer, PCR and ECG.
- CO8 :** Work as a laboratory technician.

Detailed Syllabus :

Unit No.	Title of the Practical	Practicals Allotted
1.	Study of Principle and Working of Simple and Compound Microscope. (Compulsory) (E)	1 P
2.	Study of the Principle of Light and Electron microscope. (D)	1 P
3.	Measurement of microscopic objects using micrometry. (Compulsory) (E)	1 P
4.	Study of Prokaryotic and Eukaryotic cell with the help of Model / Chart / Photomicrograph. (D)	1 P
5.	Identification of ultrastructure of different cell organelles from electron micrographs. (D)	2 P
6.	Study of permanent slides of Mitosis and Meiosis. (E)	1 P
7.	Preparation of temporary stained squash of onion root tip to study various stages of mitosis. (Compulsory) (E)	2 P
Practicals in Biomedical Techniques		
8.	Lab safety techniques & sterilization. (E)	1 P
9.	Haemoglobin estimation using Sahli's haemoglobinometer. (E) (Compulsory)	1 P
10.	RBC count in blood by using hemacytometer. (E) (Compulsory)	1 P
11.	Study of Principle & working of Spectrophotometer, PCR and ECG. (E)	1 P
12.	Separation of Amino acids by Paper Chromatography, TLC or Column chromatography. (E) (Compulsory)	2 P
13.	Separation of the Sugars by Paper Chromatography, TLC or Column chromatography. (E) (Compulsory)	2 P
14.	Compulsory Visit to a well-equipped laboratory with diagnostic equipment's like Ultrasound, X-Ray, CT-Scan, MRI Scan etc.	3 P

ZOO 171 VSCP : Vermiculture Management						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practical per week	Internal Assessment	Semester End Exam	Total
(VSC) Vocational Skill Course	02	60	01	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

CO1 : Acquire a knowledge on role of earthworms in making vermicompost.

CO2 : Understand the internal structure of earthworms used in vermiculture.

CO3 : Acquire skills on production of vermicompost.

CO4 : Able to prepare small scale and large-scale vermicomposting units.

CO5 : Become an entrepreneur by culturing earthworms.

CO6 : Able to produce allied products.

CO7 : Acquire a knowledge about life cycle of earthworms.

CO8 : Identify of enemies and diseases of earthworm.

Detailed Syllabus :

Unit No.	Title of the Practical	Practicals Allotted
1.	Identification of earthworm species using standard keys. (D)	1 P
2.	Study of Systematic position, habits, habitat & External characters of <i>Eisenia foetida</i> or <i>Eudrilus eugeniae</i> . (D)	1 P
3.	Study of Life stages and development of <i>Eisenia foetida</i> or <i>Eudrilus eugeniae</i> .	1 P
4.	Study of Vermiculture, Vermiwash & Vermicompost equipment's and devices. (D)	1 P
5.	Study and maintenance of vermicomposting methods: Bed Method and Pit Method. (E)	2 P
6.	Harvesting, packaging, transport and storage of vermicompost. (D)	2 P
7.	Preparation of Vermiwash.(E)	2 P
8.	Study of earthworm diseases & enemies. (E)	2 P

9.	Study the effects of vermicompost & vermiwash on any two short duration crop plants. (E)	2 P
10.	Study the effects of sewage water on development of earthworms. (E)	2 P
11.	Marketing management of vermicompost, vermiwash and allied products. (E)	2 P
12.	Compulsory visit to local vermicompost unit and submission of project report on vermicomposting.	2 P

ZOO 172 VSCP : Dairy Management						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practicals per week	Internal Assessment	Semester End Exam	Total
VSC (Vocational Skill Courses)	02	60	01	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : Estimate fat, SNF, specific gravity of milk.

CO2 : Estimate acidity, surface tension, viscosity of milk.

CO3 : Understand standardization, pasteurization, sterilization of milk.

CO4 : Understand preparation of toned milk, double toned milk and reconstituted milk.

CO5 : Understand separation of cream and quality of given milk sample.

CO6 : Learn various types of breeds of cattle.

CO7 : Acquire knowledge about equipments use in dairy industry.

CO8 : Explore a small scale dairy business.

Detailed Syllabus :

Unit No.	Name of the Topic	Practicals Allotted
1.	Preparation of project reports for various sizes of dairy farm.	2 P
2.	Study of Cattle Breeds (Any 5) -	2 P

	a) Milch : Gir, Sahiwal, Red Sindhi. b) Draught : Khillar, Dangi, Red Kandhari. c) Dual : Deoni, Hariyana. d) Exotic : Jersey, H.F. e) Cross breed : Holdeo, Jerdeo.	
3.	Study of buffalo breeds : Murratia, Jaffrabadi, Nagpuri, Surti.	2 P
4.	To determine specific gravity of milk, acidity and pH of milk.	1 P
5.	To study the fat determination test of milk.	2 P
6.	Study of milk collection equipments.	2 P
7.	Study of filter, strainer, clarifier.	2 P
8.	Study of cream separator.	2 P
9.	Sterilization of milk.	2 P
10.	Compulsory visit to Modern Dairy Farm & report submission.	3 P

ZOO 191 MN : Wildlife Conservation & Management						
Year : I				Semester : II		
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Minor Core	02	30	02	15	35	50

Course Outcomes :

After completion of this course, students will be able to :

CO1 : Understand biodiversity, importance of different species and ecosystems.

CO2 : Understand the ethical considerations and values which guide wildlife conservation efforts.

CO3 : Learn the National and international wildlife conservation laws, regulations and policies.

CO4 : Educating the public and engaging communities in conservation efforts.

CO5 : Manage conservation projects including budgeting and resource allocation.

CO6 : Recognize the impact of climate change on wildlife and ecosystems.

CO7 : Understand funding sources and strategies for securing financial support for conservation projects.

CO8 : Acquire research skills, including data collection, analysis and interpretation relevant to wildlife conservation.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction to Wildlife Conservation : 1.1 Overview and importance of biodiversity. 1.2 History and milestones in wildlife conservation.	01
2.	Wildlife and its habitat : 2.1 Observation and survey techniques. 2.2 Species Census methods. 2.3 Species sampling method (Quadrat, Line Transect, Belt Transect). 2.4 Ethics in Field Studies.	03
3.	Population estimation : 3.1 Population density, Natality, Birth rate, Mortality, Fertility schedules and sex ratio computation. 3.2 Fecal analysis of ungulates and carnivores - Fecal samples, Slide preparation, Hair identification, Pugmarks and Census method.	03
4.	Biodiversity and Wildlife Resources in India : 4.1 Biodiversity of the Indian subcontinent. 4.2 Biodiversity hotspots in India. 4.3 Species conservation projects in India in brief -Tiger, Rhino, Lion.	03
5.	Biodiversity Conservation : 5.1 In-situ conservation - Biosphere Reserves, National Parks, Tiger Reserve, Wildlife Sanctuaries, Conservation Reserves, Community reserves, Sacred Habitats. 5.2 Ex-situ conservation - Zoological Gardens, Gene Banks, Tissue	03

	Culture and DNA banks, Butterfly Gardening. 5.3 Concept of Biodiversity Hotspots and Mega-diversity Country. 5.4 Role of captivity in wildlife conservation.	
6.	Importance of Wildlife conservation : 6.1 Economic, Ecological, Aesthetic, Scientific, Recreational, Medicinal. 6.2 Wildlife Categories : Vulnerable, Rare, Endangered, & Threatened. 6.3 Data Deficient Categories. 6.4 Red Data Book.	04
7.	Causes of Wildlife depletion : 7.1 Degradation and destruction of natural habitats. 7.2 Exploitation for commercial purposes. 7.3 Forest fires and Deforestation. 7.4 Agricultural expansion and grazing. 7.5 Urbanization and industrialization.	04
8.	Protection Measures In Brief : 8.1 Concept of Schedules in Wildlife Protection. 8.2 Indian Wildlife (Protection) Act, 1972. 8.3 Indian Biodiversity Act, 2002. 8.4 Indian Forest Act, 1927.	03
9.	Human – Wildlife Interaction : 9.1 Man – animal conflicts in India. 9.2 Human – Wildlife Coexistence and Eco-tourism. 9.3 Wildlife Crimes, Sustainable use of Biodiversity Resources. 9.4 Care of injured and diseased animals.	04
10.	Rescue and Rehabilitation of wild animals : 10.1 Role of Rescue centres, Transit centres and Zoo. 10.2 Information regarding Central Zoo Authority of India (C. Z. A.).	02

Suggested Readings :

1. Ali S. and S. D. Ripley (1969) : The Hand book of Birds of India and Pakistan. Oxford University Press – New Delhi.
2. Arora B. M., Editor (2002) : Indian Wildlife Year book, AIZ & WV, Bareilly and

Central Zoo. Authority, New Delhi.

3. Kehimkar, I.; Gayatri, V.D. (2016) : Butterflies of India: BNHS Field Guide, BNHS.
4. Giles R. H. Jr. (1984) : Wildlife Management Techniques, 3rd ed. The Wildlife Society, Washington, D. C. Nataraj Publishers, Dehradun, India.
5. Gopal Rajesh (1992) : Fundamentals of Wildlife Management, Justice Home, Allahabad, India.
6. Negi S. S. (2002) : Handbook of National Parks, Wildlife Sanctuaries and Biosphere Reserves in India. Indus Publ., New Delhi.
7. Primack R. B. (1998) : Essentials of Conservation Biology, Sinauer Associates, Inc. Sunderland.
8. Robert G. H. (1978) : Wildlife management, W. H. Freeman and Co., San Francisco, U.S.A.
9. Singh S. K. (2005) : Text Book of Wildlife Management, IBDC, Lucknow.

OE 151 ZOO : Sericulture						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
GE/OE	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

- CO1 : To introduce the concept of sericulture.
- CO2 : To explain the rearing technique and associated tools.
- CO3 : To examine the diseases and learn the control measures.
- CO4 : To establish mulberry garden and processing of mulberry.
- CO5 : To explain Life cycle and Sexual dimorphism of silkworm.
- CO6 : Acquire knowledge in research field for biomedical and biotechnical areas.
- CO7 : Gain knowledge about applications in sericulture industry.
- CO8 : Explore their own sericulture business.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	1.1 Sericulture : Definition, history and present status; Silk route. 1.2 Types of silkworms, distribution and races: Exotic and Indigenous races, Hybrids. 1.4 External morphology, Life cycle and Sexual dimorphism of <i>Bombyx mori</i> . 1.5 Structure of silk gland and secretion of silk.	06
2.	2.1 Selection of mulberry variety. 2.2 Establishment of mulberry garden and harvesting of mulberry – Leaf plucking, Branch cutting, Whole shoot cutting. 2.3 Rearing house, rearing appliances and varieties of silkworm (bivoltine and multivoltine hybrid). 2.4 Silkworm rearing techniques : Early age and Late age rearing. 2.6 Post harvest processing of cocoons – Stiffling, Sorting, Storage, Deflossing, riddling. 2.7 Host plants of non - mulberry silkworms.	12
3.	3.1 Pests of silkworm : Uzi fly, <i>Apanteles</i> , Dermestid beetles, Mites and Vertebrates. 3.2 Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial. 3.3 Control and prevention of pests and diseases.	06
4.	4.1 Entrepreneurship in sericulture: Prospects of Sericulture in India. 4.2 Sericulture industry in different states, employment, potential of mulberry and non - mulberry sericulture. 4.3 Biotechnological and Biomedical applications of silk.	06

Suggested Readings :

1. Silkworm Rearing and Disease of Silkworm, 1956, Ptd. By Director of Ptg., Stn. & Pub. Govt. Press, Bangalore.
2. Handbook of Practical Sericulture: S. R. Ullal and M. N. Narasimhanna CSB, Bangalore.
3. Appropriate Sericultural Techniques; Ed. M. S. Jolly, Director, CSR & TI, Mysore.

4. Handbook of Silkworm Rearing: Agriculture and Technical Manual - 1, Fuzi Pub. Co. Ltd., Tokyo, Japan 1972.
5. Manual of Silkworm Egg Production; M. N. Narasimhanna, CSB, Bangalore 1988.
6. Silkworm Rearing; Wupang - Chun and Chen Da - Chung, Pub. By FAO, Rome 1988.
7. A Guide for Bivoltine Sericulture; K. Sengupta, Director, CSR & TI, Mysore 1989.
8. Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.
9. Mane, P., Chaudhari, R., Qureshi, N., Shinde, M., Kim, T., & Amalnerkar, D. (2020). Silver nanoparticles-silk fibroin nanocomposite based colorimetric bio-interfacial sensor for on-site ultra-trace impurity detection of mercury ions. *Journal of Nanoscience and Nanotechnology*, 20(4), 2122-2129.
10. Mane, P., Adhyapak, P., Kadam, D., Amalnerkar, D., Kim, T., & Chaudhari, R. (2021). Selective and sensitive colorimetric detection of mercury ions in aqueous solutions using silver nanoparticles synthesized in innovative biomaterial matrix. *Emergent Materials*, 1-9.

OE 152 ZOOP : Sericulture						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practical per week	Internal Assessment	Semester End Exam	Total
GE/OE	02	60	01	15	35	50

Course Outcomes :

After the completion of the course, students should be able to :

CO1 : To learn the rearing technique of Silkworms for entrepreneurship.

CO2 : To learn the complete life cycle of Silkworm in practice.

CO3 : To learn different types of diseases and the causes of diseases in silkworms and take measures accordingly.

CO4 : To Identify different sericulture products and their outcome.

CO5 : Identify the enemies and damages caused by them.

CO6 : Understand the sericulture industries across the states in India

CO7 : Explore the knowledge about appliances in sericulture.

CO8 : Experience the silk farming practices.

Detailed Syllabus :

Unit No.	Title of the Practical	Practical Allotted
1.	Study of external morphology and life cycle of different silkworms. (D)	2 P
2.	Study of digestive system and silk gland in silkworm.	2 P
3.	Study of silkworm enemies, nature of damage and their control measures.	2 P
4.	Study of various diseases of silkworms and their control measures. (Grasserie, Flacherie, Muscardine and Pebrine)	2 P
5.	Preparation of a map showing distribution of silk moth and rearing / sericulture practices in India. (E)	2 P
6.	Study of any five rearing appliances in sericulture. (E) Compulsory	2 P
7.	Rearing of silkworm in laboratory.	3 P
8.	Compulsory field visit to sericulture institute / industry / silk farm, Report writing and submission.	3 P
9.	Compulsory submission of photographs / sketches of Mulberry, Tassar, Eri and Muga silkmooths. (E)	2 P

SEC 151 ZOO : Pet Breeding and Management						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
SEC (Skill Enhancement Courses)	02	30	02	15	35	50

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

CO1 : Understand the importance of pet animals and learn empathy towards animals.

CO2 : Understand expenditure and economics of pet breeding business.

CO3 : Enhance the skill of pet breeding & management.

CO4 : Self employment from pet breeding business.

CO5 : To seek jobs in Toxicology and Pharmaceutical Industries, Animal houses etc.

CO6 : Save the vulnerable species of pet animals, maintain species balance in environment.

CO7 : Understand common pet diseases and their control measures.

CO8 : Can work as a pet behavior expert, consultant.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction : 1.1 Definition 1.2 Why pet animals? 1.3 Behavioral study of pet animals – Cat & Dog. 1.4 Types of Pets.	03
2.	Breeding Requirement : 2.1 Breeding plan with budget. 2.2 Breeding ethics, license procedure and legal permissions. 2.3 Selection of site. 2.4 Selection of breeds. 2.5 Selection of nutritive feed.	06
3.	Breeding Techniques : 3.1 Reproduction cycle of selected breed. 3.2 Natural breeding method. 3.3 Prevention / Termination of unwanted / unplanned pregnancies. 3.4 Artificial / selective / induced breeding techniques. 3.5 Precautions during gestation period to parturition of pet. 3.6 Post parturition care of mother and newborn pets, promoting positive interaction early in puppy's development.	08

	3.7 Compliance with the relevant legislation and standards of care in their jurisdiction while marketing puppies. 3.8 Precautions to avoid over breeding stress in adult dogs. 3.9 Study of Prevention in Cruelty to Animals Act, 1960.	
4.	Merits and demerits of Selective Breeding	02
5.	Pet diseases and treatment : 5.1 Common infectious diseases and their control measures. 5.2 Common non-infectious diseases and their control measures. 5.3 Pet care tips. 5.4 Preventing care for breeder from animal contact.	06
6.	Socio-economic importance of pets	02
7.	Pet marketing strategies to boost your sales : 7.1 Create an engaging website for your pet-care business. 7.2 Market your pet-care business on social media. 7.3 Set up a referral system. 7.4 Host pet events; build and nurture an email list. 7.5 Partner with a shelter to offer discounted services to newly adopted pets.	03

Suggested Readings :

1. Olden Broek K., Van Der Waaij L., Textbook Animal Breeding and Genetics for B. Sc. Students. Centre for Genetic Resources the Netherlands and Animal Breeding and Genomics Centre, 2015.
2. Pearson New International Edition Understanding Animal Breeding Richard M. Bourdon Second Edition.
3. The domestic dog its evolution, behaviour and interaction with people, James Serpell First edition, Cambridge University Press.
4. The complete bird owner's handbook Gary A. Callerstein, First edition, Howell book house, New York.
5. Canine Reproduction and Neonatology, A Practical Guide for Veterinarians, Veterinary Staff and Breeders, by Marthina L. Greer, DVM, JD., 2014; Teton New Media.

SEC 152 ZOOP : Wildlife Photography						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Practicals per week	Internal Assessment	Semester End Exam	Total
SEC (Skill Enhancement Courses)	02	60	01	15	35	50

Course Outcomes :

After completion of the course, students will be able to :

CO1 : Handle a professional camera with ease.

CO2 : Understand the basic operations of camera like EV, Shutter speed, ISO, etc.

CO3 : Learn to operate photo editing software.

CO4 : Organize better photographic documentation of their fields of discipline, for classroom presentations and other records.

CO5 : Create opportunities to work in the field of nature and wildlife photo journalism.

CO6 : Earn by preparing photo-assignments for renowned nature and wildlife photo magazines and books.

CO7 : Promote and inculcate the values of art in the age of science, technology and mass media.

CO8 : Create opportunity for self employment.

Detailed syllabus :

Unit No.	Title of the Practical	Practicals Allotted
1.	To study handling of camera and its maintenance.	1 P
2.	Introduction to Types of Cameras used in wildlife photography.	1 P
3.	To study & understand the camera menu, basic buttons and settings PS : Open, Close, Rate and Save.	1 P
4.	To study different types of lenses used in wildlife photography.	1 P
5.	Controlling Light with EV, Shutter Speed, Aperture and ISO.	1 P
6.	In-field training on composition.	1 P
7.	Controlling DOF and speed.	1 P

8.	Using the right ISO in various conditions.	1 P
9.	Shooting still objects - flowers, trees, and other steady things.	1 P
10.	Shooting moving objects : insects, birds, and other wildlife.	1 P
11.	Bracketing and other apt on-field tricks.	1 P
12.	Study of flash use and additional artificial lights.	1 P
13.	Study of Camera Toning.	1 P
14.	On the computer - Windows Browser, Monitor Calibration, Photo Editing - Software and Installation.	1 P
15.	Understanding File Formats and Choosing the Appropriate One : Crop and Align Horizon.	1 P
16.	Adjusting Light and Colours, Studying the Importance of Composition.	1 P
17.	Resizing and Bordering Images, Selection Tools, Using Layers, and Writing Texts.	1 P
18.	Study of different types of camera accessories – Remote trigger, Transmitter and receiver, Tripods, Lense filters.	1 P
19.	To study the transfer of files, editing and storage of data.	1 P
20.	Study of safety measures.	1 P

AEC 151 AM : Aquarium Management						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
AEC (Ability Enhancement Courses)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : Understand the ornamental fish Industry.

CO2 : Identify and differentiate the aquarium / ornamental fishes.

CO3 : Understand feeding requirement and food ingredients of aquarium fishes.

CO4 : Understand fish disease and their pathogens.

CO5 : Learn physico - chemical condition required for aquarium management.

CO6 : Learn breeding techniques.

CO7 : Learn factors affecting on fish during their transport and maintains of aquarium.

CO8 : Acquire market value of ornamental fish.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction to Aquarium Fish Keeping : 1.1 Ornamental Fish Farming. 1.2 The potential scope of Aquarium Fish Industry as a Cottage industry. 1.3 Exotic and Endemic species of aquarium fish. 1.4 Global Ornamental Fish Industry. 1.5 Advantages of keeping ornamental fishes.	03
2.	Biology of Aquarium Fishes : Common characters and sexual dimorphism of Fresh, Brackish and Marine Aquarium fishes : Guppy, Molly, Sword tail, Gold fish, Angel fish, Bala shark, Anemone fish, Parrot fish and Fighter fish.	06
3.	Food and feeding of Aquarium Fishes : 3.1 Live fish feed : Organisms and their culture. 3.2 Artificial or formulated fish feed - Composition and qualities of artificial fish feed, preparation and composition of artificial fish feeds. 3.3 Types of fish food.	03
4.	Transportation of Fish : 4.1 Transportation and methods for transport. 4.2 Live fish transport - Fish Packaging and forwarding techniques. 4.3 Factors influencing fish transport. 4.4 Reasons for mortality during transportation.	04
5.	Maintenance of Aquarium : 5.1 General aquarium maintenance. 5.2 Cleaning, monitoring and cleaning equipments.	05

	5.3 Aquarium Filters and types of filtration methods. (Mechanical, Chemical & Biological – Nitrogen Cycle) 5.4 Types of tanks and supportive equipment's. 5.5 Budget for setting up an Aquarium. 5.6 Decoration of Aquaria.	
6.	Water Parameter for Fish Culture : 6.1 Physical Parameter. 6.2 Chemical Parameter.	03
7.	Diseases of Fish : Common Diseases and their treatment : 7.1 Parasitic diseases. 7.2 Bacterial diseases. 7.3 Viral diseases. 7.4 Protozoan diseases. 7.5 Fungal diseases.	03
8.	Breeding Biology : 8.1 Natural Breeding. 8.2 Induced Breeding.	03

Suggested Readings :

1. G. Helfman, Bruce B. Collette, D.E. Facey, B. W. Bowen: The Diversity of Fishes: Biology, Evolution, and Ecology, John Wiley & Sons
2. R. J. Wootton: Fish Ecology, Springer.
3. Handbook of Fisheries and Aquaculture – ICAR.
4. A. D. Dholakia: Ornamental Fish culture and Aquarium Maintenance, Daya pub.
5. House, New Delhi
6. A. Saxena: Aquarium Management. Daya pub. House, New Delhi.
7. C.B.L. Srivastava: Aquarium fish keeping. Kitab Mahal, Allahabad.
8. K. Rataj, and R. Zukal: Aquarium Fishes and Plants. Spring Books, London.
9. K. L. Tekrival and A.A. Rao: Ornamental aquarium fishes of India. TFH United Kingdom.
10. Archana Sinha - Breeding and Culture of Freshwater Ornamental Fish.

VEC 151 IC : Introduction to Indian Constitution						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
Value Education Course (VEC)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : Understand the basics of Indian Constitution.

CO2 : Acquire the knowledge regarding the making of Constitution.

CO3 : Learn the concept of Panchayati Raj and Municipalities.

CO4 : Learn the concept of Directive Principles of State Policy.

CO5 : Understand the Fundamental Duties of Indian Citizen.

CO6 : Acquire the knowledge of fundamentals rights.

CO7 : Understand the Constitutional and Non-Constitutional bodies.

CO8 : Analysis of Constitutional remedies.

Detailed Syllabus :

Unit No.	Name of The Topic	Lectures Allotted
1.	Making of Constitution : 1.1 Historical background. 1.2 Establishment indian constitution. 1.3 Philosophy of preamble of indian constitution. 1.4 Major features of indian constitution.	08
2.	Fundamental Rights, Fundamental Duties, Directive Principle of State : 2.1 Fundamental rights. 2.2 Fundamental duties. 2.3 Directive principle of state.	08

3.	Federalism : 3.1 Salient features of indian federalism. 3.2 Center - state relation.	07
4.	Basic Introduction To Union And State Government : 4.1 Indian Parliament - House of people (Loksabha), council of states (Rajyasabha). 4.2 State legislature - Legislativ assembly (Vidhansabha), legislative council (Vidhan Parishad).	07

Suggested Reading :

1. Constitution of India, Constituent Assembly passed the Constitution on November 26, 1949, became effective on January 26, 1950.
2. Indian Polity, 6th edition, McGraw Hill Education, M. Laxmikant, 2020.
3. Government of India act, 1935.
4. National Council of Educational Research and Training, Old/New edition of Political Science.
5. Bhartiya Rajyaghatnechi Olakh, Sanay Publication, Abhijit Patil and Laxman Sake, 2021.

Web Links :

1. <https://legislative.gov.in/constitution-of-india/>
2. <http://www.mhhe.com/indianpolity6e>

CC 151 PE : Health and Yoga						
Year : I			Semester : II			
Teaching Scheme				Evaluation Scheme		
Course Type	Credits	Number of Teaching hours	Lectures per week	Internal Assessment	Semester End Exam	Total
CC (Co-curricular Courses)	02	30	02	15	35	50

Course Outcomes :

After completion of the course, students should be able to :

CO1 : By the end of the course, Daily practices in Yoga activities help improve strength and flexibility, balance and co-ordination of the student.

CO2 : Student will be able to understand the basic purpose of Yoga, to help an individual achieve complete well - being.

CO3 : Student will acquire the knowledge of healthy food habits and Yoga practices for harmony in the physical, vital, mental, psychological and spiritual aspects.

CO4 : Students will understand the nature of nadis , chakras and also Prakruti & Doshas

CO5 : Encourage self love, self confidence and self care.

CO6 : Manage immunity and quality of sleep.

CO7 : Aware about wellness.

CO8 : Help to boost academic performance.

Detailed Syllabus :

Unit No.	Name of the Topic	Lectures Allotted
1.	Introduction to Health and Yoga : 1.1 Definition, scope and importance of health and yoga. 1.2 Historical development of yoga and its relation to health.	02
2.	Asanas (Yoga Postures) & Bandhas : 2.1 Asana – Introduction & Definition. 2.2 Method of performing various asanas & their benefits : Suryanamaskar, Padmasana, Vajarasana , Shavasana, Makarasana, Tadasana.	04
3.	Yoga Philosophy and Lifestyle : 3.1 Introduction to the philosophy of yoga, including concepts like Patanjali's Yoga Sutras. 3.2 Principles of a yogic lifestyle, including diet, ethics and Mindfulness.	02
4.	Mudras & Bandhas : 4.1 Introduction to mudras & its significance. 4.2 Mudras : Chin – Chinmaya – Adi (Sakthi) Brama – Linga Mudra. 4.3 Bandhas : Jalandhar bandha, uddiyana Bandha, moola bandha and Mahabandha.	05
5.	Pranayama (Breathing Techniques) : 5.1 Introduction to pranayama and its significance in yoga. 5.2 Pranayama : Anulomaviloma , Nadi Shodhana , Bhastrika. 5.3 Kriyas : Kapalabhati – Trataka – Bhagiranga, Antaranga.	04

6.	<p>Meditation and Relaxation :</p> <p>6.1 Introduction to meditation and its role in yoga and health.</p> <p>6.2 Techniques for mindfulness meditation and relaxation.</p> <p>6.3 Benefits of regular meditation practice on mental and emotional wellbeing.</p>	04
7.	<p>Nadis & Chakras :</p> <p>7.1 Nadis : Description of nadis and their relationship with different parts of the nervous system with particular emphasis on Ida, Pingala and Susumna nadis.</p> <p>7.2 Chakras : Introduction to fundamental attributes of chakras and their relationship with various aspects of consciousness.</p>	03
8.	<p>Gunas & Doshas :</p> <p>8.1 Gunas : Introduction to Gunas; Tamas, Rajas and Sattva and Nirgun attributes.</p> <p>8.2 Doshas : Introduction to Doshas; Vata, Pitta, Kapha and balanced doshas.</p> <p>8.3 Vata Dosha : The causative factors, symptoms and treatment of Vata dosha in detail.</p> <p>8.4 Kapha Dosha : The causative factors, symptoms and treatment of Kapha dosha in detail.</p> <p>8.5 Pitta dosha : The causative factors, symptoms and treatment of Pitta dosha in detail.</p>	06

Suggested Readings :

1. Spirituality, Mental Health and Quality of Life Pathways in Indian Psychology, by Naveen Pant(2023)
2. New spiritualities and the cultures of well-being: Religion, spirituality and health: a social scientific approach, Geraldine Mossiere (editor), ISBN 978-3-031-06262-9 Published: 07 July 2022
3. Abuajah CI, Ogbonna AC, Osuji CM (2015) Functional components and medicinal properties of food: are view. J Food Sci Techno 52(5):2522–2529
4. Ashwini, R., & Barre, V. P. (2014). Stress and adjustment among college students in relation to their academic performance. Indian Journal of Health and Wellbeing, 5(3),

288–292.

5. Light of Yoga by B. K. S. Iyengar.
6. Asana, Pranayama, Mudra, Bandha - Swami Satyananda Saraswati.
7. Ayurveda and Yoga. Dr Shiv Bhushan Sharma. Sri Akhand Foundation.
8. Natural Healing Through Ayurveda: Dr Subhash Ranade., Motilal Banarsi Dass Publishers Private Limited, New Delhi.

END OF THE SEMESTER - II