PRATAP COLLEGE AMALNER (Autonomous)

Affiliated To

Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY

JALGAON 425001, INDIA

SYLLABUS UNDER

FACULTY OF SCIENCE & TECHNOLOGY

UNDER CBCS

FOR COURSES RELATED TO SUBJECT

ZOOLOGY

T.Y.B.Sc. (Semester V and VI)

WITH EFFECT FROM

ACADEMIC YEAR 2025-2026

T. Y. B. Sc. ZOOLOY (NEP Structure)

(With Effect from June 2025)
Semester V and VI

Preamble:

The National Education Policy (NEP20220) was introduced at FYBSc since academic year 2023-24. It was then opted for SYBSc during academic year 2024-25 and NEP shall be Effective for third year Students form 2025-26. The contents have accommodated the Widening horizons of the discipline of Biological Sciences. They reflect the current changing needs of the students; specifically, the subjects on biotechnology, bioinformatics and research Methodology have been incorporated. The well organized curricula including basic as well as advanced concepts in Zoology from first year to third year. The course content also lists the new practical exercises so that the students get a hands-on experience of the latest techniques that are in current usage. The curricula shall inspire the students for pursuing higher studies in Zoology and for becoming an entrepreneur and also enable students to get employed in the Biological research Institutes, Industries, Educational Institutes and in the various concerning departments of State and Central Government based on subject Zoology.

Introduction:

At first year of under-graduation the topics related to the fundamentals of zoology, including exposure to diversity of animals, comparative anatomy of vertebrates and Developmental biology are covered in semester I and II. The practical course is aimed at to equip the students with skills required for animal identification, morphological, technical Description, classification, anatomical, developmental phenomenon and also applications of zoology in the various fields.

At second year under-graduation, in semester III and IV courses such as Physiology, Biochemistry, Genetics and Evolutionary Biology, the level of the theory and practical courses increased one step ahead of the first year B.Sc. **At third year under-graduation**: Theory and practical courses in semester V shall deal with the further detailed studies of the various disciplines of the Zoology inform of core courses such as Reproductive biology, Cell and Molecular Biology, Mammalian Histology, and Animal Biotechnology. Skill based course on Public health and hygiene is included as well as students can select either Pest Management or Apiculture as discipline elective course. Semester VI shall cover the theory and practical courses such as Comparative study of representative of invertebrate and vertebrate, Chick embryology, Applied Zoology, Microtechnique as core courses. Research Methodology shall skill enhancement course that shall help students for research in Zoology and students can also select either Bioinformatics or Sericulture as discipline elective course.

Learning Objectives:

- To provide thorough knowledge about animal classification and associated taxonomic groups various animal sciences from primitive to highly evolved animal groups.
- To develop an understanding of and ability to apply basic zoological principles.
- To provide quality education in different specializations in Zoology.
- To facilitate higher education and research in zoology.
- To make the students aware of applications of Zoology subject in various industries
- To equip the students with skills related to laboratory as well as field based studies.
- To make the students aware about conservation and sustainable use of biodiversity.
- To inculcate interest and foundation for further studies in Zoology.

· To address the socio-economical challenges related to animal sciences.

· To provide quality education offering skill based programs and motivate the students for self employment in applied branches of Zoology.

Program specific objectives (PSO)

· To achieve excellence in academic and scientific research in the field of Zoology.

· To develop and implement ways and means to ensure quality performance and outputs of Zoology program.

· To use modern technology in education and scientific research in Zoology.

· To implement advanced training to improve the skills of graduates in Zoology and related fields.

· To create academic and scientific environment to attract outstanding faculty, researchers and students.

· To improve the national and international partnerships with academic institutions and research centres.

Program outcome (PO)

· To possess a good command of fundamentals in Zoology and its relationship to other disciplines.

· To know the theories and scientific facts in the sections of Zoology and interrelations among organisms and their biosphere

· To memorize the concepts of laboratory management, organization and evaluation.

· To recognize the management and concepts of bio-systems, organization and evaluation.

· To outline the policy and legislation of animal Science and ethics.

· To design and conduct experiments in Zoology

· To communicate effectively through writing reports, giving presentations, and participating in discussions.

· To demonstrate skill in the usage of computers, networks, and software packages relevant to Zoology

· To learn the principles of research methodology.

Course outcome (CO)

· Describe the diversity in form, structure and habits of invertebrates and vertebrates

· Explain the reproductive patterns in animal world

· Develop deeper understanding of life is and how it functions at cellular level as well as Histological structure of tissues.

· Understand applications of animal biotechnology, bioinformatics and research Methodology

· Familiar with various stages involved in the developing embryo

· Acquire skills in the Micro-techniques, apiculture, sericulture and other applied branches of Zoology.

Duration: The duration of B.Sc. degree program shall consists of three years.

Medium of instruction: The medium of instruction for the courses shall be English.

Examination pattern

· Each theory and practical course will be of 30 marks comprising of 20 marks internal and 30 marks external examination.

· Theory examination (30 marks) will be of two hours duration for each theory course. There shall be 5 questions each carrying equal marks (12 marks each).

· Internal examination (20 marks) and

· Practical examination (IA of 20 marks and EA of 30 Marks)

Structure of curriculum of TYBSc (Zoology) Semester V

Discipline	Course Type	Course Code	Course title	Credits	Hours/ week (Clock Hours)	Total Teaching hours	Marks (Total 50)	
							IA	EA
Discipline Specific Course (Major)	Major	Zoo-MJ-301	Reproductive Endocrinology	2	3	30	20	30
	Major	Zoo-MJ-302	Cell and Molecular Biology (CMB)	2	3	30	20	30
	Major	Zoo-MJ-303	Mammalian Histology	2	3	30	20	30
	Major	Zoo-MJP-304	Practical related to zooMJ-301	4		30	20	30
	Major	Zoo-MJP-305	Practical related to zooMJ-302	4		30	20	30
	2.Vocation/Skill Enhancement Course Group							
VSC	Zoo-VSCP-306	Zoo-VSCP-306	Pest Management	2	2	30	20	30
	3.Minor Subject Group (select any one)							
Minor	Minor	Zoo-MN-311	Animal Biotechnology	2	2	30	20	30
	Minor	Zoo-MNP-312	Practical related to Animal Biotechnology	2	2	30	20	30
	4.Discipline Elective Course Group							
EC	EC	Zoo-EC-321	Public health and hygiene	2	2	30	20	30
EC	EC	Zoo-ECP-322	Practical related to Zoo-EC-321	2	4 (Per batch)	30	20	30
		5. Field Project/OJT/Int.						
		Zoo-FP341	ZOO-FP-341	4	8		40	30

Structure of curriculum of TYBSc (Zoology) Semester VI

Discipline	Course Type	Course Code	Course title	Credits	Hours/ week (Clock Hours)	Total Teaching hours	Marks (Total 100)	
							IA	EA
Discipline Specific Course (Major)	Major	Zoo-MJ-351	Study of Leech & Calotes	2	3	30	20	30
	Major	Zoo-MJ-352	Chick Embryology	2	3	30	20	30
	Major	Zoo-MJ-353	Applied Zoology	2	3	30	20	30
	Major	Zoo-MJP-354	Practical related to Zoo-MJ351	4		30	20	30
	Major	Zoo-MJP-355	Practical relatedtoZoo-MJ-352	4		30	20	30
	2.Vocational/Skill Enhancement course group select any one							
VSCP	VSCP	Zoo-VSCP-356	Microtechnique	2	2	30	20	30
	3.Minor subject Group (select any one)							
Minor	Minor	Zoo-MN-361	Research Methodology	2	2	30	20	30
Minor	Minor	Zoo-MNP-362	Practical related to Zoo MNP-361 Research Methodology	2	2	30	20	30
	4.Discipline Elective Course Group							
EC	Elective Course (Any one)	Zoo-EC-371	Sericulture	2	2	30	20	30
EC	EC	Zoo-ECP-372	Practical related to Zoo-371	2	4 (Per batch)	30	20	30
	5.Field Project/OJT/Int.							
OJT	OJT	Zoo-OJT-391		2	4	8	20	40

IA: Internal Assessment, EA: External Assessment

Semester V

Major Courses			
Zoo-MJ-301: Reproductive Endocrinology			
Course objective · To learn about the various aspects of reproductive biology and endocrinology. · To acquire a broad understanding of the hormonal regulation of physiological processes. · To create awareness of new technologies in assisted reproduction as well as contraceptive methods.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · understand the functioning of male and female reproductive systems particularly in humans. · comprehension of the interplay of various hormones in the functioning and regulation of the male and female reproductive systems · know about modern contraceptive devices.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	Introduction: Definition and Scope of Reproductive endocrinology	03	03
Unit II	Structure, Morphology, Histology and Reproductive functions of - Pituitary gland, Thyroid and Adrenal gland.	06	06
UnitIII	**Male and Female Gonads:** 3.1 **Testis:** 3.1.1 Structure (Histology) and Endocrine Regulation. 3.1.2 Hypophysical Control (Testicular androgens). 3.1.3 Effect of testosterone on development of sexualcharacteristics. 3.2 **Ovary:** 3.2.1 Structure (Histology) and Endocrine Regulation.	08	08
UnitIV	**Female Reproductive Cycle:** 4.1 a) Oestrous cycle, b) Menstrual cycle 4.2 Function of Ovarian Hormone. 4.3 Regulation of Endometrial cycle by ovarian Hormone.	08	08
Unit V	Hormonal Control on Pregnancy, Parturition, Lactation and Fertility	05	05

Suggested Readings:

1) Austin C. R. and R. V. Short, 1972 Reproduction in Mammals, Vol-1-8, Cam. Uni. Press.

2) Copenhaver Wilfred M., Douglas E. Kelly and RichardL.Wood- Bailey's text book of histology, Williams and Wilkins, Baltimore / London.

3) Gibian P. and E. J. Platz, eds, 1970, Mammalian Reproduction, Springer Verlag.

4) Guide to learning in Reproductive Endocrinology and Infertility ABO+ G. First in women Health. The American Board of Obstetrics and Gynaecology, Inc.2915, Vine Street: Dallas, TX 75204 Fellowship @ obog. org. www. obog.org.

5) Hogarth P. J., 1978- Biology of Reproduction Wiley,New York.

6) Lohar Prakash S. - 2012- Endocrinology-Hormones and Human Health, MJP Publishers, Chennai.

7) Perry J. S., 1971, The Ovarian cycle of animals, Oliver and Boyed.

8) Williams Robert H., 1981, Text Book of Endocrinology, W. B. Saunders Company.

Major Courses			
Zoo-MJ-302: Cell and Molecular Biology (CMB)			
Course objective: · To understand the basic structure of cells, tissues and their working system. · Know the handling skill in laboratory methods of estimation, determination, working of cells and their molecules. · Use of binocular research microscope and bioinstrumentation in laboratory.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: After successful completion of this course, students are expected to: · achieve the knowledge of cell structure and cellular system. · predict the outcome of various cellular reactions carried out in cell and cellular system under various conditions. · predict the role of genes and its relevance to human genetics and diseases.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Introduction to Cell and Molecular Biology:** a) Cell Biology. b) Molecular Biology. c) Prokaryotic and Eukaryotic cells, Virus, Mycoplasma. d) Structure of plasma membrane: i) Bilayer model of Danielli and Devon, ii) Fluid mosaic model. e) Study of cell organelles with reference to ultra structure and functions of: Nucleus, Endoplasmic Reticulum, Golgi bodies, Lysosomes and Mitochondria	**10**	**10**
Unit II	**Cell Division and Cell Signalling:** a) Cell division – Definition, Stages of mitosis and meiosis. b) Stages of cell cycle – G1, S, G2 and M- Phase. c) G-Protein coupled receptor and role of second messenger (cAMP)	07	07
UnitIII	**Nucleic Acid:** a) Salient features of DNA and RNA b) Watson and Crick model of DNA molecule. d) DNA replication in Prokaryotes and Eukaryotes.	07	07
UnitIV	**Protein Biosynthesis:** a) Transcription in Eukaryotes: RNA polymerase, Transcriptional Unit, Mechanism of transcription, Processing of m-RNA and r-RNA.	06	06

Suggested Readings:

1) Conn et al: Outline of Biochemistry (Wiley)

2) De Roberties and De Roberties: Cell and Molecular Biology, Saunders College.

3) Edward Gasque: Manual of Laboratory Exp. in Cell Biology, W.C. Brown Publishers.

4) Geoffrey M. Cooper and Robert E. Housman: The Cell – A Molecular Approach. 4th edition.

5) Lodish et al: Molecular and Cell Biology, Scientific American Book.

6) Lohar Prakash S. (2014) Cell and Molecular biology, MJP Publishers, Chennai.

7) Prescott, DM: Reproduction in eukaryotic cells, Academic Press.

8) Strick berger, M.W.: Genetics, 2nd edition, Macmillan Publishing Co. Inc. New York.

9) Verma P. S. and V. K. Agrawal : Cytology

10) Watson J. D. et al: Molecular Biology of Gene (Benzamin / Cumming)

11) Wilson, EB: Cell in Development and Inheritance (MacMillan

Major Courses			
Zoo-MJ-303: Mammalian Histology			
Course objective: · To study the Histology of different tissues and systems of mammals.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: After successful completion of this course, students are expected to: · enrich themselves with histology of different tissues and systems for research and job opportunities in Pathology and Cancer research centers.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Tissue and Skin:** 1.1 Definitions of Histology. Differentiation and derivative of three germinal layers 1.2 Tissue: Types and Characteristics (Definition and Location only). 1.3 Types – 1.3.1 Epithelial tissues- a) Simple epithelial tissues, b) Compound epithelial tissues, 1.3.2 Connective tissue, 1.3.3 Muscular tissue and 1.3.4 Nervous tissue a) Structure and types of neurons (nerve cell), b) Medullated and Non-Medullated nerve fibres. 1.4 Skin: Structure and function. 1.5 Derivatives of skin - Horns, Nails, Hair, Sweat and Sebaceous gland.	**10**	**10**
Unit II	**Digestive system:** 2.2 Histology of alimentary tract: histological structure of oesophagus, stomach, duodenum, colon and rectum. 2.3 Histology of digestive glands – salivary gland, liver, pancreas (exocrine and endocrine).	06	06
UnitIII	**Circulatory, Excretory system:** 3.1 Structure and function of blood vessels: Artery, Vein and Capillary. 3.2 Blood: Composition, types of blood cells and their Functions. 3.3 Histology of Kidney: L.S. of Kidney, microscopic St ucture of uriniferous tubules, Glomerular complex (JG complex), Bowman's capsule & Glomerulus	08	08
UnitIV	**Reproductive and Endocrine system:** 5.1 Histological structure of Testis, Structure of sperm 5.2 Histological structure of Ovary, Structure of ovum 5.3 Histological structure of Pituitary gland. 5.4 Histological structure of Thyroid and Parathyroid gland. 5.5 Histological structure of Adrenal gland	06	06

Suggested Readings:

1) Arthur W. Ham: Ham's Histology, 9th ed. Philadelphia: Lippincott, 1987.Freeman W. H:, An advanced atlas of Histology

2) Muzammih Ullah: Histology and Genetics

3) Roy O. Greep.: Histology

4) Turner and Bungera: General Endocrinology

5) William F. Windle : Text book of Histolog

Major Practical			
Zoo – MJP-304: Corresponding practical to Zoo-MJP-301			
Course objective · To learn the various aspects of reproductive biology and endocrinology. · To know the basic structure of cells, tissues and their working system.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · understand the functioning of male and female reproductive Systems particularly in humans. · achieve the Knowledge of cell structure and cellular system.			
	Reproductive Endocrinology		
Practical 1	Estimation of total gonadal cholesterol from Ovary / Testis.		
2	Estimation of Ascorbic acid from Ovary / Testis.		
3	Estimation of Protein from Ovary / Testis by Lowry's method		
4	Estimation of Glycogen from Ovary / Testis by Anthrone Method		
	Minor Experiment:		
5	Study of Histological Structure of Ovary, Testis and Fallopian tube with the help of Permanent slide.		
6	Demonstration of various endocrine glands from Rat / Mice with the help of chart / model / figure.		
7	Cellular structure of Pituitary, thyroid and Adrenal gland with the help of permanent slide.		
8	Pregnancy test (any suitable method)		

Suggested Readings:

1) Austin C.R. and R.V. Short, 1972, Reproduction in Mammals, Vol-1-8, Cam. Uni. Press.

2) De Roberties and De Roberties: Cell and Molecular Biology (Saunders College)

3) Lohar Prakash S., 2012, Endocrinology, MJP Publishers, Chennai

DSC Core Practical			
Zoo –MJP-305: Corresponding practical to DSC Zoo-MJ-302			
Course objective · To know the handling skill in laboratory methods of estimation, determination, working of cells and their molecules. · To study the histology of different tissues and systems of mammals.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · predict the outcome of various cellular reactions carried out in cell and cellular system under various conditions. · enrich with Histology of different tissues and systems for research and job opportunities in Pathology and Cancer research centers.			
	Molecular Biology		
Practical 1	Quantitative estimation of RNA from suitable material by Orcinol reagent. (E)		
2	Quantitative estimation of DNA from suitable material by Diphenylamine reagent. (E)		
3	Preparation of Polytene chromosome from Chironomus/Drosophila larva. (E)		
4	Study and interpretation of electron micrographs/photographs showing. (D) a) DNA replication, b) Transcription, c) Split genes.		
	Cell Biology		
5	**Study of following histological permanent slide of blood vessels, excretory and reproductive systems. (D)** a) T. S. of artery b) T. S. of vein c) T. S. of capillary. d) L. S. of kidney e) T. S. of testis f) L. S. of ovary		
6	**Study of following histological permanent slide of endocrine glands. (D)** a) T. S. of pituitary gland b) T. S. of adrenal gland c) C. S. of thyroid gland		
7	Preparation of permanent slide to show the presence of Barr body in human female Blood / Cheek cells.(E)		
8	Preparation of temporary stained squash of onion root tip to study various stages of Mitosis. (E)		
9	Study of various stages of Meiosis. (D)		
10	Study of cell organelles from photomicrographs (D)		

Suggested Readings:

1) De Roberties and De Roberties: Cell and Molecular Biology (Saunders College)

2) Freeman W. H., An advanced atlas of Histology

3) Lodish et al: Molecular and Cell Biology (Scientific American Book)

4) Lohar Prakash S. (2014) Cell and Molecular biology, MJP Publishers, Chennai

5) Pearse A.G.E., Histochemistry – Vol. I and II

6) Tembhare D.B., Techniques in Life Sciences.

Course			
Zoo-VSCP-306 : Pest Management			
Course objectives: · To acquire basic skills in the observation and study of nature. · To inculcate interest in adopting biological control strategies for pest control. · To know various pests affecting our local crops and select the best method for their control. · To acquire basic knowledge and skills in agriculture management to enable the learner for self-employment.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: After successful completion of this course, students are expected to: · impart basic awareness regarding pest problem and crop loss due to their dominance. · understand various pests affecting our local crops and select the best method for their control. · acquire basic knowledge and skills in agriculture management to enable the learner for self-employment			
Practical		**Lectures 30**	**Marks 30**
1	Mounting of mouthparts of insects: Biting and Chewing, Chewing and lapping, piercing and sucking, siphoning and sponging.		
2	Study of House hold and Human insect pests: Rat flea, Bed bug, Housefly, Head louse.		
3	Study of various stages of metamorphosis of following insects. Cockroach, Grasshopper, Red Cotton bug, Butterfly.		
4	Study of non-insect animal pests : a. Rat b. Bird c. Monkey d. Boar e. Deer		
5	Collection and Identification of agricultural insect pests from local area. (Minimum 10).		
6	Study of common plant protection appliances like Sprayers and dusters.		
7	Study of wing venation and modification of wings in insects.		
8	Study of genetalia and ovipositor in insects. **(Compulsory)**		
9	Detection of uric acid as end product of excretion in terrestrial insects		
10	Detection of digestive enzymes present in salivary glands and gut.		

11	Study of microtomy of 5 insect organs (Students should submit at least 10 slides of whole mounts and microtomy at the time of examination).		
12	Study tour: At least two visits to the crop fields.		

Suggested Readings:

1) Crop Pests and How to Fight Them, Director of Publicity, Govt. of Maharashtra.

2) Fadt: Fundamental of Entomology.

3) Gupta: Essentials of biotechnology.

4) Little and Little: General and Applied Entomology**.**

5) Pedigo: Entomology and Pest management.

6) Pradhan,: Insect Pest of Crops.

7) Pruthi, H.S.: Textbook of Agricultural Entomology.

8) Ravindranathan K. R.: Economic Zoology, Dominant Pub., New Delhi

9) Shukla and Upadhyay: Economic Zoology, Rastogi publication.

10) Tembhare D.B.: Text Book of Modern Entomology

Zoo-MN-311: Public Health and Hygiene			
Course objective · To provide knowledge and understanding regarding life style diseases. · To promote an understanding of the value of good life style practices, physical fitness and healthy food habits for life style disease management. · To motivate them to practice yoga and meditation in day-to-day life		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · get familiarised with various aspects of environmental risks and hazards. · acquire knowledge regarding epidemiology, prevention, control and management of diseases of public health importance. · learn about diagnosis of various diseases and methods to prevent them.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Public Health and Hygiene:** 1.1 Introduction and scope, 1.2 Nutrition and health, 1.3 Classification of food, 1.4 Nutritional deficiencies, 1.5 Vitamin deficiencies, 1.6 Hygiene: Introduction, definition and types of hygiene.	**09**	**09**
Unit II	**Environment and health hazards:** 2.1 Environmental degradation, 2.2 Pollution and associated health hazards	04	07
UnitIII	**Sanitation and Diseases:** 3.1 Definition and concept, 3.2 Disposal of human & animal waste, refuse sewage.	04	07
UnitIV	**Communicable disease and their control measures:** 4.1 Malaria 4.2 Typhoid 4.3 Hepatitis-types 4.4 Tuberculosis 4.5 Chikungunya 4.6 Dengue and 4.7 AIDS.	06	07
Unit V	**Non-communicable diseases** and **their preventive measures:** 5.1 Hypertension, 5.2 Coronary Heart disease, 5.3 Stroke, 5.4 Obesity and 5.5 Mental ill health	07	07

Suggested Readings:

1) Basu, S.C. Preventive and Social Medicine.

2) Cliford Anderson R., Your Guide to Health.

3) Gibney, Clinical Health, Blackwell.

4) Gibney, Public Health Nutrition, Blackwell.

5) Goel, S.O.L. Public Health Administration.

6) Mahajan B.K., M.C. Gupta, Preventive and social medicine in India, 2013, 4thEdn.,Jaypee Broyhers Medical Publishers, New Delhi, India.

7) Park K. and Park S, 1995, Text Book of Preventive and Social Medicine. Banarsidas Bhanot Publishers,1167 Prem Nager, Jabalpur – 482001.

8) Sanitarians Hand Book.Theory and Administrative Practice. Pearles Publications, New Orleans, USA.

9) Seshu Babu V.V.R, Review of community medicine, 2006, 2ndEdn.,Paras Medical Books Pvt. Ltd., Hydrabad.

10) Shoryock Harold and Hubert O. Swart out You and Your Health illustrated Dealing with Diseases.

11) Sobti R. C., Medical Zoology and Medical Technology, Shobanlal and Co. Jalandher.

DSC Core Practical			
Zoo –MNP-312: Corresponding practical to Public Health and Hygiene			
Course objective · To provide knowledge and understanding regarding life style diseases. · To promote an understanding of the value of good life style practices, physical fitness and healthy food habits for life style disease management. · To motivate them to practice yoga and meditation in day-to-day life		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · get familiarised with various aspects of environmental risks and hazards. · acquire knowledge regarding epidemiology, prevention, control and management of diseases of public health importance. · learn about diagnosis of various diseases and methods to prevent them.			
Practical			
1	1. To detect adulterants in the food samples by appropriate tests. (E)		
2	2. Methods used to make drinking water safe. (D)		
3	3. Colorimetric estimation of blood sugar level.		
4	4. Epidemiological study of measles, tuberculosis and poliomyelitis. (D)		
5	5. Testing portability of water for human consumption by MPN method. (D)		
6	6. Biological control of mosquito larvae		
7	7. Visit to sewage treatment plant / effluent treatment plant / Public health Laboratory/water purification (treatment) plant (D)		

Zoo- EC-321			
Zoo-EC-321: Animal Biotechnology			
Course objective: · Studying animal cell and tissue culture techniques · Developing genetically engineered products for human animal welfare, · Developing gene transfer technologies, cloning, transgenic animals · Studying hybridoma technique and production of antibodies · Impart knowledge about stem cell research		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: After successful completion of this course, students are expected to: · Acquire knowledge about animal cell and tissue culture techniques. · Become familiar with genetically engineered products for human animal welfare. · Developing embryo - transfer technology ,cloning, transgenic animals. · Understand applications of hybridoma technique and functions of antibodies. · Acquire knowledge about stem cell research and its ethical issues.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	1.1 Introduction, scope and significance of Biotechnology 1.2 Animal cell and tissue culture 1.2.1 Definition and Types of culture media 1.2.2 Advantages and disadvantages of animal cell/tissue culture 1.2.3 Laboratory facility for animal tissue culture 1.2.4 Applications of animal cell and tissue culture 1.2.5 Primary culture, Examples of Cell lines 1.2.6 Applications of somatic cell fusion 1.3 Examples of Tissue and organ cultures	10	15
Unit II	**Transgenic animals** 3.1 Introduction 3.2 Methods of Transfect ion (Physical, Chemical, Viral and Bacterial) 3.3 Examples and significance of transgenic animals	06	10
UnitIII	**Hybridoma technology** 4.1 Introduction 4.2 Methods for production of monoclonal and polyclonal antibodies 4.3 Significance of Monoclonal antibodies 4.4 Types and significance of immunoglobulin	08	12
UnitIV	**Stem Cell Biotechnology** 5.1 Introduction 5.2 Types of Stem Cell and their uses 5.3 Now and Future of Stem cell Biotechnology 5.4 Ethical issues in stem cell technology	06	8

Suggested Readings:

1) Brooks G (ed.) (2002) Gene therapy. *The use of DNA as a drug*. Pharmaceutical Press, London.

2) Gerald C., (1996) *Cell and Molecular Biology –Concept and Experiment,* John Wiley and Sons, Inc ,U.S.A.

3) Lewin, B., (2004), *Genes VIII,* Oxford University Press, New York

4) Lohar Prakash S. (2012) Textbook of Biotechnology ISBN: 9788180941047 MJP Publishers, Chennai

5) Sing, B.D.(2014) Biotechnology Expanding horizons. Kalyani Publishers, Delhi.

6) Stem Cell Biology (2001) Cold Spring Harbor Laboratory Press

7) Watson, J.D. *et al*, (1987) *Molecular Biology of Gene,*4th ed., The Benjamin / Cummings Publishing Company, Inc. U.S.A.

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DSC Core Practical			
Zoo –ECP-322: Corresponding practical to DSC Zoo-EC-321			
Course objective · Studying animal cell and tissue culture techniques · Developing genetically engineered products for human animal welfare, · Developing gene transfer technologies, cloning, transgenic animals · Studying hybridoma technique and production of antibodies · Impart knowledge about stem cell research.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · acquire knowledge about animal cell and tissue culture techniques · become familiar with genetically engineered products for human animal welfare, · developing embryo - transfer technology, cloning, transgenic animals · understand applications hybridoma technique and functions of antibodies · acquire knowledge about stem cell research and its ethical issues.			
Practical	**Animal Biotechnology**		
1	Estimation of DNA in a given sample by Diphenylamine method		
2	Estimation of RNA in a given sample by Orcinol method		
3	Working principle and application of laminar air flow and autoclave (D)		
4	Isolation of microorganisms on nutrient agar by streak plate/dilution plate method (E)		
5	Production ethanol by fermentation using yeast.(E)		
6	Culture of bacteria in liquid medium and agar plates.(E).		
7	Preparation of primary culture media for cell, tissue, organ.(D)		
8	Separation of serum proteins by Agarose or polyacrylamide gel electrophoresis(E)		
9	Study of Biogas plant/ model (D)		
10	Visit to dairy / pharmaceutical / tissue culture laboratory and submission of report.		

Suggested Readings:

1) Brooks G (ed.) (2002), Gene therapy. The use of DNA asa drug. Pharmaceutical Press, London.

2) Gerald C., (1996), Cell and Molecular Biology – Conceptand Experiment, John Wiley and Sons, Inc., U.S.A.

3) Lewin, B., (2004), *Genes VIII*, Oxford University Press,New York

4) Lohar Prakash S. (2012), Textbook of Biotechnology =ISBN: 9788180941047 MJP Publishers, Chennai

5) Sing, B.D.(2014), Biotechnology Expanding horizons. Kalyani Publishers, Delhi.

6) Stem Cell Biology (2001), Cold Spring Harbor Laboratory Press

7) Watson, J.D. *et al*, (1987),Molecular Biology of Gene,4th ed., The Benjamin / Cummings Publishing Company,Inc. U.S.A.

Zoo-Fp-341	**Field Project**	

SEMESTER VI

Zoo-MJ-351			
Zoo-MJ-351: Study of Leech And Calotes			
Course objective · To understand habit, habitat and taxonomic status of Leech as invertebrates and Calotes as vertebrates · To explain the basic aspects of structural and functional details of Leech and Calotes		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · understand the systematic position, habit and habitat of Leech and Calotes · acquire the knowledge about structural and functional details about Leech as invertebrates and *Calotes* as vertebrates · compare structural and functional details in Leech and Calotes.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Study of Leech:** a) Systematic position, habit, habitat external characters, body wall. b) Digestive system, food, feeding and digestion. c) Excretory system	10	10
Unit II	d) Nervous system and sense organs. e) Reproductive system, copulation, f) Fertilization, cocoon formation, and development.	05	05
UnitIII	**Study of Calotes** a) Systematic position, habit, habitat external characters, b) Digestive system, food feeding and digestion	5	05
UnitIV	c) Respiratory system and respiratory mechanism d) Excretory system and physiology of excretion	05	05
Unit V	e) Nervous system and sense organs f) Reproductive system, copulation, fertilization and development.	05	05

Suggested Readings:

1) Hall B.K.and Hall grimsson B. (2008), Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

2) JordenE. L., Invertebrate Zoology, S.C. Chand, New Delhi.

3) Jordan E.L. and P.S. Verma, Chordate Zoology, S. Chand and Company New Delhi.

4) Kotpal R.L (1991), Zoology phylum Annelida,Rastogi publication. Meerut.

5) Kotpal R.L. (2016), Modern text book Vertebrate zoology.Fourth edition. Rastogi Publication, Meerut

6) Lal S.S. (1996), Textbook of Practical Zoology Invertebrates, Rastogi Publications.

7) Lal S. S. (1996), Textbook of Practical Zoology Vertebrates, Rastogi Publications.

DSC Core Courses

Zoo-MJ-352: Chick Embryology			
Course objective · To study the various stages involved in the developing embryo · To study the initial developmental procedures involved in chick · To know the processes involved in embryonic development and practical applications of studying the chick embryology.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · Understand various stages involved in the developing embryo · Understand the initial developmental procedures involved in chick. · Understand the processes involved in embryonic development and practical applications of studying the chick embryology.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Embryology:** 1.1 Definition and Concept of embryology **1.2** Spermatogenesis and 1.3 Oogenesis.	04	04
Unit II	**Fertilization:** 2.1 General mechanism of fertilization 2.2 Eggs: Structure of Hen's egg.	04	04
UnitIII	**Cleavage:** 3.1 Patterns of cleavages. 3.2 Blastulation 3.3 Gastrulation	08	08
UnitIV	**Development of Chick Embryo:** 4.1 18 hours chick embryo - (Primitive streak formation, mesogenesis, somite formation) 4.2 24 hours chick embryo 4.3 33 hours chick embryo 4.4 48 hours chick embryo	07	07
Unit V	**Extra-embryonic membranes:** 5.1 Yolk Sac, structure and its functions. 5.2 Amnion, structure and its functions. 5.3 Chorion, structure and its functions.	07	07

Suggested Readings:

1) Agarwal, V.K. and Usha Guptha, S (1998). Chand's simplified course in Zoology, Chordate Embryology and Histology. S. Chand & Co Ltd.

2) Balinsky. B.I. (2004). An Introduction to Embryology.W.B. Saunders & Co.

3) Berry, A.K. (2008). An Introduction to Embryology.Emkay Publications.

4) Boby Jose et al., Developmental biology, Experimental biology, Manjusha Publications, Calicut.

5) Gibbs. (2006). Practical Guide to Developmental Biology.Oxford University Press.

6) Gilbert. S. F. (2000).Developmental Biology. Sinauer Associates, Inc. Publishers.

7) Goel, S.C. (1984).Principles of animal developmental biology. Himalaya Publ. House, Bombay.

8) Huettner, A.F. (1959).Comparative Vertebrate Embryology. MacMillan.

9) Mc Even. (1970).Vertebrate Embryology. Oxford-IBH

10) Nelson. (1960) .Comparative Embryology of Vertebrates. MacMillan.

11) P.C. Jain. (2007) . Elements of Developmental Biology, 6th Edn. Rastogi Publications.

12) Rough. (1960).Frog- Reproduction and development. Oxford University Press.

13) Verma, P.S. and V.K. Agarwal (2007).Chordate Embryology. S. Chand and Co. Ltd.

Zoo-MJ-353			
Zoo-MJ-353: Applied Zoology			
Course objective: · To acquire basic knowledge and skills in applied branches of zoology · To equip the students with self-employment capabilities. · To provide scientific knowledge of profitable farming. · To get technical awareness of vermi-technology and vermi-composting technique. · To convert unwanted, organic matter, particularly food scraps and paper into fertile soil. · To learn about all aspects of raising poultry for their meat and eggs. · To know the economics, problems and prospects of Vermi-composting and Poultry.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: After successful completion of this course, students are expected to: · practice of vermicomposting, vermiculturing and poultry farming. · aspire to work in preparing bio compost, vermicomposting and vermiculturing and get employment accordingly. · start business for rearing and production of birds and get employment accordingly.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Vermiculture** 1.1 Introduction and scope 1.2 Characteristics features of earthworm 1.3 Species of Earthworm – *Eisenia foetida* and *Eudrilus eugeniae*	03	03
Unit II	2.1 Methods of vermicomposting – Small and Large scale. 2.2 Set up of Vermiwash unit. 2.3 Role of earthworm in solid waste management. 2.4 Economic importance of vermicompost and vermiwash	08	08
UnitIII	3.1 Introduction : Definition and concept 3.2 Study of Indian fowl, *Gallus gallus domesticus* w.r.t. a) Systematic position b) Habits and Habitat c) External Morphology	06	06
UnitIV	**Poultry** 4.1 Types of Poultry breeds: with respect to origin, characters and standard weight. a) American breed – White Plymoth rock b) Mediterranean breed – White Leghorn c) The English breed – White Cornish d) Asiatic breed – Brahma e) Indian breed – Assel, Kadaknath 4.2 Brooding and Rearing : a) Natural and artificial breeding	10	10

	b) Housing and Equipment of poultry c) Poultry house equipment d) Poultry Nutrition		
Unit V	5.1 Economics of poultry : a) Nutritive value of egg of hen b) Economic importance of poultry manure	03	03

Suggested Readings :

1) Banerjee, G. C., A textbook of Animal Husbandry, Oxford and IBH publishing Co. Pvt. Ltd. New Delhi.

2) Banerjee, G. C., Animal Husbandry, Oxford and IBHpublishing Co.

3) Gupta P.K., Vermicomposting for sustainableagriculture - Publisher - Agrobios, Jodhpur (India).

4) Shukla and Upadhyay, Economic Zoology, Rastogi publication.

5) Singh, R. A., Poultry introduction, Kalyani publishers,New Delhi.

6) Singh, R. A., Poultry production, Kalyani publishers,New Delhi.

7) Srivastava P. D. and N. C. Pant, Economic ZoologyVol. I and II, Commercial Publication Bureau, NewDelhi.

8) Yadav Manju, Applied Entomology, Discovery publishing house, New Delhi

9) Yadav Manju, Economic Zoology, Discovery publishing house, New Delhi

Zoo-MJP-354			
Zoo-MJP-354: Practical related to Zoo-MJ-351			
Course objective · To understand habit, habitat and taxonomic status of Leech as invertebrates and Calotes as vertebrates · To explain the basic aspects of structural and functional details of Leech and Calotes		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · understand the systematic position, habit and habitat of Leech and Calotes · acquire the knowledge about structural and functional details about Leech as invertebrates and *Calotes* as vertebrates · compare structural and functional details in *Leech* and *Calotes*			
Practical	**Zoo - 354: Study of Leech and Calotes**		
1	Study of systematic position and external characters of leech with the help of chart or diagram.		
2	Study of Digestive system of leech with the help of chart or diagram.		
3	Study of Nervous system of leech, with the help chart ordiagram.		
4	Study of reproductive system of leech, with the help chart or diagram.		
5	Study of systematic position and external characters of *calotes*, with the help chart or diagram.		
6	Study of Digestive system of Calotes, with the help chart ordiagram.		
7	Study of Nervous system of Calotes, with the help chart or diagram.		
8	Study of Reproductive system of Calotes, with the help of chart or diagram.		

Suggested Readings:

1) Jordan E. L. and P. S. Verma, Chordate Zoology, S. Chand and Company New Delhi.

2) Kotpal R.L (1991), Zoology Phylum Annelida, Rastogi Publication. Meerut.

3) Kotpal R.L. (2016), Modern text book Vertebrate Zoology. Fourth edition. Rastogi Publication, Meerut

4) Lal S.S. (1996): Textbook of Practical Zoology Invertebrates, Rastogi Publications

5) Young K.Z., A life of Vertebrate, ELBS Oxford University Press.

Zoo-MJP-355			
Zoo-MJP-355: Practical related to Zoo-MJ-352			
Course objective · To get technical awareness of vermitechnology, and poultry farming technique. · To learn the stages of embryology through permanent slides/charts. · To know the processes involved in embryonic development and practical applications of studying the chick embryology.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · Practice of vermicomposting , vermiculturing and poultry farming. · Aspire to work in preparing bio compost, vermicomposting and get employment accordingly. · Rearing and production of birds and get employment accordingly.			
Practical	**Zoo - 355: Chick Embryology**		
1	Study of Hens egg With the help of Chart/ Model/ Permanent slides (D)		
2	Study of Cleavage, Blastula and Gastrula: With the help of Chart/ Model/ Permanent slides (D)		
3	Study of Whole mounts of 18, 24, 33, 48, 72 and 96 hours of chick embryos with the help of Permanent slides / Chart/ Model (D)		
4	Temporary mounting of chick embryo (E)		
	Zoo-MJ-353-Applied Zoology.		
5	Study of External morphology of Earthworm.		
6	Study of species of Earthworm		
7	Establishment of Vermicompost unit		
8	Establishment of Vermiwash unit		
9	Study of External morphology of Indian fowl and sexual dimorphism		
10	Study of Poultry breeds		
11	Study of Poultry equipment's		
12	Compulsory visits to a Vermiculture unit / Poultry farm		

Suggested Readings :

1) Shukla and Upadhyay, Economic Zoology, Rastogi publication.

2) Singh, R. A., Poultry production, Kalyani publishers,New Delhi.

3) Srivastava P. D. and N. C. Pant, Economic Zoology Commercial Publication Bureau, New Del

Zoo-VSCP-356 Microtechnique			
Zoo-VSCP-356: Corresponding practical to Microtechnique			
Course objectives: To prepare the whole mounts microscopic slides andstaining reactions.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: Cell tissue structure, histology of tissues and details of morphology of animals. Job opportunities in Healthinstitutes, Hospitals and Pathological labs.			
Practical	**ZOO 356 – Microtechnique**		
1	Preparation of permanent whole mounts of different kinds-5 slides.		
2	Preparation of permanent slides of histological sections from different mammalian tissues-5 slides.		
3	Study of Rotary and Rocking microtome.		
4	Vital staining of mitochondria by Janus green B stain.		
5	Calibration of micrometer scale of cell diameter from the given permanent slide.		
6	Sketching by camera Lucida.		
7	Submission of permanent slide (5 Whole mounts and 5 histological sections).		

Suggested **Readings:**

1) Gray P., Hand book of basic Microtechnique.

2) Indurkar A.K., Practical course in Cytology.

3) Me Mann J.F.A and R.W Mowry, Staining Methods (Histology and Histochemical)

4) Pathak, Microtechnique (Theory and Practical)

5) Patki, Bhalchanda and Jeevaji, Introduction to Microtechnique, S. Chand Publication.

6) Pearse A.G.E., Histochemistry – Vol. I and II

7) Tembhare D.B., Techniques in Life Sciences

8) Weesner F.M., General Zoological Microtechnique.

Zoo-MN-361			
Zoo-MN-361: Research Methodology			
Course objective · To understand some basic concepts of research and its methodologies. · To select and define appropriate research problem and parameters. · Understand the various techniques of Data Collection- Observation, Questionnaire, Interview Schedule; Case Study, Social Survey, Content Analysis. · Describing various types of Sampling · Elaborate on Data Processing and Data Analysis · Writing of dissertations, project proposals, project reports, research papers.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · understand some basic concepts of research and its methodologies. · differentiate between the Quantitative and Qualitative Research and understand different types of Research Design · select and define appropriate research problem and parameters. · organize and conduct research project in a more appropriate manner. · writing of dissertations, project proposals, project reports, research papers. · understand intellectual Property Rights – Biopiracy, copyrights, patent and traditional knowledge and plagiarism.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Foundations of Research** 1.1 Meaning of research 1.2 Objectives of research 1.3 Motivation in research 1.4 Research methods versus methodology 1.5 Types of research a) Analytical *vs* Descriptive b) Quantitative *vs* Qualitative c) Basic *vs* Applied	06	06
Unit II	**Research Design** 2.1 Meaning of research design 2.2 Need of research design 2.3 Features of good design 2.4 Importance concepts of research design a) Observation and Facts b) Prediction and Explanation c) Development of Models	06	06
Unit III	**Data Collection, Analysis and Presentation** 3.1 Observation and Collection of Data 3.2 Methods of data collection - Sampling Methods	09	09

	3.3 Data Processing and Analysis Strategies a) Tabulation of data: i. Variables (Definition, types with example); Frequency distribution(Definition, types and example); ii. Measurement of central tendency (Definition, types of average – mean, median, mode with example); iii. Standard deviation (SD) and iv. Standard error **(**SE) b) Data Analysis Strategies i. Testing hypothesis ii. Chi-square test iii. Student 't' test 3.4 Data presentation using MS Excel application of MS office. Charts: Types of Charts i) Column charts, ii) Line charts iii) Pie charts iv) Bar charts v) Area charts vi) Scatter charts vii) Stock charts viii) Surface charts ix) Radar charts x) Tree charts xi) Sunburst charts xii) Histogram xiii) Box and whisker charts xiv) Water fall charts		
Unit IV	**Technical Reports and Thesis writing** 4.1 Prepare Title, Author and Addresses, key words and Abstract (summary and synopsis) 4.2 Writing of technical report and thesis - IMMRAD system (Introduction, Material methods, Result and Discussion), Acknowledgement, Summary, Conclusion and references. 4.3 Concept of scientific writing 4.4 Meaning of scientific paper 4.5 Write a letter to Editor of scientific journal for publishing a research paper.	09	09

Suggested Readings :

1) Anthony,M, Graziano,A.M.andRaulin,M.L.2009. Research Methods :A Process of Inquiry, Allyn and Bacon.

2) Coley,S. M. and Scheinberg, C.A.1990,"Proposalwriting".StagePublications.

3) Gurumani, N. Research methodology for biological science, MJP publisher, Chennai.

4) Kothari C. R. Research Methodology, New AgeInternational,2009

5) Robert A. Day, How to write and publish aScientific papers (4th edition).

6) Tejinder Singh and N. G. Madhav, Better ThesisWriting

7) Wadhera, B. L. Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, 2002, Universal Law publishing

8) Walliman, N. 2011. Research Methods –The Basics. Taylor and Francis, London, NewYork.

Zoo-MNP-362			
Zoo-MNP-362: Corresponding practical to Zoo-MN-361: Research Methodology			
Course objectives: · To understand some basic concepts of research and its methodologies. · To select and define appropriate research problem and parameters. · Understand the various techniques of Data Collection- Observation, Questionnaire, Interview Schedule; Case Study, Social Survey, Content Analysis.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes: Research and understand different types of Research Design · select and define appropriate research problem and parameters. · organize and conduct research project in a more appropriate manner. · writing of dissertations, project proposals, project reports, research papers. · understand intellectual Property Rights – Biopiracy,			
Practical	**Practicals corresponding to Research methodology**		
1	Define mean, median and mode. Compute the mean and median for thefollowing data of weight of species of Frog Weight in grams: 16, 11, 8, 10, 14, 16, 9, 9, 13, and 12.		
2	Compute the mode of the following data : Weight of Cat fish in grams: 8, 10, 9, 17, 10, 19, 15, 10, 12, and 19.		
3	Compute the S.D. for the following weight in grams of the 06 frogs:30,90,20,10,80,70		
4	Draw a Pie chart by plotting an area of circle showing 50% (low income people), 15% (Median income people) and 35% (high income people) and show the above income distribution by Bar chart.		
5	Calculate SE of a sample of 100 fish has mean length of 50 cm with an SD of5cm.		
6	Medical examination of students of city colleges showed that 432 girls out of1437 and 152 boys out of 441 had defective eye sight. Test whether there is any association between sex and defects in vision		

Zoo-EC-371			
Zoo-EC-371 Sericulture			
Course objective · To give scientific knowledge about mulberry cultivation, silkworm rearing techniques to the students. · To train the students in compressive silk production techniques.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · develop an expert man power to handle the own sericulture units/entrepreneurship/corporate sector units. · Provide gainful employment, economicdevelopment and improvement in the quality oflife to the people in rural area.			
Unit	**Topics**	**Lectures 30**	**Marks 30**
Unit I	**Introduction** 1.1 Sericulture: Definition, history, present Status 1.2 Scope of sericulture 1.3 Silk producing centres 1.4 Taxonomic position 1.5 Types of silkworms and their Distribution (Muga, Eri, Tussar, Mulberry)	05	05
Unit II	**Biology of Silkworm:** 2.1 Life cycle of *Bombyx mori* w. r. t. external and internal morphology of Egg, larva, Pupa, adult 2.2 Structure and function of silk gland and secretion of silk 2.3 Digestive system of *Bombyx mori*	06	06
UnitIII	**Cultivation of Mulberry:** 3.1 a) Selection of mulberry variety, b) Propagation, c) Climate, d)Soils, e)Planting, f)Raising of commercial nursery, g) Manuring, h) Interculture, i) Water management, j) Pruning and k) Quality of leaves 3.2 Harvesting of mulberry- a) Shoot Cutting b) Leaf plucking and c) Bud plucking. 3.3 Advantages and disadvantages of shoot rearing	06	06
UnitIV	**Silkworm Rearing:** 4.1 Rearing technique: a) Selection of quality seeds, b) Brushing, c) Quality of food, d) Shape and size of leaves, e) Preparation of feed bed for different rearing methods, f) Bed Cleaning methods, g) Spacing, moulting, mounting, h) Environmental conditions and care during spinning, i) Harvesting of cocoons, j) Sorting of cocoons and k) Post harvest processing of cocoons.	08	08

	4.2 Rearing house 4.3 Rearing Appliances: a) Rearing stand, b) Ant wells, c) Rearing trays, d) Paraffin paper, e) Foamrubber strip, f) Chopsticks, g) Feathers, h) Leaf chamber, i) Chopping board, j) Chopping knives, k) Mats, l) Cleaning nets, m) Mountages, n) Feeding stand and o) Miscellaneous appliances		
Unit V	**Important Diseases and Pests:** 5.1 Protozon disease: Pebrine 5.2 Viral disease: Nuclear Polyhedrosis Virus (NPV) 5.3 Fungal disease: Muscardine - White, green, yellow 5.4 Pests of silkworm: Uzi flies, dermestid beetles, ants and vertebrates 5.5 Prevention and control of diseases and pests	05	05

Suggested Readings:

1) Handbook of silkworm rearing: Agricultural and Technical manual-1, Fuzi Pub. Co. Ltd., Tokyo,Japan1972.

2) Jolly Ed. M.S., Appropriate SericultureTechniques; Director, CSR & TI Mysore.

3) Krishnaswamy S., Improved Method of Rearing Young age silkworm; reprinted CSB, Bangalore,1986.

4) Narsimhanna M.N., Manual of Silkworm Egg Production; CSB, Bangalore 1988.

5) Sengupta K., A Guide for Sericulture; Director, CSIR & TI, Mysore1989.

6) Silkworm Rearing; Wupang- Chun and Chen Da-Chung, Pub. By FAO, Rome 1988.

7) Ullal S.R. and M.N. Narsimhanna Handbook of Practical sericulture: CSB, Bangalore

Zoo-ECP-372			
Zoo-ECP-372: Corresponding practical to Sericulture			
Course objective · To give scientific knowledge about mulberry cultivation, silkworm rearing techniques to the students.		**Teaching Hours :30**	**Credits : 02**
Learning outcomes After successful completion of this course, students are expected to: · develop an expert man power to handle the own sericulture units/entrepreneurship/corporate sector units.			
Practical			
1.	Study of Silk worm moth (Bombax mori) with reference to the following: a) Study of Systematic Position of Bombax mori b) Study of stages of Life cycle Bombax mori: Egg, Larva, Cocoon and Adult. c) Sexual dimorphism of larva, pupa and moth		
2.	Study of Digestives system of *Bombax mori*		
3.	Mounting of Silk gland and Mouth parts of silkworm		
4.	Study of Nervous system *Bombax mori*.		
5.	Reproductive system of silkworm.		
6	Study of equipment's in sericulture: a)Rearing tray, b) Foam rubber string, c) Chopping board, d) Chopping knives, mountages-Chandrikas etc.		
7	Study of diseases, pets and predator.		
8	Filed visit/ Compulsory visit to sericulture.		

Pratap College Amalner, (Autonomous)

T.Y. B.Sc. Zoology

Equivalence for Old Syllabus 2024-25

Semester – V

PaperCode	Old Course– 2024	PaperCode	New Course– 2025
Zoo-351	Reproductive Endocrinology	ZOO-MJ-301	Reproductive Endocrinology
Zoo-352	Cell and Molecular Biology (CMB)	ZOO-MJ-302	Cell and Molecular Biology
Zoo-353	Mammalian Histology	ZOO-MJ-303	Mammalian Histology
Zoo-354	Animal Biotechnology	ZOO-MJP-304	Practical related to ZOO-MJ-301
Zoo-355	Public health and hygiene	ZOO-MJP-305	Practical related to ZOO-MJ-302
Zoo-356 (A)	Pest Management	ZOO-VSCP-306	Pest management
Zoo-356 (B)	Aquarium Fish Keeping	ZOO-MN-311	Public Health and Hygiene
Zoo-357	Practical related to Zoo-351& Zoo352 (CB)	ZOO-MNP-312	Practical related to Public Health and Hygiene
Zoo-358	Practical related to Zoo 352 (MB) & Zoo 353	ZOO-EC-321	Animal Biotechnology
Zoo-359	Practical related to Zoo354	ZOO-ECP-322	Practical related to Animal Biotechnology
		ZOO-FP-341	Field Project

Semester-IV

PaperCode	Old Course– 2024	PaperCode	New Course– 2025
Zoo-361	Study of Leech & Calotes	ZOO-MJ-351	Study of Leech And Calotes
Zoo-362	Chick Embryology	ZOO-MJ-352	Chick Embryology
Zoo-363	Applied Zoology	ZOO-MJ-353	Applied Zoology

Zoo-364	Microtechnique	ZOO-MJP-354	Practical related to ZOO-MJ-351
Zoo-365	Research Methodology	ZOO-MJP-355	Practical related to ZOO-MJ-352
Zoo- 366 (A)	Bioinformatics	ZOO-VSCP-356	Practical related to Microtechnique
Zoo- 366 (B)	Sericulture	ZOO-MN-361	Research Methodology
Zoo-367	Practical related to Zoo-661	ZOO-MNP-362	Practical related to Research Methodology
Zoo-368	Practical related To Zoo 662 & Zoo 663	ZOO-EC-371	Sericulture
Zoo-369	Practical related toZoo 664	ZOO-ECP-372	Practical related to Sericulture
		ZOO-OJT-391	On job training