



Date :- 01/08/2023

NOTIFICATION

Sub :- CBCS Syllabi of B. Sc. in Zoology (Sem. I & II)

Ref. :- Decision of the Academic Council at its meeting held on 26/07/2023.

The Syllabi of B. Sc. in Zoology (First and Second Semesters) as per **NATIONAL EDUCATION POLICY - 2020** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2023-24.

Copy of the Syllabi Shall be downloaded from the College Website
(www.kcesmjcollege.in)

Sd/-
Chairman,
Board of Studies

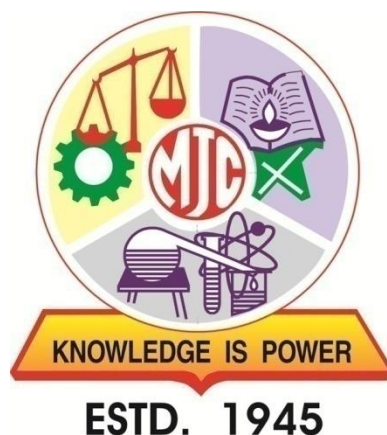
To :

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The office of the COE, M. J. College, Jalgaon.
- 3) The office of the Registrar, M. J. College, Jalgaon.

Knowledge is Power

Khandesh College Education Society's
Moolji Jaitha College, Jalgaon
An "Autonomous College"

Affiliated to
Kavayitri Bahinabai Chaudhari
North Maharashtra University, Jalgaon-425001



STRUCTURE AND SYLLABUS

**B.Sc. Honours / Honours with Research
(F.Y.B.Sc. Zoology)**

as per NEP-2020 Guidelines

[w.e.f. Academic Year: 2023-24]

Preface

Skilled human resource is a prerequisite in higher education, and it is to be acquired through thorough knowledge of theoretical concepts and hands-on laboratory methods of the subject. The MooljiJaitha College (Autonomous) has adopted a department-specific model as per the guidelines of UGC, NEP-2020 and the Government of Maharashtra. The Board of Studies in Zoology of the college has prepared the syllabus for the first-year undergraduate of Zoology. The syllabus cultivates theoretical and practical know-how of different fields of Zoology. The contents of the syllabus have been prepared to accommodate the fundamental aspects of various disciplines of Zoology and to build the foundation for various applied sectors of Zoology. Besides this, in the first year, the students will be enlightened with the skill related to microbial identification and testing, which will enhance students' employability.

The overall curriculum of three / four-year covers Animal Biotechnology, Cell Biology, Medical Lab Technician, Fundamentals of Biodiversity with its Conservation, Sericulture, Basic Biochemistry, Fundamentals of Genetics, Dairy Sciences, Pearl Culture like Applied Zoology. Furthermore, the syllabus is structured to cater to Zoology's present and future needs in the research field, Industrial Sector, Environmental Sector, Entrepreneurship etc., emphasizing imparting hands-on skills. Hence, the curriculum is endowed with more experiments that shall run hand-in-hand with theory. The detailed syllabus of each paper is appended with a list of suggested readings.

Program Outcomes (PO) for B.Sc. Program:

Upon successful completion of the B.Sc. program, student will be able to:

PO No.	PO
1	Understand the basic concepts and fundamental principles related to various science branches
2	Aquaintthe skills in handling scientific instruments and performing in laboratory experiments
3	Relate various scientific phenomena and their relevancies in the day-to-day life.
4	Analyse experimental data critically and systematically to draw the objective conclusions.
5	Develop various skills such as communication, leadership, teamwork, social, research etc., which will help in expressing ideas and views clearly
6	Develop interdisciplinary approach for providing better solutions and sustainable developments.

Program Specific Outcome PSO (B.Sc. Zoology):

After completion of this course, students are expected to learn/understand the:

PO No.	PSO
1	Emphasize imparting basic and practical knowledge of animal biotechnology, cell biology, Medical Lab Technician, Fundamentals of Biodiversity with its conservation, Sericulture, Basic Biochemistry, Fundamentals of genetics, Dairy Sciences, Pearl Culture like applied Zoology
2	Principle and applications of various bio-analytical tools and techniques
3	Structure, propertiesand applications of biomolecules in various fields of Zoology
4	Knowledgeable in applying the biological concepts effectively in various sectors
5	Wildlife legislation will systematically organize the understanding of wildlife conservation, trade and management
6	Basic knowledge and skills in the observation and study of nature, biological techniques, experimental skills and scientific investigation and certain applied branches to enable them for self employment

Credit distribution structure for Three/ Four year Honors/ Honors with Research Degree Programme with Multiple Entry and Exit

Credit distribution structure for Three Year UG Honors/ Honors with Research Degree Programme with Multiple Entry and Exit										
Level	Sem	Major (Core) Subjects		Minor Subjects (MIN)	GE/ OE	VSC, SEC (VESC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int, RP	Cumulative Credits/Sem	Degree/ Cumulative Cr.
		Mandatory (DSC)	Elective (DSE)							
4.5	I	DSC-1 (2T) DSC-2 (2T) DSC-3 (2P)	—	MIN-1 (2T) MIN-2 (2P)	OE-1 (2T)	SEC-1 (2T) SEC-2 (1P)	AEC-1 (2T) (ENG) VEC-1 (2T) (ES) IKS (1T)	CC-1 (2)	22	UG Certificate 44
	II	DSC-4 (2T) DSC-5 (2T) (IKS) DSC-6 (2P)	...	MIN-3 (2T) MIN-4 (2P)	OE-2 (2T)	SEC-3 (2T) SEC-4 (1P)	AEC-2 (2T) (ENG) VEC-2 (2T) (CI) IKS (1T)	CC-2 (2)	22	
	Cum. Cr	12	...	8	4	6	4+4+2	4	44	
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.0	III	DSC-7 (2T) DSC-8 (2T) DSC-9 (2P) DSC-10 (2P)	...	MIN-5 (2T) MIN-6 (2P)	OE-3 (2T) OE-4 (2P)		AEC-3 (2T) (MIL)	CC-3 (2) CEP (2)	22	UG Diploma 88
	IV	DSC-11 (2T) DSC-12 (2T) DSC-13 (2P) DSC-14 (2P)	...	MIN-7 (2T) MIN-8 (2P)	OE- 5 (2T) OE-6 (2P)		AEC-4 (2T) (MIL)	CC-4 (2) FP (2)	22	
	Cum. Cr	28	...	16	10	6	8+4+2	8+2+2	88	
Exit option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										
5.5	V	DSC-15 (2T) DSC-16 (2T) DSC-17 (2T) DSC-18 (2P) DSC-19 (2P)	DSE-1 (2T) A/B DSE-2 (2P) A/B	MIN-9 (2T/P)	...	VSC-1 (2T) VSC-2 (2P)	...	OJT/Int(2)	22	UG Degree 132
	VI	DSC-20 (2T) DSC-21 (2T) DSC-22 (2T) DSC-23 (2P) DSC-24 (2P)	DSE-3 (2T) A/B DSE-4 (2P) A/B	MIN-10(2T/P)	—	VSC-3 (2T) VSC-4 (2P)	...	OJT/Int(2)	22	
	Cum. Cr.	48	08	20	10	8+6	8+4+2	8+2+2+4	132	
Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor										
6.0	VII	DSC-25 (4T) DSC-26 (4T)	DSE-5 (2T) A/B DSE-6(2P)	RM (4T)	—	...	...		22	UG Honors Degree 176
	VIII	DSC-29 (4T) DSC-30 (4T) DSC-32 (4T) DSC-31 (2P)	DSE-7 (2T) A/B DSE-8(2P)		—	...	...	OJT/Int (4)	22	
	Cum. Cr.	76	16	20+4	10	8+6	8+4+2	8+2+2+8	176	
Four Year UG Honors Degree in Major and Minor with 176 credits										
6.0	VII	DSC-25 (4T) DSC-26 (4T) DSC-27 (2P)	DSE-5 (2T) A/B DSE-6	RM (4T)	...	...	...	RP (4)	22	UG Honors with Research Degree 176
	VIII	DSC-29 (4T) DSC-30 (4T) DSC-31 (2P)	DSE-7 (2T) A/B DSE-8 (2P) A/B		...	...	...	RP (8)	22	
	Cum. Cr.	68	16	20+4	10	8+6	8+4+2	8+2+2+8+12	176	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC-** Department Specific Course, **DSE-** Department Specific Elective, **T-** Theory, **P-** Practical, **CC-** Cocurricular **RM-** Research Methodology, **OJT-** On Job Training, **FP-** Field Project, **Int-** Internship, **RP-** Research Project,

Multiple Entry and Multiple Exit options:

The multiple entry and exit options with the award of UG certificate/ UG diploma/ or three-year degree depending upon the number of credits secured;

Levels	Qualification Title	Credit Requirements		Semester	Year
		Minimum	Maximum		
4.5	UG Certificate	40	44	2	1
5.0	UG Diploma	80	88	4	2
5.5	Three Year Bachelor's Degree	120	132	6	3
6.0	Bachelor's Degree- Honours Or Bachelor's Degree- Honours with Research	160	176	8	4

F. Y. B. Sc. Zoology Course Structure

Semester	Course Module	Credit	Hours/ week	TH/ PR	Code	Title
I	DSC	2	2	TH	ZOO-DSC-111	Animal Biotechnology
	DSC	2	2	TH	ZOO-DSC-112	Cell Biology
	DSC	2	4	PR	ZOO-DSC-113	Practicals of ZOO-DSC-111 and ZOO-DSC-112
	MIN	2	2	TH	ZOO-MIN-111	Medical Lab Technician (MLT)
	MIN	2	4	PR	ZOO-MIN-112	Practicals of Medical Lab Technician (MLT)
	OE/GE	2	2	TH	ZOO-OE-111	Fundamentals of Biodiversity
	SEC	2	2	TH	ZOO-SEC-111	Sericulture
	SEC	1	2	PR	ZOO-SEC-112	Practicals of Sericulture
	AEC	2	2	TH	ENGS-AEC-111	English
	VEC	2	2	TH	ES -VEC-111	Environmental studies
	IKS	1	1	TH	IKS-111	Indian knowledge system
	CC	2	2	CC	NCC-CC-111 NSS-CC-111 SPT-CC-111 CUL-CC-111	NCC NSS Sports Cultural
II	DSC	2	2	TH	ZOO-DSC-121	Basic Biochemistry
	DSC	2	2	TH	ZOO-DSC-122	Fundamentals of genetics
	DSC	2	4	PR	ZOO-DSC-123	Practicals of ZOO-DSC-121 and ZOO-DSC-122
	MIN	2	2	TH	ZOO-MIN-121	Dairy Science
	MIN	2	4	PR	ZOO-MIN-122	Practicals of Dairy Science
	OE/GE	2	2	TH	ZOO-OE-121	Conservation of Biodiversity
	SEC	2	2	TH	ZOO-SEC-121	Pearl culture
	SEC	1	2	PR	ZOO-SEC-122	Practicals of Pearl culture
	AEC	2	2	TH	ENGS-AEC-121	English
	VEC	2	2	TH	CI-VEC-121	Constitution of India
	IKS	1	1	TH	IKS-121	Indian knowledge system
	CC	2	2	CC	NCC-CC-121 NSS-CC-121 SPT-CC-121 CUL-CC-121	NCC NSS Sports Cultural

DSC : Department-Specific Core course

DSE : Department-Specific elective

GE/OE : Generic/ Open elective

SEC : Skill Enhancement Course

MIN : Minor course

AEC : Ability Enhancement Course

VEC : Value Education Courses

ENG : English

ES : Environmental studies

CI : Constitution of India

IKS : Indian Knowledge System

CC : Co-curricular course

TH : Theory

PR : Practical

Exam Pattern

- Each theory and practical course will be of 50 marks comprising of 10 marks internal and 40 marks external examination.

External Theory Examination (40 marks)

- External examination will be of two hours duration for each theory course. There shall be 4 questions each carrying equal marks (10 marks each) while the tentative pattern of question papers shall be as follows;
- Q1 (A), Q2 (A) and Q3 (A), each will be of 6 marks (attempt any 2 out of 3 sub-questions).
- Q1 (B), Q2 (B) and Q3 (B), each will be of 4 marks (attempt any 1 out of 2 sub-questions).
- Q4 will be of 10 marks (attempt any 2 out of 3 sub-questions).

External Practical Examination(40 marks):

- Practical examination shall be conducted by the respective department at the end of the semester. Practical examination will be of minimum 3 hours duration and shall be conducted as per schedule. There shall be 05 marks for journal, 10 marks for viva-voce. Certified journal is compulsory to appear for practical examination.

Internal Theory/ Practical Examination(10 marks):

- Internal theory assessment of the student by respective teacher will be comprehensive and continuous, based on written test/ assignment. The written test may comprise of both objective and subjective type questions.
- Internal practical examination should be conducted by respective department as per schedule given. For internal practical examination student should perform at least one major and one minor experiment and should have completed journal.

SEMESTER I

**F.Y.B.Sc.
Semester-I
ZOO-DSC-111: Animal Biotechnology**

Total Hours: 30

Credits: 2

Course Objectives	- Studying animal cell and tissue culture techniques - Developing gene transfer technologies, cloning, transgenic animals - Studying hybridoma technique and production of antibodies - Impart knowledge about stem cell research	
Course Outcomes	After successful completion of this course, students are expected to: - Acquire knowledge about animal cell and tissue culture techniques. - Developing embryo transfer technology, cloning, and transgenic animals. - Understand applications of the hybridoma technique and functions of antibodies. - Acquire knowledge about stem cell research and its ethical issues.	
Unit	Topic	Hours
I	History and IKS in Zoology - Indian Knowledge System: - History and Classification of Animals - Herding, Animal Husbandary, Dairy Farming and their byproducts uses for drugs and Medicine Introduction, scope and significance of Biotechnology - Animal cell and tissue culture - Definition and Types of culture media - Advantages and disadvantages of animal cell/tissue culture - Laboratory facility for animal tissue culture - Applications of animal cell and tissue culture - Primary culture, Examples of Cell lines	8
II	Recombinant DNA technology - Restriction enzymes-classification with examples - Identification and isolation of desired gene - Types and properties of vectors - Construction of genomic and cDNA libraries - Application of genetic engineering e.g. production of human Insulin. - Transgenic animals, Examples and significance of transgenic animals	7
III	Hybridoma technology - Methods for production of monoclonal and polyclonal antibodies - Significance of Monoclonal antibodies	8
IV	Stem Cell Biotechnology - Types of Stem Cell and its uses - Now and Future of Stem cell Biotechnology - Ethical issues in stem cell technology	7
Study Resources	- Ramakrishna and Chandrakasan Sivaperuman History of Zoology and Present Status in India. - Brooks G(ed.) (2002). Gene therapy. The use of DNA as a drug. Pharmaceutical Press, London. - Gerald C., (1996) Cell and Molecular Biology– Concept and Experiment, John Wiley and Sons, Inc., U.S.A. - Lewin, B., (2004), Genes VIII, Oxford University Press, NewYork - Sing, B. D. (2014) Biotechnology Expanding horizons. Kalyani Publishers, Delhi. - Stem Cell Biology (2001) Cold Spring Harbor Laboratory Press - Watson, J. D. et al, (1987) Molecular Biology of Gene, 4th ed., The Benjamin / Cummings Publishing Company, Inc. U.S.A.	

**F.Y.B.Sc.
Semester-I
ZOO-DSC-112: Cell biology**

Total Hours: 30

Credits: 2

Course Objectives	- To learn the structure of Prokaryotic and Eukaryotic cell and cell organelles. - To know about cell cycle, stages of cell cycle and cell division. - To understand cell Signalling. - To acquire knowledge about cancer.	
Course Outcomes	After successful completion of this course, students are expected to: - Identify Prokaryotic, Eukaryotic cell and cell organelles. - Able to describe cell cycle, mitosis and meiosis. - Gain the knowledge about cell signalling. - Understand the knowledge of cancer and apoptosis	
Unit	Topic	Hours
I	Introduction and Scope to Cell biology - Prokaryotic and Eukaryotic cells - General structure of Prokaryotic cell. - General structure of Eukaryotic cell: Animal Cell Structure of Plasma membrane -Unit membrane- - Danielii-Davson and Singer-Nicolson model. Functions of Plasma membrane. - Study of cell organelles w. r. t. structure and functions - Nucleus - Mitochondria - Endoplasmic reticulum - Golgi complex - Ribosome - Lysosomes	8
II	Cell cycle and Cell division - Stages of cell cycle– Interphase, G1, S, G2 andM- Phase. - Cell division - Process of mitosis and its significance - Process of meiosis and its significance	7
III	Cell Signalling - Introduction- Signalling molecules or ligands - Categories of signalling - Endocrine - Paracrine - Autocrine - Juxtacrine	8
IV	Cancer - Introduction - Benign and Malignant tumour - Properties of cancer cells - Apoptosis	7
Study Resources	- De Roberts (2017) - Cell biology, CCH, a Wolters Kluwer Business - J.D.Watson (2017) - Molecular Biology of the gene, Pearson Education; Seventh edition C. B. Powar (2010) - Cell biology, Himalaya Publishing House	

F.Y.B.Sc.**Semester-I****ZOO-DSC-113: Practicals of ZOO-DSC-111 and ZOO-DSC-112****Total Hours:60****Credits: 2**

Course Objectives	- Understand the principles and applications of various microscopy techniques and laboratory equipment in cell biology. - Develop proficiency in estimating DNA and RNA. - Learn the techniques for isolating and culturing microorganisms and fermentation technique. - Gain hands-on experience in preparing culture media, observing cellular processes, and identifying different cell organelles and structures.	
Course Outcomes	After successful completion of this course, students are expected to: - Demonstrate effective use of microscopes, CO₂ incubators, biosafety cabinets, and inverted microscopes. - Accurately estimate DNA and RNA concentrations. - Successfully isolate microorganisms using streak plate and dilution plate methods, and produce ethanol or citric acid by fermentation. - Prepare primary culture media, identify cell organelles using microphotographs, and analyze the effects of different solutions on red blood cells. Additionally, perform vital staining of mitochondria, study cell division processes (mitosis and meiosis), and understand the characteristics of benign and malignant tumors.	
Sr. No.	Topic	Hours
1	Principles and utility of Microscope	4
2	Estimation of DNA in a given sample by Diphenylamine Method	4
3	Estimation of RNA in a given sample by Orcinol method	4
4	Working principle and application of CO ₂ incubator, Biosafety cabinet, and Inverted microscope	4
5	Isolation of microorganisms on nutrient agar by streak plate and dilution plate method	4
6	Production of ethanol or citric acid by fermentation using yeast.	4
7	Preparation of primary culture media for cell culture	4
8	Visit to pharmaceutical industry / tissue culture laboratory and submission of report.	4
9	Study of different cell organelles by using Microphotographs.	4
10	Effect of Hypotonic, Isotonic and Hypertonic solution on RBC's	4
11	Separation of polytene chromosome from Chironomous larva	4
12	Study of Mitosis using suitable material.	4
13	Study of Meiosis using suitable material.	4
14	Vital staining of mitochondria by using Janus Green B Stain.	4
15	Study of Cancer: Benign tumor and Malignant tumor.	4
Study Resources	- Ruppert and Barnes, R. D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition. - Barnes, R. S. K., Calow, P., Olive, P. J. W., Golding, D. W. and Spicer, J. I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science - Hall B.K. and Hallgrimsson B.(2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc. R. Ian Freshney (2021) - Freshney's Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications, Wiley-Blackwell; 8th edition	

**F.Y.B.Sc.
Semester-I
ZOO-MIN-111: Medical Lab Technician (MLT)**

Total Hours: 30

Credits:2

Course Objectives	- Understand the principles and techniques involved in hematological testing, including blood cell counting, blood cell morphology, evaluation, and coagulation studies. - Acquire a comprehensive understanding of the methods used for microbial identification, culture, and including specimen collection, isolation techniques and familiarize oneself with the principles and techniques involved in biochemical analysis of body fluids, including blood, urine, and cerebrospinal fluid, to aid in the diagnosis and monitoring of various diseases. - Understand the role of clinical pathology in the diagnosis, prognosis, and monitoring of diseases through the analysis of body fluids and tissues. - Develop skills in processing, embedding, sectioning, staining, and microscopic examination of tissue samples for routine and special histological studies.	
Course Outcomes	After successful completion of this course, students are expected to: - Accurately collect, handle, and process samples for analysis, ensuring quality and reliability of laboratory results. - Effectively utilize laboratory instruments and equipment, adhering to standard operating procedures and safety protocols. - Develop a comprehensive understanding of the diagnostic tests used in Hematology and Serology, Microbiology and Biochemistry, and Clinical Pathology and Histology. - Develop technical proficiency, critical thinking abilities, effective communication skills, and an understanding of ethical and professional responsibilities, enabling them to contribute effectively to the field of laboratory medicine.	
Unit	Topic	Hours
I	Functional components of clinical laboratories - Organization of the clinical laboratory and role of the medical laboratory technician - Safety regulations, first aid, and clinical laboratory records - Identification, use, maintenance, and care of common laboratory glassware and equipments - Units of measurement, preparation of reagents solutions, and laboratory calculations	8
II	Hematology and Serology - Introduction to Hematology and serology. - Specimen collection and processing.	7
III	Microbiology and Biochemistry - Role of microbiology laboratory - Microbial Specimen handling and safety regulations - Specimen processing for biochemical analyses - Routine biochemical tests – Blood glucose, Serum protein.	8
IV	Clinical Pathology and histology - Urine analysis, Urine creatinine - Laboratory examination of miscellaneous body fluids (CSF and Gastric juice) and stool - Laboratory techniques in histology	7
Study Resources	- Praful Godkar (2021) - Textbook of medical laboratory technology, Bhalani Publishing House - Payal Soan, Gitesh Amrohit (2020) - A Hand Book of D.M.L.T. (Diploma in Medical Laboratory Technology), Vardhan Publishers and Distributors - Ramnik Sood (2006) - Textbook of Medical Laboratory Technology Jaypee Brothers Medical Publishers	

F.Y.B.Sc.**Semester-I****ZOO-MIN-112: Practicals of Medical Lab Technician (MLT)****TotalHours: 60****Credits: 2**

Course Objectives	- Understand the principles and techniques involved in hematological testing, including blood cell counting, blood cell morphology evaluation, and coagulation studies. - Acquire a comprehensive understanding of the methods used for microbial identification, culture, and including specimen collection, isolation techniques and familiarize oneself with the principles and techniques involved in biochemical analysis of body fluids, including blood, urine, and cerebrospinal fluid, to aid in the diagnosis and monitoring of various diseases. - Understand the role of clinical pathology in the diagnosis, prognosis, and monitoring of diseases through the analysis of body fluids and tissues. - Develop skills in processing, embedding, sectioning, staining, and microscopic examination of tissue samples for routine and special histological studies.	
Course Outcomes	After successful completion of this course, students are expected to: - Accurately collect, handle, and process samples for analysis, ensuring quality and reliability of laboratory results. - Effectively utilize laboratory instruments and equipment, adhering to standard operating procedures and safety protocols. - Develop a comprehensive understanding of the diagnostic tests used in Hematology and Serology, Microbiology and Biochemistry, and Clinical Pathology and Histology. - Develop technical proficiency, critical thinking abilities, effective communication skills, and an understanding of ethical and professional responsibilities, enabling them to contribute effectively to the field of laboratory medicine.	
Sr. No.	Topic	Hours
1	Washing of glasswares.	4
2	Study of principle, and working of Centrifuge, Spectrophotometer and microscope.	4
3	Study of units of measurement, preparation of 0.1 N HCl and NaOH.	4
4	Determination of ABO blood group with Rh factor.	4
5	Estimate Differential Leucocyte count (DLC)	4
6	Estimate Hemoglobin concentration (HB)	4
7	Estimation of blood sugar level.	4
8	Qualitative analysis of abnormal constituents of urine.	4
9	Estimation of Urine creatinine.	4
10	Detection of presence of antigen by qualitative ELISA (pregnancy Test).	4
11	Determination of Rheumatoid arthritis test.	4
12	Study of Safety regulations, first aid, and clinical laboratory records	4
13	Gram's staining of microorganisms.	4
14	Study of flow chart of histological slide preparation.	4
15	Visit to Pathological laboratory.	4
Study Resources	- Praful Godkar (2021) - Textbook of medical laboratory technology, Bhalani Publishing House - Payal Soan, Gitesh Amrohit (2020) - A Hand Book of D.M.L.T. (Diploma in Medical Laboratory Technology), Vardhan Publishers and Distributors - Ramnik Sood (2006) - Textbook of Medical Laboratory Technology Jaypee Brothers Medical Publishers	

F.Y.B.Sc.
Semester-I
ZOO-OE-111: Fundamentals of Biodiversity

Total Hours: 30

Credits: 2

Course Objectives	• To Learn about the concept, level of biodiversity and its value • Develop knowledge about biodiversity and Hotspots • Learn wildlife importance, threat and management. • Understand the wildlife importance for ecotourism	
Course Outcomes	After successful completion of this course, students are expected to: • Gain knowledge on concept and level of biodiversity. • Understand mega diversity Nation and Hotspots • Acquire knowledge about wildlife, threat and management • Aware of knowage about Ecotourism	
Unit	Topic	Hours
I	Introduction to Biodiversity • Definition, • Concept of biodiversity • Levels of biodiversity • Values of biodiversity	8
II	Biodiversity of India, • India as a mega diversity nation, • Hotspots of biodiversity	7
III	Threats to Biodiversity • Habitat loss • Poaching of wild animals • Man and wildlife conflict	8
IV	Ecotourism • Concept of Protected Area Network with special reference to Yawal Subarban and Khana National Parks	7
Study Resources	• Gadgil, M., and Guha, R. 1993. This Fissured Land: An Ecological History of India, Univ. of California Press. • Gaston, K.J and Spicer, J.I. 2004. Biodiversity: An Introduction. Blackwell Publishing Company, USA. • Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37. • Krishnamurthy, K. V. 2003. Textbook of Biodiversity. Science Publication. • Ray S. and Ray A.K. 2010. Biodiversity and biotechnology. New central book Agency (P) Ltd. Kolkata.	

**F.Y.B.Sc.
Semester-I
ZOO-SEC-111:Sericulture**

Total Hours: 30

Credits: 2

Course Objectives	- To understand scientific knowledge about cultivation of mulberry. - To get knowledge about silkworm rearing techniques. - To train the students in compressive silk production techniques. - To train the students how to identify silkworm diseases and its prevention.	
Course Outcomes	After successful completion of this course, students are expected to: - To know biology of silkworm - Acquire the knowledge of cultivation of mulberry and its harvesting. - To understand rearing of silkworm - To understand various common silkworm diseases.	
Unit	Topic	Hours
I	Introduction - Sericulture: Definition, history, presents Status - Sericulture: Definition, history, presents Status - Scope of sericulture - Silk producing centers - Taxonomic position - Types of silkworms and their Distribution (Muga, Eri, Tussar, Mulberry) - Biology of Silkworm - Life cycle of <i>Bombyx mori</i> w. r. t. external and internal morphology of Egg, larva, Pupa, adult - Structure and function of silk gland and secretion of silk - Digestive system of <i>Bombyx mori</i>.	8
II	Cultivation of Mulberry - Selection of mulberry variety Propagation, Climate, Soils, Planting, Raising of commercial nursery, Manuring, Interculture, Water management, Prunning, Quality of leaves - Harvesting of mulberry- a) Shoot Cutting b) Leaf plucking and c) Bud plucking. - Advantages and disadvantages of shoot rearing	7
III	Silkworm Rearing - Rearing house and Rearing Techniques - Rearing Appliances: a) Rearing stand, b) Ant wells, c) Rearing trays, d) Paraffin paper, e) Foam rubber 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	8
IV	Common diseases and pests: - Protozon disease: Pebrine. - Viral disease: Nuclear Polyhedrosis Virus (NPV). - Fungal disease: Muscardine. - Pests of silkworm: Uzi flies. - Prevention and control of pest, predator and diseases.	7
Study Resources	- Fuzi Pub. Co.(1972). Handbook of silkworm rearing: Agricultural and Technical manual-1, Ltd., Tokyo, Japan. - Krishnaswamy S.(1986) Improved Method of Rearing Young age silkworm; reprinted CSB, Bangalore. - Narsimhanna M.N (1988) Manual of Silkworm Egg Production; CSB, Bangalore. - Sengupta K.(1989) A Guide for Sericulture; Director, CSIR and TI, Mysore. - Ullal S.R. and M.N. Narsimhanna (1983) Handbook of Practical sericulture: CSB, Bangalore	

F.Y.B.Sc.**Semester-I****ZOO-SEC-112: Practicals of Sericulture****Total Hours:30****Credits:1**

Course Objectives	- To understand the basic concept of sericulture - To provide the elementary knowledge regarding the Anatomical and Physiological aspects of silkworm. - To train with different extension methods for effective diffusion of innovations in Sericulture. - Production of silk and its marketing for economic gain.	
Course Outcomes	After successful completion of this course, students are expected to: - How the subject emerges as a new branch of biology and its current scope - Know the diversity of silkworm species - Know primary food plants of silkworm. - Know the benefits of sericulture	
Sr. No.	Topic	Hours
1	Study of life cycle of mulberry silkworm.	4
2	Study of silkworm rearing and cocoon production technology	4
3	Study of pest of silkworm –Indian uzifly Life cycle, habitat, nature of damage, prevention and management.	4
4	Study of Pest Predator of silkworm- Ants Systematic position, nature of damage, prevention and management.	4
5	Study of Silkworm diseases-Pebrine nature of damage, prevention and management.	4
6	Study of primary food plants of Muga silkworm – pests and diseases locally available.	4
7	Study of different species used in sericulture Tasar, Muga, Eri silkworm.	4
8	Visit to Sericulture farm	4
Study Resources	- Narsimhanna M.N (1988) Manual of Silkworm Egg Production; CSB, Bangalore. - Sengupta K. (1989) A Guide for Sericulture; Director, CSIR and TI, Mysore. - Ullal S.R. and M.N. Narsimhanna(1983) Handbook of Practical sericulture: CSB, Bangalores - Wupang- Chun and Chen Da Chung (1988) Silkworm Rearing; Pub. By FAO, Rome.	

F.Y.B.Sc.
Semester-II
ZOO-DSC-121: Basic Biochemistry

Total Hours: 30

Credits: 2

Course Objectives	- Learn about the basic principles of biochemistry useful for biological studies - To acquaint students about different kinds of food and their structure and function. - To understand the macromolecule such as carbohydrates, protein and fat, their types and significance - To understand and learn the biomolecules related to biological systems.	
Course Outcomes	After successful completion of this course, students are expected to: - Understand different kinds of carbohydrates in food, their structure and function - Learn about the structure and biological importance of lipids - Acquire a classification of amino acid and proteins - Learn about major fat soluble and water soluble vitamins and important minerals	
Unit	Topic	Hours
I	Carbohydrates - Biomolecules: Names of Biomolecules, their repeating units and their main function - Definition and Biological importance - Classification of monosaccharides, oligosaccharides, polysaccharides with examples.	8
II	Lipids - Definition and biological functions of lipids - Essential fatty acids - Definition, examples, functions - Structure of fatty acid, - Saturated and unsaturated fatty acids - Classification of lipids with examples.	7
III	Protein - Amino acids – - Definition, general structure - Classification of amino acids based on structure, nutrition and metabolic fate - Protein - definition and levels of organization (primary, secondary, tertiary and quaternary). - Classification of protein with examples.	8
IV	Vitamins and minerals - Major fat soluble and water-soluble vitamins - Biological importance of vitamins - Minerals and trace elements required for living organisms. - Biological importance of minerals.	7
Study Resources	- Jain J.L. Jain S. (2007). Biochemistry, Chand Publication, Meerut. - Kulkarni, M. V., Thonte, S, S., Rathod and Ghiware (1996). Biochemistry, Nirali publication. - Outline of biochemistry (2006). Cohn and Stumpt, Publisher-Wiley; Fifth edition - Pawar CB and Chatwal G R (2008)–Biochemistry, Himalaya Publishing House - Rastogi, S. C (2007). Outlines of Biochemistry. C B S Publishers, New Delhi. - Robert K. Murray and Victor W. Rodwell (2012). Harper's Illustrated Biochemistry, Harper;.29th edition (Lange basic science.) - Satyanarayana U. and Chakrapani, U. (2013). Biochemistry Elsevier; 4 edition - Thimmaiah S. K. (1999). Standard Methods of Biochemical Analysis, Kalyani Publication.	

**F.Y.B.Sc.
Semester-II
ZOO-DSC-122: Fundamentals of Genetics**

Total Hours: 30

Credits: 2

Course Objectives	- To learn about the application of genetics in human welfare. - Understand the basic principles of genetics and how genes are inherited from one generation to another - Identify the genetic disorders and take steps to prevent the same. - To understand and learn the fundamentals of genetics and its application for the benefit of human being.	
Course Outcomes	After successful completion of this course, students are expected to: - Understand the principles of Inheritance by Mendelian genetics and its extension - Learn about the linkage, crossing over and multiple alleles - To get knowledge about mutation and its syndrome types - To understand and learn the Chromosomal theory of sex determination	
Unit	Topic	Hours
I	Mendelian Genetics and its Extension - Introduction to Genetics - Mendel's work on transmission of traits, Laws of inheritances . - Incomplete dominance and co- dominance, - Lethal genes, - Epistasis	8
II	Linkage, Crossing Over and Multiple Alleles - Linkage and crossing over, - Complete and Incomplete linkages, - Multiple alleles - Concept of Multiple alleles - Characteristics and importance of Multiple alleles - ABO and Rh factor and medico legal importance of Blood group	7
III	Mutations - Chromosomal Mutations - Deletion, Duplication, Inversion, Translocation - Aneuploidy and Polyploidy - Gene mutations.	8
IV	Sex Determination Chromosomal theory of sex determination-XX-XY,XX-XO, ZZ-ZW	7
Study Resources	- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics ed.. Wiley India. - Powar, C.B. (2002). Genetics Vol I and II, Himalaya Publishing House, Mumbai - Stricberger, M.W. (2010). Genetics, 4th Edition, macMillon public Com. Inc, New York - Lewin B. (2010). Genes Xth edition, Wiley Eastern Limited, New Delhi A. M. Winchester: Genetics - Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics, V Edition. John Wiley and Sons Inc - Gupta P.K. (2003). Cell and Molecular Biology., Rastogi Publications.	

F.Y.B.Sc.**Semester-II****ZOO-DSC-123: Practicals of ZOO-DSC-121 and ZOO-DSC-122****Total Hours: 60****Credits: 2**

Course Objectives	- To learn about the various laboratory techniques for biochemistry - To acquire knowledge in the quantitative and qualitative estimation of biomolecules - Learning Mendel's Law and its application in human inheritance. - Understanding Karyotype analysis, inheritance of common human genetic diseases.	
Course Outcomes	After successful completion of this course, students are expected to: - Acquire knowledge about principle and application of basic equipment in the laboratory. - Analyze and evaluation of biochemical experimental techniques - Exhibit a knowledge base of Mendel's Law and its application in genetics inheritance - Acquire the basic knowledge of genetics abnormalities with concepts of pedigree study	
Sr. No.	Topic	Hours
1	Study of principle and working of pH meter, Colorimeter, Spectrophotometer, incubator, and Centrifuge.	4
2	Identification of carbohydrates (monosaccharide, disaccharides and polysaccharides) with the help of suitable tests.	4
3	Qualitative test for Fats.	4
4	Qualitative test for protein	4
5	Isolation of Starch from Potato	4
6	Isolation of Casein from Milk by isoelectric precipitation	4
7	Study of Monohybrid, Dihybrid Ratio	4
8	Study of Incomplete and Co-dominance Ratio	4
9	Study of Barr body in human buccal epithelium	4
10	Study of genetic traits in human beings (colour blindness and PTC tasters/ non tasters)	4
11	Study of normal male and female human karyotype (use photographs or Xerox copies)	4
12	Abnormal human karyotypes- Down, Klinefelter and Turner syndromes (use photographs or Xerox copies)	4
13	Determination of ABO blood group with Rh factor.	4
14	Preparation of <i>Drosophila</i> Culture and its Maintenance	4
15	Study of <i>Drosophila</i> : External characters, sexual dimorphism and mutants (White eye and Sepia eye and Curly wing and Vestigial wing)	4
Study Resources	- Plummer, T. (2017). An Introduction to Practical Biochemistry, McGraw Hill Education; 3rd edition Publication - Jayaraman, J. (2011). Laboratory Manual of Biochemistry by New International Publication. - Sadasivam, S. (2018). Biochemical Methods by New Age International Pvt Ltd Publishers; Third edition - Gardner, E. J., Simmons, M. J., Snustad, D. P. (2008). Principles of Genetics. VIII Edition. Wiley India. - Snustad, D. P., Simmons, M. J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc. - Klug, W. S., Cummings, M. R., Spencer, C. A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.	

F.Y.B.Sc.
Semester-II
ZOO-MIN-121: Dairy Science

Total Hours: 30

Credits: 2

Course Objectives	- To understand various aspects of managing a dairy farm. - To make the students aware of an introduction to livestock farming practices in India - To familiarize milk chemistry and its significance in dairy processing. - To understand the various dairy processing techniques.	
Course Outcomes	After successful completion of this course, students are expected to: - Have a solid understanding of dairy farm management principles. - Familiar with the diverse livestock farming practices in India. - Comprehend the physical and chemical properties of milk - Understand various dairy processing techniques.	
Unit	Topic	Hours
I	Dairy Management - General management practices in dairy farming. - Grooming, drying-off, castration, dehorning, identification marks. - Hygiene and sanitation; Common diseases, First-aid measures.	7
II	Introduction to livestock farming in India - Taxonomic classification of livestock Study of cow breeds. - Milch breeds – Gir. - Dual Purpose breeds – Haryana - Draught breeds – Khillar, - Exotic breeds – Jersey - Cross breed - Jerdeo Study of buffalo breed. - Nagpuri	8
III	Milk Chemistry - Definition of milk. - Constituent of Milk - Nutritive value of milk - Physico – Chemical properties of milk. - Factors affecting quality and quantity of milk. - Basic microbiology of milk.	7
IV	Dairy Processing and Introduction to milk products technology. - Milk Collection, Transportation, Grading, Weighing and cooling of Milk. - Straining, Filtration, Clarification, Homogenization, Pasteurization - Packing and storage of milk. - Classification of indigenous milk products (Definition, Composition, Methods of manufacture) - Concentrated Product: Peda, Burfi, Rabdi, Basundi and Gulabjamun. - Fermented product: Chakka, Shrikhand and Shrikhand wadi. - Frozen indigenous dairy product: Kulfi, Malai ka Barf. - Fat rich product: Butter and Ghee. - Special milk: Soya milk.	8
Study Resources	- Banerjee G.C. (2010): A text Book of Animal Husbandry (8th Edition). Oxford and IBH Publishing, New Delhi - Mudgal V. D., Singhal K. K., Sharma D. D. (1995): Advances in Dairy animal Productions. International Book Distributing Company.	

F.Y.B.Sc.**Semester-II****ZOO-MIN-122: Practicals of Dairy Science****Total Hours:60****Credits: 2**

Course Objectives	- To enable students to identify and describe various cow and buffalo breeds. - Students will learn about common adulterants and microflora that can be found in milk - To train students in judging the quality of milk - To know milk products technology and Dairy equipment's	
Course Outcomes	After successful completion of this course, students are expected to: - Identify and differentiate between various cow and buffalo breeds. - Learn techniques and methods to detect adulterants microflora that can be found in milk - Trained in judging the quality of milk. - Gain hands-on experience in preparing dairy products.	
Sr.No.	Topic	Hours
1	Study of cow breeds: Milch breeds – Gir. Dual Purpose breeds – Haryana	4
2	Study of cow breeds: Draught breeds –Khillar, Exotic breeds –Jersey, Cross breed - Jerdeo	4
3	Study of buffalo breeds: Surti and Nagpuri	4
4	Detection of adulterants.	4
5	Determination of Microflora from milk.	4
6	Organoleptic and Temperature test for judging the quality of milk.	4
7	COB, Alcohol and Sediment test for judging the quality of milk.	4
8	Determination of Fat from milk.	4
9	Determination of SNF and TS of milk.	4
10	Determination of Specific gravity, Acidity and pH of milk	4
11	Preparation of Basundi and Kulfi.	4
12	Preparation of Shrikhand and paneer.	4
13	Study of Dairy equipment's: Muffle furnace, Viscometer, Centrifugal cream Separator, Milk packing material, Scrapers, Capping unit.	4
14	Study of Common diseases of dairy animals.	4
15	Student's visits: Dairy industry / dairy farm.	4
Study Resources	- Banerjee G.C. (2010): A text Book of Animal Husbandry (8th Edition).Oxford and IBH Publishing, New Delhi - MudgalV. D., SinghalK. K., SharmaD. D. (1995): Advances in Dairy animal Productions.International Book Distributing Company. - Jagdish Prasad(2016): Animal Husbandry and Dairy Science (6th edition).Kalyani Publisher. - KarN. (2002):Animal Husbandry and Rural Development.Deep and Deep Publications. - Mahanta K.C.(1997):Dairy Microbiology.Omsons Publishers. - Webb B.H. and WhittierR.O. (1970): By-products from milk AVI Pub. Co. - Davis J.G.(2020):Milk Testing.Agrobios, Jodhpur, Rajasthan	

F.Y.B.Sc.
Semester-II
ZOO-OE-121: Conservation of Biodiversity

Total Hours: 30

Credits: 2

Course Objectives	• Understand an aptitude for indulgent nature and its rich biodiversity. • To get knowledge about the diverse groups of organisms around us. • Learn wildlife its Conservations of Food Resources. • Understand the needs of growing energy and alternate energy sources	
Course Outcomes	After successful completion of this course, students are expected to: • Aware about conservation and sustainable use of biodiversity. • To create interest for conservation of biodiversity with Water Resources and its management • Acquire knowledge about conservations of Food Resources by modern agriculture techniques. • Aware of developments and contributions growing energy needs and alternate energy sources.	
Unit	Topic	Hours
I	Natural Resources and their Conservation • Natural Forest Resources • Uses and overexploitation of forests • Consequences of deforestation.	7
II	Water Resources • Concept of rain water harvesting • Watershed management, water conflicts	8
III	Conservations of Food Resources • Sources of food, food problems- • Indian scenario, ○ Impacts of modern agriculture on environment (Fertilizer - pesticide problem, water logging and salinity) ○ Organic farming.	7
IV	Energy Resources • Renewable and Non-Renewable energy sources, • Growing energy needs and alternate energy sources. • Land Resources ○ Soil erosion, ○ Desertification, ○ Wasteland Reclamation	8
Study Resources	• Myers,N., Mittermiere,R.A., Mittermeier,C.G., DeaFonseca,G.A.B and J.Kent. 2000. Biodiversity hotspots for conservation priorities. Nature, 403:853-858. • Conservation Biology: A primer from South Asia by Kamaljit S. Bawa, Richard B. • Essential of Conservation Biology by Richard B. Primack, 2002, Third Edition. Sinauer Associates, Inc, Massachusetts USA. • Biodiversity and Conservation by P. C. Joshi and Namita Joshi, 2004, A. P. H. Publishing Corporation, New Delhi. • Biodiversity: Social and Ecological Perspectives by Vandana Shiva, 1992. Natraj Publishers, Dehra Dun. • Levin (2013): Encyclopedia of Biodiversity (7 Vol. Set) Elsevier Publishers. • Singh, J.S., S.P and Gupta, S.R. 2006. Ecology, Environment and Resource conservation. Anamaya Publ., New Delhi, 688 pp.	

**F.Y.B.Sc.
Semester-II
ZOO-SEC-121: Pearl Culture**

Total Hours: 30

Credits: 2

Course Objectives	- To understand the basic concept of pearl culture. - To provide the elementary knowledge regarding the anatomical and physiological aspects of fresh water oysters. - To familiarize with the various types of implantation methods and pearl culture surgery techniques. - Production of pearl and its marketing for economic gain.	
Course Outcomes	After successful completion of this course, students are expected to: - Aware of historical developments and contributions of various pioneers - How the subject emerges as a new branch of biology and its current scope - Know the Different species of pearl oyster. - Understand the economics of pearl farming.	
Unit	Topic	Hours
I	Introduction to Pearl culture - Meaning of Pearl - Types of Pearls: Natural pearls, Artificial pearls - Pearl Producing Mollusks': Marine pearls: Pearl oysters: Pinctada fucata (Gould); Pinctada margaritifera (Linnaeus); Pinctada maxima (Jameson); Minor pinctada species and Freshwater pearls - Pearl Fisheries of India: Gulf of mannar and Gulf of kutch	8
II	Properties of Pearl - Chemical Composition of Pearl - Properties of Pearl - Classification of pearls - Texture and color of pearl - Formation of Pearl: Formation of pearl sac; Secretion of pearl forming matters; Calcium absorption and formation of calcium carbonate - Factors influencing secretion of nacre - Uses of Pearl	7
III	Implantation techniques - Pearl oyster Surgery: Selection of Oyster, Half round Pearl culture; Nucleus implantation; Surgery and precautions; Beads insertion. - Graft tissue preparation, Surgery and precautions. - Spherical Pearl implantation and Surgical Operation - Post harvest processing of cocoons. - Rearing house	8
IV	Economics of pearl farming - Introduction - Technologies and Industries market structure - Socio-economic impact - Production and trade statistics - Marketing and the nature of the market for pearl - Incomes and prices on the demand for pearls.	7
Study Resources	- Adhikari S and Chatterjee D. K. (2008) Management of Tropical Freshwater Ponds. Daya Publ. - Boyd, C. E. and Tucker, C. S. (1992). Water Quality and Pond Soil Analysis for Aquaculture, Alabama Agricultural Experimental Station, Auburn University.	

F.Y.B.Sc.**Semester-II****ZOO-SEC-122: Practicals of Pearl culture****Total Hours:30****Credits:1**

Course Objectives	- To understand the basic concept of pearl culture. - To provide the elementary knowledge regarding the Anatomical and Physiological aspects of fresh water oysters. - To familiarize with the various types of implantation methods and pearl culture surgery techniques. - Production of pearl and its marketing for economic gain.	
Course Outcomes	After successful completion of this course, students are expected to: - Aware of historical developments and contributions of various pioneers - How the subject emerges as a new branch of biology and its current scope - Know the diversity of pearl oyster species. - Know the benefits of pearl farming.	
Sr. No.	Topic	Hours
1	Study of morphology and anatomy of Pearl oyster.	4
2	Study of Life cycle of pearl oyster	4
3	Study of common species of pearl oyster used for pearl oysters.	4
4	Establishment and maintenance of pearl culture unit	4
5	Study of types of pearl formation-i.Natural pearl formation ii.Cultured pearl formation	4
6	Embedding beads in suitable mollusca (Such as <i>Unio</i> sp, or <i>Katelysia</i> sp.) under sterilized conditions for pearl culture	4
7	Study of diseases and predators of Pearl oyster.	4
8	Economic importance of pearl culture	4
Study Resources	- Boyd, C. E. and Tucker, C. S. (1992) Water Quality and Pond Soil Analysis for Aquaculture, Alabama Agricultural Experimental Station, Auburn University. - APHA, AWWA, WPCF. (1998) Standard Methods for the Examination of Water and Wastewater, 20th Ed. - Boyd CE. (1979) Water Quality in Warm Water Fish Ponds. Auburn University. - ICAR. (2006) Handbook of Fisheries and Aquaculture. - TR, Maita Y and Lalli CM. (1984) A Manual of Chemical and Biological Methods for Seawater Analysis. Pergamon Press.	