K. C. E. Society's
Moolji Jaitha College
An 'Autonomous College' Affiliated to
K.B.C. North Maharashtra University, Jalgaon.
NAAC Reaccredited Grade - A (CGPA : 3.15 - 3rd Cycle)
UGC honoured "College of Excellence" (2014-2019)
DST(FIST) Assisted College

KNOWLEDGE IS POWER
ESTD. 1945

के. सी. ई. सोसायटीचे
मूळजी जेठा महाविद्यालय
क.ब.चौ. उत्तर महाराष्ट्र विद्यापीठ, जळगाव संलग्नित
'स्वायत्त महाविद्यालय'
नॅकद्वारा पुनर्मानांकित श्रेणी – 'ए' (सी.जी.पी.ए. : ३.१५ – तिसरी फेरी)
विद्यापीठ अनुदान आयोगाद्वारा घोषित 'कॉलेज ऑफ एक्सलन्स' (२०१४-२०१९)
डी.एस.टी. (फीस्ट) अंतर्गत अर्थसहाय्य प्राप्त

Date :- 01/08/2024

NOTIFICATION

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

Ref. :- Decision of the Academic Council at its meeting held on 27/07/2024.

The Syllabi of B. Sc. in Zoology (First and Second Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2024 Pattern)** and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2024-25.

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.

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समर्थ कॉलनी जवळ, जळगांव – ४२५ ००२. (महाराष्ट्र, भारत) । दूरध्वनी क्र. : +९१ २५७–२२३७३६३, २२३४२८१ । ई–मेलः mjcollege@kces.in । वेबसाईटः mjcollege.kces.in

Khandesh College Education Society's

Moolji Jaitha College, Jalgaon

An "Autonomous College"

Affiliated to

Kavayitri Bahinabai Chaudhari

North Maharashtra University, Jalgaon-425001

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STRUCTURE AND SYLLABUS

B.Sc. Honors/Honors with Research

(F.Y.B.Sc. Zoology)

Under Choice Based Credit System (CBCS)

and

as per NEP-2020 Guidelines

[w.e.f. AcademicYear:2024-25]

Preface

Have you ever been captivated by the intricate dance of a butterfly, marveled at the powerful leap of a dolphin, or pondered the complex social structures of chimpanzees? If so, then zoology is the perfect field for you!

This undergraduate program offers a thrilling journey into the scientific exploration of animals. You'll delve into the remarkable diversity of the animal kingdom, from single-celled organisms to towering giants, unraveling the mysteries of their form, function, and behavior.

Our curriculum goes beyond textbooks, providing a rich blend of theoretical knowledge and practical experiences. You'll gain hands-on skills in laboratories, analyze data collected during field trips, and develop critical thinking through engaging coursework.

By the time you graduate, you'll not only possess a deep understanding of the animal world but also be equipped with valuable research and analytical skills. This program will prepare you for a fulfilling career in various fields, from animal conservation and wildlife management to veterinary medicine and scientific research.

So, if you're passionate about animals and eager to explore the wonders of their biology and ecology, then embark on this exciting adventure with us!

Welcome to the Fascinating World of Zoology!

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

Program outcomes associated with a B.Sc. degree are as follows:

1. Graduates should have a comprehensive knowledge and understanding of the fundamental principles, theories, and concepts in their chosen field of study.
2. Graduates should possess the necessary technical skills and competencies related to their discipline, including laboratory techniques and data analysis.
3. Graduates should be able to identify, analyze, and solve complex problems using logical and critical thinking skills. They should be able to apply scientific methods and principles to investigate and find solutions.
4. Graduates should be proficient in effectively communicating scientific information, both orally and in writing.
5. Graduates should have a basic foundation in research methods and be capable of designing and conducting scientific investigations.
6. Graduates should be able to work effectively as part of a team, demonstrating the ability to collaborate with others, respect diverse perspectives, and contribute to group projects.
7. Graduates should recognize the importance of ongoing learning and professional development. They should be equipped with the skills and motivation to continuously learn, adapt to new technologies and advancements in their field, and stay updated with current research.

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

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

PO No.	PSO
1	Graduates will possess a comprehensive understanding of cellular structures, functions, and processes, including cell signaling, the cell cycle, and apoptosis. They will also demonstrate proficiency in microscopy techniques and molecular biology, such as DNA and RNA estimation. Additionally, graduates will have a solid grasp of ecological principles, biogeochemical cycles, and population dynamics, preparing them for advanced research and application in biological and ecological sciences.
2	Graduates will gain a thorough understanding of forensic zoology principles, forensic medicine, and forensic analysis techniques, including the role of insects in investigations, biological evidence analysis, and fingerprint identification. They will also acquire the skills necessary for DNA fingerprinting and blood group analysis in forensic contexts. Additionally, graduates will be equipped to promote public health by making informed dietary choices, advocating for safe food and water access, identifying nutritional deficiencies, and developing strategies to prevent and manage lifestyle diseases.
3	Graduates will possess a well-rounded understanding of medical diagnostics, including blood and urine analysis, infectious and non-infectious diseases, and medical imaging tools. They will also gain expertise in dairy farm management, the chemistry of milk, and dairy processing techniques. Additionally, graduates will understand genetic principles, immune mechanisms, and various immunological techniques, along with knowledge of sericulture, including silkworm biology, cultivation, rearing, and disease management, preparing them for diverse professional opportunities in health, agriculture, genetics, and biotechnology.
4	Graduates will gain proficiency in laboratory techniques, including sample collection, handling, and analysis, while adhering to safety protocols and ethical standards. They will acquire a deep understanding of human physiology, covering the digestive, respiratory, circulatory, and excretory systems. Additionally, graduates will be well-versed in aquaculture practices, including fish farming, fish pathology, water quality management, and pearl oyster cultivation, enabling them to contribute effectively to both laboratory medicine and the aquaculture industry.
5	Graduates will develop a comprehensive understanding of the structural and functional anatomy of nonchordates, biochemistry, mammalian histology, bioinformatics, and pest control. They will gain hands-on experience in relevant laboratory techniques, including microtechniques and bioinformatics applications, enabling them to analyze and interpret biological data effectively. This expertise will prepare them for diverse careers in biological research, laboratory work, and pest management.
6	Graduates will gain in-depth expertise in the structural and functional anatomy of chordates, animal biotechnology, endocrinology, and public health, with hands-on experience in relevant practical techniques. They will also develop proficiency in studying animal behavior, biostatistics, and embryology, enabling them to apply this knowledge to diverse biological research and public health contexts.

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

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

F.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1)	Subject-II (M-2)	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT, RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
I (4.5)	I	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	DSC-1(2T) DSC-2(2P)	OE-1(2T)	---	AEC-1(2T) (Eng) VEC-1(2T) (ES) IKS(2T)	CC-1(2T)	22	**UG Certificate**
	II	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	DSC-3(2T) DSC-4(2P)	OE-2(2T) OE-3(2P)	---	AEC-2(2T) (Eng) VEC-2(2T) (CI)	CC-2(2T)	22	
	Cum. Cr.	**8**	**8**	**8**	**6**	**---**	**10**	**4**	**44**	
Exit option: Award of UG Certificate with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor.										

S.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major*		Subject-II (M-2) Minor #	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
2 (5.0)	III	DSC-5(2T) DSC-6(2T) DSC-7(2P)	---	MIN-1(2T) MIN-2(2T) MIN-3(2P)	---	OE-4(2T)	SEC-1(2T)	AEC-3(2T) (MIL)	CC-3(2T) CEP(2)	22	**UG Diploma**
	IV	DSC-8(2T) DSC-9(2T) DSC-10(2P)	---	MIN-4(2T) MIN-5(2P)	---	OE-5(2T)	SEC-2(2T) SEC-2(2P)	AEC-4(2T) (MIL)	CC-4(2T) ۞ FP(2)	22	
	Cum. Cr.	**12**	**---**	**10**	**---**	**4**	**6**	**4**	**8**	**44**	
	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 & Minor.										

***** Student must choose one subject as a Major subject out of M-1, M-2 and M-3 that he/she has chosen at First year

Student must choose one subject as a Minor subject out of M-1, M-2 and M-3 that he/she has chosen at First year (Minor must be other than Major)

۞ OJT/Internship/CEP should be completed in the summer vacation after 4th semester

T.Y. B.Sc.

Year (Level)	Sem	Subject-I (M-1) Major		Subject-II (M-2) Minor	Subject-III (M-3)	Open Elective (OE)	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
		Mandatory (DSC)	Elective (DSE)	(MIN)							
3 (5.5)	V	DSC-11(2T) DSC-12(2T) DSC-13(2T) DSC-14(2P) DSC-15(2P)	DSE-1A/B (2T) DSE-2A/B (2P)	---	---	---	VSC-1(2T) VSC-2(2P)	---	OJT/Int (4)	22	UG Degree
	VI	DSC-16(2T) DSC-17(2T) DSC-18(2T) DSC-19(2T) DSC-20(2T) IKS DSC-21(2P) DSC-22(2P)	DSE-3A/B (2T) DSE-4A/B (2P)	---	---	---	VSC-3(2T) VSC-4(2P)	---	---	22	
	Cum. Cr.	**24**	**8**	**---**	**---**	**---**	**8**	**---**	**4**	**44**	
	Exit option: Award of UG Degree in Major with 132 credits OR Continue with Major and Minor										

Fourth Year B.Sc. (Honours)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-25(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	---	22	UG Honours Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-29(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	OJT/Int (4)	22	
	Cum. Cr.	**28**	**8**	**4**	**---**	**---**	**---**	**4**	**44**	
Four Year UG Honors Degree in Major and Minor with 176 credits										

Fourth Year B.Sc. (Honours with Research)

Year (Level)	Sem	Major Core Subjects		Research Methodology (RM)	VSC, SEC (VSEC)	OE	AEC, VEC, IKS	CC, FP, CEP, OJT/Int/RP	Cumulative Credits/Sem	Degree/ Cumulative Credit
IV (6.0)	VII	DSC-23(4T) DSC-24(4T) DSC-26(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	RP(4)	22	UG Honours with Research Degree
	VIII	DSC-27(4T) DSC-28(4T) DSC-30(2P)	DSE-7A/B (2T) DSE-8A/B (2P)	---	---	---	---	RP(8)	22	
	Cum. Cr.	**20**	**8**	**4**	**---**	**---**	**---**	**12**	**44**	
Four Year UG Honours with Research Degree in Major and Minor with 176 credits										

Sem- Semester, **DSC**- Department Specific Course, **DSE**- Department Specific Elective, **OE/GE**- Open/Generic elective, **VSC**- Vocational Skill Course, **SEC**- Skill Enhancement Course, **VSEC**- Vocation and Skill Enhancement Course, **AEC**- Ability Enhancement Course, **IKS**- Indian Knowledge System, **VEC**- Value Education Course, **T**- Theory, **P**- Practical, **CC**-Co-curricular **RM**- Research Methodology, **OJT**- On Job Training, **FP**- Field Project, **Int**- Internship, **RP**- Research Project, **CEP**- Community Extension Programme, **ENG**- English, **CI**- Constitution of India, **MIL**- Modern Indian Laguage

- Number in bracket indicate credit
- The courses which do not have practical 'P' will be treated as theory 'T'
- If student select subject other than faculty in the subjects M-1, M-2 and M-3, then that subject will be treated as Minor subject, and cannot be selected as Major at second year.

Details of F.Y. B.Sc. (Zoology)

		Course Code		Credits	Teaching	Marks

Course	Course Type		Course Title		Hours/ Week						
					T	P	Total	Internal		External	
								T	P	T	P
Semester I, Level – 4.5											
DSC-1	DSC	ZOO-DSC-111	Cell Biology	2	2	---	2	20	---	30	---
DSC-2	DSC	ZOO-DSC-112	Practical of Cell Biology	2	---	4	4	---	20	---	30
OE-1	OE	ZOO-OE-111	Ecology	2	2	---	2	20	---	30	---
Semester II, Level – 4.5											
DSC-3	DSC	ZOO-DSC-121	Forensic Zoology	2	2	---	2	20	---	30	---
DSC-4	DSC	ZOO-DSC-122	Practical of Forensic Zoology	2	---	4	4	---	20	---	30
OE-2	OE	ZOO-OE-121	Nutrition - deficiency and diseases.	2	2	---	2	20	---	30	---
OE-3	OE	ZOO-OE-122	Practical of Nutrition - deficiency and diseases.	2	---	4	4	---	20	---	30

Examination Pattern

Theory Question Paper Pattern:

- 30 (External) +20 (Internal) for 2 credits
  - External examination will be of 1½ hours duration
  - There shall be 3 questions Q1 carrying 6 marks and Q2, Q3 carrying 12 marks each. while the tentative pattern of question papers shall be as follows;
  - Q1 Attempt any 2 out of 3 sub-questions; each 3 marks
  - Q 2 and Q3 Attempt any 3 out of 4 sub-question; each 4 marks.

Rules of Continuous Internal Evaluation:

The Continuous Internal Evaluation for theory papers shall consist of two methods:

1. Continuous & Comprehensive Evaluation (CCE): CCE will carry a maximum of 30% weightage (30/15 marks) of the total marks for a course. Before the start of the academic session in each semester, the subject teacher should choose any three assessment methods from the following list, with each method carrying 10/5 marks:

i. Individual Assignments
ii. Seminars/Classroom Presentations/Quizzes
iii. Group Discussions/Class Discussion/Group Assignments
iv. Case studies/Case lets
v. Participatory & Industry-Integrated Learning/Field visits
vi. Practical activities/Problem Solving Exercises
vii. Participation in Seminars/Academic Events/Symposia, etc.
viii. Mini Projects/Capstone Projects
ix. Book review/Article review/Article preparation
x. Any other academic activity
xi. Each chosen CCE method shall be based on a particular unit of the syllabus, ensuring that three units of the syllabus are mapped to the CCEs.

2. Internal Assessment Tests (IAT): IAT will carry a maximum of 10% weightage (10/5 marks) of the total marks for a course. IAT shall be conducted at the end of the semester and will assess the remaining unit of the syllabus that was not covered by the CCEs. The subject teacher is at liberty to decide which units are to be assessed using CCEs and which unit is to be assessed on the basis of IAT.

The overall weightage of Continuous Internal Evaluation (CCE + IAT) shall be 40% of the total marks for the course. The remaining 60% of the marks shall be allocated to the semester-end examinations.

The subject teachers must communicate the chosen CCE methods and the corresponding syllabus units to the students at the beginning of the semester to ensure clarity and proper preparation.

Practical Examination Credit 2: Pattern (30+20)

External Practical Examination (30 marks):

- Practical examination shall be conducted by the respective department at the end of the semester.
- Practical examination will be of 3 hours duration and shall be conducted as per schedule.
- Where an incubation condition is required, a practical examination shall be conducted for 2 consecutive days for 2 hours/day.
- There shall be 05 marks for journal and viva voce. A certified journal is compulsory to appear for practical examination.
- The external practical examination of SEC will be of 25 marks, and there will be no internal exam for SEC practical.

Internal Practical Examination (20 marks):

- Internal practical examination of 10 marks will be conducted by the department as per the schedule given.
- For internal practical examination, students must produce the laboratory journal of practicals completed along with the completion certificate signed by the concerned teacher and the Head of the department.
- There shall be continuous assessment of 30 marks based on student performance throughout the semester. This assessment can include quizzes, group discussions, presentations and other activities assigned by the faculty during regular practicals. For details, refer to internal theory examination guidelines.
- Finally, 40 (10+30) marks of performance of the student will be converted into 20 marks.

SEMESTER I

F.Y. B.Sc. Zoology (Major)
Semester I
ZOO-DSC-111: 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 cell, 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	**Topics**	**Hours**
I	**Introduction and Scope to Cell biology** • **Prokaryotic and Eukaryotic cells** o General structure of Prokaryotic cell. o General structure of Eukaryotic cell: Animal Cell • **Structure and Function of Plasma membrane** o Danielii-Davson Model o Unit Membrane Model o Singer-Nicolson Model • **Study of cell organelles w. r. t. structure and functions** o Nucleus, Mitochondria, Endoplasmic reticulum, Golgi complex, Ribosome, Lysosomes	8
II	**Cell cycle and Cell division** • Stages of cell cycle– Interphase, G1, S, G2 and M- Phase. • Cell division o Process of mitosis and its significance o Process of meiosis and its significance	7
III	**Cell Signalling** • Introduction, ligand molecules - acetylcholine, dopamine, adrenaline, serotonin, and γ-aminobutyric acid (GABA) • Categories of cell signalling o Endocrine o Paracrine o Autocrine o 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.R.Baker (1981) - Cytological techniques, Chapman and Hall; 5th edition • C. B. Powar (2010) - Cell biology, Himalaya Publishing House	

F.Y. B.Sc. Zoology (Major)
Semester I
ZOO-DSC-112: Practical of Cell Biology

Total Hours:60 **Credits:2**

Course Objectives	• To understand the principles and applications of microscopy and analyse the effect of isotonic, hypotonic and hypertonic solution on RBC's. • To study prokaryotic and eukaryotic cells, various plasma membrane models, different cell organelles,cell signalling mechanism and Benign and Malignant tumour. • Perform vital staining of mitochondria using Janus Green B Stain and to observe the various stages of mitosis and meiosisusing suitable material. • Estimation of DNA and RNA in a given sampleand examine the polytene chromosome from *Chironomous* larva.
Course Outcomes	After successful completion of this course, students are expected to: • Demonstrate proficiency in using microscope and assess the impact of isotonic, hypotonic, and hypertonic solution on RBC's. • Identify and describe the prokaryotic and eukaryotic cells, various plasma membrane models and different cell organelles. • Sucessfully perform vital staining of mitochondria by using Janus Green B Stain and observe and differentiate various stages of mitosis and meiosis using suitable material. • Accurately estimate DNA and RNA in a given sample.

Sr. No.	Practical	Hours
1	Study the principle and utility of Compound Microscope.(D)	4
2	Study of the general structure of Prokaryotic and Eukaryotic cells (Animal Cell).(D)	4
3	Study of Danielii-Davson plasma membrane model.(D)	4
4	Study of Unit memberane model.(D)	4
5	Study of Singer-Nicolson plasma membrane model.(D)	4
6	Effect of Isotonic, Hypotonic, and Hypertonic solution on RBC's.(E)	4
7	Study of different cell organelles by using Microphotographs.(D)	4
8	Vital staining of mitochondria by using Janus Green B Stain.(E)	4
9	Estimation of DNA in a given sample by Diphenylamine reagent.(E)	4
10	Estimation of RNA in a given sample by Orcinol reagent.(E)	4
11	Separation of polytene chromosome using suitable material.(E)	4
12	Study of Mitosis using suitable material.(E)	4
13	Study of Meiosis using suitable material. (E)	4
14	Study of the cell signaling. (D)	4
15	Study of Cancer: Benign tumor and Malignant tumor (D)	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;

F.Y. B.Sc. Zoology (Open Elective)
Semester I
ZOO-OE-111: Ecology

Total Hours:30 **Credits:2**

Course Objectives	• To understand the importance of ecology and environmental sciences. • To learn biogeochemical cycles. • To learn animal relationship. • To evaluate human impact on ecosystems.	
Course Outcome	After successful completion of this course, students are expected to: • Understand the concepts and principles of Ecology. • Understand the biogeochemical cycles. • Learn to grasp animal relationship. • Gain the knowledge of population ecology.	
Unit	**Topic**	**Hours**
I	**Introduction to Ecology and environmental sciences** • Principles and Scope of Ecology • Abiotic factor – Water, soil, air, light, temperature, mineral and climate. • Biotic factor – Producer, Consumers and Decomposers or reducers. • Structure and Functions of Ecosystems - Pond ecosystem and Forest ecosystem • Food chain and Food web.	8
II	**Biogeochemical cycles** • Phases of biogeochemical cycle- Biotic phase and Abiotic phase • Gaseous cycle – Carbon cycle, Nitrogen cycle and Oxygen cycle. • Sedimentary cycle – Sulphur cycle and Phosphorous Cyle.	7
III	**Animal relationship** • Interspecific relationship o Neutralism o Symbiosis – Commensalism (Temporary, Permanent, Ectocommensal and Endocommensals.) o Mutualism o Antagonism- Antibiosis, Parasitism, Predation and Competition. • Herbivore and Carnivore • Ecological succession: Types, mechanisms, changes involved in succession, concept of climax.	8
IV	**Population ecology** Density, Natality, Mortality, Age distribution, Growth, Equilibrium, Population fluctuations, Biotic potential, Dispersal, Dispersion, Population regulation, Population interaction, Populations and communities.	7
Study Resources	• Krebs, C.J. (2008) Ecology: The experimental Analysis of Distribution and Abundance (6th Edition), Benjamin Cummings Publ. • Odum, E. P. (2004). Fundamentals of Ecology, Oxford and IBH Publishing • Singh, J.S., S.P and Gupta, S.R. (2006) Ecology, Environment and Resource conservation. Anamaya Publ., New Delhi.	

SEMESTER II

F.Y. B.Sc. Zoology (Major)
Semester II
ZOO-DSC-121: Forensic Zoology

Total Hours:30 **Credits:2**

Course Objectives	• To understand the scope, need and history of Forensic Science. • To understand the role of Forensic medicine and laws. • To understand forensic analysis. • To understand knowledge of insects importance in forensic science.	
Course Outcomes	After successful completion of this course, students are expected to: • Understand the basics principles of Forensic Zoology. • Learnforensic medicine and laws. • Study the Forensic analysis. • Acquire the knowledge of insects importance in forensic science.	
Unit	**Topics**	**Hours**
I	**Introduction to Forensic Zoology** • Definition, Scope, and Application of Forensic Zoology. • Forensic Laboratories in India. • Basic Principles of Forensic Science with Examples.	7
II	**Forensic Medicine and Laws** • Introduction to Forensic Medicine: Definitions of Forensic Medicine. • Medical Jurisprudence (Laws). • Medical evidence documentations.	7
III	**Forensic Analysis** • Detection of Biological Evidences: Hair, Teeth, Blood, Semen and Saliva. • Technique and Examination of Biological Traces: Liquid blood, Blood stains and Swabs, Semen, Tissues, Bones, Hairs, Saliva • DNA Fingerprinting.	8
IV	**Forensic Importance of Insects** • Role of Blow flies and Dermestid beetles in forensic zoology. • Insects as indicators of time of death. • Evidence collection of insects.	8
Study Resources	• Fundamentals of Forensic Science, Second Edition, Max M. Houck and Jay A Siegel, Academic Press. • Forensic Science, Third Edition, Stuart H James and Jon. J. Nordby. • Forensic Science in India and the World, Deepak Ratna and Mohd. Zaidi, Alia Law Agency, Allahabad. • Forensic Science in India - A Vision for 21st Century, B. B. Nanda and Dr. R. K. Tewari, Select Publishers. • Forensic Biology, Richard Li, CRC Press. • Forensic Science: An introduction to Scientific and Investigative Techniques by S. H James, J. J. Nordby. • Examination of Body Fluid: Blood, Semen and Saliva.	

F.Y. B.Sc. Zoology (Major)
Semester II
ZOO-DSC-122: Practical of Forensic Zoology

Total Hours:60 **Credits:2**

Course Objective	• To examine human hair morphology • To differentiate various types of fingerprints for use in forensic identification. • To detect the blood group, dry blood and semen. • To learn the life cycles of blowflies (*Glossina*) and dermestid beetles (*Dermestesmaculatus*)	
Course Outcomes:	After successful completion of this course, students are expected to; • Contribute to forensic investigations by analyzing biological evidence like hair and body fluids. • Utilize fingerprint analysis for identification purposes. • Interpret the significance of insect life cycles in death investigations. • Apply knowledge of DNA fingerprinting and blood group systems in resolving parental disputes.	
Sr. No.	**Practical**	**Hours**
1.	Examine human hair for cortex and medulla. (E)	4
2.	Examine hair morphology and determine the species to which the hair belongs. (E)	4
3.	To prepare slides of scale pattern of human hair. (E)	4
4.	Identify and differentiate various types of Thumb prints. (E)	4
5.	Detection of Blood group. (E)	4
6.	Teichmann Crystal Test for dry Blood. (E)	4
7.	Acid phosphatase (AP) test for Semen. (E)	4
8.	Study of life cycle of Blow fly - *Glossina* (D)	4
9.	Study of life cycle of Dermistid Beetle- *Dermestes maculatus*(D)	4
10.	To prepare cast of foot prints in any suitable animal. (D)	4
11.	To carry out microscopic examination of diatoms. (D)	4
12.	To prepare a case report on problems of wildlife forensics (E).	4
13.	Study of the DNA fingerprinting.(D)	4
14.	To prepare a case report on crime scene.(D)	4
15.	Visit to Forensic Laboratory.	4
Study Resources	• Forensic Science in India and the World, Deepak Ratna and Mohd. Zaidi, Alia Law Agency, Allahabad. • Forensic Science in India - A Vision for 21st Century, B. B. Nanda and Dr. R. K. Tewari, Select Publishers. • Forensic Biology, Richard Li, CRC Press. • Forensic Science: An introduction to Scientific and Investigative Techniques by S. H James, J. J. Nordby. • Examination of Body Fluid: Blood, Semen and Saliva.	

F.Y. B.Sc. Zoology (Open Elective)
Semester II
ZOO-OE-121: Nutrition – deficiency and diseases

Total Hours:30 **Credits:2**

Course Objectives	• To identify the components of food. • To define the concept of a balanced diet. • To explain the importance of food hygiene, access to safe drinking water, and healthy lifestyle habits for overall well-being. • To recognize common nutritional deficiency diseases.	
Course Outcomes	After successful completion of this course, students are expected to; • Make informed dietary choices that contribute to a healthy lifestyle. • Advocate for improved access to safe food and water in their communities. • Identify the signs and symptoms of common nutritional deficiencies and recommend preventative measures. • Develop strategies for preventing and managing lifestyle diseases.	
Unit	**Topics**	**Hours**
I	**Introduction to Nutrition** • Definition and concept of health - WHO, Physical and Mental health. • Food hygiene • Potable water- sources and methods of purification at domestic level.	8
II	**Nutrition** • Components, nutrients and biological functions of - Macronutrient- Carbohydrates, Lipids and Proteins. Micro nutrients – Vitamins and Minerals. • Concept of balanced diet, nutrient requirements and dietary pattern for different groups *viz.*, pregnant and nursing mothers, infants, school children, adolescents, adults, and elderly people.	7
III	**Nutrient deficiency** • Common nutritional deficiency diseases- Protein Malnutrition - Kwashiorkor and Marasmus - symptoms, treatment, and prevention. • Iron, Iodine, Vitamin A and Vitamin D deficiency - symptoms, treatment, and prevention.	8
IV	**Lifestyle diseases** • Life style dependent diseases- Hypertension, *Diabetes mellitus*, and Obesity their causes and prevention. • Social health problems- Smoking, Alcoholism, and Narcotics.	7
Study Resources	• Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed;; New Age International Publishers • Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) • Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO. • Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford and IBH Publishing Co. Pvt Ltd. • Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill.	

F.Y. B.Sc. Zoology (Open Elective)
Semester II
ZOO-OE-122: Practical of Nutrition – deficiency and diseases

Total Hours:60 **Credits:2**

Course Objectives	• To identify the components of food. • To define the concept of a balanced diet. • To explain the importance of food hygiene, access to safe drinking water, and healthy lifestyle habits for overall well-being. • To recognize common nutritional deficiency diseases	
Course Outcomes	After successful completion of this course, students are expected to; • Make informed dietary choices that contribute to a healthy lifestyle. • Advocate for improved access to safe food and water in their communities. • Identify the signs and symptoms of common nutritional deficiencies and recommend preventative measures. • Develop strategies for preventing and managing lifestyle diseases.	
Sr. No.	**Practical**	**Hours**
1.	Detection of common adulterants in food (Any five).(E)	4
2.	Calculate the Body-Mass-index (BMI). (E)	4
3.	Estimation of Hemoglobin by using Sahli's haemoglobinometer. (E)	4
4.	Estimation of Vitamin C from lemon / awala or any suitable material. (E)	4
5.	Isolation of starch from potato or any suitable material. (E)	4
6.	Estimation of protein from egg / milk or or any suitable material. (E)	4
7.	Estimation of lipid from groundnut oil or any suitable material. (E)	4
8.	Study of hypertension, their causes and prevention. (D)	4
9.	Study of *Diabetes mellitus*, their causes and prevention. (D)	4
10.	Study of obesity, their causes and prevention (D)	4
11.	Study of malnutrition. (D)	4
12.	Study of malnutritional deficiency diseases- Kwashiorkor and Marasmus. (D)	4
13.	Study of balance diet and dietary pattern for adolescents. (D)	4
14.	Survey for BMI of college students.	4
15.	Visit to Natioanl Institute of Nutrition.	4
Study Resources	• Mudambi, S.R. and Rajagopal, M.V. (2007). Fundamentals of Foods, Nutrition and Diet Therapy; Fifth Ed;; New Age International Publishers • Srilakshmi, B. (2007). Food Science; Fourth Ed; New Age International (P) Ltd. • Swaminathan, M. (1986). Handbook of Foods and Nutrition; Fifth Ed; BAPPCO. • Bamji, M.S.; Rao, N.P. and Reddy, V. (2009). Text Book of Human Nutrition; Oxford and IBH Publishing Co. Pvt Ltd. • Wardlaw, G.M. and Hampl, J.S. (2007). Perspectives in Nutrition; Seventh Ed; McGraw Hill. • Lakra, P. and Singh M.D. (2008). Textbook of Nutrition and Health; First Ed; Academic Excellence.	