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. III & IV)

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

The Syllabi of B. Sc. in Zoology (Third and Fourth Semesters) as per **NATIONAL EDUCATION POLICY – 2020 (2023 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. Honours/Honors with Research

(S.Y.B.Sc. Zoology)

Under Choice Based Credit System (CBCS)

and

as per NEP-2020 Guidelines

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

Preface

We're thrilled to welcome you back for your second year in the captivating world of zoology! Building upon the foundation you established in your first year, this year promises an even more in-depth exploration of the animal kingdom, venturing into specialized fields with exciting applications.

This year's curriculum takes you on a focused journey through various disciplines that intersect with animal biology. You'll delve into the fascinating world of dairy science, mastering the intricate processes behind milk production and its significance for human health. Immunology will equip you to understand how animals, including humans, fight off diseases, while medical diagnostics will introduce you to the tools and techniques used to identify health issues.

The marvels of heredity come alive in genetics, where you'll explore the mechanisms of inheritance and their role in shaping animal diversity. If you're interested in the wonders of silk production, sericulture will unveil the fascinating biology of silkworms and the intricate processes involved in this age-old practice. For those captivated by gems, pearl culture will delve into the secrets behind these captivating natural treasures.

Moving beyond the animal kingdom itself, human physiology will provide a deeper understanding of the intricate workings of the human body, fostering a holistic appreciation of animal biology. For those interested in a sustainable food source, aquaculture will explore the science and practices of fish and shellfish farming.

Public health and hygiene round out the curriculum, highlighting the critical intersection between animal health and human well-being. This comprehensive program equips you with a diverse skillset, preparing you for careers in areas ranging from animal healthcare and conservation to research and education.

Get ready to embark on a year of discovery, unraveling the intricate connections between animals, their environments, and human well-being. We're excited to have you on this journey!

Welcome Back to the Animal Kingdom: Deepen Your Exploration!

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, Graduates will:

PO No.	PSO
1	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	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	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	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	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	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	Major (Core). Subjects		Minor Subjects (MIN)	GE/ OE	VSC, SEC (VSEC)	AEC, VEC, IKS	CC, FP, CEP, OJT/Int, RP	Cumulative Credits/Sem	Degree/ Cumulative Cr.
		Mandatory (DSC)	Elective (DSE)							
1 (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**
	II	DSC-4 (2T) DSC-5 (2T) 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**	**10**	**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.										

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-7(2T) DSC-8(2T) DSC-9(2P) DSC-10(2P)	---	MIN-5(2T) MIN-6(2T) MIN-7(2P)	---	OE-3(2T)		AEC-3(2T) (MIL)	CC-3(2T) CEP(2)	22	**UG Diploma**
	IV	DSC-11(2T) DSC-12(2T) DSC-13(2P) DSC-14(2P)	---	MIN-8(2T) MIN-9(2P)	---	OE-4(2T) OE-5(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-15(2T) DSC-16(2T) DSC-17(2T) DSC-18(2P) DSC-19(2P)	DSE-1A/B (2T) DSE-2A/B (2P)	---	---	---	VSC-1(2T) VSC-2(2P)	---	OJT/Int (4)	22	UG Degree
	VI	DSC-20(2T) DSC-21(2T) DSC-22(2T) DSC-23(2T) DSC-24(2T) IKS DSC-25(2P) DSC-26(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-27(4T) DSC-28(4T) DSC-29(4T) DSC-30(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	---	22	UG Honours Degree
	VIII	DSC-31(4T) DSC-32(4T) DSC-33(4T) DSC-34(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-27(4T) DSC-28(4T) DSC-30(2P)	DSE-5A/B (2T) DSE-6A/B (2P)	RM(4T)	---	---	---	RP(4)	22	UG Honours with Research Degree
	VIII	DSC-31(4T) DSC-32(4T) DSC-34(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 S.Y. B.Sc. (Zoology)

Course	Course Type	Course Code	Course Title	Credits	Teaching Hours/ Week			Marks			
					T	P	Total	Internal		External	
								T	P	T	P
Semester III, Level – 5.0											
DSC-7	DSC	ZOO-DSC-231	Medical Diagnostics	2	2	---	2	20	---	30	---
DSC-8	DSC	ZOO-DSC-232	Dairy Science	2	2	---	2	20	---	30	---
DSC-9	DSC	ZOO-DSC-233	Practicals of Medical Diagnostics	2	---	4	4	---	20	---	30
DSC-10	DSC	ZOO-DSC-234	Practicals of Dairy Science	2	---	4	4	---	20	---	30
MIN-5	MIN	ZOO-MIN-231	Fundamentals of Genetics	2	2	---	2	20	---	30	---
MIN-6	MIN	ZOO-MIN-232	Immunology	2	2	---	2	20	---	30	---
MIN-7	MIN	ZOO-MIN-233	Practicals of Fundamentals of Genetics and Immunology	2	---	4	4	---	20	---	30
OE-3	OE	ZOO-OE-231	Sericulture	2	2	---	2	20	---	30	---
CEP	CEP	ZOO-CEP-231	Community Engagement Programme	2	---	4	4	50	---	---	---
Semester IV, Level – 5.0											
DSC-11	DSC	ZOO-DSC-241	Medical lab techniques	2	2	---	2	20	---	30	---
DSC-12	DSC	ZOO-DSC-242	Human Physiology	2	2	---	2	20	---	30	---
DSC-13	DSC	ZOO-DSC-243	Practicals of Medical lab techniques	2	---	4	4	---	20	---	30
DSC-14	DSC	ZOO-DSC-244	Practicals of Human Physiology	2	---	4	4	---	20	---	30
MIN-8	MIN	ZOO-MIN-241	Pearl Culture	2	2	---	2	20	---	30	---
MIN-9	MIN	ZOO-MIN-242	Practicals of Pearl Culture	2	---	4	4	---	20	---	30
OE-4	OE	ZOO-OE-241	Aquaculture	2	2	---	2	20	---	30	---
OE-5	OE	ZOO-OE-242	Practicals of Aquaculture	2	---	4	4	---	20	---	30
FP	FP	ZOO-FP-241	Field Project	2	---	4	4	50	---	---	---

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. 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 are required to 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.
- Practical examination shall be conducted for 2 consecutive days for 2 hr/ day where incubation conditionis required.
- There shall be 05 marks for journal and viva-voce. Certified journal is compulsory to appear for practical examination.
- 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 department as per schedule given.
- For internal practical examination student 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 internal theory examination guidelines.
- Finally 40 (10+30) marks performance of student will be converted into 20 marks.

SEMESTER III

S.Y. B.Sc. Zoology (Major)
Semester III
ZOO-DSC-231: Medical Diagnostics

Total Hours: 30 **Credits: 2**

Course Objectives	• To know the importance of medical diagnostics and learn about the blood analysis • To study diagnostic methods used for urine analysis • To learn the about Infectious and Non-infectious Diseases • To study the medical imaging tools.	
Course Outcomes	After successful completion of this course, students are expected to: • Able to describe importance of medical diagnostics and blood analysis. • Familiar with diagnostic methods used for urine analysis. • Gain the knowledge about Infectious and Non-infectious Diseases. • Understand the knowledge about medical imaging tools.	
Unit	**Topic**	**Hours**
I	• **Introduction to Medical Diagnostics and its Importance.** • **Diagnostics Methods Used for Analysis of Blood.** • Blood composition • Preparation of blood smear • Differential Leucocyte Count (D.L.C) • Platelet count using haemocytometer • Erythrocyte Sedimentary Rate (E.S.R)	8
II	• **Diagnostic Methods Used for Urine Analysis** • Physical characteristics, • Normal and abnormal constituents	7
III	• **Infectious and Non-infectious Diseases** Causes, symptoms, diagnosis and prevention of: • Diabetes and Hypertension (Primary and secondary) • Tuberculosis and Hepatitis	8
IV	• **Medical imaging tools** X-Ray, PET scan, MRI and CT Scan	7
Study Resources	• Park, K. (2007), Preventive and Social Medicine, B.B. Publishers • Godkar P.B. and Godkar D.P. (2003). Textbook of Medical Laboratory Technology, Edition, Bhalani Publishing House • Guyton A.C. and Hall J.E. (1956). Textbook of Medical Physiology, Saunders • Robbins and Cortan, (1971). Pathologic Basis of Disease, VIIIthEdition, Saunders • Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.	

S.Y. B.Sc. Zoology (Major)
Semester III
ZOO-DSC-232: Dairy Science

Total Hours: 30 **Credits: 2**

Course Objectives	• To understand various aspects of managing a dairy farm. • To study the common different breeds of cow and buffalo in India. • To familiarize milk chemistry and its significance in dairy processing and various dairy processing techniques. • To know about indigenous milk products and role of dairy industry as entrepreneur.	
Course Outcomes	Aftersuccessfulcompletionofthiscourse,studentsareexpectedto: • Have a solid understanding of dairy farm management principles. • Enable students to identify and describe various cow and buffalo breeds. • Comprehend the milk chemistry and its significance in dairy processing and various dairy processing techniques. • Gain knowledge about indigenous milk products and role of dairy industry as entrepreneur.	
Unit	**Topic**	**Hours**
I	• Introduction to dairy farming in India. • Taxonomic classification of dairy animals. • Common terminologies used for body part of cattles • Hygiene and sanitation; Common diseases, First-aid measures.	7
II	**Study of cow breeds.** • Milch breeds – Gir • Dual Purpose breeds – Hariana • Draught breeds – Khillar • Exotic breeds –Jersey • Cross breed –Brown swiss **Study of buffalo breed.** • Nagpuri	7
III	**Milk chemistry and Dairy processing** • 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 • Milk Collection, Transportation, Grading, Weighing and Cooling of Milk; Straining, Filtration, Clarification, Homogenization, Pasteurization; Packing and Storage of milk.	8
IV	**Indigenous milk product and Entrepreneur approach** • 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. • Dairy industry as an entrepreneur for development of small scale industry. • Food Safety and Quality Management	8
Study Resources	• Banerjee G.C. (2010): A text Book of Animal Husbandry (8^{th} 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, Kalyani Publisher.

S.Y. B.Sc. Zoology (Major)
Semester III
ZOO-DSC-233: Practicals of Medical Diagnostics

Total Hours:60 **Credits: 2**

Course Objectives	• To know about the bloodand urine analysis. • To study the infectious and non-infectious diseases and medical imaging tools. • To estimate blood sugar level, cholesterol, SGOT and SGPT. • To train students in recording of blood pressure.	
Course Outcomes	After successful completion of this course, students are expected to: • Able tosuccessfully analysied the blood and urine samples. • Gain the knowledge about infectious and non-infectious diseases and medical imaging tools. • Able to estimate blood sugar level, cholesterol, SGOT and SGPT. • Successfully record the blood pressure.	
Sr. No.	**Practical**	**Hours**
1	Determination of ABO blood group with Rh factor. (E)	4
2	Estimation of Hemoglobin concentration (Hb). (E)	4
3	Preparation of blood smear and estimationof Differential Leucocyte Count (D.L.C). (E)	4
4	Estimate Erythrocyte Sedimentary Rate (E.S.R).(E)	4
5	Qualitative analysis of Urine w.r.t. normal constituents.(E)	4
6	Qualitative analysis of Urine w.r.t. abnormal constituents.(E)	4
7	Study of infectious diseases –Tuberculosis and Hepatitis - w.r.t. causes, symptoms, diagnosis and prevention.	4
8	Study of non-infectious diseases - Diabetes, Hypertension - w.r.t. causes, symptoms, diagnosis and prevention.	4
9	Estimation of blood sugar level. (E)	4
10	Estimation of cholesterol from blood. (E)	4
11	Estimation of SGOT from blood. (E)	4
12	Estimation of SGPT from blood. (E)	4
13	Recording of Blood pressure.(E)	4
14	Study of medical imaging tools: X-Ray, CT Scan, MRI and PET scan (using photographs).	4
15	Student's visit: Pathological laboratory	4
Study Resources	• Praful Godkar (2021) - Textbook of medical laboratory technology, Bhalani Publishing House • Payal Soan, GiteshAmrohit (2020) - A Hand Book of D.M.L.T. (Diploma in Medical Laboratory Technology), Vardhan Publishers & Distributors • Ramnik Sood (2006) - Textbook of Medical Laboratory Technology Jaypee Brothers Medical Publishers	

S.Y. B.Sc. Zoology (Major)
Semester III
ZOO-DSC-234: 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	Aftersuccessfulcompletionof thiscourse,studentsareexpectedto: • identify and describe the morphological characteristics of breeds and recognize and diagnose common diseases affecting dairy animals. • assess the quality of milk using various tests. • prepare traditional Indian dairy products such as Basundi, Kulfi, Shrikhand, and paneer. • familiar with dairy equipment, including muffle furnaces, viscometers, centrifugal cream separators, milk packing materials, scrapers, and capping units.

Sr. No.	Practical	Hours
1	Study of morphology of important breed of cowGir, Hariana, Khillar, Jersey and Brown swiss.	4
2	Study of buffalo breeds: Nagpuri.	4
3	Study of common diseases of dairy animals.	4
4	Detection of milk adulterants. (E)	4
5	Determination of microflora from milk. (E)	4
6	Organoleptic and temperature test for judging the quality of milk. (E)	4
7	COB, Alcohol and Sediment test for judging the quality of milk. (E)	4
8	Determination of SNF and TS of milk. (E)	4
9	Determination of Specific gravity of milk. (E)	4
10	Determination of Acidity and pH of milk. (E)	4
11	Preparation of Basundi and Kulfi. (E)	4
12	Preparation of Shrikhand and paneer. (E)	4
13	Study of Dairy equipment's: Muffle furnace, Viscometer, Centrifugal cream Separator, Milk packing material, Scrapers, Capping unit.	4
14	Study of cattle farm layout.	4
15	Student's visit: Dairy industry / dairy farm.	4

Study Resources	• Banerjee G.C. (2010): A text Book of Animal Husbandry (8th Edition).Oxford & 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. • Kar N. (2002): Animal Husbandry and Rural Development. Deep and Deep Publications. • Mahanta K. C. (1997) : Dairy Microbiology. Omsons Publishers. • Webb B.H. and Whittier R.O. (1970): By-products from milk AVI Pub

S.Y. B.Sc. Zoology (Minor)
Semester III
ZOO-MIN-231: Fundamentals of Genetics

Total Hours: 30 **Credits: 2**

Course Objectives	• To understand the basic principles of genetics. • To study the principles of Inheritance by Mendelian genetics and its extension. • To understand and learn concept of multiple alleles and multiple genes. • To aquire the knowledge aboutlinkage and crossing over and chromosomal theory of sex determination.	
Course Outcomes	After successful completion of this course, students are expected to: • Know the basic principles of genetics. • Understand the principles of Inheritance by Mendelian genetics and its extension. • Gain the knowledge about multiple alleles and multiple genes. • To understand and learn the chromosomal theory of sex determination.	
Unit	**Topic**	**Hours**
I	**Introduction to genetics** • Definition, scope and importance of genetics. • Classical and modern concept of gene (Cistron, Muton, Recon). • Brief explanation of the following terms: Allele, Wild typeand Mutant alleles, Locus, Dominant and Recessive traits,Homozygous and Heterozygous, Genotype and Phenotype,Genome.	8
II	**Mendelian Genetics** • Mendelian Genetics: Monohybrid cross, Dihybrid cross, Test cross, Back cross, Mendel's laws of Inheritance,Mendelian traits in man. • Exceptions to Mendelian Inheritance: Incompletedominance, Codominance, Lethal alleles, Epistasis. • Chromosome theory of inheritance. • Pedigree analysis-Autosomal dominant and autosomalrecessive, X linked dominant and X-linked recessive**.**	8
III	**Multiple Alleles and Multiple Genes** • Concept of multiple alleles, ABOand Rh blood group systems. • Polygenic inheritance with reference to skin colour and eyecolour in man. • Concept of pleiotropy.	7
IV	**Linkage and Crossing Over** • Linkage and crossing over, types of crossing over. **Sex Determination** • Chromosomal theory of sex determination-XX-XY,XX-XO, ZZ-ZW	7
StudyResources	• Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics VIII ed.. Wiley India. • Powar, C.B. (2002). Genetics Vol I & 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. • Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics, V Edition. John Wiley and Sons Inc.	

S.Y. B.Sc. Zoology (Minor)
Semester III
ZOO-MIN-232: Immunology

Total Hours: 30 **Credits:2**

Course Objectives	• To understand various immunemechanisms. • To study about various immune cells and organs involved inimmunity. • To understand different immunological techniques. • To learn the autoimmunemechanisms.	
Course Outcomes	After successful completion of this course, students are expected to: • Learn aboutvarious immune mechanisms. • Acquire knowledge about various immune cells and organs involved in immunity. • Knowdifferent immunological techniques. • Acquire knowledge about autoimmune mechanisms.	
Unit	**Topic**	**Hours**
I	**Fundamentals of the immune system** • Introduction to basic concepts in immunology • Components of immune system: Cells of immune system, Organs (Primary and Secondary lymphoid organs) of the immune system • Types of immunity: a) Innate and Acquired immunity b) Cell mediated and Humoral immunity. • Autoimmune diseases. • Immune Response: Primary and Secondary. • Phagocytosis.	08
II	**Antigens** • Basic properties of antigens. • Maturation and development of B and T cell. • Epitopes, haptens and adjuvants.	07
III	**Immunoglobulins** • Structure, classes and functions of Immunoglobulins. • Monoclonal antibodies. • Antigen antibody interactions. • General introduction tovaccines.	08
IV	**Immuno-techniques** • Precipitation, Agglutination, Immunodiffusionand Complement fixationtest. • Radioimmunoassay, Immunofluorescence,ELISA • Westernblotting.	07
Study Resources	• Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006), Immunology, VI Edition. W.H. Freeman andCompany. • David, M., Jonathan, B., David, R. B. and Ivan R. (2006), Immunology, VII Edition, Mosby, Elsevier Publication. • Abbas,K.AbulandLechtmanH.Andrew(2003),CellularandMolecularImmunology. V Edition. SaundersPublication.	

S.Y. B.Sc. Zoology (Minor)
Semester III
ZOO-MIN-233: Practicals of Fundamentals of Genetics and Immunology

Total Hours:60 **Credits: 2**

Course Objectives	• To learn monohybrid, dihybrid, incomplete, Co-dominance ratio and Barr body in human buccal epithelium. • To understand karyotype analysis, genetic traits in human and study the *Drosophila*. • To learn various immune organs and structure and function of the different antibodyclasses. • To study different immunological techniques and the autoimmunemechanisms.	
Course Outcomes	After successful completion of this course, students are expected to: • Exhibit a knowledge of monohybrid, dihybrid, incomplete, Co-dominance ratio and Barr body in human buccal epithelium. • Learn karyotype analysis, genetic traits in human. • Acquire knowledge about various immune organs and structure and function of the different antibody classes. • Knowdifferent immunological techniques and the autoimmune mechanisms.	
Sr. No.	**Practical**	**Hours**
1	Study of Monohybrid, Dihybrid Ratio.	4
2	Study of Incomplete and Co-dominance Ratio.	4
3	Study of Barr body in human buccal epithelium. (E)	4
4	Study of genetic traits in human beings (colour blindness and PTC tasters/ non tasters). (E)	4
5	Study of normal male and female human karyotype and Abnormal human karyotypes- Down, and Turner syndromes (by using random karyotype pictures). (E)	4
6	Preparation of Drosophila Culture and it's Maintenance. (E)	4
7	Study of *Drosophila*: External characters, sexual dimorphism and mutants (White eye and Sepia eye and Curly wing & Vestigial wing).	4
8	Demonstration of lymphoid organs. (D)	4
9	Study of general structure and classes of Immunoglobulin.	4
10	Detection of presence of antigen by qualitative ELISA (Dot ELISA). (E)	4
11	Experiment of Rocket immune electrophoresis. (E)	4
12	Experiment of Ouchterlony's double immuno-diffusion method. (E)	4
13	Determination of Rheumatoid Arthritis test. (E)	4
14	Autoimmune disease – Lada diabetes and Rheumatoid Arthritis.	4
15	Estimation of Total Leucocyte Count. (E)	4
Study Resources	• 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.	

S.Y. B.Sc. Zoology (Open Elective)
Semester III
ZOO-OE-231: 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: • Know biology of silkworm • Acquire the knowledge of cultivation of mulberry and its harvesting. • Understand rearing of silkworm • Understand various common silkworm diseases.	
Unit	**Topic**	**Hours**
I	**Introduction** • 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 *Bombyx mori* 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 *Bombyx mori*.	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	• Krishnaswamy S.(1986). Improved Method of Rearing Young age silkworm; reprinted CSB, Bangalore. • Sengupta K.(1989). A Guide for Sericulture; Director, CSIR & TI, Mysore. • Ullal S.R. and M.N. Narsimhanna(1983), Handbook of Practical sericulture: CSB,	

S.Y. B.Sc. Zoology (Major)
Semester III
ZOO-CEP-231: Community Engagement Programme
Guidelines forCommunity Engagement Program (CEP)

Course Structure : 2 Credits
Contact hours : 60 hours

In alignment with the National Education Policy (NEP) 2020, Moolji Jaitha College (Autonomous), Jalgaon is introducing the Community Engagement Program at the undergraduate level. The NEP 2020 emphasizes holistic development, inclusivity, and integrating vocational education with academic learning, aiming to nurture socially responsible individuals. Inspired by NEP 2020, the Community Engagement Program aim to produce knowledgeable, compassionate, and proactive graduates, contributing to a more just, equitable, and sustainable society. This course fosters a strong connection between education and socioeconomic problems of real-world. Students will learn about the challenges faced by vulnerable households and appreciate local wisdom and lifestyles.

Objectives

- To engage students in activities that promote emotional, social, and intellectual growth, fostering a well-rounded approach to personal and academic development.
- To provide hands-on experiences that complement classroom learning, enabling students to apply their knowledge insocioeconomic problems of real-world.
- To instil a sense of responsibility towards the community by encouraging students to actively participate in social and environmental initiatives, appreciate rural culture, lifestyle, and wisdom.

Learning Outcomes

After completing this course, students will be able to

- Understand rural and/or urban culture, ethos, and socioeconomic realities.
- Develop a sense of empathy with the local community while appreciating the significant contributions of local communities to society and the economy.
- Learn to value the local community wisdom and identify opportunities for contributing to the community's socioeconomic improvements.

Activities

- Conduct workshops and interactive sessions on emotional intelligence and social skills.
- Organize debates, discussions, and intellectual challenges that stimulate critical thinking and socioeconomic problem-solving using concern subject.
- Organize field visits where students can work on real-world problems, such as environmental conservation, rural and/or urban planning, or community health.
- Organize internships or service-learning opportunities with local businesses, NGOs, or government agencies.
- Facilitate project-based learning activities that require students to use their academic knowledge to develop solutions to community issues.
- Engage students in community service activities that address local social and environmental issues.
- Organize cultural exchange programs or field trips to rural areas to foster an appreciation of rural culture and wisdom.
- Facilitate collaborative projects involving students, educators, and community members to develop solutions for local challenges, promoting teamwork and collective problem-solving.

- Conduct educational sessions on the status of various agricultural and development programs and the challenges faced by vulnerable households, ensuring inclusivity and accessibility for all students.

Sr. No.	Module Title	Module Content	Assignment submission	Teaching/ Learning Methodology
1	**Appreciation of Rural Society**	Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages', rural infrastructure.	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	– Classroom discussions – Field visit – Assignment
2	**Understanding rural and local economy and livelihood**	Agriculture, farming, land ownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets, migrant labour.	Describe your analysis of the rural house hold economy, its challenges and possible pathways to address. Circular economy and migration patterns.	– Field visit – Group discussions in class – Assignment
3	**Rural and local Institutions**	Traditional rural and community organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), Nagarpalikas and municipalities, local civil society, local administration.	How effectively are Panchayati Raj and Urban Local Bodies (ULBs) institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual).	– Classroom – Field visit – Group presentation of assignment
4	**Rural and National Development Programmes**	History of rural development and current national programmes in India: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM AwaasYojana, Skill India, Gram Panchayat Decentralised Planning, National Rural Livelihood Mission (NRLM), Mahatma Gandhi National Rural Employment Guarantee Act 2005 (MGNREGA), SHRAM, Jal Jeevan Mission, Scheme of Fund for Regeneration of Traditional Industries (SFURTI), Atma Nirbhar Bharat, etc.	Describe the benefits received and challenges faced in the delivery of one of these programmes in the local community; give suggestions about improving the implementation of the programme for the poor. Special focus on the urban informal sector and migrant households.	– Classroom – Each student selects one program for field visit – Written assignment

Note: The modules are suggestive in nature and students can opt any one activities for community engagement program and field project based on topic appropriate to their regional community context.

Some additional suggestive themes for field-based / community engagement activities are listed below:

- Management curriculum may include aspects of micro-financing in a rural context;
- Chemistry syllabus can have a component of conducting water and soil analysis in surrounding field areas;
- Political science syllabus could include a mapping of local rural governance institutions and their functioning.
- Environment education will include areas such as climate change, pollution, waste management, sanitation, conservation of biological diversity, management of biological resources and biodiversity, forest and wildlife conservation, and sustainable development and living
- Understanding panchayats and constitutional mandate of local governance
- Panchayat administration, Gram Sabha, Mahila Sabha, Gram Panchayat Development Plan (GPDP), local planning of basic services.
- Micro-finance, SHGs, system of savings and credit for local business, linkages to banks, financial inclusion.
- Rural – entrepreneurship, opportunities for small business in local communities, access to financial and technical inputs to new entrepreneurs.
- Renewable energy, access to household and community level solar and bio-mass systems for sustainable energy use.
- Participatory Monitoring and evaluation of socio-economic development programmes, and cost-benefit analysis of project proposals.
- Migrant workers' livelihood security and social services.
- Hygiene and sanitation, improving health and personal behaviours, locally manageable decentralised systems and awareness against stubble burning.
- Water conservation, traditional practices of storage and harvesting, new systems of distribution and maintenance.
- Women's empowerment, gender inequality at home, community and public spaces, safety of girls and women, access to skills, credit and work opportunities.
- Child security, safety and good parenting, nutrition and health, learning and training for child care.
- Rural Marketing, market research, designing opportunities for rural artisans and crafts, and new products based on demand assessment.
- Community Based Research in Rural Settings, undertaking research that values local knowledge, systematises local practices and tools for replication and scale-up.
- Peri-urban development of informal settlements, mapping and enumeration, design of local solutions.

Assessment:

- Readings from related literature including e-content and reflections from field visits should be maintained by each student in the form of Field Diary (20 Marks)
- Submission of assignments based on modules assignment submission (details mentioned above) (20 Marks)
- Oral/ Group discussion/ Presentation (10 Marks)

SEMESTER IV

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-DSC-241: Medical lab techniques

Total Hours: 30 **Credits:2**

Course Objectives	• To understand the principles and techniques involved in hematological testing. • To acquire a comprehensive understanding of the methods used for microbial identification, culture. • To understand the role of clinical pathology in the diagnosis, prognosis, and monitoring of diseases through the analysis of body fluids and tissues. • To 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, effective communication skills, and an understanding of ethical and professional responsibilities.	
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 glasswares and equipments. • Units of measurement, preparation of reagent 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. • Laboratory examination of miscellaneous body fluids (CSF and Gastric juice) and stool. • Histological laboratory techniques.	**7**
Study Resources	• Praful Godkar (2021) - Textbook of medical laboratory technology, Bhalani Publishing House. • Ramnik Sood (2006) - Textbook of Medical Laboratory Technology Jaypee Brothers Medical Publishers.	

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-DSC-242: Human Physiology

Total Hours: 30 **Credits: 2**

Course Objectives	• To learn the physiology of human digestion. • To study the physiology of human respiration. • To get knowledge of the physiology of circulation in human. • To understand the physiology of human excretion.	
Course Outcomes	• Acquire knowledge about physiology of human digestion. • Know the physiology of human respiration. • Learn the physiology of circulation in human. • Gain the knowledge of physiology of human excretion.	
Unit	**Topic**	**Hours**
I	**Digestion** • Digestion - Buccal, Gastric and Intestinal. • Absoption and assimilation. • Digestive disorders - Ulcer and Constipation.	7
II	**Respiration** • Respiratory pigments –Haemoglobin and Myoglobin. • Mechanism of Respiration. • Transport of O_2 and CO_2 and Respiratory Quotient. • Respiratory disorders – Asthma and Bronchitis.	8
III	**Circulation** • Composition and functions of blood. • Double circulation. • Cardiac cycleand Blood pressure. • Pace maker and its role. • Circulatory disorders - Heart Failure and Angina pectoris.	**7**
IV	**Excretion** • Physiology of urine formation. • Counter current multiplier theory. • Composition of urine. • Excretory Disorder – Kidney Failure and Gout.	**8**
Study Resources	• Tortora, G. J., & Derrickson, B. (2006). Principle of Anatomy and Physiology, 11th, John Wiley & Sons. Inc., USA. • Chatterjee, C. C. (1992). Human physiology: Volume-I. Medical Allied Agency. • Chatterjee, C. C. (1992). Human physiology: Volume-II. Medical Allied Agency. • Goel, K. A., &Sastri, K. V. (1984). A TextBook of animal physiology. RastogiPublications. • Nielsen, K. S. (1964). Animal physiology (Vol. 7). Prentice-Hall of India (Private)Limited. • Arora M. P.(2018). Animal Physiology. Himalaya Publishing House Pvt.Lt. • Sobti, R. C. (2008). Animal physiology. Alpha Sci. International. • Jabde, P. V. (2005). Text Book Of General Physiology. Discovery Publishing House.	

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-DSC-243: Practicals of Medical lab techniques

Total Hours:60 **Credits: 2**

Course Objectives	• To understand the principles and techniques involved in hematological testing, including blood cell counting, blood cell morphology evaluation, and coagulation studies. • To acquire a comprehensive understanding of the methods used for microbial identification, culture. • To understand the role of clinical pathology in the diagnosis, prognosis, and monitoring of diseases through the analysis of body fluids and tissues. • To develop skills in processing, embedding, sectioning, staining, and microscopic examination of tissue samples for routine and special histological studies.
CourseOutcomes	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.	Practical	Hours
1	Washing ofglasswares.	4
2	Study of principle and working of Centrifuge, Spectrophotometer and microscope. (D)	4
3	Study of units of measurement,preparation of 0.1 N HCl and 0.1 N NaOH. (E)	4
4	Determination of ABO blood group with Rh factor. (E)	4
5	Estimation of Differential Leucocyte count (DLC). (E)	4
6	Estimationof Hemoglobin concentration (Hb). (E)	4
7	Estimation of blood sugar level. (E)	4
8	Qualitative analysis of abnormal constituents of urine. (E)	4
9	Estimation of Urine creatinine. (E)	4
10	Detection of presence of antigen by qualitative ELISA (pregnancy Test). (E)	4
11	Determination of Rheumatoid arthritis test. (E)	4
12	Study of safety regulations, first aid and clinical laboratory records.	4
13	Gram's staining of microorganisms. (E)	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 Diploma in Medical Laboratory Technology, Vardhan Publishers & Distributors.
- Ramnik Sood (2006). Textbook of Medical Laboratory Technology JaypeeBrothers Medical Publishers.

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-DSC-244: Practicals of Human Physiology

Total Hours:60 **Credits: 2**

Course Objectives	• To understand the principles and techniques involve in blood and urine analysis. • To detect the action of salivary amylase on starch, to measure BP and lung capacity. • To estimate bleeding, clotting time and blood glucose level. • To study disorders of digestion, respiration, circulation and excretion.	
Course Outcomes	After successful completion of this course, students are expected to: • Able to successfully analysed the blood and urin sample. • Accurately detect the action of salivary amylase on starch, measure BP and lung capacity. • Able to estimate bleeding, clotting time and blood glucose level. • Gain the knowledge digestion, respiration, circulation and excretion.	
Sr. No.	**Practical**	**Hours**
1	Detection of blood group with Rh factor. (E)	4
2	Estimation of Haemoglobin. (E)	4
3	Preparation Haemin crystal. (E)	4
4	Determination of Total count of WBC. (E)	4
5	Determination of Total count of RBC. (E)	4
6	Determination of DLC. (E)	4
7	Estimation of blood glucose level. (E)	4
8	Estimation of bleeding time. (E)	4
9	Estimation of clotting time. (E)	4
10	Determination of Blood pressure. (E)	4
11	Detection of action of salivary amylase on starch. (E)	4
12	Measurement of lung capacity. (E)	4
13	Detection of urea, albumin, sugar and creatin in urine. (E)	4
14	Study of disorders of digetion and respiration.	4
15	Study of disorders of circulation and excretion.	4
Study Resources	• Tortora, G. J., & Derrickson, B. (2006). Principle of Anatomy and Physiology, 11th, John Wiley & Sons. Inc., USA. • Chatterjee, C. C. (1992). Human physiology: Volume-I. Medical Allied Agency. • Chatterjee, C. C. (1992). Human physiology: Volume-II. Medical Allied Agency. • Goel, K. A., &Sastri, K. V. (1984). A TextBook of animal physiology. RastogiPublications. • Nielsen, K. S. (1964). Animal physiology (Vol. 7). Prentice-Hall of India (Private)Limited. • Arora M. P.(2018). Animal Physiology. Himalaya Publishing House Pvt. Ltd. • Sobti, R. C. (2008). Animal physiology. Alpha Sci. International. • Jabde, P. V. (2005). Text Book Of General Physiology. Discovery Publishing House.	

S.Y. B.Sc. Zoology (Minor)
Semester IV
ZOO-MIN-241: Pearl Culture

Total Hours: 30 **Credits:2**

Course Objectives	• To understand the basic concept of pearl culture. • To provide the knowledge of chemical composition and properties of pearl culture. • 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: • Get the knowledge of pearl fisheries of India. • How the zoology subject emerges as a new branch of applied zoology and its current Scope • Know the different species of pearl oyster. • Understand the economics of pearl farming.	
Unit	**Topics**	**Hours**
I	**Introduction to Pearl culture** • Meaning of pearl • Types of Pearls:Natural pearls and Cultured pearls • Pearl Producing Mollusks': **A.Freshwater Mollusks:** *Hyriopsis schlegelii*; *Cristaria plicata*; and *Lamellidens marginalis*. **B. Marine Mollusks:** *Pinctada fucata* (Gould); *Pinctada margaritifera* (Linnaeus); *Pinctada maxima* (Jameson); and Minor *Pinctada* species. • Pearl farming region in India: Gulf of mannar and Gulf of kutch.	7
II	**Properties of Pearl** • Chemical composition of pearl. • Classification of pearls. • Physical properties of pearl. • Formation of Pearl: Formation of pearl sac; Secretion of pearl forming nacre and calcium absorption and formation of calcium carbonate; Factors influencing secretion of nacre • Uses of pearl	8
III	**Implantation and harvesting** Selection of mussel; Surgery of mussel and precautions; Graft tissue preparation; Nucleus implantation; and Post surgical care and Harvesting of pearl.	**7**
IV	**Economics of pearl farming** • Socio-economic impact. • Production and trade. • Marketing and the nature of the market for pearl. • Incomes and prices on the demand for pearls. • Recent Trends in Freshwater Pearl Farming in India.	8
Study Resources	• Adhikari S & 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.	

S.Y. B.Sc. Zoology (Minor)
Semester IV
ZOO-MIN-242: Practicals of Pearl Culture

Total Hours:60 **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.	
CourseOutcomes	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.	**Practical**	**Hours**
1	Study of morphology and anatomy of fresh water pearl mussel - *Lamellidens marginalis.*	4
2	Study of morphology and anatomy of marine water pearl oyster - *Pinctada fucata*	4
3	Study of life cycle of *Lamellidens marginalis.*	4
4	Study of life cycle of *Pinctada fucata*.	4
5	Study of common species of fresh water pearl mussel used for pearl formation.	4
6	Establishment of fresh water pearl culture unit. (E)	4
7	Study of types of pearl - i. Natural pearl ii. Cultured pearl	4
8	Embedding beads in suitable mussel for pearl culture. (E)	4
9	Study of diseases of fresh water pearl mussel.	4
10	Study of predators of fresh water pearl mussel.	4
11	Economic importance of pearl.	4
12	Maintenance of fresh water pearl culture unit. (E)	4
13	Study of pearl formation.	4
14	Study of chemical composition of pearl.	4
15	Visit to any pearl culture unit.	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 & Lalli CM. (1984). A Manual of Chemical and Biological Methods for Seawater Analysis. Pergamon Press.	

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-OE-241: Aquaculture

Total Hours: 30 **Credits:2**

Course Objectives	• To learn about the aquaculture concept and various culture systems. • To understand estabilisment of fish culture ponds. • To study the fish pathology. • To understand techniques involve inmanagement of fish culture.	
Course Outcomes	After completingthis coursethe learnerswillbe able to: • Acquire knowledge about the aquaculture concept and various culture systems. • Able to established fish culture ponds. • Get knowledge aboutfish pathology. • Successfully able to manage fish farm.	
Unit	**Topics**	**Lectures**
I	**Freshwateraquaculturesystems** Aquacultureconcept,Culturesystems:Freshwaterprawnculture,Fishculture,Crabculture,Mussel culture.Compositefishculture:Definitionand variouspatterns.Mixedfishfarming inIndia.Culture of Major carps.	8
II	**Estabilisment of fishand prawn cultureponds** Nursery ponds.Rearing ponds,Stocking ponds. Fishbreeding:Naturalandartificial. Harvesting:Fishing techniques,preservationandprocessing offish. Fresh waterprawnculture:Introduction,Breeding, Juvenileprawnmigration,Seasonalandregional distributionof seeds,Identificationof juveniles and Controlled breeding. Cultureponds: Monoculture. Mixed culture	7
III	**Fish pathology** Parasitic infections. Fungus infections. Protozoan diseases; Worm diseases. Non parasiticdiseases.Anesthetic drugs. Antiseptics and Antibiotics.	8
IV	**Management of fish culture** Fish food organisms and their production. Supplementary feeding.Fertilization. Fish toxicants. Aquatic insects and their control. Transport of fish seed and Brood fish. Methods for packaging and transport. Causes of mortality in transport.Use of chemicals in live fish transport.	7
Suggested Readings	• Jingran, V. G. (1983). Fish and fisheries ofIndia,Hindustan pub. corp. New Delhi. • Hute, M. and Kahn,H.(2000). Textbook of fish culture, Blackwell ScientificPublication, Australia. • Srinivasulu,M., Reddy,K.R.S., Rao, S. (1999). Text book of Aquaculture, Discovery PublishingHouseNew Delhi. • Yawn Mehta,Fisheries &Aquaculture Biotechnology(2011).Campus BooksInternational, Prahalad street, Ansari Road, DurgaGanj, New Delhi.	

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-OE-242: Practicals of Aquaculture

Total Hours: 60 **Credits: 2**

Course Objectives	• To analyze water quality and study the biosecurity protocols to prevent disease outbreaks. • To study major IndianCarps Rohu Catla and Mrigal, formulation of fish feed using different ingredients and live feed for aquaculture species. • To understand the ideal design of Aquaculture unit and setupof aeration, filtration, and biofiltration systems in aquaculture unit. • To know the techniques involved in harvesting fish and preservation methods in fish culture.	
CourseOutcomes	After completingthis coursethe learnerswillbe able to • Successfully analyzed water quality and apply biosecurity protocols to prevent disease outbreaks. • Understand the major Indian Carps Rohu Catla and Mrigal, formulation of fish feed using different ingredients and live feed for aquaculture species. • Able to design of Aquaculture unit and setup of aeration, filtration, and biofiltration systems in aquaculture unit. • Train in fish harvesting and preservation of fish.	
Sr. No.	**Practical**	**Hours**
1	Study ofmajorIndian carpsRohu, Catlaand Mrigal.	4
2	Study ofideal designofaquacultureunit.	4
3	Setup ofaeration, filtration,and biofiltration systemsin aquacultureunit.(E)	4
4	WaterQualityAnalysis:MeasurementofpH, temperature(E).	4
5	Formulation offishfeedusing differentingredients(E).	4
6	Preparationof livefeed foraquaculturespecies.(E)	4
7	Estimation of dissolved oxygenoffish culture pond and normal water(E).	4
8	Estimation of freecarbon dioxide offishculture pond and normal water(E).	4
9	Estimation of Hardnessof fish culture pond and normal water(E).	4
10	Estimation of ammonia, nitrates, and nitritesby using ofwater testing kits(E).	4
11	Study ofpost-harvesthandling and processingtechniquesfor harvestingfish.	4
12	Study ofpreservationmethods in fish culture.	4
13	Studyofcommonfish diseasesand parasites.	4
14	Study ofimplementation ofbiosecurity protocolsto prevent diseaseoutbreaks.	4
15	Visittoaquacultureunit.	4
Study Resources	• Jingran, V. G. (1983). Fish and fisheries ofIndia,Hindustan pub. corp. New Delhi. • Hute, M. and Kahn,H.(2000). Textbook of fish culture, Blackwell ScientificPublication, Australia. • Srinivasulu,M., Reddy,K.R.S., Rao, S. (1999). Text book of Aquaculture, Discovery PublishingHouseNew Delhi.	

S.Y. B.Sc. Zoology (Major)
Semester IV
ZOO-FP-241: Field Project
Guideline for Field Projects

Credits : 2
Contact hours : 60

Preamble

In alignment with the National Education Policy (NEP) 2020, Moolji Jaitha College (Autonomous), Jalgaon is introducing the Field Project at the undergraduate level. The NEP 2020 emphasizes holistic development, inclusivity, and integrating vocational education with academic learning, aiming to nurture socially responsible individuals. This course fosters a strong connection between education and real-world applications. These initiatives aim to bridge the gap between theoretical knowledge and practical experience, helping students develop critical thinking, problem-solving skills, and a sense of civic responsibility.

Objectives

- To provide students with practical exposure in rural and urban socioeconomic context.
- To develop students abilities to apply subject knowledge to address real world problems
- To foster critical thinking and innovative approaches to solve socioeconomic issues.

Outcomes

After completing this course, students will be able to

- Participateactively in filed projects that benefit local communities and promote sustainable development practices.
- Analyse the socio economic data using appropriate methods showcasing improved problem-solving skills, technical proficiency.
- Demonstrate the ability to apply theoretical knowledge to real-world situations effectively and exhibit communication skills.

Course structure

The course is divided in to four probable phases

I] Orientation and preparation

- Introduce to the course, objectives and expectation
- Overview of socioeconomic development issues in rural and urban context
- Training on working methodology and data collection techniques
- Review existing literature related to topic to understand the background and context.

II] Work planand Field visit

- Visit the potential sites to get a sense of the environment and logistical requirements.
- Create a detailed project plan outlining the steps, timeline, resources needed, and roles of team members.
- Obtain necessary approvals (Ethical/ local authorities/organizations/communities)
- Gather materials and resources (recording devices, cameras, notebooks and supplies)
- Conduct Preliminary Survey, choose appropriate methods for data collection and analysis (e.g., surveys, interviews, observations).

III] Data collection and analysis

- Pilot test to identify issues with data collection.
- Collect data systematically, ensuring consistency and accuracy.
- Keep detailed records of all data (field notes, recordings, photographs etc)

- Organize and analyse the data (manual/ software)

IV] Interpretation and Reporting

- Interpret your findings in the context to objectives.
- Write and submit a comprehensive report detailing your methodology, findings, analysis, and conclusions. (Include visuals - charts, graphs, and photographs).
- Prepare a presentation to share findings with peers/ instructors/ community.

Assessment

- Field work participation, field note book, team work etc. (10 Marks)
- Data Collection and Analysis (15 Marks)
- Field project report (15 Marks)
- Presentation of Findings(10 Marks)

Examples of activities to be conducted under field projects

- **Biodiversity Survey**: Conduct a biodiversity survey in a local park or nature reserve, documenting plant and animal species.
- **Water Quality Testing**: Test water samples from different sources (e.g., rivers, lakes, groundwater) for pollutants and compare results.
- **Soil Analysis**: Collect soil samples from various locations and analyse their composition and quality.
- **Wildlife Tracking**: Use camera traps or tracking devices to monitor and study the behaviour of local wildlife.
- **Urban Heat Island Effect**: Measure and map temperature differences in various parts of a city.
- **Land Use Mapping**: Create maps showing different land uses in a region and analyze changes over time.
- **Cultural Heritage Documentation**: Document and analyze local cultural heritage sites or practices.
- **Community Interviews**: Conduct interviews with community members to understand social dynamics and traditions.
- **Ethnographic Study**: Participate in and observe community events to gather ethnographic data.
- **Crop Yield Analysis**: Study the factors affecting crop yield in different fields or under different farming practices.
- **Pest Management**: Investigate the effectiveness of various pest management techniques in local farms.
- **Sustainable Farming Practices**: Evaluate the impact of sustainable farming practices on soil health and crop productivity.
- **Community Needs Assessment**: Conduct surveys and interviews to identify the needs and concerns of a community.
- **Social Network Analysis**: Study the social networks within a community to understand relationships and influence.
- **Public Health Study**: Investigate public health issues in a community, such as access to healthcare or prevalence of diseases.
- **Infrastructure Survey**: Assess the condition and effectiveness of local infrastructure, such as roads, bridges, and buildings.
- **Renewable Energy Potential**: Evaluate the potential for renewable energy sources (e.g., solar, wind) in a specific area.
- **Water Management**: Study and improve local water management systems, including irrigation and drainage.
- **Literacy Program Evaluation**: Evaluate the effectiveness of local literacy programs and suggest improvements.

- **Educational Resource Assessment**: Assess the availability and quality of educational resources in local schools.
- **Market Analysis**: Conduct a market analysis for a local business or industry.
- **Entrepreneurship Project**: Develop a business plan for a local entrepreneurial venture
- **Local History Documentation**: Research and document the history of a local site, building, or community.
- **Oral History Project**: Conduct interviews with local residents to collect oral histories and preserve community memories.
- **Archival Research**: Explore local archives to uncover historical documents and artifacts related to a specific topic or period.
- **Community Mural**: Design and create a mural in collaboration with community members that reflects local culture and history.
- **Public Art Installation**: Develop and install a public art project that engages the local community.
- **Art Exhibit Curation**: Curate an exhibit featuring works by local artists, highlighting themes relevant to the community.
- **Music Documentation**: Record and document traditional or contemporary music from the local area.
- **Community Concerts**: Organize and perform in community concerts that showcase local musical talent.
- **Community Theatre Production**: Develop and produce a play that involves community members as actors and crew.
- **Site-Specific Theatre**: Create a theatrical performance that takes place in a non-traditional venue, such as a historic site or public space.
- **Cultural Mapping**: Map cultural resources and heritage sites within the community and analyze their significance.
- **Festival Documentation**: Document and analyze local festivals or cultural events, exploring their history and impact.
- **Ethnographic Study**: Conduct an ethnographic study of a particular cultural practice or community group.
- **Public Philosophy Discussions**: Organize and facilitate public discussions on philosophical topics relevant to the community.
- **Community Documentary**: Create a documentary film about a local issue, event, or group.
- **Digital Storytelling**: Develop digital storytelling projects that capture and share local stories.
- **Language Survey**: Conduct a survey of languages spoken in the community and analyze patterns of language use and change.
- **Dialect Study**: Study and document local dialects or accents, exploring their features and origins.
- **Language Preservation**: Work with community members to document and preserve endangered languages or dialects.
- **Gentrification Impact Study**: Examine the effects of gentrification on local communities, including displacement and economic changes.
- **Crime and Safety Analysis**: Study crime patterns and perceptions of safety within a community.
- **Ritual and Festival Study**: Participate in and document local rituals or festivals to understand their social and cultural significance.
- **Migration Patterns Study**: Analyze migration patterns and their effects on both the sending and receiving communities.
- **Food and Culture Study**: Investigate the role of food in cultural practices and social interactions within a community.
- **Local Governance Analysis**: Study the structure and functioning of local government and its impact on the community.
- **Political Participation Study**: Analyze patterns of political participation and engagement within a community.

- **Public Policy Impact Assessment**: Evaluate the impact of specific public policies on local communities.
- **Election Study**: Analyze voting behavior and patterns in local elections.
- **Mental Health Survey**: Conduct surveys to assess the mental health needs and resources in a community.
- **Social Behavior Observation**: Observe and analyze social behaviors in public spaces, such as parks or markets.
- **Stress and Coping Study**: Investigate sources of stress and coping mechanisms within a community.
- **Community Support Systems**: Study the role and effectiveness of community support systems and networks.
- **Youth Development Programs**: Evaluate the impact of youth development programs on community wellbeing.
- **Educational Equity Study**: Assess disparities in educational resources and outcomes in local schools.
- **Parent and Teacher Interviews**: Conduct interviews to understand perceptions of educational quality and challenges.
- **After-School Program Evaluation**: Evaluate the effectiveness of after-school programs in supporting student development.
- **Educational Attainment Study**: Analyze factors influencing educational attainment in a community.
- **Local Economy Analysis**: Study the structure and dynamics of the local economy, including key industries and employment patterns.
- **Small Business Survey**: Conduct surveys of local small businesses to understand their challenges and successes.
- **Economic Impact of Events**: Analyze the economic impact of local events or festivals on the community.
- **Income Inequality Study**: Investigate patterns and causes of income inequality within a community.
- **Housing Affordability Analysis**: Study housing affordability issues and their impact on residents.
- **Gender Roles and Expectations**: Study gender roles and expectations within a community and their impact on individuals.
- **Women's Health Study**: Investigate issues related to women's health and access to healthcare.
- **Gender-Based Violence Survey**: Conduct surveys to understand the prevalence and impact of gender-based violence.
- **Workplace Equality Study**: Analyze gender equality in local workplaces, including pay equity and job opportunities.
- **Urban Development Projects**: Study the impact of urban development projects on local communities.
- **Public Space Usage**: Analyze how public spaces are used and perceived by different community members.
- **Transportation Study**: Investigate transportation needs and challenges within a community.
- **Green Space Analysis**: Study the availability and usage of green spaces in urban areas and their impact on residents.