SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

THREE YEAR UNDERGRADUATE PROGRAMME

B.Sc. ZOOLOGY (NEP)

LEVEL – 4.5

FACULTY: SCIENCE AND TECHNOLOGY

(Courses effective from Academic Year 2024-25)

SYLLABUS

THREE YEAR UNDERGRADUATE PROGRAMME
B.Sc. ZOOLOGY under FACULTY: SCIENCE AND TECHNOLOGY
Board of Studies in Zoology (Including Apiculture)

Dhote Dr. Jayashri Dipak (Chairman) Shri Shivaji Science College Amravati.	Gadhikar Dr. Yashashri A. G.V.I.S.H. Amravati
Joshi Dr. Pravin Purushottam Amolkachand Mahavavidyalaya, Yeotmal.	Kale Dr. G.B. G.S. Science Arts, Commerce College, Khamgaon, Dist. Buldhana.
Nandurkar Dr. Sou. H.P. Head Deptt. Of Zoology , SGBAU Amravati.	Makode Dr. P.M. Shri. Dr. R.G. Rathod Arts and Science College, Murtizapur, Dist. Akola
Patil Dr. P.S. R.A. Arts, Shri M.K. Commerce and S.R. Rathi Science College, Washim.	Sapkal Dr. Hemant P. Shri Shivaji Arts, Commerce and Science College, Akola.
Zilpe Dr. Suvarna K. Smt. Radhabai Sarda Arts, Commerce College and Science College, Anjangaon Surji Dist. Amravati.	Bobade Dr. Atul D. Department of Zoology Shri Shivaji Science College, Nagpur.
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Karlekar Dr. Mangla B. Bhamburkar Niwas, Old Biyani Square, Camp Amravati.	Virani Dr. Ramzan S. Karimbad Housing Society, Pandharkawada, Dist. Amravati.

Sant Gadge Baba Amravati University, Amravati

Structure of 3 /4 Year under Graduate Degree Program in Zoology Discipline In the faculty of Science & Technology (Science Group) applicable to Non-autonomous affiliated colleges.

Table 2: Credit Distribution over Six Vertical for Zoology Discipline.

Vertical	Vertical Type		Semester							Total Credits	Grand Total
			I	II		III	IV	V	VI		
	(i) Three-year UG Degree Programme (Level 4.5.to 5.5)										
a	**Major - Zoology** (DSC) **60-64** (Minimum 50% of Total Credits)		2+2 (4)	2+2 (4)	**Major** Mandatory	4+2 (6)	4+2 (6)	6+4 (10)	4+4 (8)	22+16 (38)	**48**
					IKS (Subject Specific)	2	0	0	0	2	
					Elective	0	0	2+2 (4)	2+2 (4)	4+4 (8)	
b	**Minor - Zoology** (from same facultyof DSC) **18-20**		2+2 (4)	2+2 (4)	**Minor**	2+2 (4)	2+2 (4)	2+2 (4)	2+2 (4)	12+12 (24)	**24**
c	**Generic/ Open Elective Courses (OE)** (faculty wise Basket Other than faculty of Major/Minor Subject) **10-12**		4	4		2	2	0	0	12	**12**
d	**(i)Vocational Skill Courses (VSEC)** corresponding to Major - **Zoology** (Skill based/ Advance Practicals wherever applicable) **8-10**		0	2		2	2	2	2	10	**10**
	(ii) Skill Enhancement Courses SEC (Basket of skill courses approved by the University) **6**		2	2		0	2	0	0	6	**6**
e	**(i)Ability Enhancement Courses** (AEC)- Focus: Linguistic & Communication Skills (Eng.+ Modern Indian Language) **8**		2	2		2	2	0	0	8	**8**
	(ii)Indian Knowledge System (IKS)2 (Generic)		2	0		0	0	0	0	2	**2**
	(iii)Value Education Courses (VEC) *Understanding India, EVS, Digital & Technological Solution*. **4**		2	2		0	0	0	0	4	**4**
f	**(i) Internships/ Apprenticeship** corresponding to Major - **Zoology OJT 8**		0	0		0	0	0	4	4	**4**
	(ii)Field Projects/Community Engagement & Service(CEP) corresponding to Major -Zoology **4-6**		0	0		2	2	2	0	6	**6**
	(iii) Co-curricular courses (CC) (health & wellness, yoga education, sports, fitness, cultural activities, NSS/NCC & Fine/ Applied/ Visual/ Performing Arts **8**		2	2		2	2	0	0	8	**8**
	Total Credits		**22**	**22**		**22**	**22**	**22**	**22**	**132**	**132**
	(ii) Four-year UG Degree programme (Level 6.0) A. Honors Degree in Major and Minor										
	Vertical Type				**Semester VII**				**Semester VIII**		
	Major (Offered at Three yearUG Programme)	**Mandatory**			**12-14 (2*4+2*2 or 3*4+2)**				**12-14 (2*4+2*2 or 3*4+2)**		**28**
		Elective			4				4		**8**
	Research Methodology (RM)				4				0		4
	On the Job Training (OJT)				0				4		4
	Total				**22**				**22**		**44**
	Cumulative								**176**		
					(132+44)						
	(ii) Four-year UG Degree Programme (Level 6.0) B. Honors with Research Degree in Major and Minor										
	Vertical Type				**Semester VII**				**Semester VIII**		
	Major (Offered at Three yearUG Programme)	**Mandatory**			8-10 (2*4+2 or 2*4)				8-10 (2*4+2 or 2*4)		20
		Elective			4				4		8
	Research Methodology (RM)				4				0		4
	Research Project (RP)				4				8		12
	Total				**22**				**22**		**44**
	Cumulative								**(132+44) 176**		

Faculty: Science & Technology (Science Group)
(Teaching and Learning Scheme: B.Sc. - Zoology with Minor ----------)
(Three Years- Six Semesters Bachelors Degree Programme)
FIRST YEAR: SEMESTER – I

Mode of Teaching	Vertical Number	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical)/ Outdoor / Field	a.	Major (Zoology)	Theory1	133201	Fundamental Biology of Invertebrates	2	2	6
			Lab/Practical 1	133202	Practical based on Theory 1	2	4	
	b.	Minor (Other subject in combination with Zoology)	Theory1	-----	Theory/Courseof Other Subject in combination with Zoology.	2	2	6
			Lab/Practical 2	-----	Practical basedon Theory 1 of other subject in combination with Zoology.	2	4	
	c.	Generic/ Open Elective (other than Science & Technology faculty)	Theory1	133203	From basket of open elective	2	2	4
			Theory2	133204	From basket of open elective	2	2	
	d.	VSC	----	----	----	---	---	4
		SEC	Lab/Practical 3	133205	Skill oriented practical on Major-Zoology	2	4	
	e.	AEC - English	Theory	-	--	1	1	6
		AEC –MIL	Theory	-	--	1	1	
		IKS-Generic	Theory	-	--	2	2	
		VEC	Theory	-	--	2	2	
	f.	CC	Outdoor	-	Course on health & wellness, yoga education, sports, fitness, cultural activities, NSS /NCC & Fine/ Applied/ Visual/ Performing Arts.	2	4	4
		TOTAL				**22**	**30**	**30**

Note:

a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. However, for Music Discipline the batch size shall be of 7 students. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.

b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).

c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.

d. Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.

e. Value Education Courses to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.

f. Generic / Open Elective Courses (GE/OE): Courses to be selected from the Basket of Courses provided by the University

g. Abbreviations: Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory : Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language

Examination and Assessment Process:

i. The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.

ii. Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.

iii. For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative (evaluation of students learning at the end of an instructional unit) examination modes in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019).

Examination, Evaluation and Assessment Scheme

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination.

Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in Teaching Learning Scheme prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table –

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
a	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	--	--	--	--	--	--
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	50	20	50	20	--	--	50	20	50	20
	SEC	Internal	--	--	50	20	50	20	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
f	Internship/ Apprenticeship	Internal	Assessment of these verticals shall be based on various activities/practices. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process shall be prescribed separately.											
	FP/CEP													
	CC													

Continuous Assessment Tests (CAT)

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under-

i. Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
   - First on completion of 25% Syllabus of the course or on completion of 25 teaching days,
   - Second on completion of 50% Syllabus of the course or on completion of 50 teaching days,
   - Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.

ii. Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.

iii. Total Performance in CAT (i.e. 40 %) shall be based on the best two out of three in CAT examinations

iv. Internal assessment shall be carried out by the respective course teacher by choosing variety of assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

Conduction of the Examination:

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.

The theory/practical examinations of all the Semesters shall be held as per the following Schedule –

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination.

1. The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should be communicated to the University before commencement of the practical examination. The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.
2. The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
3. An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
4. Provided that the student shall be eligible to appear for examination if -
   a. He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time.
   b. He/she has prosecuted a regular course of study in a university department/college affiliated to the University.
   c. He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
5. The provisions of Ordinance No. 6 and Ordinance No. 9 shall be mutatis-mutandis applicable to every collegiate/non-collegiate student.
6. The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

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Additional Instructions to the Paper Setters
BSc Zoology as per Scheme under NEP 2020

1. The duration of University theory examination shall be of Two hours or appropriate hours as prescribed in the syllabus/curriculum of the pertinent course
2. The Maximum Marks for the Question Paper shall be 30
3. The Question Paper shall consist of Short Answer type (60%) and Long Answer type (40%) questions.
4. Examiner shall set Long answer type Questions and Short Answer type Questions as specified in the following Table or as applicable as per the curriculum.
5. There shall be internal choice for Short-Answer type Question and Long Answer type Question for every Unit.
6. The Question paper should be set based on the Course Outcomes (COs) defined in the curriculum and setter shall ensure that all the outcomes are addressed through appropriate questions. Read and study the Course Outcomes of a paper/subject/course very carefully.
7. The Questions should help to measure attainment of their corresponding Course Outcomes as prescribed in the syllabus/curriculum. All questions must be mapped to their related Course Outcomes.
8. Questions paper should try to address the different levels of learning (Bloom's Taxonomy) i.e. Knowledge/Remembering, Understanding, Applying, Analysing, Evaluating and Creating
9. All Units mentioned in the course should be covered with equal weightage. The question paper shall be set so as to cover the entire syllabus of the respective course (paper).
10. The degree of difficulty of the question paper should be such that a student, who has engaged himself in the continuous learning process should be able to clear with ease. However, for scoring further his all-round knowledge and skills should be tested.
11. Model Solutions/answers to the short answer type questions and long answer type questions and scheme of marking for all question shall be submitted along with the question paper in a separate envelope.
12. Please ensure that the total marks for a course/subject/paper amounts to the prescribed total as notified in the scheme/curriculum. The total number of marks available for each question and each part of a question should be shown in the mark scheme and must tally with the marks shown on the question paper.
13. Avoid Questions like "Write short notes on …"
14. The question paper should be precise and should be designed such that the questions:
    a) are unambiguous
    b) are asked for appropriate marks
    c) The questions should be serially numbered as 01, 02, 03, 04, 05, 06 etc.
    d) Sub-questions, if any, shall be numbered as A,B,C,D,… continuously for all Units
    e) It must be ensured that all questions are from within the prescribed syllabus
    f) The paper setters should specify whether any Charts, Graphs, Tables, Codes, Books etc. are to be provided to the students. The use of which shall be permitted during the actual conduct of the examination.
15. For Short-Answer type Questions, ensure that:
    - the item calls for a single, brief answer
    - the item has been written as a direct question

- the desired response is related to the main point of the item
- clues to the answer have been avoided (e.g. “a” or “an”, length of the blank)
- the units and degree of precision is indicated for numerical answers.

16.For Long Answer type questions, make sure that:

- questions starting questions with “who”, “what”, “when”, “where”, “name”, “list” are avoided as these terms limit the response.
- questions must follow Bloom’s taxonomy with inclusion of following levels:

Table 2. Distribution of Marks amongst Question paper

<table>
<tr><th>Total marks of Theory Paper</th><th>Marks for Long + Short Answer</th><th>Distribution of Unit wise Long/Short Answer type Questions</th></tr>
<tr><td rowspan="2">30</td><td rowspan="2">12 + 18</td><td>1. Compulsory Question: Two One Sentance Questions Based on All Four Units, Total Eight Questions carrying 01 Mark Each out of with Compulsory 6 Questions to solve.

2. Questions with Internal Choice of All Four Units:

a. Long Answer: on any Two Units
Long Questions of Maximum Marks 6 with internal Choice on any Two Units as per the choice of Paper setter.

b. Short Answer: on any Two Units
Short Questions of Maximum 3 Marks with Internal Choice on any Two Units as per the choice of Paper setter.</td></tr>
<tr><td>Q1: 6 Marks Based on All Units (Two Questions on Each Unit)
Q2: 6 Marks Unit I
Q3: 6 Marks Unit II
Q4: 6 Marks Unit III
Q5: 6 Marks Unit IV</td></tr>
</table>

Note: For a unit, an identical pattern of long and short answer shall be adhered for internal choice, that is ‘either-or’ questions shall be in same pattern.

Table 3: Model Question Paper Pattern

Sr. No of Questions	Questions	Marks allotted to each Question
	B.Sc. (Zoology) Semester Examination NEP -2020 **Paper Title As per Curriculum** **Time: Two Hours** **Total marks: 30** **N.B.:** 1. Question No 1 is compulsory 2. Draw well labelled diagrams whenever necessary. 3. Students may use various colors to signify answers.	
Q1:	**Write answers in One Sentance: (Solve any Six)** [Set two questions on each unit (out of total Four units). Students should solve any six questions out of eight and each question carry one mark] i. ------- ii. ------- iii. ------- iv. --------- v. --------- vi. ---------- vii. ---------- viii. ----------	**Max. Marks** (1x6) = **0 6**
Q 2:	**Answers in short (Any Two of the Following)** [Paper Setter shall set Four Questions on Unit decided for Short Type Questions carrying 3 Marks Each. Students should solve any Two Questions out of Four] **a)** ---------- **b)** ---------- **c)** ---------- **d)** ----------	06 Marks (3x2)= 06
Q 3:	**Explain in detail (Any One of the following)** [Paper Setter shall set Two Questions on Unit decided for Long Type Questions carrying 6 Marks Each. Students should solve any One Questions out of Two] **e)** ---------- **f)** ----------	6 Marks (1x6) = 06
Q 4:	**Answers in short (Any Two of the Following)** [Paper Setter shall set Four Questions on Unit decided for Short Type Questions carrying 3 Marks Each. Students should solve any Two Questions out of Four] **g)** ---------- **h)** ---------- **i)** ---------- **j)** ----------	06 Marks (3x2)= 06
Q 5:	**Explain in detail (Any One of the following)** [Paper Setter shall set Two Questions on Unit decided for Long Type Questions carrying 6 Marks Each. Students should solve any One Questions out of Two] **k)** ---------- **l)** ----------	6 Marks (1x6) = 06

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	**I**	**133201**	**Fundamental Biology of Invertebrates**	**2**	**30**	**2 Hrs**	**30**

Course Objectives:	After this course, students will be able to • Classify Invertebrates animals. • Understand the differences among Invertebrate Phyla • Recite the taxonomy and hierarchy of Invertebrates
Course Outcome:	• Students will be able to understand and have basic knowledge of Animal Kingdom, Animal Diversity and its Classification. • The students should gain insights of the concept of Invertebrate animals starting from protozoa to Echinodermata • Students will understand the concept of evolution from single cell organism to multicellular organism • Students will understand the functions performed by the Invertebrates animals.

Unit	Contents	Workload Allotted	Weightage of Marks Allotted
Unit I	**General Classification and Protozoa** 1.1 Introduction to Non-Chordata 1.2 General characters of Phylum and Outline classification up to Classes. 1.3 Protozoa: Salient features with some examples 1.4 Locomotion and nutrition in Protozoan 1.5 *Plasmodium vivax* and its life cycle 1.6 Parasitic protozoan	8 Hrs	8 Marks
Unit II	**Porifera and Coelenterata** 2.1 Origin of Metazoa : Porifera- Salient features with some examples 2.2 Canal system and skeleton system in sponges 2.3 Coelenterate: Salient features with some examples 2.4 Polymorphism and Alternation of generation in Coelenterates 2.5 Corals and Coral reef with economic importance 2.6 Regeneration in Hydra	7 Hrs	7 Marks
Unit III	**Helminthes and Annelids** 3.1 Helminthes: Salient features with some examples 3.2 Parasitic adaptations in helminthes 3.3 Helminthic diseases. 3.4 Annelids: Salient features with some examples 3.5 Coelom: Types and significance 3.6 Metamerism and its significance	8 Hrs	8 Marks
Unit IV	**Arthropods, Mollusca and Echinodermata** 4.1 Arthropods: Salient features with some examples and phylognetic importance of Peripatus and Limulus 4.2 Mimicry and Luminescence in arthropods 4.3 Parasitic adaptation in arthropods (Flies, ticks, mites) 4.4 Mollusca: Salient features with some examples , Phenomenon of Torsion and Pearl formation 4.5 Echinodermata: Salient features with some examples 4.6 Water vascular system in star fish	7 Hrs	7 Marks

References:	1. Hickman, C.P. Jr.F.M. Hickman and L.S.Roberts, Integrated principles of Zoology Mosby College publication St.Louis. 2. Ayyar, E.K. and T.N.Ananthakrishnan, Manual of Zoology Vol.I (Invertebrata), Part-I & II S. Viswanathan (Printers and Publishes) Pvt. Ltd. Madras. 3. Jordan, E.L. and P.S.Verma Invertebrate Zoology, S.Chand and Co., Ltd. Ram Nagar, New Delhi. 4. Parker and Haswell, Text book of Zoology, Vol. I (Invertebrata), A.Z.T.B.S. Publishers and Distributors, New Delhi – 110051. 5. Waterman, Allyn J. etal., Chordate structure and Function, Mac Millan and Co Newyork. 6. S.N.Prasad : Text Book of Invertebrate Zoology. 7. Vishwanathan : Invertebrate Zoology. 8. Majpuria : Invertebrate Zoology. 9. Dhami and Dhami : Non-chordate Zoology. 10. Baini Prasad: Indian Zoological memoir. Pila. 11. R.L.Kotpal : Modern Text Book of Invertebrate Zoology. 12. Malviya M.K. Invertebrate Zoology, by Rajdhool publications. 13. Bhamrah H.S.and Kavita Juneja A text book of Invertebrate Zoology, Anmol Publication Pvt. Ltd,. New Delhi. 14. Barnes R.D. Invertebrate Zoology - (W.B. Saunders Co.)

Examination, Evaluation and Assessment Scheme

1. External Theory -- 30 Marks
2. Internal- 20 Marks

Distribution of Internal Marks

1. Continuous Assessment Test (Best 2 out of 3 tests)	----------	10 Marks
2. Report of Seminar / Field visit/ Case study/ Any innovative method	-----	10 Marks
Total ----------		20 Marks

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	**I**	**133202**	**Practical based on Theory 1 Major-Zoology**	**2**	**60**	**4 Hrs**	**50**

Lab/ Practical 1	1. Microscope and its Practical use- Dissecting Microscope, Compound microscope and Research Microscope. 2. Study of Slides and Museum Specimens- Paramecium, Plasmodium vivax, Sycon, Euspongia, Euplectella, Obelia, Hydra, Aurelia Taenia solium, Ascaris, Leech, Aphrodite, Nereis, Palaemon, Scolopendra, Limulus, Peripatus, Pila, Octopus, Sea Urchin, Sea cucumber and Aster. 3. Preparation of Permanent Stained slides- Examination of some free living and parasitic protozoans-- Paramecium, Vorticella. Salivary gland of cockroach, Mouth parts of cockroach, Trachea of cockroach 4.Study of Prepared Slides- *Entamoeba histolytica*, Monocystis, Paramecium, Sycon :L.S., Hydra : T.S. passing through Body Plan, Obelia : Medusa, *Taenia solium* : Scolex, Leech : T.S. passing through Crop with Diverticula, Leech: Nephridium, Pila: L.S. Osphradium, Culex: Larva, Anopheles: Larva, Starfish : T.S. of Arm, Asterias : Bipinnaria Larva 5. Dissections- (Only By using charts/ICT tools) Leech- Alimentary canal, Pila- Nervous System, Prawn- General Anatomy, Star Fish- Water vascular system. 6. Study of Zooplankton from any nearby water body and submit report / Study of Diversity, Mimicry and camouflage phenomenon in Arthropods in the surrounding area and submit report.

- **Distribution of Marks:**

Practical External (25 Marks)		**Practical Internal (25 Marks)**	
Dissection (Labeling of diagram only- Any one)	05 Marks	Student performance and Attendance during regular practical	10 Marks
Spotting (Point no.2 and Point no. 4- Any five)	10 Marks	Certified Practical Record	05 Marks
Preparation of Permanent Slide (Any one)	05 Marks	Submission of Report	05 Marks
Viva-voce	05 Marks	Use of ICT	05 Marks
Total	**25 Marks**	**Total**	**25 Marks**

FOR BASKET (GOEC-1):

For Students of SEM-I of the program other than Science & TechnologyFaculty.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	133203	Economic Zoology	2	30	2 Hrs	30

Course Objectives:	After this course, students will be able to • 1. Deals with animal world that is associated with the economy, health and welfare of humans • 2. Achieving sustainable development. • 3. Economic and rural development with the help of animals
Course Outcomes:	• The course is designed to develop in student a basic understanding of the functioning of an economic aspects of Zoology. • Students will be able to describe and assess ecological role of insects and various methods of pest control. • Students will be able to discuss strategies for Vermicompost, Prawn culture, Pearl culture

Unit	Contents	Workload Allotted	Weightage of Marks Allotted
Unit I	**Vermicompost** 1.1Introduction of Vermiculture and Vermicomposting. Vermiculture techniques. 1.2 Bedding, Essential parameters for Vermiculture and Management 1.3 Methods of Harvesting (Manual & Mechanical). 1.4 Economic Importance of Vermiculture.	8 Hrs.	8 Marks
Unit II	**Integrated Pest management (IPM)** 2 .1 Categories of insect pests and diseases, IPM: Introduction, history, Importance, concepts. 2.2 Principles and tools of IPM, Economic importance of insect pests. 2.3 Methods of detection of insect pest and diseases. 2.4 Methods of control: Host plant resistance, mechanical, physical, biological and chemical control	7 Hrs.	7 Marks
Unit III	**Prawn culture** 3.1 Introduction to Freshwater Prawn Culture, Life cycle of freshwater prawns 3.2 Prawn Pond Preparation and Management, Prawn Seed Collection and Hatchery Management 3.3 Prawn Feeds and Feeding Management, Nutritional requirements of freshwater prawns.	8 Hrs.	8 Marks

Unit IV	**Pearl Culture** 4.1 Morphology and anatomy of Pearl oyster, the Life cycle of pearl oyster. 4.2 Process of Pearl formation. Natural Process of Pearl formation. 4.3 Chemical composition of Pearls. 4.4 Economic importance of pearls. Pearl oyster culture Techniques of pearl Oyster culture (Fresh water and Marine water) for artificial production of pearls. 4.5 Pearl culture Economy, Diseases and Predators of Pearl oysters Present status, prospects and problems of pearl industry in India.	7 Hrs.	7 Marks
References:	1. Applied Entomology. Vol. I & II. K. P. Srivastava. Kalyani Publication, Ludhiana. 2. Principles of Insect Pest Management. G. S. Dhaliwal and Ramesh Arora, Kalyani Publications, Ludhiana. 3. A Text Book of Entomology, 1974. V. K. Mathur and K. D. Upadhayay, Goel Printing Press, Barani. 4. Modern Entomology by .D.B Tembhare , Himalaya Publishing House 5. A Text Book of Animal Husbandry, C. C. Banerjee, Oxford and IBH, Publish Co. 6. Pearl Culture by Dr. A. V. Suryawanshi, Iterative International Publisher IIP.		

Examination, Evaluation and Assessment Scheme

1. External Theory -- 30 Marks
2. Internal- 20 Marks

Distribution of Internal Marks

1.	Continuous Assessment Test (Best 2 out of 3 tests) ----------	10 Marks
2.	Report of Seminar / Field visit/ Case study/ Any innovative method -----	10 Marks
	Total ----------	**20 Marks**

FOR BASKET (GOEC-2):

For Students of SEM-I of the program other than that of Science &Technology Faculty

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	I	133204	Wildlife Ecotourism	2	30	2 Hrs	30
Course Objectives:		After this course, students will be able to • Learn about to enable tourist to enjoy nature without causing any disturbances • Discuss economic development and wild life conservation • Learn about flow of the people keeps the poachers at bay from killing the valuable animals.					
Course Outcomes:		• Students should acquire the knowledge of ecotourism relating to concept, history, scope, components and principles. • They are getting deep information about types of ecotourism. The course helps to know about wildlife, National parks, sanctuaries and the list of activities carried out for the tourist. • After completing this course students are having a deep knowledge of ecotourism places and wildlife destinations.					

Unit	Contents	Workload Allotted	Weightage of Marks Allotted
Unit I	**Introduction to Ecotourism** 1.1 History and scope of ecotourism 1.2 Components of ecotourism 1.3 Principles and characteristics of ecotourism 1.4 Resources and products of ecotourism 1.5 Commercialization of ecotourism	8 Hrs	8 Marks
Unit II	**Types of Ecotourism** 2.1 Agro-ecotourism (Ethnic and Farm tourism) 2.2 Geo- ecotourism 2.3 Cultural & Pilgrimage tourism 2.4 Island and beach tourism (Mangrove, Back water & Wetland Tourism) 2.5 Wildlife tourism	8 Hrs	8 Marks
Unit III	**Wildlife Tourism Concepts and Range Of Activities** 3.1 Scope and importance of wildlife tourism in India 3.2 General Wildlife Watching and Viewing by Safari, Trekking and Trails 3.3 Important National Parks and Sanctuaries in wildlife tourism 3.4 Visit to special places : Protected areas, Endemism and	7 Hrs	7 Marks

	biodiversity hotspots 3.5 Special Interest Tourism : Bird Watching ,Visiting Zoos and Aquaria–Recreational Fishing		
Unit IV	**Economic aspects, Present scenario & Future prospects in Wildlife Tourism** 4.1 Global Market Size of Wildlife Tourism 4.2 Impacts of Wildlife Tourism–Positive Impacts and Negative Impacts 4.3 Ecotourism industry and its stakeholders 4.4 Ecotourism potential of India 4.5 Economic aspects of ecotourism: special resources, carrying capacity, required investment, role of public sector, employment impact, etc.	7 Hrs	7 Marks
References:	1. Barkal and Mclik, Tourism–Past , Present and Future, London. 2. Buckley, R. (2003). Case studies in ecotourism. Cambridge: CABI. 3. Buckley, R. ed. (2004). Environmental impacts of ecotourism. Oxfordshire: CABI. Bulbeck, C. (2005). Facing the wild : ecotourism, conservation, and animal encounters. 4. Ceballos-Lascurain, H. (1996). Tourism, ecotourism, and protected areas. Gland: IUCN 5. Diamantis, D. (2004). Ecotourism: Management and Assessment, London: Thomson. 6. Fennell, D.A. (1999). Ecotourism: an introduction. London: Routledge. 7. KaulR.M. Dynamics of Tourism–A Triology, Vol.1, New Delhi. 8. Lindberg, K. and D.E. Hawkins. (eds). (1993). Ecotourism: a guide for planners and manager s. North Benninton: The Ecotourism Society. 9. Page, S.J. and R.K. Dowling. (2002). Ecotourism. New York: Prentice Hall. 10. Seth, Pran Nath, Successful Tourism Practices, Vol 1, New Delhi. 11. Wearing, S. and J. Neil. (1999). Ecotourism: impacts, potentials, and possibilities. Oxford: B utterworth-Heinemann. 12. Weaver, D. (2001). Ecotourism. Milton: John Wiley & Sons.		

Examination, Evaluation and Assessment Scheme-

1. External Theory -- 30 Marks
2. Internal- 20 Marks

Distribution of Internal Marks

1. Continuous Assessment Test (Best 2 out of 3 tests) ---------- 10 Marks
2. Submission of Project (Any type of ecotourism spot in India) ---------- 05 Marks
3. Field visit report ---------- 05 Marks

(Tourist Place/ National park/Sanctuary/Biodiversity hotspot)

Total 20 Marks

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	**I**	**133205**	**Skill based practical on Major- Apiculture (Bee Keeping) I**	**2**	**30**	**2 Hrs**	**50**

Course Objectives:	After this course, students will be able to • To know the purpose of acquiring bee products like beeswax, honey, royal jelly • Maintaince of bees belonging to the different species of bees
Course Outcomes:	After successful completion of the course, the students will be able to: • The objective of this course is to know the basic concepts of beekeeping by undergraduate students, and beginners. • Articulate the basic concept of Apiculture, its importance, history and present status. • Describe the taxonomy, morphological sex differences in pupa, larvae and adult of honey bee. • Differentiate between different life stages of honey bee and explain their life cycle. • Demonstrate and discuss the culture methods of Apis species. • The knowledge gained by the students can be utilized in the field or even to start their own enterprise after completion of the course.
Lab/ Practical 3 133205	**Laboratory Practical's:** 1. History and importance of apiculture 2. The systematic position of bees and their classification. 3. Study of habit, habitat and nesting behaviour of *Apis dorsata, Apis indica, Apis florea*, and *Apis mellifera* . 4. Life cycle of the honeybee. 5. Colony organization and division of labour of honey bee, 6. Study of mouth parts, appendages, pollen basket and sting apparatus of worker bee. 7. Study of structure of Different Beehives or Honeycomb. 8. Bee language and communications. 9. A visit to an Apiary or Bee Research and Training Institute.
Reference Books:	1. Anatomy of Honey bee R.E. Snodgrass. 2. Bees and Bee keeping in India, D.P. Abrol, Kaluani Publications. 3. First Lesson in Beekeeping : Dadant C.D. Malilton, Illinois. 4. Beekeeping in Integrated Mountain Development - Economics & Scientific perspective Publication. 5. Beekeeping- Teach yourself Books, By-Vernon F.(1984) 6. The hive & the Honey Bee- 1975, 4th edition Dadant Publication, America. 7. Bees their vision, chemical senses & language-1950, Cornel University Press- By Fon firsh, & Karl. 8. Honey bee Biology 1982- By Free Johnson & Central Association of Bee Keepers England. 9. The Social Behaviour of the Bees, 1974 : By Missioner C.D. 10. Beekeeping in India, 1962,82, Sardar singh, ICAR, New Delhi. 11. Beekeeping by E.F.Phillips. Agrobios (India) Publication. 12. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios. 13. ABC & XYZ of Bee Culture (40th Edition) 1982, R.A.Morme and K.Flattum, A.I.Root & Co., 623, W. Liberty St. Medina, Dhid, 44336, USA.

Note: Mode of Examination: Internal (There is no External Examination)

Evaluation of Practical Marks	Marks
Submission of Project (Any type of Culture)	20
Visit to Apiculture (Submit Report)	10
Seminar (PPT Presentation)	10
Attendance	05
Overall Performance and Participation	05
Total Marks-	**50**

FIRST YEAR: SEMESTER – II

Mode of Teaching	Vertical Number	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical) / Outdoor / Field	a.	Major (Zoology)	Theory 2	133206	Fundamental Biology of Chordates	2	2	6
			Lab/Practical-4	133207	Practical based on Theory 2	2	4	
	b.	Minor (Other subject in combination with Zoology offered at Sem-II)	Theory 2	-----	Theory 2 of other subject in combination with Zoology offered at Sem-II	2	2	6
			Lab/Practical-5	-----	Practical based on Theory 2 of other subject in combination with Zoology offered at Sem-II	2	4	
	c.	Generic/ Open Elective (other than Science & Technology faculty)	Theory 3	133208	From basket of open elective	2	2	4
			Theory 4	133209	From basket of open elective	2	2	
	d.	VSC	Lab/Practical-6	133210	Advance practical on Major (Zoology)	2	4	8
		SEC	Lab/Practical-7	133211	Skill Oriented practical on Major (Zoology)	2	4	
	e.	AEC English	Theory	-		1	1	4
		AEC –MIL	Theory	-		1	1	
		VEC	Theory	-		2	2	
	f.	CC	Outdoor	-	Course on health & wellness, yoga education, sports, fitness, cultural activities, NSS/NCC & Fine/ Applied/ Visual/ Performing Arts.	2	4	4
		TOTAL				**22**	**32**	**32**

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration
4.5	II	133206	Fundamental Biology of Chordates	2	30	2 Hrs
Course Objectives	After this course, students will be able to • To enlighten the concepts of diversity, adaptations, organization and taxonomic status of chordates. • Understand systemic physiology of chordate. • To discuss the affinities and adaptations of chordates to different modes of life.					
Course Outcomes	• Students are having a complete knowledge of classification of chordates. • They should be able to describe general characters and unique features of hemichordates, Urochordata, cephalochordates and Cyclostomata. • They should know the orders of fishes, their known features. Students have enough ideas about origin, characters and development of Amphibia with well-known features i.e. parental care. • They are easily distinguished between poisonous and non-poisonous snakes and their role.					

Unit	Contents	Workload Allotted	Weightage of MarksAllotted
Unit I	**General Classification of Chordata** 1.1 Introduction to Chordates: General Characters 1.2 Classification outline of Chordates up to Classes. 1.3 Hemichordata: General characters and affinities. 1.4 Urochordata: General characters and Metamorphosis in Ascidia 1.5 Cephalochordata: General characters, Excretory organ and gonads in Amphioxus 1.6 Cyclostomata- General Characters and affinities	8 Hrs	8 Marks
Unit II	**Pisces** 2.1 Pisces: General characters and Classification. 2.2 Pattern of Scales, fins and lateral line 2.3 Accessory respiratory Organ in fishes 2.4 Electric organs in fishes 2.5 Migration in Fishes 2.6 Dipnoi: Distribution, General characters and affinities	8 Hrs	8 Marks
Unit III	**Amphibia and Reptilia** 3.1 Amphibia: General characters and Classification 3.2 Metamorphosis and Psudomorphosis 3.3 Parental care in Amphibians (with suitable examples) 3.4 Reptilia: General characters and Classification 3.5 Terrestrial Adaptations and Ecological role of Reptiles 3.6 Poisonous and non-poisonous Snakes: Biting mechanism in Poisonous and non-poisonous Snakes; Venom and Antivenom	7 Hrs	7 Marks
Unit IV	**Aves and Mammalia** 4.1 Aves: General characters and Classification 4.2 Types of beaks, Feet, Claws and Feathers in Birds 4.3 Flight adaptations in birds and Migration 4.4 Mammalia: General characters and Classification 4.5 Classification and distribution of Prototheria, Metatheria and Eutheria 4.6 Adaptation in mammals: Aquatic, Desert and Flying	7 Hrs	7 Marks

References	1. A Text book of Practical Zoology Vertebrate – S.S.Lal, Rastogi. Publication, Meerut 2. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p. 3. Manual of Chordate Zoology and Elements of Animal Physiology, Jordan, E.K.and P.S. Verma, 1995. 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp. 4. Zoology of Chordates, Nigam, H.C., 1983. Vishal Publications, Jalandhar - 144 008, 942. 5. The Phylum Chordata, Newman, H.H., 1981. Satish Book Enterprise,Agra - 282 003, 477 pp. 14. Text Book of Zoology, Vol. II (Chordata), Parker and Haswell, 1964.A.Z.T,B.S. Publishers and Distributors, New Delhi – 110 051, 952 pp 6. Chordate Structure and Function, Waterman, Allyn J. et al., 1971. Mac Millan & Co., New York, 587 pp. 7. P.S.Verma & V.K.Agrawal.(2008) Cell Biology, Genetics, Molecular Biology, Evolution & Ecology –S. Chand Publications.

Examination, Evaluation and Assessment Scheme

1. External Theory -- 30 Marks
2. Internal- 20 Marks

Distribution of Internal Marks

1.	Continuous Assessment Test (Best 2 out of 3 tests)	----------	10 Marks
2.	Report of Seminar / Field visit/ Case study/ Any innovative method	-----	10 Marks
	Total ----------		20 Marks

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	**II**	**133207**	**Lab. / Practical - 4 : (Practical's based on Theory 2)**	**2**	**30**	**3 Hrs**	**50**

Course Objectives	After this course, students will be able to • To enlighten the concepts of diversity, adaptations, organization and taxonomic status of chordates. • Understand systemic physiology of chordate. • To discuss the affinities and adaptations of chordates to different modes of life.
Course Outcomes	• Students are having a complete knowledge of classification of chordates. • They should be able to describe general characters and unique features of hemichordates, Urochordata, cephalochordates and Cyclostomata. • They should know the orders of fishes, their known features. Students have enough ideas about origin, characters and development of Amphibia with well-known features i.e. parental care. • They are easily distinguished between poisonous and non-poisonous snakes and their role.
Lab/ Practical 4	**A. Study of museum specimens/slides:** **Protochordata:** *Herdmania, Branchiostoma*, Agnatha: *Petromyzon, Myxine* **Pisces:** *Torpedo, Exocoetus, Acipenser, Sea horse* **Amphibia:** *Ichthyophis, Salamandra, Bufo* **Reptilia:** *Chamaeleon, Turtle, Varanus,Viper, Naja, Checkered kill back* ; Keys for Identification of poisonous and non-poisonous snakes **Aves:** Study of any one example of Raptor, Passerine, Ducks and Waders are found in local region **Mammalia:** Bat, *Funambulus*, Mongoose B. Demonstration with help of ICT tools / Charts: 1. Accessory respiratory Organs in fishes 2. Pattern of Scales in Snake 3. Types of beaks, Feet and Claws in birds C. Permanent micro preparation- Fish Scale (Placoid/Cycloid) D. Parental Care in Amphibians. E. Study of Mesozoic Reptiles and Birds F. Mimicry and Coloration in Amphibians and Reptiles. G. Identification Keys of Poisonous and Non-poisonous snakes. H. Histological Slides**: -** Amphioxus, Frog and Mammals - T.S, Oral hood, Pharynx, Tail T.S. lung, Stomach, Kidney, T.S. Intestine, T.S. Liver, Pancreases, Ovary, Testis, Pituitary, Thyroid I. Study Tour to any wild habitats/Sanctuary/ National Park/ Museums: Preparation of checklist of local Vertebrate animals. (Fishes/Amphibians//Reptiles/Aves/Mammals)

References	1. A Text book of Practical Zoology Vertebrate – S.S.Lal, Rastogi. Publication, Meerut 2. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p. 3. Manual of Chordate Zoology and Elements of Animal Physiology, Jordan, E.K.and P.S. Verma, 1995. 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp. 4. Zoology of Chordates, Nigam, H.C., 1983. Vishal Publications, Jalandhar - 144 008, 942. 5. The Phylum Chordata, Newman, H.H., 1981. Satish Book Enterprise,Agra - 282 003, 477 pp. 14. Text Book of Zoology, Vol. II (Chordata), Parker and Haswell, 1964.A.Z.T,B.S. Publishers and Distributors, New Delhi – 110 051, 952 pp 6. Chordate Structure and Function, Waterman, Allyn J. et al., 1971. Mac Millan & Co., New York, 587 pp. 7. P.S.Verma & V.K.Agrawal.(2008) Cell Biology, Genetics, Molecular Biology, Evolution & Ecology –S. Chand Publications.

- **Distribution of Marks:**

Practical External (25 Marks)		**Practical Internal (25 Marks)**	
Spottings from section A & G (4 Specimens & 2 Slides	12 Marks	Practical Record Book	05 Marks
Study of Scales in Snakes/ Beak/ Feet/ Claws in Birds/ Mimicry in Reptiles	04 Marks	Submission Tour / Field visit/ Check list	10 Marks
Permanent micro preparation- Fish Scale	04 Marks	Permanent slide submission	05 Marks
Viva voce	05 Marks	Student Attendance and performance	05 Marks
Total	**25 Marks**	**Total**	**25 Marks**

FOR BASKET GOEC-3:
For the students of SEM-II of the program of other than that of Science & technologyfaculty.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	133208	GOEC -3: Human Health and Infectious Diseases	2	30	2 Hrs	30
Course Objectives			1. To introduce the basic concepts of pathophysiology of infectious diseases 2. To study the major infectious diseases transmission to humans and response of immunity 3. To understand the Pathogenesis, mechanisms of pathogenesis; transmission and epidemiology of various bacterial, viral, fungal and protozoan diseases. 4. To study the Sexually transmitted diseases. 5. To study the prevention and control measures of infectious diseases				
Course Outcomes			After this course, students will be able to • Know about primary health care, diseases • Learn about clinical syndromes and create a differential diagnosis of the causative agent • Explain at an introductory level, biological processes essential for maintenance of health				

Unit	Contents	Workload Allotted	Weightage of Marks Allotted
Unit I	**Introduction to Infectious Diseases** 1.1 Basic concepts in pathophysiology of infectious diseases 1.2 Infectious disease transmission 1.3 Infection and immunity 1.4 Acute and Chronic Infections 1.5 Major infectious diseases of humans.	8 Hrs	8 Marks
Unit II	**Bacterial Infections** 2.1 Pathogenesis 2.2 Mechanisms of transmission 2.3 Diagnosis of bacterial infectious diseases 2.4 Treatment of major human infections (Tuberculosis, Cholera) 2.5 Epidemiology and public health implications.	7 Hrs	7 Marks
Unit III	**Viral Diseases** 3.1 Pathogenesis 3.2 Mechanisms of transmission 3.3 Diagnosis of viral diseases 3.4 Corona virus and its variants. 3.5 Epidemiology and public health implications	8 Hrs	8 Marks
Unit IV	**Fungal Diseases** 4.1 Pathogenesis 4.2 Mechanisms of transmission 4.3 Diagnosis of fungal diseases 4.4 Treatment of major Fungal human pathogens: (Dermatophytes, Candida, Aspergillus). 4.5 Epidemiology and public health implications.	7 Hrs	7 Marks

References	1. Mandell, G.L., Bennett, J.E., Dolin, R. Mandell. Douglas, and Bennett's Principles and Practice of Infectious Diseases, Philadelphia, Churchill Livingstone. 2. Andrew Cliff and Matthew Smallman-Raynor Turgeon. Oxford Textbook of Infectious Disease Control.M.L. Oxford University Press. 3. John G. Barlett. Pocket Book of Infectious Disease Therapy.Lippincott Williams &Wilkins. 4. David Schlossberg. Clinical Infectious Disease.Cambridge University Press. 5. R Guerrant, Walker D.H, Weller P.F. Tropical Infectious Diseases. Elsevier Churchill Livingston. 6. Forbes, B., Sahm, D., Weissfeld, A. Bailey and Scott's Diagnostic Microbiology. Mosby,St. Louis. 7. Koneman, E.W., Allen, S.D. Janda, W.M., Schreckenberger, P.C., Winn, W.C. ColorAtlasand Textbook of Diagnostic Microbiology, J.B. Lippincott, Philadelphia. 8. Murray P.R, Baron E.J, Pfaller M.A, Tenover F.C, Yolken R.H. Manual of Clinical Microbiology, American Society for Microbiology. 9. Garcia L.S, Bruckner D.A. Diagnostic Medical Parasitology. American Society for Microbiology.

Examination, Evaluation and Assessment Scheme

1. External Theory -- 30 Marks
2. Internal- 20 Marks

Distribution of Internal Marks

1. Continuous Assessment Test (Best 2 out of 3 tests)	----------	10 Marks
2. Report of Seminar / Field visit/ Case study/ Any innovative method	-----	10 Marks
Total ----------		20 Marks

FOR BASKET GOEC-4 :

For the students of SEM-II of the program other than that of Science & Technology faculty.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	II	133 209	Animal Behaviour and Ecology	2	30	2 Hrs	30
Course Objectives:	After this course, students will be able to • Learn about how animals interact with their environment • Focusing an behaviours that influence survival and reproduction To explain how animals adapt with the surrounding environment						
Course Outcomes:	• Develop skills, concepts and experience to understand all aspect of animal behaviour. • Understand and be able to objectively evaluate the role of behavior in the protection and conservation of animals in the world. • Know the evolutionary and functional basis of animal ecology						

Unit	Contents	Workload Allotted	Weightage of Marks Allotted
Unit I	**Animal Behaviour** 1.1 The science of animal behaviour- Definition and brief history 1.2 Ecological aspects of behaviour- Habitat selection, food selection. 1.3 Innate and Learning Behaviour 1.4 Female choice and Maternal Behaviour 1.5 Migratory behaviour (Birds and Fishes)	8 Hrs	8 Marks
Unit II	**Pheromones and Hormones** 2.1 Pheromones and their biological action 2.2 Chemical Communication (Honey Bee and Termites) 2.3 Mimicry and Body Coloration. 2.4 Hormones in insects and Crustaceans metamorphosis 2.5 Parental care (Amphibian and Fishes)	7 Hrs	7 Marks
Unit III	**Animal Ecology** 3.1 Introduction and Scope of Ecology 3.2 Structure and Function of Ecosystem 3.3 A biotic factors affecting survival and sustenance of organization Eg : water, temperature, light, pH and salinity 3.4 Energy flow in ecosystem 3.5 Food chain and Food web.	8 Hrs	8 Marks
Unit IV	**Environmental Factors** 4.1 Environmental pollution-Concepts and Types 4.2 Air, Water and Soil pollution-causes, effects and controls 4.3 Noise pollution causes effects and control 4.4 Hazards waste and human health risk	7 Hrs	7 Marks

	4.5 Solid waste management: control measures of municipal, biomedical and e-waste		

References:

1. Animal Behaviour by Drickamar.
2. John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
3. Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc., Massachusetts, USA.
4. Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros Patricia J. De Coursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
5. Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.) R.D. Lewis. (3rdEd) 2002 Barens and Noble Inc. New York, USA
6. Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.
7. McFarland.D. 1985. Animal Behaviour Psychology, Ethology and Evolution. Pitman Publications.
8. Slater.P.J.B. 1999. Essentials of Animal Behaviour. Cambridge University Press, 1999.
9. Aubrey Manning and Marian. S. Dawkins. 1995. An Introduction to Animal Behaviour. Cambridge University Press, 1995.

Examination, Evaluation and Assessment Scheme

1. External Theory -- 30 Marks
2. Internal- 20 Marks

Distribution of Internal Marks

1. Continuous Assessment Test (Best 2 out of 3 tests)	----------	10 Marks
2. Report of Seminar / Field visit/ Case study/ Any innovative method	-----	10 Marks
Total	----------	20 Marks

Level	Semester	Course Code	Course Name	Credits	TeachingHours	Exam Duration	Max Marks
4.5	**II**	**133210**	**VSC Lab 6 Advance Applications (Carrier oriented) / Practical on Major**	**2**	**30**	**2 Hrs**	**30**

Course Objectives:	After this course, students will be able to • To develop scientific technical expertise • Familiarize with basic tools and techniques in zoology
Course Outcomes:	• Students will be able to understand key skills needed to study Chordates. • The students should gain insights of maintenance of Animal house. • Students will understand general procedure of Birds Photography • Students will understand the economic importance of species.
Lab/ Practical 6 133210	**Laboratory Practical's:** 1. Role of Modern Microscope in Histological Studies. 2. Study of latest techniques in making of slides and museum Specimens. 3. Role of ICT tools in the Dissections. 4. Setup and Maintenance of Animal house. 5. Design and construction of different types of aquarium. 6. Setting up of aquarium: Selection of friendly fish species. 7. Primary idea about installation of bee hives. 8. First line treatment in snake bites. 9. Methods of tracking birds' migratory routes. 10. Brief idea about advanced methods in animal study.
References:	1. A Handbook of Practical Zoology for B. Sc. II by Dr. K. J. Adate, Dr. V. V. Ajagekar, Dr. S. A. Vhanalakar & Dr. L.P. Lanka (ISBN: 978-93-88901-76 2. Practical Manual of Livestock Production Management Volume I (Unit I-IV) Dr. N. V. Jadhav, Dr. Anil Kumar Patidar , Dr. Abhishek Saini. 3. https://thefishsite.com/articles/19-steps-to-efficient-african-catfish- breeding 4. Beekeeping in Integrated Mountain Development - Economics & Scientific perspective Publication. 5. Beekeeping- Teach yourself Books, By-Vernon F.(1984) 6. The hive & the Honey Bee- 1975, 4th edition Dadant Publication, America.

Note: Mode of Examination: Internal (There is no External Examination)

Evaluation of Practical Marks	Marks
1. Preparation of working Model of any modern Microscope	10 Marks
2. Preparation of slide / specimen	10 Marks
3. Construction of aquarium in the laboratory	10 Marks
4. Prepare a model artificial bee hive	10 Marks
5. Submission of case study of snake bite / Submission of migratory route of any bird species	10 Marks
Total	**50 Marks**

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
4.5	**II**	**133211**	**Skill based practical on Major- Apiculture (Bee Keeping) II**	**2**	**30**	**2 Hrs**	**50**

Course Objectives:	After this course, students will be able to • To know the purpose of acquiring bee products like beeswax, honey, royal jelly • Maintaince of bees belonging to the different species of bees
Course Outcomes:	• Differentiate diseases of honey bees, and different methods for control. • Outline the important tools and equipment's used in apiculture • To study different by-products of apiculture • Evaluate, appreciate and specify the importance of embarking on self-employment through rearing honey bee
Lab/ Practical 7 133211	**Laboratory Practical's:** 1. Study of different Bee keeping equipment's: a) Bee box (Langstroth type) b) Honey extractor c) Smoker d) Bee-veil e) Gloves f) Hive tool g) Brush h) queen excluder. 2. Bee keeping and seasonal management. 3. Study of different Bee products (collection methods, composition and uses): a) Honey b) Wax c) Venom d) Propolis e) Royal jelly f) Pollen. 4. Study of different Diseases and enemies of Bees: a) Bee diseases- Protozoan, Bacterial, viral, Fungal. 5. Bee pests- Wax moth (Greater and Lesser), wax beetle. 6. Bee predators- Bee eater, King crow, Wasp, Lizard, Bear, Man. 7. Bee pollination and management of bee colonies for pollination.
Reference Books:	1. Anatomy of Honey bee R.E. Snodgrass. 2. Bees and Bee keeping in India, D.P. Abrol, Kaluani Publications. 3. First Lesson in Beekeeping : Dadant C.D. Malilton, Illinois. 4. Beekeeping in Integrated Mountain Development - Economics & Scientific perspective Publication. 5. Beekeeping- Teach yourself Books, By-Vernon F.(1984) 6. The hive & the Honey Bee- 1975, 4th edition Dadant Publication, America. 7. Bees their vision, chemical senses & language-1950, Cornel University Press- By Fon firsh, & Karl. 8. Honey bee Biology 1982- By Free Johnson & Central Association of Bee Keepers England. 9. The Social Behaviour of the Bees, 1974 : By Missioner C.D. 10. Beekeeping in India, 1962,82, Sardar singh, ICAR, New Delhi. 11. Beekeeping by E.F.Phillips. Agrobios (India) Publication. 12. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios. 13. ABC & XYZ of Bee Culture (40th Edition) 1982, R.A.Morme and K.Flattum, A.I.Root & Co., 623, W. Liberty St. Medina, Dhid, 44336, USA. 14. Apiculture, 1987 (Translated from French in English by R.K.Kauls 1994), P.Jean-Prost, Oxford and IBH Publication, New Delhi.

Note: Mode of Examination: Internal (There is no External Examination)

Evaluation of Practical Marks	Marks
1. Case Study any type Apiculture (All Parameters)	25 Marks
2. Specimen Collection (any Five)	10 Marks
3. Prepare artificial feed in the Laboratory	05 Marks
4. Attendance (Practical)	05 Marks
5. Overall Performance and Participation	05 Marks
Total	**50 Marks**