સૌરાષ્ટ્ર યુનિવર્સિટી

એકેડેમિક વિભાગ

યુનિવર્સિટી કેમ્પસ, યુનિવર્સિટી રોડ, રાજકોટ-૩૬૦૦૦૫

ફોન નં.(૦૨૮૧)૨૫૭૮૫૦૧ એક્સટે. નં.૨૦૨, ૩૦૪ ફેક્સ નં.(૦૨૮૧)૨૫૭૬૩૪૭ ઈ-મેઈલ : academic@sauuni.ac.i

નં.એકે/વિજ્ઞાન/૧૦૨૭૮૫/૨૦૨૪

તા.૨૩/૦૧/૨૦૨૪

B.Sc. Zoology

પરિપત્ર:-

સૌરાષ્ટ્ર યુનિવર્સિટીની વિજ્ઞાન વિદ્યાશાખા હેઠળની સ્નાતક કક્ષાના B.Sc.(Zoology)ના અભ્યાસક્રમ ચલાવતી સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓને આથી જાણ કરવામાં આવે છે કે, NEP-2020 અંતર્ગતના રાજય સરકારશ્રીના તા.૧૧/૦૭/૨૦૨૩ના ઠરાવ ત્યારબાદ તા.૨૭/૦૭/૨૦૨૩ના રોજ પ્રકાશિત થયેલ સ્ટાન્ડર્ડ ઓપરેટિંગ પ્રોસિજર(SOP) તેમજ ત્યારબાદ તેને આનુસંગિક તા.૨૮/૦૭/૨૦૨૩ના રોજ આવેલ સુધારા મુજબના અભ્યાસક્રમો ચેરમેનશ્રી, ઝૂલોજી વિષયની અભ્યાસ સમિતિ દ્વારા રજુ કરાયેલ B.Sc.(Zoology) સેમેસ્ટર-૦૨ના અભ્યાસક્રમો આગામી શૈક્ષણિક સત્ર જુન-૨૦૨૩થી અમલમાં આવે તે રીતે ઝૂલોજી વિષયની અભ્યાસ સમિતિ, વિજ્ઞાન વિદ્યાશાખા, એકેડેમિક કાઉન્સિલ તથા સિન્ડિકેટની બહાલીની અપેક્ષાએ મંજુર કરવા માન.કુલપતિશ્રીને ભલામણ કરેલ, જે માન.કુલપતિશ્રીએ મંજુર કરેલ છે. જેથી સંબંધિત તમામે તે મુજબ તેની ચુસ્તપણે અમલવારી કરવી.

(મુસદ્દો કુલસચિવશ્રીએ મંજુર કરેલ છે.)

સહી/-
(ડૉ.આર.જી.પરમાર)
કુલસચિવ

બિડાણ:- ઉક્ત અભ્યાસક્રમ (સોફ્ટ કોપી)

રવાના કર્યું

23/1/24

એકેડેમિક ઓફીસર

પ્રતિ,

(૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની B.Sc.(Zoology) વિષય ચલાવતી સ્નાતક કક્ષાની સર્વે સંલગ્ન કોલેજોના આચાર્યશ્રીઓ તરફ

(૨) વિજ્ઞાન વિદ્યાશાખા હેઠળની B.Sc.(Zoology) વિષયની અભ્યાસ સમિતિના સર્વે સભ્યશ્રીઓ

નકલ જાણ અર્થે રવાના:-

૧. માન.કુલપતિશ્રી/કુલસચિવશ્રીના અંગત સચિવ

નકલ રવાના (યોગ્ય કાર્યવાહી અર્થે):-

૧. ડીનશ્રી, વિજ્ઞાન વિદ્યાશાખા ૨. પરીક્ષા વિભાગ ૩. પી.જી.ટી.આર.વિભાગ ૪. જોડાણ વિભાગ

SAURASHTRA UNIVERSITY

FACULTY OF SCIENCE

Course Structure and Syllabus for Science FYUGP

B.Sc. Honours/ Honours with Research in Zoology

Based on

UGC's guidelines NEP-2020 "Curriculum and Credit Framework for Undergraduate Programmes- CCFUP" and

Education Department, Government of Gujarat's
Uniform Credit Structure for all HEIs of Gujarat State and
Implementation of the Common Curriculum and Credit Framework under the National Education Policy-2020
(No: KCG/admin/2023-24/0607/kh.1 Sachivalaya, Gandhinagar dated 11/07/2023) and

Standard Operating Procedure for Implementation of NEP-2020 for the State of Gujarat- HEIs of Gujarat
(No: KCG/admin/2023-24/865/ dated 26/07/2023) and

Additional content to be added to SOP published by KCG
(No: KCG/NEP-2020/2023-24/893/ dated 28/07/2023)

General Guidelines for Implementation of **Four Year Under Graduate Programmes** for Saurashtra University (16 pages) published in August 2023
(E-mail from Academic Section Saurashtra University dated Oct 11, 2023)

Effective from November –2023 & onwards

Graduate Attributes:

Graduates should be able to demonstrate the acquisition of the following:

Academic excellence: Comprehensive knowledge and coherent understanding of Microbiology and other interdisciplinary areas of study.

Practical, professional, and procedural knowledge required for carrying out professional or highly skilled work/tasks related to Microbiology, including knowledge required for undertaking self-employment initiatives and knowledge and mind-set required for entrepreneurship, improved product development, or a new mode of organization.

Critical and Analytical reasoning/thinking and Effective communications: Analysis and evaluation of information to form a judgment about a subject or idea and ability to communicate the same in a structured form.

Research-related skills: the ability to understand basic research ethics and skills in practicing/doing ethics in the field/ in personal research work, regardless of the funding authority or field of study.

Leadership qualities and Teamwork abilities: The graduates should be able to demonstrate the capability for mapping out the tasks of a team and setting direction and inspiring vision, and building a team that can help achieve the goals.

Global Citizenship: Mutual understanding with others from diverse cultures, perspectives, and backgrounds by embracing and practicing constitutional, humanistic, ethical, and moral values in life, including universal human values of truth, righteous conduct, peace, love, nonviolence, and scientific temper.

Life Long Learning: Ready to imbibe new knowledge, values, and skills with an open mind and willing to adopt change for constructive development.

Programme Outcomes (PO):

By the end of the program the students will be able to:

PO 1	Broad Scientific Knowledge: Graduates will demonstrate a comprehensive understanding of fundamental principles across multiple scientific disciplines, including but not limited to biology, chemistry, physics, mathematics, and earth sciences.
PO 2	Critical Thinking: Graduates will exhibit the ability to analyze and evaluate scientific information, synthesize complex concepts, and apply critical thinking skills to solve scientific problems and make informed decisions.
PO 3	Quantitative and Analytical Skills: Graduates will be proficient in utilizing quantitative techniques, mathematical tools, and data analysis methods to interpret and draw conclusions from scientific data.
PO 4	Effective Communication: Graduates will possess strong written and verbal communication skills, enabling them to convey scientific concepts clearly and concisely to both technical and non-technical audiences.
PO 5	Laboratory Proficiency: Graduates will be adept at designing, conducting, and interpreting experiments, utilizing laboratory equipment and techniques effectively, and maintaining a strong emphasis on safety and ethical considerations.
PO 6	Problem Solving and Research Skills: Graduates will demonstrate the ability to identify research questions, design research methodologies, collect and analyze data, and draw meaningful conclusions to contribute to the advancement of scientific knowledge.
PO 7	Ethical and Social Responsibility: Graduates will exhibit an awareness of ethical considerations in scientific research and its applications, and understand the societal implications of scientific discoveries and technological advancements.
PO 8	Adaptability and Lifelong Learning: Graduates will be prepared to adapt to evolving scientific paradigms and new technologies, and demonstrate a commitment to continuous learning and professional development.
PO 9	Information Literacy: Graduates will be proficient in accessing, evaluating, and utilizing scientific literature and resources, demonstrating an ability to stay informed about the latest developments in various scientific fields.
PO 10	Career Readiness: Graduates will possess a strong foundation to pursue a variety of career paths, including entry-level positions in scientific research, education, industry, government, healthcare, and more, or to pursue further education at the graduate level in specialized scientific disciplines.

Programme Specific Outcomes (PSO):

By the end of the program the students will be able to:

PSO 1	Animal Diversity and Classification: Graduates will demonstrate a deep understanding of animal taxonomy, evolution, and diversity, including the ability to classify and identify various animal species based on their characteristics.
PSO 2	Anatomy and Physiology: Graduates will have a thorough knowledge of the anatomical structures and physiological functions of different animal systems, enabling them to explain the adaptations and behaviours of animals.
PSO 3	Ecology and Behaviour: Graduates will understand the ecological interactions and behaviours of animals within their natural habitats, including concepts related to population dynamics, community structure, and animal responses to environmental factors.
PSO 4	Genetics and Evolution**: Graduates will be proficient in the principles of genetics and evolution as they relate to animal species, including the mechanisms of inheritance, genetic variation, and the role of natural selection in shaping animal populations.

PSO 5	Cell Biology and Histology: Graduates will have a solid foundation in cellular biology and histological techniques, allowing them to examine and analyze animal tissues at the microscopic level.
PSO 6	Ethics and Animal Welfare: Graduates will be aware of ethical considerations related to the treatment of animals in research, conservation, and other contexts, and will uphold standards of animal welfare.

B.Sc. Honours/ Honours with Research in Zoology
(NCrF Level- 4.5 First Year – Certificate in Zoology)

Semester II

SN	Course Category As per GoG-NEP-SOP - July 2023& additional content 28/7/23	Course Title	Credit			Hrs./ Wk.		Evaluation - Weightage CCE: SEE = 50:50				
								CCE Marks		SEE Marks		Total Marks
			T	P	Total	T	P	T	P	T	P	
1	**Major (Core)-3** (Zoology)	**Zoology – 3** **(4- Credit Course** including Theory & Practical components)	**3**	**1**	**4**	**3**	**2**	**25**	**25**	**50**	**-**	**100**
2	**Major (Core)-4** (Zoology)	**Zoology – 4** **(4- Credit Course** including Theory & Practical components)	**3**	**1**	**4**	**3**	**2**	**25**	**25**	**50**	**-**	**100**
3	**Minor(Elective)*-2**	(As per GoG- NEP-SOP July 2023& additional content 28/7/23 – Clause 3.3.2) **Any One from Basket** (As per the expertise and resources available in the college) **(4- Credit Course** including Theory & Practical components)	**3**	**1**	**4**	**3**	**2**	**25**	**25**	**50**	**-**	**100**
4	**Multi/Inter - Disciplinary Course -2** (MDC/IDC-1) **(Elective)**4** Categories: Natural & Physical Science/ Maths.,Stat.and Comp. Appl./Lib.,Info.and Media Sci./Comm. and Mgt./Huma., and Social Sci./ Sanskrit etc...	(As per GoG- NEP-SOP July 2023& additional content 28/7/23 – Clause 3.3.3) **Any One from Basket** (As per the expertise and resources available in the college) **(4- Credit Course** including Theory & Practical components)	**3**	**1**	**4**	**3**	**2**	**25**	**25**	**50**	**-**	**100**
5	**Ability Enhancement Course -2** (AEC-2)	(As per GoG- NEP-SOP July 2023& additional content 28/7/23 – Clause 3.3.4) **English Language**	**2**	**-**	**2**	**2**	**-**	**25**	**-**	**25**	**-**	**50**
6	**Skill Enhancement Course-2**	(As per GoG- NEP-SOP July 2023& additional content	**-**	**2**	**2**	**-**	**4**	**-**	**25**	**-**	**25**	**50**

	(SEC-2)	28/7/23 – Clause 3.3.5) **Skill based Practical Course-2: Analysis of Oils & Fats**										
7	**Common Value Added Course-2** (C-VAC-2)*** NSS/NCC/ Sports & Fitness/ Ethics and Culture/ Culture and Communication/ Ethics and Values in Ancient Indian Traditions/ Human Values and Ethics/IPDC	(As per GoG- NEP-SOP July 2023& additional content 28/7/23 – Clause 3.3.6) **Any One from Basket** VAC based on **IKS:** NSS/NCC/Sports & Fitness/Human Values and Ethics	-	**2**	**2**	-	**4**	-	**25**	-	**25**	**50**
Total Credits and Marks (Semester-II)			14	08	**22**	14	16	**125**	**150**	**225**	**50**	**550**

* Any one course from the basket is to be selected as a Minor elective course as per the expertise and resources available in the college. The same course will continue as a Minor in the semester-II as well.
** Any one course from the basket is to be selected as Multi/Inter disciplinary elective courses (MDC/IDC) as per the expertise and resources available in the college. The same MDC/IDC course as selected in Sem.-Iwill be continued in the semester-II as well.
*** Common **Value Added Elective Courses** (C-VAC-2) common to all is to be selected from University Basket for semester 2**,** as per the expertise and resources available in the college.

Courses Offered by BoS- Zoology to other FYUGP- B.Sc. Programin Semester-II

SN	**Course Category** As per GoG- NEP-SOP - July 2023& additional content 28/7/23	**Course Title**	**Credit**			**Hrs./ Wk.**		**Evaluation - Weightage CCE: SEE = 50:50**				
			T	**P**	**Total**	**T**	**P**	**CCE** Marks		**SEE** Marks		**Total** Marks
								T	**P**	**T**	**P**	
1	**Minor (Elective)-2** (Zoology) (In addition to courses mentioned in SOP basket; Recommended for Physical Science, Mathematical Science, Life science Programs)	**Introduction to Zoology - 2: (4- Credit Course** including Theory & Practical components)	**3**	**1**	**4**	**3**	**2**	**25**	**25**	**50**	-	**100**
2	**Multi/Inter - Disciplinary Course -2** (MDC/IDC-2) **(Elective)** (In addition to courses mentioned in SOP basket; Recommended for Physical Science, Mathematical Science,	**Zoology – Fundamentals of Biology – 2 (4- Credit Course** including Theory & Practical components)	**3**	**1**	**4**	**3**	**2**	**25**	**25**	**50**	-	**100**

	Life science Programs)												

Evaluation Scheme: (As per GoG- NEP-SOP July 2023& additional content 28/7/23 – Chapter-7: Evaluation Reforms)

The evaluation process should be formulated to make a systematic evaluation of students' progress based on UGC guidelines. The evaluation must be designed with learner attributes in mind. These attributes have clear linkages to Programme Education Objectives and Outcomes. The evaluation consists of the following two components:

1. Continuous and Comprehensive Evaluation (CCE) - Formative
2. Semester End Evaluation (SEE)- Summative

CCE carries 50% of the total marks allotted to a subject and the other 50% being assigned to the SEE.

In each course, every credit carries 25 marks, of which 50% marks is assigned for CCE and rest 50% marks for SEE. The 50% marks assigned to the CCE is distributed between the continuous classroom evaluation and mid-term evaluation. The pattern may be as follow:

SN	Evaluation	*T-3 + P-1 = Total 4 credit subjects (Marks)	2 credit subjects (Marks)
1	**CCE (50%)**		
	Classroom & Mid-Term Evaluation	**T-25 + P- 25**	**25**
2	**SEE (50%)**	**50**	**25**
	Total	**100**	**50**

***T = Theory; P= Practical**

Continuous and Comprehensive Evaluation (CCE)

Subject–wise CCE will be undertaken by the concerned faculty member. The mode of evaluation will be decided by the faculty member concerned with the subject. Normally CCE consists of class participation, case analysis and presentation, assignment, tutorials, slip tests (announced/ surprised), quizzes, attendance etc. or any combination of these. The students are expected to submit their answer scripts/ reports of internal evaluation within the stipulated time. Failure to do so may result in the script not being valued. Another part of CCE consists of mid-term written evaluation, which is compulsory for all students. It can be done in a scheduled manner. The duration of the mid-term evaluation shall be one hour.

Semester End Evaluation (SEE)

The SEE carries 50% of the marks assigned to a course. SEE shall be of 2 ½ hours for 3/4 credit course and 2 hours in case of 1/2 credit courses. The controller of the examination will conduct these examinations. Paper setting and evaluation will be done by the external examiners to an extent of 50% of the evaluation process. This examination shall be conducted as per a schedule which shall be notified in advance.

The backlog exam will be conducted twice a year just after the result declared of the semester evaluation. Students shall have a second chance to clear their backlog and avoid the burden to carry forward the backlog with the next semester exam.

Appearance in all the evaluations is mandatory and no exemption can be granted except in the following case:

1. In case of inability to attend the exam due to reasons considered genuine by the controller of examination in consultation with the Director/Board.

2. In case of medical emergency, a certificate from the registered medical practitioner must be produced before the commencement of exams. The evaluation board will then take final decision on the recommendation for exemption.

Eligibility Criteria to appear in SEE

To be able to appear for the SEE, a student must comply with the following conditions:

1. Should have at least 75% of attendance in all the courses put together.

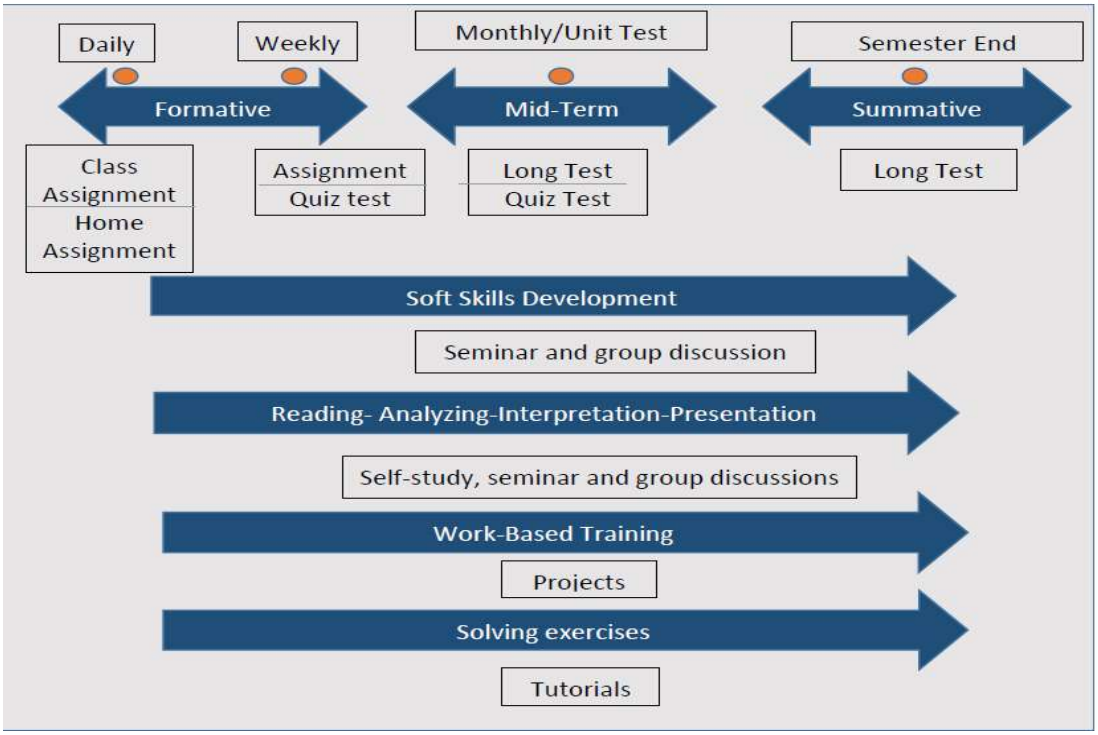
2. Should have at least 70% of attendance in each course/subject.

3. Should not have any disciplinary proceedings pending against him/her.

4. Should have no pending due.

Continuum of Evaluation

Evaluation must be continuous which may include both formative and summative components in a timely manner for continuous feedback as follow:



Mode of Evaluation

A wide range of modes of evaluation for evaluating students is available for the teachers/ institutions to use. A suitable compendium of such a mode needs to be carefully chosen for a particular program depending on its nature, objectives, and available resources. The mode of evaluation can be as below:

Written Mode	Oral Mode	Practical Mode	Integrated Mode
Semester Exam Class Test Open book exam/test Open note exam/test Self-test/Online test Essay/Article writing Quizzes/Objective test Class assignment Home assignment Reports writing Research/Dissertation Class Studies	Viva/Oral exam Group Discussion Role Play Authentic Problem Solving Quiz Interview	Lab work Computer simulation/virtual labs Craft work Co-curricular work	Paper presentation/Seminar Field Assignment Poster Presentation

Written Mode		
Evaluation Type	**Nature**	**Objective**
Semester Exam	Traditionally essay type, with	For depth and planned

	objective / short answer questions to evaluate Lower Order Thinking (LOT) OBE skills	preparation
Class test	Traditionally essay type	Fixed date forces students to learn
Open book test	Allowed choice of reference book	Measures what students can do with resources, less stress on memory
Open note test	To get used to the system	Encourage good note taking
Self-test	For subjective and objective items	Mastery learning occurs with proper feedback
Article/essay writing	Individual long written assignment	Individual expression and creativity
Quizzes/Objective test	Short duration structured test	Excellent validity as greater syllabus coverage
Class assignment	With defined time	Student's performance to make decision
Home assignment	With undefined time	Reinforce learning and facilitate mastery of specific skills
Reports Writing	On activities performed or event observed	Develop a key transferable skill
Research/Dissertation	Detailed research-based report	To judge creativity and research skills
Case Studies	Analyse a given case (real or fictional)	To assess thinking, value, and attitude
Oral Mode		
Evaluation Type	**Nature**	**Objective**
Viva/Oral exam	Individually or in small group	Practical experience towards job interview situation
Group discussion	Small group of 2-5 members work on a joint task	Encourage teamwork
Role Play	Small group of 2-5 members work on a joint task	Develop personality
Authenticate problem solving	Small group of 2-5 members work on a joint task	Communication of ideas
Quiz	Small group of 2-5 members work on a joint task	Assess memory power
Interview	Individually	Judge the personal confidence level

Practical Mode		
Evaluation Type	**Nature**	**Objective**
Lab work	Component of working with one's hand	Keep the students on the task
Computer simulation/virtual labs	Component of working with one's hand	To understand the practical exposure
Craft work	Component of working with one's hand	Encourage application of concepts learnt
Co-curricular work	Component of working with one's hand	For immediate feedback

Integrated Mode		
Evaluation Type	**Nature**	**Objective**
Paper presentation/Seminar	Group or individual work	Learn from others presentation
Field Assignment	Field visit with report	Develop observation and recording skills
Poster presentation	Group or individual work	Develop research, creativity, and discussion skills
Paper presentation/Seminar	Group or individual work	Learn from others presentation

Models of Evaluation

Based on the types of evaluation, various models of evaluation implementation are suggested for theory, practical, self-study and work-based learning. The focus of these models is to encourage the students to improve on skills and performance.

Evaluation Norms &Question Paper Pattern for Theory &Practical Courses: Please refer General Guidelines for Implementation of **Four Year Under Graduate Programmes** for Saurashtra University (16 pages) published in August 2023.

Model for Theory Courses- Theory-3+Practical-1 = 4 Credit Course	
CCE-50% (50 Marks)SEE-50% (50 Marks)	
Exam Pattern	**Marks**
Class Test (Average of **TWO** tests)	**T-25 + P-25**
Quiz (Average of **TWO quiz**)	
Home Assignment	
Active Learning- PBL/CSBL/Seminar/Flipped Class Room etc. OBE evaluation tools.	
Class Assignment	
Attendance	
Continuous and Comprehensive Evaluation	
Semester-End Evaluation	**T-50**

Model for Practical Courses-1 Credit Course	
CCE-100% (25 Marks)	
Exam Pattern	**Marks**
Lab work assessment	10
Viva voce/Lab quiz	10
Attendance	05
Continuous and Comprehensive Evaluation	**25**

Model for Skill Enhancement Course - Skill based Practical Course **-2 Credit Course**	
CCE-50% (25 Marks)SEE-50% (25 Marks)	
Exam Pattern	**Marks**
Lab work assessment or Project based Assessment	10
Viva voce/Lab quiz	10
Attendance& Performance	05
Continuous and Comprehensive Evaluation	**25**
Semester-End Evaluation	**25**

Theory Question Paper Pattern

Semester End Examination (SEE)

Instructions:

- All Units/ Module carry equal weightage of 10 Marks each
- Time duration: 2 Hours

The Theory Question Paper Skeleton is as follows

Question 1 (Unit/Module 1)		Marks
A		06
B		04
	OR	
A		06
B		04
	Total Marks Question 1	**10**
Question 2 (Unit/Module 2)		
A		06
B		04
	OR	
A		06
B		04
	Total Marks Question 2	**10**
Question 3 (Unit/Module 3)		
A		06
B		04
	OR	
A		06
B		04
	Total Marks Question 3	**10**
Question 4 (Unit/Module 4)		
A		06
B		04
	OR	
A		06
B		04
	Total Marks Question 4	**10**
Question 5 (Unit/Module 5)		
A		06
B		04
	OR	
A		06
B		04
	Total Marks Question 5	**10**

B.Sc. Honours/ Honours with Research in Zoology

(NCrF Level- 4.5 First Year – Certificate in Zoology)

Semester II

Course Category	**Major-3**
Title of the Course	**Zoology - 3**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**CCE- 25+ SEE- 50**

Course Objectives

Objectives of this course is to teach students

- Basic principles of chromatography and centrifugation techniques and their use in biological sciences
- About structure and function of various cell organelles
- Factors affecting sex determination in different animals, mode of inheritances and types of mutations in chromosomes, learn about different genetic syndromes and human karyotype
- Processes mechanical and chemical digestion of food and its absorptions and urine formation
- Identification of parasites and their important to human health and causing diseases

Course Outcomes - COs

Students will be able to

- Use chromatography and centrifugation techniques in laboratories.
- Learn functions and role of different cell organelles
- Develop an insight of how genetic is responsible in determining sex in animals, inheritance, mutation and disorders
- Comprehend knowledge of digestion and urine formation
- Learn different protozoans and helminthes as parasite to human and diseases caused by them

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		Yes/~~No~~	Minor		~~Yes~~/No
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	~~Yes~~/No	Interdisciplinary	~~Yes~~/No

5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?	Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?	Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?	Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Unit No.	Topics	Hours	Marks
1	**Techniques in Biology** 1. Chromatography: a. Principle of chromatography b. Types of chromatography i. Paper chromatography ii. Thin Layer Chromatography (TLC) c. Application of chromatography 2. Centrifuge: a. Understanding of centrifugation b. Types of centrifuge c. Types of rotors and their applications d. Application of centrifuge	**10**	**15**
2	**Cell Biology** 1. Cell organelles: Mitochondria, Golgi, Lysosome, Plastid, Centriols, Basal Body, Cillia, Ribosome	**13**	**15**
3	**Genetics** 1. Sex determination in animals (Drosophila, Humans, Bonellia and Turtles) 2. Cytoplasmic inheritance in paramecium and Snail 3. Chromosomal mutation a. Numerical b. Structural 4. Human Karyotype 5. Genetical disorders due to Aneuploidy (Down's Syndrome, Turner Syndrome, Patau Syndrome, Edward's Syndrome)	**10**	**15**
4	**Physiology** 1. Physiology of digestion a. Digestion in different region b. Digestion of different food components 2. Urine Formation a. Structure of Nephron b. Ultra-filtration c. Reabsorption d. Secretion	**05**	**15**

5	**Parasitology** 1. Parasitic protozoans and human diseases a. Entamoeba, Giardia, Plasmodium, Leishmania 2. Parasitic helminth and human diseases a. Tapeworm, Wuchereria, Schistosoma, Fasciola	**07**	**15**

Reference Books:

1. Biological Instrumentation and Methodology by P. K. Bajpai
2. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P. S. Verma and V. K. Agarwal
3. Principles of anatomy and physiology by Gerard J Tortora
4. Economic Zoology by G. S. Shukla and V. B. Upadhyay

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Semester II

Course Category	**Major Practical -3**
Title of the Course	**Zoology Practical – 3**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**CCE- 25**

Course Objectives

Objectives of this course is to teach students

- Practical applications of chromatography and centrifugation techniques
- About structure and function of various cell organelles
- Factors affecting sex determination in different animals, mode of inheritances and types of mutations in chromosomes, learn about different genetic syndromes and human karyotype
- Processes mechanical and chemical digestion of food and its absorptions and urine formation
- Identification of parasites and their important to human health and causing diseases

Course Outcomes - COs

Students will be able to

- Use chromatography and centrifugation techniques in laboratories.
- Learn functions and role of different cell organelles
- Develop an insight of how genetic is responsible in determining sex in animals, inheritance, mutation and disorders
- Comprehend knowledge of digestion and urine formation
- Learn different protozoans and helminthes as parasite to human and diseases caused by them

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		Yes/~~No~~	Minor		~~Yes~~/No
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	~~Yes~~/No	Interdisciplinary	~~Yes~~/No
5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?					Yes/~~No~~

6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?	Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?	Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Pr. No.	List of Practicals
1	Study working principle of paper chromatography and Thin Layer Chromatography
2	Study working principle of centrifuge
3	Study Cell organelles - Mitochondria, Golgi, Lysosome, Ribosome
4	Study Cell organelles - Centriols, Basal Body, Cillia, Plastid
5	Study sex determination by chart/multimedia as per theory
6	Study cytoplasmic inheritance in paramecium by chart/multimedia
7	Study of aneuploidy as per theory by chart/multimedia
8	Study effect of salivary amylase on starch digestion
9	Study parasitic protozoans as per theory by chart/multimedia
10	Study parasitic helminth as per theory by chart/multimedia

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Semester II

Course Category	**Major-4**
Title of the Course	**Zoology - 4**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**CCE- 25+ SEE- 50**

Course Objectives

Objectives of this course is to teach students

- Salient features of chordate animals and their classification/taxonomy with detailed study of amiphoxus as a type
- Integrity of varied biotic and abiotic factors and their interactions in different ecosystems
- Role of evolution in diversifying life on the earth
- Adaptive features of animals to suit to different ecological conditions

Course Outcomes - COs

Students will be able to

- Comprehend chordate life forms and their peculiarities
- Learn about system grade organization in amphioxus and its embryology
- Get knowledge of zonation and food chains in different ecosystems
- How early life evolved from primitive features to the complex ones by different evolutionary theories. This will develop their analytical/comparative skills
- Identify various ecological adaptations in animals

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		Yes/~~No~~	Minor		~~Yes~~/No
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	~~Yes~~/No	Interdisciplinary	~~Yes~~/No
5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?					Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?					Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?					Yes/~~No~~

8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Unit No.	Topics	Hours	Marks
1	**Taxonomy of Chordate – 1** 1. Classification of Protochordata to Amphibia upto class.	08	15
2	**Forms and functions in chordate animals** 1. Type Study – Amphioxus – External features, Food and Feeding, Digestive System, Endostyle, T.S. passing through pharynx region 2. Embryology of Amphioxus – Sperm, Ovum, Fertilization, Cleavage, Blastulation and Gastrulation.	09	15
3	**Habitat Ecology** 1. Freshwater ecosystem 2. Marine ecosystem 3. Estuary ecosystem 4. Terrestrial ecosystem 5. Desert ecosystem	08	15
4	**Evolution** 1. Types of Evolutions a. Divergent b. Convergent and c. Parallel 2. Isolation and speciation a. Isolation: i. Types of Isolation: Temporal, Geographical and Reproductive ii. Types of Mechanism: Prezygotic and Post zygotic b. Speciation: i. Definition Species, Race, Dene ii. Modes of speciation: Sympatric, Allopatric and Parapatric	12	15
5	**Wildlife** 1. Ecological adaptations in animals a. Cursorial Adaptation, b. Fossorial Adaptations, c. Aquatic Adaptations, d. Arboreal Adaptations, e. Volant Adaptations, f. Desert Adaptations	08	15

Reference Books:

1. Textbook of vertebrate by R. L. Kotpal
2. Ecology and Environment by P. D. Sharma
3. A textbook of organic evolution by MP Arora and H. Arora
4. Wildlife conservation and management by Reena Mathur

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Semester II

Course Category	**Major Practical -4**
Title of the Course	**Zoology Practical – 4**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**CCE- 25**

Course Objectives

Objectives of this course is to teach students

- Identifying characters of chordate animals
- Different systems in Amphioxus and its embryology
- Differences between different habitats/ecosystems
- To determine some of the physiochemical parameters of water
- Types of evolutions and ecological adaptations

Course Outcomes - COs

Students will be able to

- Identify chordate life forms
- Comprehend functional anatomy in Amphioxus
- Comprehend differences in various ecosystems
- Learn adaptations of animals to their environment

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		Yes/~~No~~	Minor		~~Yes~~/No
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	~~Yes~~/No	Interdisciplinary	~~Yes~~/No
5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?					Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?					Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?					Yes/~~No~~

8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Pr. No.	List of Practicals
1	**Identification and classification of chordate animals** Sub-phylum: Urochordata (Ascidia, Doliolum, Oikoplura) Sub-phylum: Cephalochordata (Amphioxus) Class: Cyclostomata (Lamprey, Myxine)
2	**Identification and classification of chordate animals** Class: Chondrichthyes (Scoliodon, Torpedo, Stegostoma) Class: Osteichthyes(Salmon, Labio, Seahorse)
3	**Study Forms and functions in Amphioxus** External Characters, Lateral view with digestive system, Food & feeding mechanism with endostyle, (iv) T.S. of pharynx in Amphioxus
4	**Study embryology in Amphioxus** Sperm, Ova, Fertilization, Cleavage, Blastulation and Gastrulation
5	**Study of aquatic ecosystem** Pond ecosystem through chart
6	**Study of terrestrial ecosystem** Forest ecosystem through chart
7	**Determine physico-chemical properties of water** Turbidity, Sedimentation rate, EC, pH, Temperature
8	**Study different types of evolution by charts** (as per theory)
9	**Study different ecological adaptations in animals** Cursorial, Fossorial, Aquatic
10	**Study different ecological adaptations in animals** Volant, Arboreal, Desert
11	**Field visit**

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Semester II

Course Category	**Skill Enhancement Course**
Title of the Course	**Vermicompost**
Course Credit	**02**
Teaching Hours per Semester	**60**
Total Marks	**CCE-25 + SEE-25**

Course Objectives

Objectives of this course is to teach students skill based vocational topics which enable them to venture into vermicompost business.

Course Outcomes - COs

Students will be able to

- Develop understanding of vermicompost and improve their employability skill

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		~~Yes~~/No	Minor		~~Yes~~/No
	Skill Enhancement Courses		Yes/~~No~~	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	Yes/~~No~~	Interdisciplinary	Yes/~~No~~
5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?					Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?					Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?					Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?					Yes/~~No~~

Pr. No.	List of Practicals
1	To study Classification and external characters of earthworm
2	To study digestive system of earthworm by chart/multimedia
3	To study reproductive system of earthworm by chart/multimedia
4	To study some common earthworm species found in India
5	To study important environmental parameters affecting vermicompost (Temperature, Moisture, pH, and types of soil, feed)
6	Tools and equipments used in vermicomposting
7	To study basic requirements for vermicomposting
8	To study preparation and maintenance of base culture
9	To study first aid precautions in vermicomposting
10	Visit to any vermicomposting farm/institute/university

Reference Books:

1. Vermitechnology by M. Seetha Lekshmy, R. Santhi
2. A Textbook of Vermicompost: Vermiwash and Biopesticides by Dr Keshav Singh, Dr Gorakh Nath, Dr Rabish Chandra Shukla and Dr Deepak Kumar Bhartiya

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Semester II

Course Category	**Minor – 2**
Title of the Course	**Introduction to Zoology – 2**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**CCE- 25+ SEE- 50**

Course Objectives

Objectives of this course is to teach students

- Basic principles of chromatography and centrifugation techniques and their use in biological sciences
- About structure and function of various cell organelles
- Factors affecting sex determination in different animals, mode of inheritances and types of mutations in chromosomes, learn about different genetic syndromes and human karyotype
- Processes mechanical and chemical digestion of food and its absorptions and urine formation
- Identification of parasites and their important to human health and causing diseases

Course Outcomes - COs

Students will be able to

- Use chromatography and centrifugation techniques in laboratories.
- Learn functions and role of different cell organelles
- Develop an insight of how genetic is responsible in determining sex in animals, inheritance, mutation and disorders
- Comprehend knowledge of digestion and urine formation
- Learn different protozoans and helminthes as parasite to human and diseases caused by them

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		~~Yes~~/No	Minor		Yes/~~No~~
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	Yes/~~No~~	Interdisciplinary	Yes/~~No~~

5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?	Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?	Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?	Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Unit No.	Topics	Hours	Marks
1	**Techniques in Biology** 1. Chromatography: a. Principle of chromatography b. Types of chromatography i. Paper chromatography ii. Thin Layer Chromatography (TLC) c. Application of chromatography 2. Centrifuge: a. Understanding of centrifugation b. Types of centrifuge c. Types of rotors and their applications d. Application of centrifuge	**10**	**15**
2	**Cell Biology** 1. Cell organelles: Mitochondria, Golgi, Lysosome, Plastid, Centriols, Basal Body, Cillia, Ribosome	**13**	**15**
3	**Genetics** 1. Sex determination in animals (Drosophila, Humans, Bonellia and Turtles) 2. Cytoplasmic inheritance in paramecium and Snail 3. Chromosomal mutation a. Numerical b. Structural 4. Human Karyotype 5. Genetical disorders due to Aneuploidy (Down's Syndrome, Turner Syndrome, Patau Syndrome, Edward's Syndrome)	**10**	**15**
4	**Physiology** 1. Physiology of digestion a. Digestion in different region b. Digestion of different food components 2. Urine Formation a. Structure of Nephron b. Ultra-filtration c. Reabsorption d. Secretion	**05**	**15**

5	**Parasitology** 1. Parasitic protozoans and human diseases a. Entamoeba, Giardia, Plasmodium, Leishmania 2. Parasitic helminth and human diseases a. Tapeworm, Wuchereria, Schistosoma, Fasciola	**07**	**15**

Reference Books:

1. Biological Instrumentation and Methodology by P. K. Bajpai
2. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P. S. Verma and V. K. Agarwal
3. Principles of anatomy and physiology by Gerard J Tortora
4. Economic Zoology by G. S. Shukla and V. B. Upadhyay

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Semester II

Course Category	**Minor Practical – 2**
Title of the Course	**Introduction to Zoology Practical – 2**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**CCE- 25**

Course Objectives

Objectives of this course is to teach students

- Practical applications of chromatography and centrifugation techniques
- About structure and function of various cell organelles
- Factors affecting sex determination in different animals, mode of inheritances and types of mutations in chromosomes, learn about different genetic syndromes and human karyotype
- Processes mechanical and chemical digestion of food and its absorptions and urine formation
- Identification of parasites and their important to human health and causing diseases

Course Outcomes - COs

Students will be able to

- Use chromatography and centrifugation techniques in laboratories.
- Learn functions and role of different cell organelles
- Develop an insight of how genetic is responsible in determining sex in animals, inheritance, mutation and disorders
- Comprehend knowledge of digestion and urine formation
- Learn different protozoans and helminthes as parasite to human and diseases caused by them

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		~~Yes~~/No	Minor		Yes/~~No~~
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	Yes/~~No~~	Interdisciplinary	Yes/~~No~~

5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?	Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?	Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?	Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Pr. No.	List of Practicals
1	Study working principle of paper chromatography and Thin Layer Chromatography
2	Study working principle of centrifuge
3	Study Cell organelles - Mitochondria, Golgi, Lysosome, Ribosome
4	Study Cell organelles - Centriols, Basal Body, Cillia, Plastid
5	Study sex determination by chart/multimedia as per theory
6	Study cytoplasmic inheritance in paramecium by chart/multimedia
7	Study of aneuploidy as per theory by chart/multimedia
8	Study effect of salivary amylase on starch digestion
9	Study parasitic protozoans as per theory by chart/multimedia
10	Study parasitic helminth as per theory by chart/multimedia

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Semester II

Course Category	**MDC/IDC - 2**
Title of the Course	**Fundamentals of Biology - 2**
Course Credit	**03**
Teaching Hours per Semester	**45**
Total Marks	**CCE- 25+ SEE- 50**

Course Objectives

Objectives of this course is to teach students

- Range of techniques used in biology research , i.e., microscopy and ph
- Structure and function of eukaryotic cells
- Principals of Mendelian genetics, inheritance pattern and genetic variation
- Various types of environmental pollution and their mitigation
- Basics of animal behaviours

Course Outcomes - COs

Students will be able to

- Learn various fundamental techniques in biology and develop analytical skills.
- Understand the structure and purposes of basic components of prokaryotic and eukaryotic cells and cell organelles.
- Genetics will deal with concept of gene and mandelian laws and examples of multiple alleles which enable them to understand inheritance of characters.
- Environmental education is to increase public awareness about environmental issues, explore possible solutions and to lay the foundation for fully informed and active participation of individual in the protection of the environment and the prudent and rational use of natural resources.
- Get knowledge of how animals respond to the stimuli and express in form of different behaviours.

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		~~Yes~~/No	Minor		~~Yes~~/No
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	Yes/~~No~~	Interdisciplinary	Yes/No

5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?	Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?	Yes/~~No~~
7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?	Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Unit No.	Topics	Hours	Marks
1	**Techniques in biology** 1. Types of microscopy and their working principles a. Dissecting Microscope b. Compound Microscope 2. pH meter a. Concept of pH, Henderson – Hasselbalch equation, precaution and care of pH meter.	**08**	**15**
2	**Cell Biology** 1. Types of cells and cell theory 2. Cell organelles a. Cytoplasm b. Plasma membrane c. Endoplasmic Reticulum d. Nucleus 3. Types of chromosomes based on centromere	**09**	**15**
3	**Genetics** 1. Introduction to Gene 2. Introduction to Mendelian laws of hereditary 3. Incomplete Dominance 4. Co-dominance 5. Multiple alleles a. ABO blood group in humans b. Rh Factor, Erythroblastosis Fetalis	**08**	**15**
4	**Environmental Challenges** 1. Causes, effects and controlling measures of various kinds of environmental pollutions; a) Air pollution, b) Water pollution, c) Soil pollution, d) Noise pollution, e) Thermal pollution, f) Light pollution 2. Effects of human population explosion on environment 3. Climate change as result of global warming	**12**	**15**
5	**Animal Behaviour** 1. Learning behaviour – types of learning behaviour (Non associative learning – Habituation, Sensitisation; Associative learning – Classical Conditioning and Trail and Error), Phase-specific learning – Imprinting 2. Social behaviour (HoneyBee and Termites)	**08**	**15**

	3. Courtship behaviour (Peacock, Scorpion, Spider, Hornbill, Stickle Back) 4. Parental Care: Arius, Ichthyophis, Alytes, Hornbill		

Reference Books:

1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by P. S. Verma and V. K. Agarwal
2. Ecology and Environment by P. D. Sharma
3. Biological Instrumentation and Methodology by P. K. Bajpai
4. Animal Behavour by V. K. Agarwal

B.Sc. Honours/ Honours with Research in Zoology

(NCrF Level- 4.5 First Year – Certificate in Zoology)

Semester II

Course Category	**MDC/IDC – 2 Practical**
Title of the Course	**Fundamentals of Biology Practical -2**
Course Credit	**01**
Teaching Hours per Semester	**30**
Total Marks	**CCE- 25**

Course Objectives

Objectives of this course is to teach students

- Practical use of light microscopes and pH meter
- Morphology of different cell organelles
- Problem solving in genetics
- Blood group types and determination
- Some of the basic animal behaviours.

Course Outcomes – COs

Students will be able to

- Use light microscopes in laboratories
- Identify plant and animal cells and cell organelles
- Solve genetical problems of inheritance
- Determine blood group
- Identify different behaviours in animals.

1	Employability/Entrepreneurship/Skill Development પરકેન્દ્રિતથયેલછેકેનહિ ?					Yes/~~No~~
2	Value added Courses Imparting Transferable and Life Skillsનાગુણોધરાવેછે?					Yes/~~No~~
3	Major		~~Yes~~/No	Minor		~~Yes~~/No
	Skill Enhancement Courses		~~Yes~~/No	Ability Enhancement Courses		~~Yes~~/No
	Value Added Courses		~~Yes~~/No	Exit/ Vocational Courses		~~Yes~~/No
4	Holistic Education	Yes/~~No~~	Multidisciplinary	Yes/~~No~~	Interdisciplinary	Yes/No
5	દિવ્યાંગમાટેવિષયઅંતર્ગતઆનુસાંગિકજોગવાઈકરાયેલછે ?					Yes/~~No~~
6	New India Literacy Programme (NILP) મુજબનોવિષયછે ?					Yes/~~No~~

7	Swayam પ્લેટફોર્મપરના MOOC વિષયપરઆધારિતઆવિષયછે ?	Yes/~~No~~
8	ઈન્ડીયનનોલેજસીસ્ટમ (IKS) પરઆધારિતવિષયછે ?	Yes/~~No~~

Pr. No.	List of Practicals
1	Study working principle of dissecting and compound microscope.
2	Study working principle of pH meter.
3	Study plant and animal cells by preparing temporary slide (Ex. Onion cells, cheek cell).
4	Study cell organelles by charts/multi media (as per theory)
5	Solve the given genetic problems • Mono hybrid • Di hybrid • Incomplete dominance • Co-dominance
6	Solve the given genetic problems • Multiple Alleles (ABO Blood group in human)
7	To Determine own blood group and Rh factor
8	Case study of any polluted site with aim to discuss type of pollution, source of pollution, environmental impact and possible mitigation.
9	To study learning behaviour of classical conditioning (Pavlov's experiment) and imprinting behaviour (chick) by charts/models
10	To study social behaviour, courtship and parental care behaviours by charts/models (as per theory syllabus)