Royal College of Arts, Science and Commerce (Autonomous)

Affiliated to University of Mumbai

Program: Bachelor of Science

Course: F.Y.B.SC. (Zoology)

Syllabus for Semester: I and II

Syllabus for Undergraduate Programme as per

National Education Policy (NEP-2020) with effect from the Academic Year 2024-25

NEP Credit Structure for Science

Level	Sem	Major		Minor	OE	VSC	SEC	AEC	IKS	VEC	OJT/FP /RP/CC /CEP	Cumulative Credits	
		DSC	DSE										
4.5	I	6 (4Th + 2 Pr)		4+2 (4Th + 2 Pr)	2	2		2	2	2		22	UG Certificate Cumulative Credit:44
	II	6 (4Th + 2 Pr)		4+2 (4Th + 2 Pr)	2		2	2		2	2	22	
Exit Option: Award of UG Certificate in Major with 40 -44 Credits and an Additional 4 Credits Core NSQF Course / Internship OR Continue with Major and Minor													
5	III	8 (6Th + 2 Pr)		4 (2 Th + 2 Pr)	2+2		2	2			2	22	UG Diploma Cumulative Credit:88
	IV	8 (6Th + 2 Pr)		4 (2 Th + 2 Pr)	2+2		2	2			2	22	
Exit Option: Award of UG Diploma in Major and Minor with 80-88 Credits and an Additional 4 Credits Core NSQF Course / Internship OR Continue with Major and Minor													
5.5	V	10 (8Th + 2 Pr)	4 (2Th + 2 Pr)			4					4	22+	UG Degree Cumulative Credit:132
	VI	10 (8Th + 2 Pr)	4 (2Th + 2 Pr)			4					4	22	
	Total	**48**	**8**	**20**	**12**	**10**	**6**	**8**	**2**	**4**	**14**	**132**	

Programme Outcomes (PO)

Sr. No.	On completing B.Sc., the students will have:
PO1	Acquired the basic knowledge related to the subject offered.
PO2	The knowledge to explain the basic concepts, fundamental principles and the scientific theories related to various scientific phenomena and their relevance in day-to-day life.
PO3	Acquired the skills in handling scientific instruments.
PO4	Acquired the skills of planning and performing laboratory experiments, reading observations and drawing logical inferences from the scientific experiments.
PO5	Developed scientific outlook not only with respect to their subject, but also in all aspects related to life.

Programme specific outcomes (PSO)

Sr. No.	On completing B.Sc.in Zoology, the students will be able to:
PSO1	Demonstrate the understanding of the concepts in basic and applied Zoology.
PSO2	Appraise the role of BT in applied zoology sectors like fishery and animal husbandry, Use of genetic engineering to conserve wildlife, Use of biostatistics for data studies, Ecological awareness and biodiversity conservation.
PSO3	Apply theoretical knowledge to demonstrate experiments in lab setting.
PSO4	Use relevant tools, equipment and instruments in lab.
PSO5	Develop observational and analytical skills necessary for interpretation of experiments and projects.
PSO6	Exhibit critical thinking problem solving skills.
PSO7	Communicate the scientific information with clarity and precision.
PSO8	Practice ethical awareness and professional responsibilities.
PSO9	Demonstrate the ability to engage in self-directed learning and collaborative team work.

SEMESTER - I

MJ1: LIFE PROCESSES AND ANIMAL BIOTECHNOLOGY

Code: RCSZOMJ101

Course Objectives (CLO):

CLO1. To develop the understanding of learners about the basic of life processes.

CLO2. To mobilize the learners ability to understand and evaluate the Control and coordination in life processes of the living organism.

CLO3. To acquaint learners to the modern developments and concepts of Zoology highlighting the biotechnological applications in various fields.

Course Outcomes (CO):

Upon completion of the course, the learners should be able to:

CO1. Define and state the concepts of life processes. Classify and discuss the variation in these processes at different levels of taxonomy.

CO2. Describe and appraise the control and co-ordination of physiological processes in organisms.

CO3. Discuss the achievements of BT in fishery and animal husbandry.

CO4. Defend and interpret applications of BT and justify the related ethical and ecological considerations.

MJ1: LIFE PROCESSES AND ANIMAL BIOTECHNOLOGY

Code: RCSZOMJ101

Module	Module 1: Life Processes-I	15 hr
1.1	**Movement and locomotion**	02 hr
1.1.1	Amoeboid movement, tube feet, flagellum	
1.1.2	Action of muscles (Role of muscles in movement)	
1.2	**Nutrition**	
1.2.1	Apparatus for nutrition:	04 hr
1.2.2	Animals without alimentary canal, ex. Amoeba	
1.2.3	Animals with incomplete alimentary canal, ex. Hydra,	
1.2.4	Animals with complete alimentary canal, Ruminants and Non ruminants	
1.2.5	Brief account of physiology of digestion in vertebrates and symbiotic Digestion in Ruminants.	
1.3	**Respiration**	03 hr
1.3.1	Types of respiratory surfaces:	
1.3.1.1	General body surface: Cell membrane - ex. Amoeba	
1.3.1.2	Skin - ex. Earthworm and Frog	
1.3.1.3	Trachea and spiracles	
1.3.1.4	Gills of fish	
1.3.1.5	Lungs of Human	
1.4	**Excretion and osmoregulation**	02 hr
1.4.1	Concepts of osmoregulation and excretion.	
1.4.2	Categorization of animals on the basis of principle nitrogenous Excretory products.	
1.5	**Circulation**	04 hr
1.5.1	Types of circulation	
1.5.1.1	Open and closed circulation	
1.5.1.2	Single and double circulation	
1.5.2	Hearts Types	
1.5.2.1	Heart of Cockroach	
1.5.2.2	Heart in chordates (Fish, Frog, Rat)	

Module	Module 2: Life Processes-II and Animal Biotechnology	15 hr
2.1	**Control and Co-ordination**	04 hr
2.1.1	Conduction of nerve impulse	
2.1.1.1	Resting potential	
2.1.1.2	Action potential	
2.1.1.3	Refractory period	
2.1.4	Endocrine regulation	
2.1.4.1	Hormones as chemical messengers	
2.1.4.2	Feedback mechanisms	
2.2	**Reproduction**	03 hr
2.2.1	Asexual Reproduction	
2.2.1.1	Binary fission in Paramecium	
2.2.1.2	Budding in Hydra	
2.2.2	Sexual mode of reproduction	
2.2.2.1	Gametogenesis	
2.3	**Fertilization**	03 hr
2.3.1	External and internal fertilization	
2.3.2	Oviparity	
2.3.3	Viviparity	
2.3.4	Ovo-viviparity	
2.4	**Animal Biotechnology**	05 hr
2.4.1	Scope and achievements of Biotechnology (Fishery, Animal Husbandry)	
2.5	Applications of Biotechnology:	
2.5.1	Genetic Engineering and the Conservation of Endangered Species – Bio banking	
2.5.2	Ethical and ecological considerations	
2.5.3	Recombinant DNA in medicines (Transgenic animals).	
2.5.4	Green genes: Green Fluorescent Protein (GFP) from Jelly fish-valuable as reporter genes	
2.5.5	DNA fingerprinting application in forensic Science (Crime investigation)	

Reference Books:

1. Campbell Biology, 11th Ed. (2017) Lisa Urry et al. Pearson Publication. ISBN. 978-0134093413

2. Biology (1994) by John W. Kimball, 6th Ed. ISBN. 978-0697142573

3. Invertebrate Zoology: A functional and evolutionary approach. 7th Ed. (2006) Robert D Barns. ISBN: 978-8131501047.

4. Modern Textbook of Zoology Vertebrates. (2020) 4th Ed. R L Kotpal. Rastogi Publication. ISBN: 978-9350780954

5. Modern Textbook of Zoology Invertebrates (2020) 12th Ed. R L Kotpal. Rastogi Publication. ISBN: 978-8193887554.

6. Embryology (2017) Mohan P Arora. Himalaya Publishing House. ISBN: 978-9352730964.

MJ2: INSTRUMENTATION, LABORATORY PRACTICES AND BIOSTATISTICS

RCSZOMJ102

Course Objectives (CLO):

CLO1. To introduce the learners to factors affecting measurements.

CLO2. To impart the knowledge on safe laboratory practices.

CLO3. To acquaint learners with the principle and application of common Instrument and techniques used in lab.

CLO4. To orient learners towards the concepts and applications of Descriptive statistics.

Course Outcomes (CO):

Upon completion of the course, the learners should be able to:

CO1. Identify different factors affecting measurements.

CO2. Describe lab safety rules and regulations.

CO3. State the principles and applications of common Instrument and techniques.

CO4. Define the basic concepts in descriptive statistics and state its applications.

MJ2: INSTRUMENTATION, LABORATORY PRACTICES AND BIOSTATISTICS

RCSZOMJ102

Module	Module 1: INSTRUMENTATION	15 hr
1.1	**Basic Measurement Theory**	02 hr
1.1.1	Introduction, Categories of measurement,	
1.1.2	Factors affecting measurements, error, validity, Reliability, Reproducibility, accuracy and precision, categories of error, with suitable examples.	
1.2	**Microscopy: Introduction and Applications**	04 hr
1.2.1	Light microscope: Simple and compound	
1.2.2	Fluorescence microscope	
1.2.3	Transmission and Scanning electron microscope	
1.3	**pH measurement and Centrifugation**	03 hr
1.3.1	pH meter: Principle and applications	
1.3.2	Centrifugation: Principle, types of centrifuge and applications.	
1.4	**Chromatography**	06 hr
1.4.1	Chromatographic techniques: Principle and applications	
1.4.2	Adsorption and partition chromatography - Types.	
1.5	Colorimetry and Spectrometry- Principle and applications	
1.6	Electrophoresis - Principle and applications (AGE and PAGE)	

Module	Module 2: Laboratory Practices	15 hr
2.1	**Introduction to Safe Laboratory Practices**	03 hr
2.1.1	Introduction and Scope,	
2.1.2	Fundamentals of GLP (Resources Characterization, Rules)	
2.2	**Laboratory rules and Protocols**	05 hr
2.2.1	General Rules/Protocols for Lab Safety measures, Safety symbols	
2.2.2	Precaution and Safety in handling of chemicals, Laboratory tools, Glassware and instruments.	
2.2.3	Internal and External Audit.	
2.3	**Laboratory hierarchy and SOP Levels of Laboratories**	02 hr
2.3.1	Log Book Maintenance, Basic SOPs for instrument handling and Maintenance, Keeping data records	
2.4	**Laboratory safety practices**	02 hr
2.4.1	Use of Fire extinguisher	
2.4.2	Precautions and first aid for acid burn	
2.4.3	Precautions and first aid of chemical inhalation and the accident	
2.5	**Biostatistics**	03 hr
2.5.1	Introduction and scope	
2.5.2	Descriptive biostatistics	
2.5.2.1	Measures of central tendency	
2.5.2.2	Measures of Dispersal : Range, Interquartile range, Standard Deviation	

Reference Books:

1. A course in electronic measurements and instrumentation. (2015) A K Sawhney. Dhanpat Rai and Co publication. ISBN: 978-8177001006.

2. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology. 8th Ed. ISBN: 978-1316614761.

3. An Introduction to Practical Biochemistry. (2017) David Plummer. 3rd Ed. 978-0070994874.

4. Bioinstrumentation. (2019) Bhawana Pandey and MH Fulekar. Dreamtech Press ISBN: 978-9389520286.

5. Handbook Good Laboratory Practices-World health organization (WHO)

6. Life science protocol manual (2018)-DBT star college scheme

7. Guidelines for good laboratory practices-Indian council of medical research, New Delhi (2008).

MJP1: PRACTICAL BASED ON MJ1 AND MJ2

Code: RCSZOP1

Course Objectives (CLO):

CLO1. To impart knowledge of life processes in animals.

CLO2. To develop good laboratory practices.

CLO3. To train learner to handle basic laboratory equipment and practice calibration and calculation techniques.

CLO4. To enable the learners to apply the knowledge of applications of BT and descriptive statistics to solve problems.

Course Outcomes (CO):

Upon completion of the course, the learners should be able to:

CO1. Describe the structures/organs involved in vital life processes of animals.

CO2. Execute lab safety practices, and interpret the meaning of safety symbols.

CO3. Demonstrate the skills of basic calibration and handling of common Instruments.

CO4. Apply computational skills to solve statistics problems and use knowledge of BT applications in crime investigation.

MJP1: PRACTICAL BASED ON MJ1 AND MJ2

Code: RCSZOP1

Practical	Name of the Course: MJP1: Practical based on MJ1 and MJ2
1	Study of nutritional apparatus in *Amoeba*, Hydra, digestive system of Cockroach, Fish, Bird and Mammal (ruminant and non-ruminant).
2	Study of effect of pH and temperature on amylase/ trypsin activity.
3	Study of heart of Cockroach, Fish, Frog, Pigeon and Mammal.
4	Study of excretory apparatus in *Amoeba*, Planaria, Earthworm, Cockroach, Fish, Mammal.
5	Study of mode of reproduction in Planaria, Cockroach, Mammals (T.S Testis and T.S Ovary).
6	Study of respiratory structures in *Amoeba*, Cockroach, Spider, Fish, Frog, Mammal.
7	Introduction to basic laboratory safety practices, precautions and safety rules and symbols.
8	Study of compound microscope, care and functions of its components.
9	Handling of common laboratory equipment (instrument and glassware): burner, autoclave, burette, and pipette.
10	Handling of weighing balance and preparation of solution of different gradients (Percentage, ppm, molarity, normality).
11	Measurement of pH of Milk, Aerated drinks, Lemon juice, etc. using pH paper and pH meter.
12	Paper chromatography for separation of amino acids.
13	Separation of lipids by thin layer chromatography.
14	Separation of pigments by chalk chromatography.
15	Measurement of optical density using Colorimeter.
16	Visit to clinical lab/ pathology lab, OR Central Instrumentation facility OR R & D center, and submission of report OR Participation in Instrumentation workshop.
17	Identification of transgenic animals and their applications. (Using photographs).
18	DNA fingerprinting, applications in forensic science (Crime Investigation) using electrophoretic patterns.
19	Study of central tendencies (Mean, Median, Mode) and Standard deviation.
20	Plotting of Bar diagram, Histogram, Pie diagram, Frequency polygon, Scatter plot, Box-whisker plot (using MS Excel).
21	(Additional activity which the centre may consider)

Reference Books:

1. A course in electronic measurements and instrumentation. (2015) A K Sawhney Dhanpat Rai and Co. Pvt Ltd. ISBN: 978-8177001006

2. Wilson And Walker's Principles And Techniques Of Biochemistry And Molecular Biology. 8th Ed. ISBN: 978-1316614761.

3. An Introduction to Practical Biochemistry. (2017) David Plummer. 3rd Ed. McGraw HillEducation. ISBN: 978-0070994874.

4. Bioinstrumentation. (2019) Bhawana Pandey and MH Fulekar. Dreamtech Press ISBN: 978-9389520286.

5. Guidelines for good laboratory practices-Indian council of medical research, New Delhi (2008).

7. Invertebrate Zoology: A functional and evolutionary approach. 7th Ed. (2006) Robert D Barns. ISBN: 978-8131501047.

8. Modern Textbook of Zoology Vertebrates. (2020) 4th Ed. R L Kotpal. Rastogi Publication. ISBN: 978-9350780954

9. Modern Textbook of Zoology Invertebrates (2020) 12th Ed. R L Kotpal. Rastogi Publication. ISBN: 978-8193887554.

10. Embryology (2017) Mohan P Arora. Himalaya Publishing House. ISBN: 978-9352730964.

11. Comparative anatomy of vertebrates (2008) R. K. Saxena, Sumitra Saxena. ISBN: 978-1905740994.

SEMESTER – II

MJ3: EVOLUTION AND ETHOLOGY

RCSZOMJ201

Course Objectives (CLO):

CLO1. To orient learners to the concept of origin of life on earth and Evidences in favor of Organic evolution

CLO2. To familiarize learners with the theory of speciation and causes of evolution.

CLO3. To acquaint learners to the different Aspects of animal behavior and its related concepts.

Course Outcomes (CO):

Upon completion of the course, the learners should be able to:

CO1. Define the concepts of origin of life on earth and state the different evidences supporting Organic evolution.

CO2. Describe the causative factors of evolution and appraise the theory of speciation.

CO3. Discuss different aspects of animal behavior and types of learning.

CO4. Explain social behavior and Cognitive aspects of learning.

MJ3: EVOLUTION AND ETHOLOGY

RCSZOMJ201

Module	Module 1: Evolution	15 hr
1.1	**Early ideas of evolution: Origin of Life on Earth: Theories of Biogenesis, Lamarckism and Darwinism**	03 hr
1.1.1	Urey-Miller's Experiment, Protobiont	
1.1.2	Natural Selection: Stabilizing, Directional, Disruptive selection	
1.2	**Reproductive isolating mechanisms**	05 hr
1.2.1	The nature of evolutionary units	
1.2.1.1	Species concepts	
1.2.1.2	The Biological Species concept	
1.2.2	General theory of speciation: Sympatric, Allopatric, Parapatric and Peripatric	
1.3	**The causes of evolution**	04 hr
1.3.1	Hardy-Weinberg equilibrium	
1.3.2	Mutation: Causes and types, Gene flow, Genetic Drift	
1.4	**Evidences in favor of Organic evolution**	03 hr
1.5.1	Evidences from Paleontology, Anatomy, Embryology, Physiology and Genetics	

Module	Module 2: Ethology	15 hr
2.1	**Introduction to Ethology**	04 hr
2.1.1	Definition and Scope of Ethology	
2.1.2	Animal behavior: Innate and Learned behavior	
2.1.3	Types of learning: Habituation, Imprinting and Types of imprinting - Filial and sexual, Classical conditioning	
2.1.4	Instrumental learning	
2.2	**Aspects of animal behavior**	05 hr
2.2.1	Communication in bees and ants	
2.2.2	Mimicry and colorations	
2.2.3	Displacement activities, ritualization	
2.2.4	Migration in fish, schooling behavior	
2.2.5	Habitat selection, territorial behavior	
2.3	**Social behavior**	03 hr
2.3.1	Social behavior in primates - Hanuman langur	
2.3.2	Elements of socio-biology: Altruism and Kinship	
2.4	**Cognitive aspects of learning**	03 hr
2.4.1	Nature of cognitive process	
2.4.2	Insight learning	15 hr
2.4.3	Associative learning and representation	04 hr

Reference Books:

1. Biological science, 3rd edition – D.J. Taylor, N. P. O. Green, G. W. Stout. Cambridge University press, Low priced edition**.** ISBN:9780521639231

2. Survival Strategies – Cooperation & Conflict in Animal Societies (OIPSE): Cooperation and Conflict in Animal Societies. (2001) Raghavendra Gadagkar. Harvard University Press. ISBN:9780674005570.

3. An introduction to animal behaviour, 4th edition - Aubrey Manning and M. S. Dawkins. Cambridge University press, Low priced edition. ISBN:9780521578912

4. Animal behaviour (2019) Mohan P. Arora & Himanshu Arora. Himalaya publication. ISBN: 978-9352997367.

5. Bishop, B. A., & Anderson, C. W. (1990). Learners' conceptions of natural selection and its role in evolution. *Journal of Research in Science Teaching, 27,* 415-427.

6. Hafner, M.S. (1991). *Evolution laboratory: Laboratory exercises and discussions in evolutionary biology.* Baton Rouge, LA: Louisiana State University.

7. Hartl, D. L. (1988). *A primer of population genetics* (2nd edition). Sunderland, MA: Sinauer Associates.

8. Sober, E. (1994). *Conceptual issues in evolutionary biology.* Cambridge, MA: MIT Press.

9. Zoology – S. A. Miller and J. B. Harley (1999), Tata McGraw hill. ISBN:9780071158107

10. Animal Behaviour- (2014) Reena Mathur, Rastogi Publications ISBN: 978-9350780480

11. Animal Behaviour (2010) V.K Agarwal. S Chand and Company. ISBN: 978-8121932103.

12. Animal Behaviour (2015) 2nd Ed. Michael D Breed and Janice Moore. Elsevier Press. ISBN: 978-0-12-801532-2.

13. Evidence and Evolution: The Logic Behind the Science, Elliott Sober, 2008. Cambridge University Press. ISBN:9781139470117.

MJ4: ECOLOGY AND BIODIVERSITY

RCSZOMJ202

Course Objectives (CLO):

CLO1. To introduce the learners to the diverse aspects of ecology.

CLO2. To acquaint learners with types of Animal interactions and concepts of biogeochemical cycles.

CLO3. To orient learners towards the value of biodiversity and make them aware of the threats and conservation strategies.

CLO4. To familiarize the learners with Biodiversity hotspots of India.

Course Outcomes (CO):

Upon completion of the course, the learners should be able to:

CO1. Describe types of ecosystems and various concepts of ecology.

CO2. Explain biogeochemical cycles and Animal interactions with respective examples.

CO3. Discuss value of biodiversity, Identify the threats and state the different conservation methods.

CO4. Appraise the Indian biodiversity hotspots.

MJ4: ECOLOGY AND BIODIVERSITY

RCSZOMJ202

Module	Module 1: Ecology	15 hr
1.1	**Types of ecosystems: Aquatic (Freshwater, Marine) and terrestrial (Forest and Desert)**	05 hr
1.1.1	The "niche" concept.	
1.2	**Food chain: Detritus and grazing food chains, Food web, Ecological pyramids: Number, Biomass, and Energy**	
1.3	**Population dynamics: Density, Natality, Mortality, Fecundity, Sex ratio, survivorship curves, age pyramid.**	04 hr
1.3.1	Exponential and logistic growth	
1.4	**Study of Animal interactions**	03 hr
1.4.1	Competition: Interspecific and intraspecific (any two examples).	
1.4.2	Commensalism (Remora fish on shark, Cattle-Egrets on livestock).	
1.4.3.	Mutualism (Termite and Trichonympha, bees and flowers, cleaning symbiosis in fish by prawns.	
1.4.4	Parasitism (*Ascaris* and man, lice and humans)	
1.4.5	Predation (Lion and deer)	
1.5	**Biogeochemical cycles**	03 hr
1.5.1	Carbon cycle, Nitrogen cycle, and Phosphorus cycle.	

Module	Module 2: Biodiversity	15 hr
2.1	Introduction to Biodiversity: Definition, Concepts, types, scope and Significance	03 hr
2.2	**Value of Biodiversity**	04 hr
2.2.1	Consumptive value	
2.2.2	Productive value	
2.2.3	Social value	
2.2.4	Ethical value	
2.2.5	Aesthetic value	
2.2.6	Option value	
2.3	**Threats to Biodiversity**	06 hr
2.3.1	Habitat loss and Man-Wildlife conflict	
2.3.2	Biodiversity Conservation	
2.3.2.1	Species Conservation: In-situ and Ex-situ conservation	
2.3.2.2	Habitat Conservation	
2.4	**Introduction of Biodiversity hotspots**	02 hr
2.4.1	Himalayas, Western Ghats and Indo-burma region.	

Reference Books:

1. Fundamentals of Ecology, 5th Ed. (2004). Odum, E.P. and Barrett G. W. Publisher: Brooks/ Cole. ISBN: 978-0534420666.
2. Elements of Ecology. 9th International Edition (2014). Smith T. M. and Smith R. L. Benjamin Cummings publication.
3. Wildlife Biology, An Indian Perspective (2017). Saha G.K. and Mazumdar S. PHI Learning Private Limited. ISBN: 978-8120353138.
4. Ecology – Principle and application (1999) Chapman J. L. and Reiss M. J., Cambridge University press, Low priced edition. ISBN: 0521588022.
5. Essentials of Ecology, 3rd edition (2011) G. Tyler and Miller Jr. Thompson Books. ISBN: 978-0538735377.
6. Essentials of ecology and environmental sciences. 5th Ed. (2013) S. V. S. Rana. PHI publisher. ISBN: 978-8120347861.
7. Biodiversity- (2000) K.C.Agarwal- Agro Botanica Publications
8. Zoology, 5th Ed. (1999). S. A. Miller and J. B. Harley, Tata McGraw hill. ISBN: 978-0071158107.

MJP2: PRACTICAL BASED ON MJ3 AND MJ4

CODE: RCSZOP2

Course Objectives (CLO):

CLO1. To equip learners in basic practical knowledge of ecology and Biodiversity.

CLO2. To impart knowledge about major sanctuaries / national parks in India

CLO3. To train learners to develop skill in measuring ecological parameters and animal community structure.

CLO4. To acquaint learners to some aspects of animal behavior and evidences of evolution.

Course Outcomes (CO):

Upon completion of the course, the learners should be able to:

CO1. Describe animal interactions, ecological role of characteristic species.

CO2. Identify the brand animals and location of wildlife reserves of India.

CO3. Demonstrate the skills of estimation of ecological parameters and animal community structure.

CO4. Appraise mimicry and explain types of evidences to prove evolution.

MJP2: PRACTICAL BASED ON MJ3 AND MJ4

CODE: RCSZOP2

Practical	MJP2: Practical based on MJ3 and MJ4
1	Identification of mammalian fauna, avian fauna, and herpeto-fauna of India.
2	To study the various animal tracking system: Global Positioning System, Remote Sensing and Biotelemetry.
3	Effect of climate change on biodiversity: Case Study
4	Population estimation through capture-recapture method.
5	Mimicry: Leaf insect, stick insect, stick worm (caterpillar), Kallima butterfly, Monarch butterfly and common tiger butterfly (*Danaus*).
6	Determination of hardness of water sample.
7	Determination of dissolved oxygen of water sample.
8	Determination of salinity of the water sample by Refractometer / Argentometric method.
9	Study of food chain: (Grassland, Forest, Desert and Aquatic).
10	Study of animal interaction: Ectoparasite (Head Louse) and Endoparasite (Tape worm), Exo-parasite (Bed Bug), Mutualism (Clownfish and Sea anemones/ Hermit crab and Sea snemone), Commensalism (Sharks and Remora).
11	Study of animal community structure by quadrant method (Field or Simulation).
12	Study of aquatic fauna and their ecological role; fresh water (Daphnia), Intertidal (Sea Star, Sea Anemone, Barnacles), deep sea (Coral, Squids, Sperm Whale) (pictures / diagrams only).
13	Using photographs / paintings / coloured drawings identify and study ecological role of characteristic animal species (Desert- Camel, Himalayan- Marmots, Himalayan tahr, Grassland- One horned Rhinoceros, Gaur) of terrestrial environment.
14	Study of evidences of evolution:
A)	Analogy – Leg of grasshopper and leg of mammal Wing of insect, wing of bird, wing of bat
B)	Homology - Fore limb of amphibian/a reptilian, and wing of bird / bat.
15	Study of Fossils: Ammonite, Trilobite, *Archaeopteryx*.

16	Using map of India locate & demarcate major sanctuaries / national parks. Name of Brand animal of each national park and sanctuaries. National Parks - Kaziranga, Kanha, Rajaji, Jim Corbet, Dachigham, Ranthambore, Bharatpur, Tadoba, Madumalai, Sunderaban N.P., Periyar, Gir, Sanjay Gandhi N.P. Marine National ParkS - Pirotan and Garimatha marine sanctuary, Malvan marine sanctuary, Mahatma Gandhi marine N.P. of Andaman.
	(Additional activity which the center may consider: Study of IUCN red data book status of brand animals (India only)).

Reference Books:

1. Biological Science, 3rd Ed. (2005) D.J. Taylor, N. P. O. Green, G. W. Stout. Cambridge University press, Low priced edition. ISBN: 978-0521684170
2. Animal Behaviour: Psychobiology, Ethology and Evolution (1999). David McFarland. Pearson Publication. ISBN: 978-0582327320
3. An introduction to animal behaviour, 6th edition – (2012) Aubrey Manning and M. S. Dawkins. Cambridge University press, ISBN: 978-0521165143.
4. National Geographic Vol. 193 (3) March 1998: Rise of life on Earth p. 54-81
5. Scientific American Oct. 1994: Origin of life on Earth p. 53-61.
6. Essentials of human genetics. 5th Ed. (2009) –M.L. Kothari, L.A. Mehta and S.S. Roychoudhary, University Press. SBN: 978-8173716478.
7. Essentials of Ecology, 3rd edition (2011) G. Tyler and Miller Jr. Thompson Books. ISBN: 978-0538735377
8. Biodiversity: An Introduction.(2004) 2nd Ed. Kevin J. Gaston & John I. Spicer . Blackwell Publishing. ISBN: 1-4051-1857-1.
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Paper Pattern FYBSC NEP

Exam Pattern Theory

Semester – I and II

Paper – I and Paper - II

Total marks -30 Time – 01 Hour.

Q1) Attempt any 10 out of 12 (01 mark each – Objective)

Module 1 and 2

Q2) Attempt any two, out of four – (5+5)

Module 1

Q3) Attempt any two, out of four – (5+5)

Module 2

Exam Pattern Practical

Practical Q. Paper pattern – 50 marks (25 +25)

Duration 1 hr 30 min for 25 marks.

Q1) Major Experiment – 08

Q2) Minor Experiment – 05

Q3) Identification – 08 (Four spots)

Q4) Journal – 02

Q5) Viva – 02

Internal Assessment

SEMESTER I

Sr. No.	Class	Course Code	Internal Marks	Internal Assessment heads with marks	
				Test (10M)	Assignment (10M)
1	FYBSC	RCSZOMJ101	20	MCQ TEST	Visit to Clinical/Pathology lab and submission of report with viva.
2	FYBSC	RCSZOMJ102	20	MCQ TEST	Applications of Biostatistics Tools, Data collection, visualization, interpretation.

SEMESTER II

Sr. No.	Class	Course Code	Internal Marks	Internal Assessment heads with marks	
				Test (10M)	Assignment (10M)
1	FYBSC	RCSZOMJ201	20	MCQ TEST	Field visit to Sanjay Gandhi National Park, Borivali / Local Beach and submission of report with viva.
2	FYBSC	RCSZOMJ202	20	MCQ TEST	Effect of climate change on Biodiversity – Case Study / project.

END