



**RAJARSHI SHAHU MAHAVIDYALAYA, LATUR**  
**(Autonomous)**

**(BoS in ZOOLOGY)**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**SEMESTER PATTERN**

**(W.e.f. Academic Year 2020-21)**

**SYLLABUS FOR B.Sc.-I (ZOOLOGY)**

**June-2020**

**RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS), LATUR.**  
**SEMESTER PATTERN CURRICULUM UNDER CHOICE BASED CREDIT SYSTEM (CBCS)**  
**Faculty of Science B.Sc. F.Y.**  
**SUBJECT: ZOOLOGY**  
**(w. e. f. June -2020)**

Semester	Course		Paper No. and Title	Total period /week	Marks		Credits
					Internal	External	
SEM-I	CCZ-I	A	General zoology-I	45 3/week	20	30	2
		B	Cell Biology and Bioinstrumentation-II	45 3/week	20	30	2
	CCZP-I	A+B	Lab Course-I	45 3/week	20	30	2
SEM-II	SECZ-II	A	Developmental Biology-III	3/Week	20	30	2
SEM-I	CCZ-I	B	Histology and Histochemistry-IV	45 3/week	20	30	2
		CCZP-II	A+B	Lab Course-II	45 3/week	20	30

**Program objectives and out comes**

**Objectives**

- To impart the knowledge of animal science to the pupils.
- To make the pupils to use the knowledge in their daily life.
- To make the pupils aware of natural resources and environment.
- Application of knowledge in Zoology for nutrition, agriculture and live stock.
- To provide practical experiences which form a part of their learning processes?
- To develop aptitude for scientific work and ability to pursue studies far beyond graduation.
- To encourage the pupils to take life science as a carrier which is the need now a days
- To make the pupils fit for the society.

**Program Out comes**

- To impart knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science, natural phenomenon, and manipulation of
- Nature & environment by man.
- Understanding the scientific terms, concepts, facts, phenomenon and their Interrelationships.
- Applications of the knowledge.
- To develop skills in practical work, experiments and laboratory materials, Instruments.
- To develop interests in the subject and scientific hobbies.
- To develop scientific attitude which is the major objective? This makes the students open minded, critical observations, curiosity, thinking etc.
- Abilities to apply scientific methods, collection of scientific data, problem solving,
- Organize science exhibitions, clubs etc.
- Appreciation of the subject, contributions of scientists, scientific methods, scientific programs etc.

**RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS), LATUR.**

**Semester wise course structure**

**B.Sc. F.Y. Semester –I**

**Sub: Zoology**

**Course Title: General Zoology-I**

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**Credits: 02**

**Marks: 50**

**Lectures: 45**

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**Learning Objective:**

- Students will be able to identify and define invertebrates and Vertebrates.
- Students will be able to classify animals as invertebrate and Vertebrate.
- Students will be able to compare different classes of invertebrates and Vertebrates.

**Course Outcomes:**

- Learner can differentiate the invertebrates and Vertebrates.
- Learner can classify invertebrates and Vertebrates.
- Learner can compare invertebrates with Vertebrates with different basic characters.

**Unit – I (General characters and Classification up to class level of each phylum)**

i) Phylum Protozoa-life cycle of plasmodium

ii) Phylum Porifera

iii) Phylum Coelenterate and Helminthes

iv) Phylum Annelida-Type study of leech

**Unit –II (General characters and Classification up to class level of each phylum)**

i) Phylum Arthropoda

ii) Phylum Mollusca and Echinodermata

iii) Protochordata:-

a) Subphylum Hemichordata

b) Subphylum Urochordata, Retrogressive metamorphosis

c) Subphylum Cephalochordates.

**UNIT:-III Vertebrates- (General characters and classification with suitable example)**

i) Basic characteristics of chordates.

ii) Agnatha-Cyclostomata

iii) Pisces

iv) Dipnoi

v) Amphibian and Reptelia-Identification of Poisonous and Non- Poisonous Snakes

vi) Aves and Mammalia-Prototheria, Metatheria and Eutheria

**UNIT:-1V Type study: Rat**

i) Morphology

ii) Digestive system

iii) Respiratory system

iv) Circulatory, Brain and Reproductive system

v) Sense organs: - Ear and Eye.

**Suggested Readings**

1. Invertebrate Zoology by Jordan E.L. and P.S.Verma S.Chand Publication, and Co., Ltd. Ram Nager New Delhi
2. Vertibrate Zoology by Jordan E.L. and P.S.Verma S.Chand Publication, and Co., Ltd. Ram Nager New Delhi
3. Non-Chordate Zoology by Dhabhi and Dhami Pradeep Publication, Opposite Sitla Mandir, Jalndhar-144008
4. Chordate Zoology by Dhami and Dhami- Pradeep Publication, Opposite Sitla Mandir, Jalndhar-144008
5. A Text book of Embryology By. Arumugam Saras Publication
6. Rat a mammalian type By G.R. Kshirsagar., G.Y.-Rane Prakashan, TilakRoad, Poona 30.

**RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS), LATUR.**

**Semester wise course structure**

**B.Sc. F.Y. Semester –I**

**Sub: Zoology**

**Course Title: Cell Biology and Bio-instrumentation-I**

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**Credits: 02**

**Marks: 50**

**Lectures: 45**

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**Learning Objective:**

- To study the structural and functional organization of cell
- To make the students understand the structure and functions of cell organelles
- To understand the importance of nucleus in the cell
- To understand the role of various physical and chemical components of the cell
- To learn basic techniques in cytology
- To study various bioinstrumentation

**Course Outcomes:**

- Learner would acquire insight of transport mechanisms for maintenance and composition of cell
- Learner would able to find out chemical composition of cell and its organelles.
- Learner would acquire skill of different instruments for research analysis.

**Unit – I**

- i) Introduction to Cell Biology
- ii) Cell and Cell Theory
- iii) Ultra structure of prokaryotic and eukaryotic cell
- iv) Comparison between plant and animal cell
- v) Structure and Function of plasma membrane

**Unit –II**

- i) Structure and Function of Endoplasmic reticulum
- ii) Structure and Function of Golgi complex
- iii) Structure and Function of Mitochondria
- iv) Structure and Function of Ribosome
- v) Structure and Function of Lysosome

**Unit:-III**

- i) Structure and function of Nucleus and Chromosome

- ii) Cell cycle-Its regulation and Significance,
- iii) Mitosis, Meiosis and their significance. v) Apoptosis
- iv) Cell Fractionation and Centrifugation
- v) Autoradiography

**Unit:-IV**

- i) Chromatography: - Paper, Thin layer, Column Chromatography
- ii) Electrophoresis-Principles and Working
- iii) Colorimeter- Principles and Working
- iv) PH meter- Principles and Working
- v) Micro-Technique and Microscopy

**Suggested Readings**

1. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology by  
P.S.Verma and V. K. Agarwal S.Chand Publication, and Co., Ltd. Ram nager New Delhi
2. Cell (A Molecular approach): Cooper, G. M.
3. Cell and Molecular Biology (1996) Karp, G.
4. Cell Biology (1993) Sativa D. E.
5. Cell and Molecular Biology (1995) Kish V. M. and Kleinsmith L. J.
6. Cell and Molecular Biology: De Robertis and Robertis
7. Cell Biology by C.B. Pawar
8. Elements of Biotechnology by P.K. Gupta and Rastogi

**RAJARSHI SHAHU MAHAVIDYALAYA,(AUTONOMOUS), LATUR.**  
**B.Sc. F.Y. Semester –I**  
**Sub: Zoology**  
**Course Title: General Zoology, Cell Biology and Bio-instrumentation**  
**Lab. Course: I**

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**Credits: 02**

**Marks: 50**

**Lectures: 45**

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**Learning Objectives**

- To make the students to understand the different animals by Museum study.
- To make the students to understand the staining, mounting and micro techniques like blood smear. Squash preparation...
- To make the students to understand chromatography techniques.

**Course Outcome**

- Learners would understand the taxonomy of different animals.
- Learners would be able to identify microscopic organism by Staining techniques
- Learners would be able to understand process of cell division by Squash preparation.
- Learners would analyze the biomolecules by chromatography techniques

**1) Museum Study-I**

Study of at least two museum specimens from invertebrate phyla (protozoa to Echinodermata and Protochordata)

**2) Museum Study-II**

Study of at least two museum specimens from Cyclostomata to Mammalia

**3) Mountings:**

Spicules and gemmules of sycon, Obelia colony, Jaws of leech & Nephridia, Nereis Parapodia  
Scales: Ctenoid, Cycloid and Placoid

**4) Staining**

Identification of microorganism and Plankton from water sample by single staining technique.

**CELL BIOLOGY AND BIO INSTRUMENTATION**

1. To demonstrate the presence of mitochondria in striated muscle cells and epithelial cell using Vital stain Janus Green B.

2. Squash preparations to observe stages of Mitosis and Meiosis in onion root tips, and bud anthers Temporary /Grasshopper testis respectively
3. Study of mitosis and meiosis from permanent slides.
4. Identification and study of cells- Slides/Photomicrographs/live cell (Amoeba, Sperm, Euglena, Bacteria).
5. Identification and study of Skeletal, smooth and cardiac muscles by staining method.
6. Study of blood cells by staining smear
8. Separation of lipid/amino acid by paper chromatography.
9. Colorimetric estimation of glucose/protein.
10. Excursion report

**NOTE: Any twelve practicals for each semester**



**RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS), LATUR.**

**Semester wise course structure**

**B.Sc. F.Y. Semester –II**

**Sub: Zoology**

**Course Title: Developmental Biology-II**

**Credits: 02**

**Marks: 50**

**Lectures: 45**

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**Learning objective**

- To make the students to understand the developmental stages of animals.
- To make the students to understand the Infertility in human being.
- To make the students to understand the Stem cells.

**Course Outcomes:**

- Learners would understand the different developmental stages of animals.
- Learners would be able to understand the Infertility in human being.
- Learners would be able to understand the application of Stem cells.

**Unit –I Introduction**

- i) Gametogenesis- Spermatogenesis and Oogenesis,
- ii) Types of eggs,
- iii) Male and Female gametes
- iv) General fertilization

**Unit –II Early Embryonic Development of frog**

- i) Cleavage
- ii) Blastulation and Gastrulation
- iii) Differentiation of germ layers
- iv) Metamorphosis- changes and hormonal regulation of metamorphosis in amphibians

**Unit –III**

- i) Extra embryonic membranes in Chick
- ii) Placenta in mammals- structure, types and physiology of placenta
- iii) Regeneration in animals- (invertebrates and Vertebrates)
- vi) Developmental study of *Drosophila melanogaster*/ Zebra fish

**Unit-IV**

- i) Infertility, Diagnosing Infertility-Test tube baby and Gamete intra fallopian transfer.
- ii) Ageing concept
- iii) Stem cell- Embryonic stem cell, Adult stem cell, Haemopoetic stem cell, Nervous stem cell,

### **Suggested Readings**

1. A Text book of Embryology By. Arumugam Saras Publication
2. Elements of Biotechnology by P.K. Gupta and Rastogi
3. Developmental Biology: - Scott F. Gilbert
4. Balinsky: Introduction to embryology (CBS College Publisher)

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**Semester wise course structure**

**B.Sc. F.Y. Semester –II**

**Sub: Zoology**

**Course Title: Histology and Histochemistry-IV**

**Credits: 02**

**Marks: 50**

**Lectures: 45**

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**Learning objective**

- To acquaint the learner with key concepts of Histology and Histochemistry.
- To study structural aspect of different organs.
- To study various histochemical techniques used in analysis of biochemical's.

**Course Outcomes:**

- Learner will be able to understand and compare the different key concepts of Histology and Histochemistry
- Learner will be able to understand structural aspect of different organs
- Learner will be able use various histochemical techniques for analysis of different biochemical's like Proteins, carbohydrates, Lipids. and Nucleic acid.

**Unit-I (Histology Tissues)**

- 1) Epithelial tissue: a) Squamous b) Cuboidal c) Columnard) Glandular
- 2) Connective tissue: a) Hyaline cartilage b) Bone,
- 3) Loose connective tissues: Blood and lymph

**Unit –II (Histology of organs)**

- i) Stomach ii) Intestine iii) Liver iv) Kidney v) Pancreas

**Unit –III (Histology of endocrine gland)**

- i) Pituitary gland ii) Thyroid gland iii) Adrenal gland iv) Testis and Ovary

**Unit-IV(Histochemical Technique for Proteins, Carbohydrates and Lipids)**

- i) Protein:-Ninhydrin Schiff Method (Amino groups)
- ii) Carbohydrates- PAS reaction (Bauer-Feulgen method -Glycogen)
- iii) Lipids – Oil Red O Method, Sudan black B method.
- iv) Histochemical Technique for Nucleic Acid- DNA – Feulgen Nuclear Method,

**Suggested Readings**

1. Patki, L.R. et al., 1983.An introduction to Micro technique. S. Chand

2. Bruce Cassel man, W.G. (1962) Histochemical technique. Butter and Tanners
3. Bancroft, J.D., Alan Stevens and Turner, D.R. 1996. Theory and Practice of Histological Techniques. Churchill Livingstone, New York
4. Histology Mammals: Athavale, M.V. and Latey, A.N.
5. 4.Histology Greep: R.O. and Well,L.

**RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS), LATUR.**

**B.Sc. F.Y. Semester –II**

**Sub: Zoology**

**Course Title: Developmental Biology, Histology, Histochemistry**

**Lab Course: II**

**Credits: 02**

**Marks: 50**

**Lectures: 45**

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### **Learning Objectives**

- To make the students to understand the life history of frog.
- To make the students to understand the developmental study of chick.
- To make the students to understand the different tissues and stem cells.
- To make the students to understand the Microtomy techniques.

### **Course Outcome**

- Learners would understand the life history of frog.
- Learners would be able to identify permanent slides of chick embryo.
- Learners would be able to understand process of cell division by Squash preparation.
- Learners would able to prepared permanent slides of different tissues.

### **Developmental Biology:**

1. Study of eggs and tadpole of frog from collected/Preserved material
2. Study of frog development through permanent slides and models/Chart.
3. Whole mount preparations of chick embryos
4. Temporary preparations of blastoderm of chick
5. Study of types of eggs.
6. Sperms smear preparation
7. Study of regeneration in invertebrates and vertebrates
8. Study of parthenogenesis in Honey bee
9. Study of permanent slides of Chick Embryo: 18 hrs. 24 hrs. 36 hrs. 48 hrs. 72 hrs. Stages.
10. Identification and study of male and female gametes of frog.

### **Histology and Histochemistry:**

1. Temporary preparation of Squamous epithelium, ciliated epithelium, skeletal Muscle fiber and blood smear.

2. Study of histological structure of following organs – Stomach, intestine, pancreas, liver, Kidney, testis, ovary, thyroid, adrenal and pituitary.

3. Preparation of histological permanent slides by the process of block Preparation, section cutting and staining.

4. Location of biomolecules like, protein, carbohydrates, lipids by Histochemistry techniques

**NOTE: Any twelve practicals for each semester**

END

