

SANT GADGE BABA AMRVATI UNIVERSITY AMRAVATI

Curriculum Scheme for Second year B. Sc II. Sem III & Sem IV (Zoology)															
Sr. no.	Course category	Subject code no.	Subject/Course	Credit	Teaching and Learning Scheme			Hours/Week	Examination and Evaluation Scheme						
					Lectures	Tutorial	Practical		Maximum Marks				Minimum Passing		
									Theory		Practical		Total Marks	Marks	Grade
									Theory + MCQ (EXT)	SEM (Int)	Internal	External			
Semester -III															
1.	B.Sc.	DSC-3-03S	Zoology	4.5	06	---	----	06	80	20	--	--	100	40	p
		Practical for DSC-3	Zoology	2.25	---	-----	06	04	----	----	25	25	50	25	P
Semester -IV															
2.	B.Sc.	DSC-4-04S	Zoology	4.5	06	---	----	06	80	20	--	--	100	40	p
		Practical for DSC-4	Zoology	2.25	---	-----	06	04	----	----	25	25	50	25	P

Name of the Programme: B.Sc. II

Class: Part 3S

Semester: III DSC-3-03S

Subject: Zoology

Name of the course (Paper): Cell Biology and Developmental Biology

Course Outcomes Code: COs-03

About the course

The course is a walk for the Bachelor's degree through the amazing diversity of living organisms from simple to complex. The course makes a detailed knowledge of cell structure and functions. It explains the types, mechanism and significance of cell division. It also deals with the development of organism and how organism developed from single cell to multicellular organism.

COs:

Upon completion of this course successfully, students would be able to

1. Describe the structure and function of cellular organelles.
2. Describe various mode of cellular transport.
3. Compare active transport with passive transport.
4. Describe structure of chromosomes.
5. Differentiate between various types of chromosomes.
6. Define the basic concept of developmental biology, cell division, embryogenesis and emergence of adult organisms.
7. Describe zygote formation and different stages of embryonic development in frog and chick.

UNIT-I:

1. Plasma membrane: Sandwich model, Unit Membrane Model and Fluid-mosaic Model.
2. Functions of Plasma membrane: Transport across membranes, active transport, passive transport, facilitated transport.
3. Exocytosis, Endocytosis, Phagocytosis and Pinocytosis.
4. Structure of Nucleus and nucleolus.
5. Chromatin: Euchromatin and Heterochromatin.

UNIT-II:

1. General organization of Eukaryotic chromosomes.
2. Nucleosome; Solenoid model.
3. Types of Chromosomes based on position of centromere.
4. Giant chromosomes- Polytene and Lampbrush Chromosome.
5. Functions of Chromosomes.

UNIT-III:

1. Endoplasmic reticulum: Ultrastructure, Types and Functions.
2. Golgi complex: Ultrastructure and Functions.

3. Ribosome: Types (70S and 80S), Ultrastructure (Stoffler and Wittmann's model only); functions.
4. Lysosomes: Polymorphism, Ultrastructure, and functions.
5. Mitochondria: Ultrastructure and functions.

UNIT-IV:

1. Mitosis and its significance.
2. Meiosis and its significance.
3. Gametogenesis: Spermatogenesis and oogenesis
4. Fertilization: Types of fertilization.
5. Mechanism of fertilization.

UNIT V:

1. Cleavage, blastulation and gastrulation up to the formation of three germ layers in Frog.
2. Fate map in frog.
3. Cleavage, blastulation and gastrulation up to the formation of three germ layers in chick.
4. Development of Extra embryonic membranes in chick.
5. Significance of Extra embryonic membranes in chick.

UNIT-VI:

1. Placentation in mammals; Types and Functions of Placenta.
2. Parthenogenesis: Types and Significance.
3. Regeneration in invertebrates.
4. Regeneration in vertebrates.
5. Elementary idea, sources, types and use of Stem cells.

LIST OF PRACTICAL BASED ON CELL AND DEVELOPMENTAL BIOLOGY

I) Cell Biology:

1. Use, care and maintenance of microscope.
2. Study of different cell types by permanent slides/ICT Tools/Charts
(Endothelium, Neuronal, Epithelia, Connective Tissue)
3. Demonstration of mitochondria by using vital staining.
4. Preparation of Polytene chromosome in *Chironomus* or *Drosophila* larva.
5. Preparation of various stages of mitosis.
6. Preparation of various stages of meiosis from suitable material.

II) Developmental Biology:

1. Study of stages of gametogenesis in rat/frog, (Permanent Stained Slides).

2. Study of different of types of animal eggs.
3. Study of developmental stages (Life Cycle) of Cockroach, Housefly, Mosquito, Butterfly, Moth, Frog (Any Four).
4. Study of developmental stages of *Lymnaea*.
5. Developmental stages of frog: Cleavage, blastula, gastrula, neurula, and tadpoles through available resources.
6. Study of chick embryo at different hours of incubation by permanent slides.
7. Study of different types of placenta with suitable histological slides or visual diagrams.

DISTRIBUTION OF MARKS DURING PRACTICAL EXAMINATION

EXTERNAL MARKS

1. Identification and comments on spots 1-4: (2 from Cytology, 2 from Developmental Biology)	08 Marks
2. Cytological Preparation:	08 Marks
3. Comment on given life cycle:	04 Marks
4. Viva-voce:	05 Marks
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	Total = 25

INTERNAL MARKS

1. Attendance:	05 Marks
2. Performance:	05 Marks
3. Certified Class record:	05 Marks
4. Study Tour Report:	05 Marks
5. Submission of Charts/Photograph/models on the basis of syllabus:	05 Marks
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	Total =25

SKILL ENHANCEMENT MODULE (SEM)

1. Study of Different Types of Microscopes

- Search for literature on internet for different types of microscopes
- Collect photographs of different types of microscopes.
- Prepare a list of different types of microscopes available in your college/locality (in PHC/Pathology Laboratory).
- Prepare a report on working of each microscope and its uses.
- Submit a report with photographs.

2. Comparative study of cleavages in different animals.

- Select animals with different patterns of cleavage.
- Search for literature on internet regarding mechanism of each type of cleavage.
- Collection of photographs of different stages of cleavage.
- Submit a report.

3. Study of different types of animal eggs like fish, frog, reptile, birds

- Make photographic collection of eggs from above-mentioned groups.
- Study morphological features of eggs.
- Study the egg-laying pattern based on data collected/ from internet.
- Study the developmental stages from photographs.

4. Study of developmental stages of (life cycle) insects not included in syllabus

- Search for information on internet.
- Study the life cycle of a holometabolous and a hemimetabolous insect.
- Photographic collection of life cycle stages.
- Prepare a chart of life cycles.
- Prepare report and submit.

5. Comparative study prokaryotic and eukaryotic cell.

- Procure resources such as reference books and internet data on cell biology.
- Describe the structure of a prokaryotic and a eukaryotic cell.
- Describe the structure and function of various cellular organelles.
- Describe the differences between prokaryotic and eukaryotic cells.
- Prepare a model of prokaryotic and eukaryotic cell.

6. Study of giant chromosomes.

- Collect available *Chironomus* larvae/Prepare a culture of *Drosophila*.
- Prepare a slide of polytene chromosome.
- Perform photomicrography.

7. To study all aspects of plasma membrane.

- Search for different models of plasma membranes by using the latest resources.
- To make a chart / model showing the functions of the plasma membrane.
- Create a chart / model of how exchange of various substances takes place in and out of the plasma membrane.

8. Studying eukaryotic chromosomes with the help of models or charts

- Model-assisted replication of eukaryotic chromosomes.
- Creating a chart or model showing the types of chromosomes.
- Constructing a model/chart showing the function of chromosomes.

9. Study of Cell Division

- Prepare slides showing different types of stages of mitosis and observe under microscope.
- Take photographs using a mobile phone and submit.
- Prepare a slide of meiotic stages, focus under a microscope.
- Take photographs using a mobile phone and submit.

10. Study of Regeneration in Vertebrates and Invertebrates

- Survey your college campus, surrounding area and near forest.
- Prepare a list of vertebrates and invertebrates showing regenerative capacity with photographs, and submit.

B. Sc. Zoology Semester IV

Name of the Programme: B.Sc. II

Class: Part 3S

Semester: IV DSC-4-04S

Subject: Zoology

Name of the course (Paper): Genetics and Ecology

Course Outcomes Code: COs-04

About the course

The course is a walk for the Bachelor's degree through the amazing diversity of living organisms from simple to complex. The course makes a detailed knowledge of genetics and ecology. It explains the inheritance of traits in animals, mechanism of linkage, crossing over and different genetic disorders. It also deals with effect of abiotic and biotic factors on organisms and structure and functioning of ecosystems.

COs:

Upon completion of this course successfully, students would be able to

1. Describe Mendel's Laws of Inheritance.
2. Differentiate between a monohybrid and a dihybrid cross.
3. Deduce the type of gene interaction from ratio of offspring.
4. Describe linkage and crossing over.
5. Describe various modes of sex determination.
6. Identify the type of syndrome from karyotype.
7. Describe various prenatal diagnostic techniques.
8. Describe effects of water, temperature and light as ecological factors.
9. Identify the type of biotic interaction from given example.
10. Describe components of ecosystem and structure of terrestrial and marine ecosystem.

UNIT I:

1. Law of dominance.
2. Law of segregation.
3. Law of independent assortment.
4. Interactions of genes: Supplementary factor, complementary factor, duplicate factor.
5. Inhibitory factors and lethal factors – dominant and recessive.

UNIT II:

1. Types of linkage, arrangement of linked genes and significance of linkage.
2. Crossing over –Mechanism of crossing over, theories of crossing over (Darlington's theory, breakage and exchange theory and copy choice theory).
3. Types of crossing over – Single, double and multiple crossing overs.
4. Factors affecting crossing over, Significance of crossing over.

5. Multiple alleles in relation to Blood group in man.

UNIT III:

1. Sex determination: Autosomes and sex chromosomes, Sex determination in animals, Chromosomal Theory, Genic Balance Theory. Environmental and hormonal control of sex determination, Gynandromorphs.
2. Human karyotype.
3. Non-disjunction and Disorders: Turner's syndrome, Klinefelter's syndrome, Down's syndrome, Edward's Syndrome,
4. Autosomal recessive disorders: Cystic fibrosis, Albinism, Phenylketonuria, Alkaptonuria,
5. Sex linked genetic disorders and their inheritance in man: Hemophilia and color blindness.

UNIT IV:

1. Genetic Screening and prenatal diagnosis: CVS (Chorionic Villus Sampling), Amniocentesis.
2. Human Heredity: - Inheritance of eye color, Skin color.
3. Recessive genes and consanguineous marriages.
4. Pedigree Analysis, Symbols used in pedigree analysis.
5. Kinds of twins: Identical, Fraternal, Siamese twins, Significance of twin study.

UNIT V:

1. Water as an abiotic ecological factor.
2. Temperature: Temperature tolerance, Effects of temperature on animals. Homeotherms, poikilotherms. hibernation, aestivation.
3. Light: Biological effects of light on aquatic and terrestrial animals: Reproduction, Metamorphosis, pigmentation, vision, photokinesis, phototropism, photoperiodism,
4. Biotic factors: Intraspecific and interspecific associations: Predation, parasitism, Antagonism, commensalism, mutualism, competition (Gauze's Principle).

UNIT VI:

1. Autotrophs and heterotrophs.
2. Food chain, food web, ecological pyramids (number, energy and biomass).
3. Terrestrial ecosystem: Characteristics, types of Biomes.
4. Aquatic ecosystem: Characteristics, Fresh water ecosystems (Lentic and Lotic) and Marine Ecosystem.
5. Ecotone and Edge Effect.

LIST OF PRACTICAL BASED ON GENETICS AND ECOLOGY

A) Genetics Experiments:

1. Recording of Mendelian traits in man.
2. Detection of monohybrid cross with the help of plastic beads.

3. Detection of dihybrid cross with the help of plastic beads.
4. Culturing *Drosophila* using standard methods.
5. *Drosophila* – male and female identification, Mutant forms of *Drosophila* (from pictures)
6. Demonstration of Barr body from buccal epithelium or leucocyte.
7. Preparation of human karyotypes with the help of ICT/suitable tools.
8. Study of syndromes with the help of ICT tools/Photo slides- Turner's syndrome, Klinefelter's syndrome, Down's syndrome
9. Detection of syndrome from karyotype (Turner's syndrome, Klinefelter's syndrome, Down's syndrome).
10. Study of human genetic traits and application of Hardy-Weinberg Principle to them – Baldness, length of index and ring Finger, attached and free earlobes, rolling of tongue, Widow's peak.

B) Ecology-

1. Estimation of pH in water.
2. Estimation of Dissolved oxygen, salinity, free CO₂, total hardness in water sample.
3. Adaptations of aquatic and terrestrial animals based on study of museum specimens such as rocky, sandy, muddy-shore, flying and burrowing animals.
4. Preparation of checklist of producers and consumers of local ecosystems and construction of a food web diagram based on field visit.
5. Mounting and identification of zooplankton.

General:-

Study of a natural ecosystem and field report of the visit.

DISTRIBUTION OF MARKS DURING PRACTICAL EXAMINATION

EXTERNAL MARKS

- | | |
|---|----------|
| 1. Genetics Experiment: | 08 Marks |
| 2. Ecological Estimation/Analysis: | 04 Marks |
| 3. Spotting: | 08 Marks |
| (2 spots each from section A and B of two marks each) | |
| 4. Viva-voce: | 05 Marks |

Total:- 25 Marks

INTERNAL MARKS

1. Attendance:	05 Marks
2. Performance:	05 Marks
3. Certified class record:	05 Marks
4. Field visit report	05 Marks
5. Submission of photographic collection as per syllabus:	05 Marks

Total:- 25 marks

SKILL ENHANCEMENT MODULE (SEM)

1. Study of a Natural Aquatic Ecosystem

- Select of local natural aquatic ecosystem
- Study various abiotic factors of the ecosystem and collect data on their annual variation.
- Study various biotic components of the ecosystem and their interrelationships.
- Submit a report.

2. Study of a Natural Terrestrial Ecosystem

- Select of local natural aquatic ecosystem
- Study various abiotic factors of the ecosystem and collect data on their annual variation.
- Study various biotic components of the ecosystem and their interrelationships.
- Submit a report.

3. Study of Adaptations in Local Aquatic Animals

- Select aquatic animals showing different adaptations
- Study the behaviour of selected animals / birds/ insects
- Prepare a report on morphological and anatomical adaptations in these animals

4. Studying the laws of Mendel's in a new and effective way

- Working Model/ Colorful charts / Slides Shows any effective way can be used to study and demonstrate the Mendelian laws.
- Comparative study can be done by using any effective method.
- Try to collect plant material to prove Mendel's principle.

5. Survey of Mendelian traits in local population

- Conduct a survey of about 100 people among the local population.
- Note down the occurrence of different traits (dominant/recessive).
- Apply Hardy-Weinberg principle to the data

6. Counting of twins at local level through survey

- Collect the data of the percentage of twins.
- Comparative analysis of kinds of twins.

7. Study the food chain found in the around your town/village

- Prepare a flow chart with photographs (Mobile or camera click) of food chains in terrestrial, aquatic ecosystems.
- Prepare a flow chart with photographs (Mobile or camera click) of food chains in terrestrial , aquatic ecosystems.
- During local visits you can observe food web in the area and collect photographic evidence.