



SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. I Zoology

Revised Semester Pattern Syllabus

(w.e.f. June, 2013)

SEMESTER- I (THEORY)

Paper	Title of the paper	Marks
I	Animal Diversity I,	50
II	Cell Biology and Genetics	50

SEMESTER- II (THEORY)

Paper	Title of the paper	Marks
III	Animal Diversity –II	50
IV	Ecology, Ethology Evolution and Applied Zoology	50

PRACTICAL

TO BE TAKEN AT THE END OF SEMESTER-II

Practical	Title of the practical	Marks
I	Practical Based on Theory Papers I, II, III and IV	50

Solapur University, Solapur
B.Sc.Part-I Zoology
(Revised semester pattern syllabus)
(w.e.f. June, 2013)

1) Title of the Course: B.Sc.-I Zoology (Revised Syllabus) -2013-14

2) Introduction: This course provides a broad overview of zoology and how it applies to the diversity of nature and overall integration of living beings.

Major theoretical perspectives and concepts are presented, including animal diversity, inter relation, and ecological balance.

It also explore the influence of animal and plant life with respect its integration.

3) Objectives of the course:

- To comprehend the systematic position, functional morphology, mode of life, affinities and biodiversity of invertebrates and vertebrates, Ethology, Ecology and Evolution.
- Taking a course on introductory Zoology can help a student to achieve a number of educational goals besides a credit in life sciences or biological sciences.
- To attain a high student population in a class, a professor should clearly outline the objectives to learning Zoology in the syllabus. That way, a student learns that Zoology can be used as a model in protecting biodiversity and conserving endangered species with the help of new integrated multidisciplinary subjects.
- This course also provide scope for employment opportunities in applied aspects of zoology

4) Advantages of the Course:

- Becoming a zoologist opens the door to many types of careers,
- Zoologists can be wildlife biologists, field technicians, research assistants or animal trainers.
- They work in habitat management, field data collection, agricultural research and medical laboratory support.
- A Zoologist has a solid foundation for further education if he wants to become a veterinarian, or to acquire a Ph.D. to teach at the university level.
- Zoologist will have knowledge of animals, their behavior, physiology and evolution, as well as their interactions with each other and their environment which help for conservation and sustainable development.

5) Eligibility of Course:

- For admission into bachelor's degree one should pass higher secondary education or 10+2 from a recognized board with science subjects (Biology, Chemistry, Physics).

6) Duration:

- The duration for this program is of 3 years with semester pattern(06 Semesters)

7) Medium of Instruction: English

8) Structure of the Course:

- Structure of B.Sc. course in faculty of Science has total of 06 semester for 03 years.
- B. Sc. I comprises of total two semesters. In each semester (I & II) two theory papers (Paper I & Paper II) having weightage of 50 marks each.
- For semester II comprises two theory papers (Paper III & Paper IV) having weightage of 50 marks each. Each paper comprising of 6 to 7 units distributed in total 35 lecture hours.
- At the end of academic year i. e. Semester II the practical examination is conducted which is based on theory papers I, II, III and IV. Total weightage of practical is 50 marks.

9) Syllabus :

**SEMESTER - I
Paper- I
Animal Diversity I**

- 1) Five kingdom classification : Salient features and classification upto classes of following kingdoms with suitable examples –
A) Kingdom : Protista, B) Kingdom : Animalia with reference to phyla Porifera, Coelenterata, Platyhelminthes, Nematelminthes and Annelida. [5]
(This topic may be taught in practical classes)
- 2) Protista – Type Study – Paramecium : Morphology, Locomotion, Nutrition Osmoregulation, Reproduction (Binary fission and conjugation) [6]
- 3) Porifera – Type Study – Sycon- Cell types and Canal system [4]
- 4) Coelenterata – Type Study – Hydra: Morphology (including cell types), Locomotion, Nutrition and Reproduction [5]
- 5) Platyhelminthes – Type Study – Tape worm : Morphology, life cycle and Parasitic adaptations [3]
- 6) Annelida – Type study – Earthworm (*Pheretima posthuma*) : Morphology, Body wall, Coelom, Digestive system, Circulatory system, Excretory system, Reproductive system (copulation, fertilization and cocoon formation) and Nervous system- Brain. [12]

Total Periods: [35]

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SEMESTER –I
Paper – II (Cell Biology and Genetics)

- 1) Compound and Electron microscope : Principle and applications [2]
- 2) Ultrastructure of Prokaryotic and Eukaryotic cells [2]
- 3) Study of Nucleus with reference to Nuclear membrane, Nucleoplasm, Chromatin and nucleolus. [3]
- 4) Study of Ultra structure and functions of the following [12]
 - i) Plasma membrane (Fluid Mosaic Model)
 - ii) Mitochondria
 - iii) Endoplasmic reticulum
 - iv) Golgi complex
 - v) Lysosome
 - vi) Ribosomes
 - vii) Giant chromosomes – Polytene and lamp brush chromosome
- 5) Mendelian inheritance : Law of dominance, segregation and independent assortment with suitable examples. [3]
- 6) Study of Co- dominance and incomplete dominance with suitable examples [2]
- 7) Multiple alleles – Characteristics, ABO- Blood group system & Rh factor and Coat colour in rabbit [3]
- 8) Sex determination : Chromosomal theory of sex determination, XO,XY,ZW,Environmental and Hormonal methods of sex determination. [4]
- 9) Human genetics [4]
 - a) Phenyl keton uric imbecility (PKU)
 - b) Sickle cell anemia

Total Periods: [35]

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List of Recommended Books:

- 1) Hyman, L. H. – The invertebrates, Vol. I (McGraw Hill)
- 2) Hyman L.H. – The invertebrates, Vo. II (McGraw Hill)
- 3) Barnes R. D. – Invertebrate Zoology (W.B. Saunders Co.)
- 4) Pearse / Buchschaum – Living invertebrates, Blackwell Scientific Publications, California
- 5) Parker and Haswell – A Text Book of Zoology – Invertebrates Vol. I Edited by Marshall and Williams, C.B.S. Publishers and Distributors, New Delhi.
- 6) P. S. Dhami and J.K. Dhami – Invertebrates, S. Chand and Company. New Delhi
- 7) De Robertis EDP and De Robertis EME – Cell and Molecular Biology
- 8) C.B. Powar – Cell Biology, Himalaya Pub. House
- 9) Verma P. S. and Agarwal V. K. – Genetics, S. Chand and Company
- 10) Strickberger – Genetics. C Millian Publications
- 11) Winchester – Genetics, Oxford Publication
- 12) E. L. Jordan & P. S. Varma – Invertebrate Zoology
- 13) Genetics by P.P. Meyyan
- 14) A Text Book of Invertebrates – N. C. Nair, N. Soundara Pandian, S. Leelavathy, T. Murugan
- 15) R. L. Kotpal – Modern Text Book of Zoology, Invertebrates
- 16) Cell Biology – Dr. N. Arumugam
- 17) P. S. Varma & V. K. Agarwal – Cell Biology, Genetics, Molecular Biology, Evolution and Ecology
- 18) R. P. Meyyan, N, Arumugam – Genetics & Evolution
- 19) P. K. Gupta – Cell and Molecular Biology
- 20) Search engine- www.wikipedia.org

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SEMESTER –II
Paper –III (Animal Diversity –II)

- 1) Classification of Chordates : Salient features and classification upto orders of the following with suitable examples – [5]
- A) Protochordata : Urochordata and Cephalochordata
 - B) Craniata : i) Agnatha, Cyclostomata
 - ii) Gnathostomata : a) Superclass : Pisces
 - b) Superclass :Tetrapoda : Class - Amphibia
- (This topic may be taught in practical classes)
- 2) Cyclostomata: General Characters, Ammocoetus larva [2]
- 3) Fishes :
- a) Types of fins and scales
 - b) Structure of gills in cartilaginous and bony fish
 - c) Mechanism of gill respiration [6]
- 4) Amphibia: Type Study – Frog (*Rana tigrina*) [20]
- a) Morphology
 - b) Histological structure of skin
 - c) Digestive system
 - d) Respiratory system and mechanism of respiration
 - e) Blood vascular system : Blood, Heart, Arterial and Venous system
 - f) Excretory and Reproductive system
 - g) Nervous system
 - h) Embryology of frog : Structure of Egg, Cleavage, Blastula and its fate map, Gastrulation and formation of three germ layers. Metamorphosis.
- 5) Neotany and parental care in amphibian. [2]

Total periods: [35]

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Semester II
Paper – IV
Ecology, Ethology, Evolution and Applied Zoology

I) Ecology

1. Introduction, definition, aim and scope of Ecology [2]
2. Biotic factors : Brief idea of following animal associations with suitable examples
A) Intraspecific associations: i) Beneficial : Mate and reproduction, Parental care, Groupism, and Social behaviour.
ii) Harmful : Cannibalism and Competition
B) Interspecific associations : Neutralism, Symbiosis (Commensalism & Mutualism), Antagonism (Predation and Parasitism), Types of Parasite & Host. [5]
3. Abiotic factors : Introduction and Effects on Plants and Animals :
i) Temperature ii) Light iii) Water iv) Humidity v) Soil vi) Wind vii) Fire [3]
4. Brief idea (definition) of Species, Community, Niche, Ecosystem, Biome and Biosphere. [3]
5. Grass land and Pond ecosystems with reference to Food chain, Ecological pyramids and Energy flow. [2]
6. Ecological successions : Introduction and Types ,Primary and secondary succession. [2]

II) Ethology

[4]

1. Mimicry – Stick insect and Camouflage – chameleon
- b) Courtship behavior in birds, weaver (baya) birds.
- c) Social behavior in Honey bees: Casts, swarming, absconding, Nuptial flight and communication (waggle and round dance).

III) Evolution

[6]

- a) Organic evolution concepts
- b) Paleontological evidences
- c) Anatomical evidences

IV) Applied Zoology

[8]

1. Brief idea (definition and scope) of Sericulture, Apiculture, Poultry science , Dairy science, Fishery science, Pearl culture, Lac culture, Goat farming and Piggery.
2. Vermitechnology : Techniques and importance of Vermiculture, Vermicompost and Vermiwash

List of Recommended Books:

- 1) Evolution & Biostatistics – by N. Arumugam & R. P. Meyyan.
- 2) Environmental Studies – Based on UGC syllabus – N. Arumugam & V. Kumaresan
- 3) Organic Evolution – N. Arumugam
- 4) Chordate Zoology – A. Thangamani, S. Prasanna Kumar, N. Arumugam, L. M. Narayanan
- 5) Ecology – By E. P. Odum
- 6) The Protochordates – by S. H. Bhamrah and Kavita Juneja – Anmol Publications, New Delhi
- 7) Introduction to Protochordata – S. H. Bhamrah and Kavita Juneja – Anmol Publications, New Delhi
- 8) Chordate Zoology – S. Chand Company, New Delhi
- 9) Text Book of Zoology – Vertebrates, Vol. II – T. J. Parker and W. A. Haswell Edited by Marshall and Williams, CBS Publications and Distributors, New Delhi.
- 10) E. L. Jordan – Chordate Zoology, S. Chand and Company, New Delhi.
- 11) Odum – Ecology (Amerind)
- 12) Fundamentals of Ecology – Odum – (Saunders)
- 13) Ecology – Rickelfs (W.H. Freeman)
- 14) Economic Zoology – Venkitraman (Sudarshana Publishers)
- 15) The Foundations of Ethology (Spinger Verlog)
- 16) Economic Zoology – Shukla and Upadhyaya – Rastogi Publications
- 17) Immelamann – Introduction of Ethology (Plenum Press)
- 18) A Text Book of Chordates – A. Thangamani, L. M. Narayan, S. Prasannakumar, N. Arumugam
- 19) R. L. Kotpal – Modern Text Book of Zoology, Vertebrates
- 20) A. Arumugam, J. Johnson Rajeshwar, S. Arumuam, R. Ram Prabhu – Applied Zoology

10) Practicals :

Practical Course in Zoology for B. Sc. I Semester I and II

I. Dissection of Earthworm :

- i) Systematic position and External morphology
- ii) Digestive System
- iii) Reproductive system
- iv) Nervous system

II. Temporary Mounting of Earthworm:

Septal nephridia, Setae, Spermatheca, Ovary,

III. Cytological Preparation :

- 1) Stained preparation of Mitochondria using Janus green B from any suitable material.
- 2) Stained preparation of Nucleus of squamous epithelium of frog.

IV. Examples in Genetics – Examples based on Monohybrid, Dihybrid and Blood groups and Coat colour in rabbit (10 examples are to be solved).

V. Identifications / Spottings :

A) Animal classification -

- 1) Study of Five kingdom classification.
- 2) Salient features and classification upto classes of following kingdoms with suitable examples –

A) Kingdom : Protista - Amoeba, Paramecium, Euglena

B) Kingdom : Animalia with reference to phyla :

i) Porifera : Sycon, Spongilla, Hyalonema

ii) Coelenterata : Hydra, Obelia, Aurelia, Sea anemone and Coral

iii) Platyhelminthes : Planaria, Liverfluke, Tape -worm

iv) Nematelminthes : Ascaris

v) Annelida : Nereis, Earthworm, Leech

- 3) Classification of Chordates : Salient features and classification upto orders of the following with suitable examples –

Protochordata :

i) Urochordata - Herdmania,

ii) Cephalochordata : Amphioxus

A) Craniata : i) Agnatha, Cyclostomata : Petromyzon / Myxine

ii) Gnathostomata :

a) Superclass : Pisces : I) Class – Chondrichthyes : Dogfish, Sting – ray / Electric – Ray. II) Class –

Osteichthyes : Flying fish, Sea- Horse, Eel, Labeo.

b) Superclass : Tetrapoda : Class - Amphibia:

Ichthyophis, Frog, Toad and Salamander.

B) Study of Earthworm : Sections of Earthworm Passing through Pharynx, Gizzard, Typhlosole region, study of cocoon

C) Study of Paramecium : Binary fission and conjugation

D) Study of Sycon : Spicules , T.S. and L. S. of Sycon

- E) Study of Hydra** – Whole mount with bud, Sections through Body, Ovary and Testis
- F) Study of Tapeworm** - Scolex, Mature and Gravid proglottids, Hexacanth larva
- G) Study of Fishes** – Types of fins : Paired , Un-paired & Types of Tail fins
Types of Scales – Placoid, Cycloid & Ctenoid
Study of Gills – Cartilaginous & Bony fish
- H) Study of Mimicry**- stick insect and camouflage - chameleon
- I) Study of Honey bee** – Queen, Worker, Drone and Bee hive
- J) Study of Frog** – (Demonstration Practicals)
Heart, Digestive system, Lungs, Kidneys, Ovaries, Testis, Blood and Brain.
Skeleton - **Axial** : Skull, Lower jaw, Hyoid apparatus & Vertebrae
Appendicular : Pectoral & Pelvic girdles, Fore & Hind limb bones
- K) Study Tour** – Visit to sea shore or any other suitable place of Zoological interest to study animal biodiversity (Upto four days).

B.Sc. Part I Semester I and Semester II (Zoology)

Nature of Question Paper

Q. 1. Multiple Choice (Ten Objectives)	Marks 10
Q.2. Write short notes on (Any Five out of Six)	Marks 10
Q.3. A) Write short answers to (Any two out of three)	Marks 06
B) Write short answer	Marks 04
Q.4. Long answer question (Two out of Three)	Marks 10
Q.5. Long answer question(One out of Two)	Marks 10

Scheme of Marking for Practical

Q.1. Dissection	Marks 10
Q.2. Temporary stained preparation	Marks 6
Q.3. Genetics example	Marks 6
Q.4. Cytological preparation	Marks 8
Q.5. Spotting	Marks 10
Q.6. Tour Report	Marks 5
Q.7. Laboratory Record	Marks 5
Total Marks	[50]

1. Structure of the courses :-

- A) Each paper of every subject for Arts, Social Sciences & Commerce Faculty shall be of 50 marks as resolved by the respective faculties and Academic Council.
- B) For Science Faculty subjects each paper shall be of 100 marks and practical for every subject shall be of 50 Marks as resolved in the faculty and Academic Council.
- C) For B. Pharmacy also the paper shall be of 50 marks for University examination. Internal marks will be given in the form of grades.
- D) For courses which were in semester pattern will have their original distribution already of marks for each paper.
- E) For the faculties of Education, Law, Engineering the course structure shall be as per the resolutions of the respective faculties and Academic Council.

2. Nature of question paper:

A) Nature of questions.

“20% Marks - objectives question” **(One mark each and multiple choice questions)**

“40% Marks - Short notes / Short answer type questions / Short Mathematical type questions/ Problems. **(2 to 4 Marks each)**

“40% Marks - Descriptive type questions / Long Mathematical type questions / Problems. **(5 to 10 Marks each)**

- B) Objective type question will be of multiple choice (MCQ) with four alternatives. This answer book will be collected in first 15 minutes for 10 marks and in first 20 minutes for 20 marks. Each objective question will carry one mark **each**.
- C) Questions on any topic may be set in any type of question. All questions should be set in such a way that there should be permutation and combination of questions on all topics from the syllabus. As far as possible it should cover entire syllabus.
- D) There will be only five questions in the question paper. All questions will be compulsory. There will be internal option **(25%)** and not overall option. **for questions 2 to 5.**

3. Practical Examination for B. Sc. I. will be conducted at the end of second semester.

4. Examination fees for semester Examination will be decided in the Board of Examinations.

The structures of all courses in all Faculties were approved and placed before the Academic Council. After considered deliberations and discussion it was decided not to convene a meeting of the Academic Council for the same matter as there is no deviation from any decision taken by Faculties and Academic Council. Nature of Question Paper approved by Hon. Vice Chancellor on behalf of the Academic Council.