# F.Y.B. Sc. (Zoology)
# SEMESTER II
(CREDITS: THEORY-3, PRACTICALS-1)
**Course Title: Animal Diversity**
**COURSE CODE: ZOOMJ-S2P1-3CR24**

**THEORY [CREDITS - 03]**

## Animal Diversity and Ecology

**Course learning outcome**

After successfully completing this course, students will be able to:

- Describe reproduction in protozoa.
- Understand spicules in Porifera
- Explain polymorphism in Cnidaria.
- Describe parasitic adaptations of Platyhelminthes and Nemathelminthes
- Define metamerism.
- Know metamorphosis in insect.
- Understand and describe various ecological adaptations.

| **Module 1** | **Non-Chordate Amplifications** | **[10L]** |
|---|---|---|

**Learning Objective**

Focused on specification of phylum Protozoa to Helminthes.

**Learning Outcomes:**

- Describe Reproduction in protozoa.
- Understand spicules in Porifera
- Explain Polymorphism.
- Describe parasitic adaptations of Platyhelminthes and Nemathelminthes.

| | | |
|---|---|---|
| **1.1** | • Phylum Protozoa: Reproduction<br>• Phylum Porifera: Spicules<br>• Phylum Cnidaria: Polymorphism<br>• Phylum Platyhelminthes and Nemathelminthes: Parasitic adaptations | **[10L]** |

| **Module 2** | **Non-Chordate Amplifications** | **[10L]** |
|---|---|---|

**Learning Objective**

Focused on specification of phylum Annelida to Echinodermata.

**Learning Outcomes:**

- Define metamerism.
- Know metamorphosis in insect.
- Diversity of mollusca shell.

| | | |
|---|---|---|
| • Water vascular System in star fish. | | |
| **2.1** | • Phylum Annelida: Metamerism<br>• Phylum Arthropoda: Metamorphosis in Insects<br>• Phylum Mollusca: Shell in Mollusca<br>• Phylum Echinodermata: Water vascular system in Asteroidea | **[10L]** |
| **Module 3** | **Ecological Adaptations** | **[10L]** |
| **Learning Objective:**<br>Types of adaptation in Animals. | | |
| **Learning Outcomes:**<br>Understand and describe various ecological adaptations. | | |
| **3.1** | • Aquatic adaptations<br>• Arboreal adaptations<br>• Volant adaptations<br>• Desert adaptations | |

**References:**


1. Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.
3. Invertebrate Zoology- E.L.Jordan & P.S.Verma.
4. Invertebrate Zoology- T.C. Majupuria, Pradeep Publication, Jalandhar, India.
5. A manual of Practical Zoology Invertebrates- P.S.Verma, S. Chand & Co. Ltd. New Delhi, India.
6. A manual of Practical Zoology Chordates- P.S.Verma, S. Chand & Co. Ltd. New Delhi, India.
7. Modern zoology –Dr. Ramesh Gupta,Prakash Publication,12th Edition,Muzaffarnagar(UP)
8. Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
9. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I.(2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
10. Modern Text Book of Zoology (invertebrate) R.L. Kotpal, Rastogi Publication, Meerut, India.
11. A manual of Practical Zoology Invertebrates- P.S.Verma, S. Chand & Co. Ltd. New Delhi, India.
12. A manual of Practical Zoology Chordates- P.S.Verma, S. Chand & Co.Ltd. New Delhi, India.

**Mapping of CLOs and PSOs**

| Course Learning Outcomes | Programme Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Describe reproduction in protozoa. | | √ | | | | |
| Understand spicules in Porifera | √ | | | | | |
| Explain polymorphism in Cnidaria. | | √ | | | | |
| Describe parasitic adaptations of Platyhelminthes and Nemathelminthes | | √ | | | | |
| Define metamerism. | √ | | | | | |
| Know metamorphosis in insect. | √ | | | | | |
| Understand and describe various ecological adaptations. | √ | | | | | |

# F.Y.B. Sc. (Zoology)
# SEMESTER II

(CREDITS: THEORY-3, PRACTICALS-1)

## Course Title: Evolution and Ethology

**COURSE CODE: ZOOMJ-S2P2-3CR24**

**THEORY [CREDITS - 03]**

## Evolution, Ethology and Chordates

**Course learning outcome**

After successfully completing this course, students will be able to:

- Define and describe evolutions.
- Identify homologous organs, analogous organs and vestigial organs.
- Describe patterns of behaviour.
- Explain nesting behaviour in birds.
- Understand different system of Scoliodon.
- Explain different system of Scoliodon.

| Module 1 | Evolution and Ethology | [10L] |
|---|---|---|

**Learning Objective:**

Evolution,

**Learning Outcomes:**

CO1: Define and describe evolutions.
CO2: Identify homologous organs, analogous organs and vestigial organs.

| | | |
|---|---|---|
| **1.1** | **Evolution**<br>• Homologous organs<br>• Analogous organs<br>• Connecting link<br>• Vestigial organs | |
| **Module 2** | **Ethology** | **[10L]** |
| **Learning Objective**<br>Behaviour, Pattern of behaviour | | |
| **Learning Outcomes:**<br>CO1: Describe patterns of behavior.<br>CO2: Explain nesting behavior in birds. | | |
| **2.1** | Ethology:<br>• Introduction, Scope and patterns of behaviour<br>• Nesting behaviour (Weaver bird, Horn bill) and Social behaviour (termites) | **[10L]** |
| **Module 3** | **Chordates-Type study-Scoliodon** | **[10L]** |
| **Learning Objective**<br>Type study of Scoliodon | | |
| **Learning Outcomes:**<br>CO1: Understand different system of scoliodon.<br>CO2: Explain different system of scoliodon. | | |
| **3.1** | • External characters<br>• Digestive system<br>• Respiratory System<br>• Circulatorysystem<br>• Urinogenital system<br>• Brain | |

**References:**


1. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition.McGraw-Hill Higher Education.
2. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*.IX Edition. The McGraw-Hill Companies.
3. Young, J. Z. (2004). *The Life of Vertebrates*.III Edition.Oxford University press.
4. Modern Text Book of Zoology (vertebrate) R.L.Kotpal, Rastogi Publication, Meerut, India.
5. Intruduction to Chordates- T.C. Majupuria, Pradeep Publication, Jalandhar, India.
6. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*.IVthEdition.McGraw-Hill Higher Education.
7. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition.The McGraw-Hill Companies
8. Young, J. Z. (2004). *The Life of Vertebrates*.III Edition.Oxford Universitypress.
9. Modern Text Book of Zoology (vertebrate) R.L. Kotpal, Rastogi

Publication, Meerut, India.
10. Chordates and Invertebrates- Titles by N.Arumugam, Saras Publi., Kanyakumari, India.

**Mapping of CLOs and PSOs**

| Course Learning Outcomes | Programme Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Define and describe evolutions. | √ | | | | | |
| Identify homologous organs, analogous organs and vestigial organs. | | √ | | | | |
| Describe patterns of behavior. | | √ | | | | |
| Explain nesting behavior in birds. | | √ | | | | |
| Understand different system of scoliodon. | √ | | | | | |
| Explain different system of scoliodon. | | √ | | | | |

# F.Y.B. Sc. (Zoology)
# SEMESTER II
(CREDITS: PRACTICALS-1)

## Course Title: Zoology Practical MJ-201

**COURSE CODE: ZOOMJ-S2PR1-1CR24**

**Practical Credit- 01**

**Course Learning Outcome**

After the successful completion of the Course, the learner will be able to:

- Describe reproduction in protozoa.
- Understand spicules in porifera
- Explain types of Polymorphism
- Describe parasitic adaptations of Platyhelminthes and Nemathelminthes
- Define metamerism.
- Know metamorphosis in insect.
- Understand and describe various ecological adaptations.

**ZOOLOGY PRACTICAL Module – I**

**(Based on ZOOMJ-S2PR1-1CR24) [10L]**

The following Practicals are to be taught/studied only with the help of charts, models, videos, photographs, permanent slides, working models etc.

| | |
|---|---|
| 1 | Protozoa: To study Reproduction in Paramecium, Amoeba, Euglena, Monocystis |

| | |
|---|---|
| 2 | Porifera: To study spicules and gemmules in Sponge spicules, gemmules |
| 3 | Cnidaria: Polymorphism |
| 4 | Platyhelminthes and Nemathelminthes: To study parasitic adaptation of Tapeworm and Round worm |
| 5 | Annelida: To study Metamerism: Leech, Earthworm |
| 6 | Arthropoda: To study Metamorphosis in Insects: *Bombax mori* |
| 7 | Mollusca: To study various types of Shell in Mollusca: Sepia, Pila, Pearl oyster |
| 8 | Echinodermata: Water vascular system in Asteroidea |
| 9 | Study of Ecological adaptations:<br>(a) Arboreal adaptations – Chameleon, Squirrel<br>(b) Volant adaptations - Flying fish, Draco<br>(c) Desert adaptations – Camel, Phrynosoma<br>(d) Aquatic adaptations - Flat fish, Sucker fish |

**PRACTICAL Module – II**

**(Based on ZOOMJ-S2PR2-1CR24– II)**

**Zoology Practical Credit -01 [10L]**

- Define and describe evolutions.
- Identify homologous organs, analogous organs and vestigial organs.
- Describe patterns of behaviour.
- Explain nesting behaviour in birds.
- Understand different system of scoliodon.
- Explain different system of scoliodon.

| | |
|---|---|
| 1 | To study Evolution:<br>• Homologus organs: Forelimbs and hindlimbs of chordates<br>• Analogus organs: Wings of butterfly, Birds and Bats<br>• Connecting link: Duckbill Platypus, Peripatus, Aercheopteryx<br>• Vestigial organs: Caecum and Vermiform appendix in man, Hindlimbs in python, Leg in whale |
| 2 | To study nesting behavior and social behaviour:<br>• Weaverbird<br>• Hornbill<br>• Termites: Queen, Drones, Workers, Soldiers |

| | | | |
|---|---|---|---|
| | 3 | To study in Scoliodon<br>1. External features and Systems<br>• Digestive system<br>• Male and Female Urinogenital system<br>• Brain (Dorsal and ventral view)<br>2.Mounting<br>• Placoid scales<br>• Ampulla of Lorenzini | |

**Mapping of CLOs and PSOs**

| **Course Learning Outcomes** | **Programme Outcomes** | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Describe reproduction in protozoa. | | √ | | | | |
| Understand spicules in porifera | √ | | | | | |
| Explain types of Polymorphism | | √ | | | | |
| Describe parasitic adaptations of Platyhelminthes and Nemathelminthes | | √ | | | | |
| Define metamerism. | √ | | | | | |
| Know metamorphosis in insect. | √ | | | | | |
| Understand and describe various ecological adaptations. | √ | √ | | | | |
| Define and describe evolutions. | √ | √ | | | | |
| Identify homologous organs, analogous organs and vestigial organs. | | √ | | | | |
| Describe patterns of behavior. | | √ | | | | |
| Explain nesting behavior in birds. | | √ | | | | |
| Understand different system of scoliodon. | √ | √ | | | | |
| Explain different system of scoliodon | | √ | | | | |

# F.Y.B. Sc. (Zoology)
# SEMESTER II
(CREDITS: THEORY-2, PRACTICALS-2)

**Couse Title: Ecology and Wildlife Biology**

**COURSE CODE: ZOOMN-S2P1-2CR24**

**THEORY [CREDITS - 02]**

| **Ecology and Wildlife Biology** | | |
|---|---|---|
| **Course learning outcome** | | |
| After successfully completing this course, students will be able to:<br>• Define adaptations<br>• Understand and describe various ecological adaptations.<br>• Define wildlife.<br>• Give difference between national parks and sanctuary.<br>• Explain difference between national parks and sanctuary. | | |
| Module 1 | **Ecological Adaptations** | **[10L]** |
| Learning Objective<br>Types of adaptations | | |
| Learning Outcomes:<br>CO: 01 Define adaptations<br>CO: 02 Understand and describe various ecological adaptations. | | |
| 1.1 | • Aquatic adaptations<br>• Arboreal adaptations<br>• Volant adaptations<br>• Desert adaptations | **[10L]** |
| Module 2 | **Wildlife biology** | **[10L]** |
| Learning Objective<br>Wildlife of Gujarat. | | |
| Learning Outcomes:<br>• Define wildlife.<br>• Give difference between national parks and sanctuary.<br>• Explain difference between national parks and sanctuary. | | |
| 2.1 | • Introduction, National Parks and Sanctuaries of Gujarat –<br>• Gir National Parks and Sanctuaries<br>• Marine National Parks and Sanctuaries<br>• Nal Sarovar Bird Sanctuary | [6L] |

| | | |
|---|---|---|
| | • Purna Sanctuary<br>• Vansda National Parks | |

References:


1. Shukla, G.S. & Upadhyay, V.B. Economic Zoology. Rastogi Publi. 2005, 487 pages.( For Poultry)
2. JawaidAhsan, Sinha, S. P. 2008. A Handbook of Economic Zoology. S. Chand and Co. Publ. 272 pages.( For Poultry)
3. Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
4. Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*.IVthEdition.McGraw-Hill Higher Education.
5. Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*.
6. IX Edition.The McGraw-Hill Companies
7. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
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11. Invertebrate Zoology- E.L. Jordan & P.S.Verma
12. Invertebrate Zoology- T.C. Majupuria, Pradeep Publication, Jalandhar, India.
13. A Text Book of Histology – Leslie P. Gartner-4$^{th}$edi.-Amazone
14. Intruduction to Chordates- T.C. Majupuria, Pradeep Publication, Jalandhar, India.
15. A manual of Practical Zoology Invertebrates- P.S.Verma, S. Chand & Co. Ltd. New Delhi, India.
16. A manual of Practical Zoology Chordates- P.S.Verma, S. Chand & Co. Ltd. New Delhi, India.
17. Ecology, Cell biology, Genetics, Animal diversity, Animal Physiology, Immunology, Chordates and Invertebrates- Titles by N.Arumugam, Saras Publi., Kanyakumari, India.


**Mapping of CLOs and PSOs**

| **Course Learning Outcomes** | **Programme Outcomes** | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Define adaptations | √ | | | | | |
| Understand and describe various ecological adaptations. | √ | √ | | | | |
| Define wild life. | √ | | | | | |
| Explain difference between national parks and sanctuary. | | √ | | | | |

# F.Y.B. Sc. (Zoology)
# SEMESTER II
(CREDITS: PRACTICALS-2)

## Course Title: Zoology Practical

**COURSE CODE: ZOOMN-S2PR1-2CR24**

**Practical Credit- 02**

**Course Learning Outcome**

After the successful completion of the Course, the learner will be able to:

CO: 01 Demonstrate practical skills.
CO: 02 Understand and describe various ecological adaptations.
CO: 03 Give difference between national parks and sanctuary.

**PRACTICAL Module (Based on ZOOMN-S2PR1-2CR24)**

The following practical's are to be taught/studied only with the help of charts, models, videos, photographs, permanent slides, working models etc.

| | |
|---|---|
| **1** | Study of Ecological adaptations:<br>• Arboreal adaptations: Chameleon, Squirrel<br>• Volant adaptations: Flying fish, Draco<br>• Desert adaptations: Camel, Phrynosoma<br>• Aquatic adaptations: Flatfish, Suckerfish |
| **2** | Study of national parks and Sanctuaries:<br>• Gir National Park<br>• Marine National Park<br>• Vansda National Park<br>• Velavadar National Park<br>• Wild ass Sanctuary<br>• Thol Sanctuary |

**Mapping of CLOs and PSOs**

| **Course Learning Outcomes** | **Programme Outcomes** | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Demonstrate practical skills. | | | √ | | | |
| Understand and describe various ecological adaptations. | √ | √ | | | | |
| Give difference between national parks and sanctuary. | | | √ | | | |

# F.Y.B. Sc. (Zoology)
# SEMESTER II
## Course Title: Aqua Culture
### COURSE CODE: ZOOMDC-S2P1-4CR24
### THEORY [CREDITS - 04]

| Aqua Culture | | |
|---|---|---|
| **Course learning outcome** | | |
| After successfully completing this course, students will be able to:<br>• Define Aquaculture.<br>• Identify different species of prawn.<br>• Know methods of prawn fishing.<br>• Describe preservation and processing methods of prawn.<br>• Identify major carps.<br>• Describe major carps.<br>• Explain different pattern of fish farming<br>• Main fishery of South Gujarat costal area | | |
| **Module 1** | **Prawn Culture** | **[07L]** |
| **Learning Objective**<br>Detail about of prawn culture. | | |
| **Learning Outcomes:**<br>Define Aquaculture.<br>Identify different species of prawn. | | |
| **1.1** | Habit and Habitats of prawns<br>Species of prawns –<br>• Tiger prawn<br>• White prawn<br>• Banana prawn<br>• Giant river prawn | **[7L]** |
| **Module 2** | **Major Carp Culture** | **[8L]** |
| **Learning Objective**<br>Edible Carp culture methods. | | |
| **Learning Outcomes:**<br>Identify major carps.<br>Describe major carps. | | |
| **2.1** | Study of<br>• Catla catla<br>• Labeo rohita<br>• Cirrihina mrigala | 8L |
| **Module 3** | **Integrated Fish Farming** | **[8L]** |

**Learning Objectives:**

This module is intended to

- Gain knowledge about fish farming

**Learning Outcome:**

After the successful completion of the module, the learner will be able to

- Explain different pattern of fish farming

| | | |
|---|---|---|
| 3.1 | Fish farming in Paddy fields | 5L |
| 3.2 | • Fish farming in Dams and Reservoirs<br>• Fish farming with Live Stock | 3L |
| **Module 4** | **Marine Fisheries** | **[7L]** |

**Learning Objectives:**

This module is intended to

- Clear basic concept of fishery

**Learning Outcome:**

After the successful completion of the module, the learner will be able to

- Main fishery of South Gujarat costal area

| | | |
|---|---|---|
| 4.1 | • Bombay duck fishery<br>• Pomfret fishery | 7L |

**References:**


1. A textbook on Fish biology and fisheries by H.R. Singh
2. Aquaculture: Farming aquatic animals by Olando Martin
3. Aquaculture Principles and Practices by TVR Pillay & MN Kutty
4. A textbook on Fish biology and fisheries by S.S.Khanna & H.R. Singh
5. An introduction to Fishes by S.S.Khanna.


**Mapping of CLOs and PSOs**

| **Course Learning Outcomes** | **Programme Outcomes** | | | | | |
|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** |
| Define aquaculture. | √ | | | | | |
| Identify different species of prawn. | | √ | | | | |
| Know methods of prawn fishing. | √ | | | | | |
| Describe preservation and processing methods of prawn. | | √ | | | | |
| Identify major carps. | | √ | | | | |
| Describe major carps. | | √ | | | | |

# F.Y.B. Sc. (Zoology)
# SEMESTER II
## Course Title: Poultry Farming
### COURSE CODE: ZOOSEC-S2PR1-2CR24
### PRACTICAL [CREDITS - 02]

## Poultry Farming

**Course learning outcome**

After successfully completing this course, students will be able to:

CO1: Know and understand history, scope and importance of Poultry Farming
CO2: Explain different types of poultry housing system.
CO3: Describe Indian and exotic breeds of poultry.
CO4: Understand different poultry appliances and its uses.

**Module 1** **Practical** **[10L]**

**Learning Objective**

Introduction, Construction and Management of Poultry Farming.

**Learning Outcomes:**

CO1: Know and understand history, scope and importance of Poultry Farming.
CO2: Explain different types of poultry housing system.

1. To study the external features of fowl.
2. To study the different animals used in poultry farming.
3. To study the Indian breeds for poultry farming.
4. To study the exotic breeds for poultry farming.
5. To study various equipment used in poultry farming.
6. Economic importance of poultry feathers and excreta.
7. To study the different types of incubators used in poultry farming.
8. Poultry visit.

**References:**


1. EconomicZoology:G.S.Shukla&V.B.Upadhyay,RastogiPublication,Meerut.
2. https://www.pashudhanpraharee.com/types-of-poultry-housing-systems/
3. https://www.agrifarming.in/poultry-housing-types-equipment-and-construction
4. https://www.fao.org/3/i3531e/i3531604.pdf


**Mapping of CLOs and PSOs**

| Course Learning Outcomes | Programme Outcomes | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Know and understand history, scope and importance of Poultry Farming | √ | | | | | |
| Explain different types of poultry housing system. | | √ | | | | |
| Describe Indian and Exotic breeds of poultry. | | √ | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Understand different poultry appliances and its uses. | | √ | | | | |
| Know and understand history, scope and importance of Poultry Farming. | √ | | | | | |