

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

**Faculty of Science**

**M. Sc. Zoology**

Syllabus/ scheme

**Sem. – 4**



Sem./CBCS/Grading pattern

*w. e. f. June-2020*

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<b>HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY PATAN</b>	
<b>M. Sc. (Zoology) CBCS Syllabus 2019</b>	
<b>Document code</b>	<b>Syllabus ZOO- 2019</b>
<b>Name of faculty</b>	<b>Science</b>
<b>Faculty code</b>	<b>SCI</b>
<b>Programme name</b>	<b>ZOOLOGY</b>
<b>Programme code</b>	<b>ZOO</b>
<b>Effective from</b>	<b>June-2020</b>

The proposed new structure for M. Sc. course is based on Choice Based Credit System (CBCS) which is in force from June-2019.

### **CBCS Course Pattern**

1. This programme is divided into **Four Semesters** (Two Years). The duration of an academic year consists of two semester, each of 15 weeks for teaching. The academic session in each semester will provide 90 teaching days. Each semester has 24 credit and the programme is comprised of total 96 credits.
2. There will be three categories of courses/papers in this programme:
  - A. Four Compulsory – **Core** theory **courses** with 4 credits each in every semester.
  - B. One choice based elective course (disciplinary/interdisciplinary) with 2 credits in each semester.
  - C. Two practical each of 3 credits in each semesters.
  - D. In semester 4, only 20% students of the total strength of the class will be offered to carry out dissertation work on merit basis of result of previous semesters and remaining students will study regular syllabus.
3. Detailed course pattern for each semester is given below.

### M. Sc. Semester IV

Course	Paper code	Paper title	Exam duration (Hours)	External marks	Internal marks	Total marks	Teaching hours per week	Credit points
Paper-I	ZOCC-401	Animal Behaviour	2.30	70	30	100	4	4
Paper-II	ZOCC-402	Histology, Histochemistry and Parasitology	2.30	70	30	100	4	4
Paper-III	ZOCC-403	Entomology	2.30	70	30	100	4	4
Paper-IV	ZOCC-404	Toxicology and Environmental Biology	2.30	70	30	100	4	4
Practical Paper-I	ZOOPR-401	Animal Behaviour, Histology, Histochemistry and Parasitology	3/4	75		75	6	3
Practical Paper-II	ZOOPR-402	Entomology, Toxicology and Environmental Biology	3/4	75		75	6	3
Elective Course	ZOOEC-401 <b>OR</b> ZOOEC-402 <b>OR</b> ZOOEC-403	Wildlife and Conservation Biology - 4  Fisheries and Aquaculture-4  Environmentally Sound Technologies-4	2.00	50		50	2	2
Total				480	120	600	30	24

**OR**

Course	code	Internal evaluation (200 marks)			External evaluation (400 marks)				Total
		Mid-term presentation	Mid-term progress report	Attendance	Thesis	presentation	Viva-voce	Soft skill paper	
Dissertation	MSZOO-DI-401	50	100	50	200	50	100	50	600

**\*Mid- term progress report:** mid-term progress report should contain introduction, review of literature, methodology of dissertation work and obtained results till date.

**Note:**

1. For four credit course: each syllabus is of 4 units having equal weightage.
2. For two credit course: each syllabus is of 2 units having equal weightage.
3. For question paper of 70 marks: each question paper shall have 2 sections and having 3 questions each.

<b>Section I</b>	<b>Must be drawn from Unit 1 and 2</b>
Q. 1	One long question of 14 marks OR two short questions of 7 marks each from Unit 1.
Q. 2	One long question of 14 marks OR two short questions of 7 marks each from Unit 2.
Q. 3	Short questions of 7 marks from Unit 1 & 2
<b>Section II</b>	<b>Must be drawn from Unit 3 and 4</b>
Q. 4	One long question of 14 marks OR two short questions of 7 marks each from Unit 3.
Q. 5	One long question of 14 marks OR two short questions of 7 marks each from Unit 4.
Q. 6	Short questions of 7 marks from Unit 3 & 4

4. For question paper of 35 marks: each question paper shall have 3 questions: Q-1 from unit-1 of 15 marks, Q-2 from unit-2 of 15 marks and Q-3 is of objective type having 05 marks from all the units of the paper.

<b>Section I</b>	<b>Must be drawn from Unit 1</b>
Q. 1	Two long question of 15 marks OR three short questions of 5 marks each from Unit 1.
	<b>Must be drawn from Unit 2</b>
Q. 2	Two long question of 15 marks OR three short questions of 5 marks each from Unit 2.
Q. 3	Short questions of 5 marks from Unit 1 & 2

# ZOCC-401 ANIMAL BEHAVIOUR

## UNIT 1- Introduction to animal behaviour

1. Introduction and history of animal behaviour
2. Concepts of animal behaviour
3. Imprinting animals
4. Approaches and methods to study animal behavior and role of sense organs in behaviour

## UNIT 2- Types of animal behaviour

1. Learning behaviour: types and neural mechanism
2. Aggressive behaviour: types, causes and hormonal control
3. Territorial behaviour: types, functions and methods
4. Parental care: Types and affecting factors

## UNIT 3- Behavioural ecology and social behaviour

1. Orientation in animals: types, kinesis and taxes
2. Feeding strategies in animals
3. Types of communication: Auditory, Visual, Chemical and Tactile
4. Social organization in mammals

## UNIT 4- Physiology of animal behaviour

1. Role of pheromones in animal behaviour
2. Role of hormones in animal behaviour
3. Biological clocks
4. Human ethology

## References

1. Alcock J. 2013 Animal Behavior: An Evolutionary Approach, 10th edition (Sinauer Associates, Inc.)
2. Bolhuis J. J. and Giraldeau L. (eds) 2005 The behaviour of animals (Blackwell Pub.)
3. Breed and Moore 2011 Animal Behavior, 1st Edition (Academic Press)
4. Mathur R. 2008 Animal behaviour (Rastogi Pub.: India)
5. Manning A. and Dawkins M. S. 1997 An Introduction to Animal behaviour (4th edition)
6. Sherman P. W. and Alcock J. 1997 Exploring animal behaviour (Sinauer Asso. Inc. Pub.: Sunderland, Massachusetts)
7. Slater P. J. B. 1999 Essentials of Animal Behaviour (Cambridge Uni. Press)

# **ZOCC-402 HISTOLOGY, HISTOCHEMISTRY AND PARASITOLOGY**

## **UNIT 1- Histological Techniques**

1. Introduction to histology and histochemistry
2. Tissue processing, fixation and microtomy
3. Staining methods: acid, basic, neutral and vital stains and various histochemical stains
4. Staining of frozen and paraffin sections

## **UNIT 2- Histology of body tissue**

1. Introduction to types of body tissue
2. Histology of Epithelial tissue and connective tissue
3. Histology of muscle, bones and cartilage
4. Histology of digestive system tissues (tongue, oesophagus, stomach, large intestine, pancreas, liver) and nervous tissue

## **UNIT 3- Parasitology 1**

1. Introduction Parasitology
2. Types of hosts and parasites
3. Food and water-borne bacterial diseases
4. Sexually transmitted bacterial diseases

## **UNIT 4- Parasitology 2**

1. Parasitic protozoans and human diseases
2. Parasitic trematoda, cestoda and human diseases
3. Parasitic nematode and human diseases
4. Parasitic mites, ticks and their control

## **References**

1. Bloom and Fawcett. D. 1972 Text book of histology 10th ed. 3.
2. David H.C. 1987 Histology 9th ed. (Horper International Pub)
3. McManus J.F.A. and Mowry R.W. 1960 Staining methods.
4. Cheng T.C. (1964) The Biology of animal parasites, Saunders International Student Edition
5. Panikar C.K.J (1988) 5. The Parasitology of Trematodes Oliver and Boyd Ltd. Edinburgh.
6. Sood Pamnik (1993) Parasitology (Protozoology and Helminthology) CBS Publication and Distrubution, Delhi

## ZOCC-403 ENTOMOLOGY

### UNIT 1- Introduction to entomology

1. Introduction to entomology
2. General characters of insect
3. Classification of class insects (up to order)
4. External morphology of insect: Head, Thorax and Abdomen (Grasshopper)

### UNIT 2- Internal morphology of an insect (Grasshopper)

1. Digestive system, circulatory system, respiratory system
2. Nervous system and sense organs
3. Reproductive system and excretory system
4. Different types of receptors and related organs

### UNIT 3- Physiology of an insect

1. Metamorphosis and molting in insect
2. Gaseous exchange and thermoregulation in insect
3. Excretion and water regulation in insect
4. Communication in insect: light production, sound production and chemical communication

### UNIT 4 Applied entomology

1. Insect pest to crop, pulses and vegetable and their control
2. Household pest and their control
3. Methods to control insect pest
4. Insect vectors
5. Integrated pest management

### References

1. Chapman R.F. 1998. The Insects: Structure and Function. Cambridge Univ. Press, Cambridge.
2. David B.V. and Ananthkrishnan T. N. 2004. General and Applied Entomology. Tata-McGraw Hill, New Delhi.
3. Duntson P. A. 2004. The Insects: Structure, Function and Biodiversity. Kalyani Publ., New Delhi.
4. Mathur and Upadhyay A textbook of Entomology. Aman publication house, India.
5. Richards O. W. and Davies R. G. 1977. Imm's General Text Book of Entomology. 10th Ed. Chapman & Hall, London.
6. Saxena R.C. and Srivastava R. C. 2007. Entomology: At a Glance. Agrotech Publ. Academy, Jodhpur.



# ZOCC-404 TOXICOLOGY AND ENVIRONMENTAL BIOLOGY

## Unit 1 Introduction to toxicology

1. Brief history of toxicology
2. Introduction and classification of toxic agents
3. Spectrum of undesired effects of toxicity
4. Characteristic of exposure of toxicant

## Unit 2 Dose response relationship in toxicology

1. Dose–Response Relationships: LD<sub>50</sub>, LC<sub>50</sub>, IC<sub>50</sub>, IC<sub>90</sub>, IC<sub>99</sub>, EC<sub>50</sub>, EC<sub>90</sub> and EC<sub>99</sub>
2. Evaluating the Dose–Response Relationship
3. Variation in toxic responses
4. Descriptive animal toxicity tests

## Unit 3 Environmental pollution

1. Air pollution
2. Water pollution
3. Soil pollution
4. Noise pollution

## Unit 4 Global environmental change and environmental impact assessment

1. Green house effect
2. Approaches to deal with global warming
3. Impact, prevention and mitigation of invasive species.
4. Environmental impact assessment

## References

1. Walker C H, Hopkin S P, Sibly R N and Peakall D B (Eds.) 2006. Principles of ecotoxicology- 3 rd edition, Taylor and Francis, NewYork, NY.
2. Landis W.G.and Yu M.H. 2003 Introduction to Environmental toxicology -3 rd edition, Lewis publishers, Florida.
3. Hodgson E. and Levi P. 2000. Text Book of Modern Toxicology, McGraw – Hill International edition. Singapore.
4. Agarwal A. and Gopal K. 2010 Principles of toxicology, ibdc publishers India.

## **ZOOEC-401 WILDLIFE AND CONSERVATION BIOLOGY - 4**

### **Unit 1: Important legislations for wildlife**

1. Indian Wildlife Protection Act (1972)
2. Forest Act (1927)
3. National Biodiversity Act (2002)
4. Importance of law and regulations in wildlife conservation

### **Unit 2: Wildlife conservation at global scale**

1. IUCN as a global conservation organization
2. CITIES
3. TRAFFIC
4. Wildlife crime control: case studies

### **References**

7. Sinclair A. R., Fryxell J M and Caughly G. (2006) Wildlife Ecology, Conservation and Management. Blackwell Publishing, U.S.A.
8. Gopal R. (1992) Fundamentals of Wildlife Management. Justice Home, Allahabad, India.
9. Jairajpuri M. S. (1990) Collection and preservation of animals. Zoological Survey of India.
10. Magguran, A.E. (1996). Ecological diversity and its measurements. Princeton University.
11. Gadgil, M. (2002) A methodology manual for scientific inventorying, monitoring and conservation of Biodiversity
12. Hickman C. P., et al. 2006 Integrated principals of Zoology, McGraw Hill Higher Education. 931pp. 14th edition.

## ZOOEC-402 FISHERIES AND AQUACULTURE - 4

### Unit 1

1. Migration in fish
2. Parental care and sexual selection in fish
3. Communication in fish
4. Fisheries rules and regulation in India and Gujarat

### Unit 2

1. Ornamental fish production and management
2. Mussel farming in India
3. Nutrition in aquaculture
4. Aquarium management

### References

1. Day, F. 1981. Fishes of India, Vol.I and Vol. II. William Sawson& Sons Ltd., London. 2.
2. Jhingran, C.G. 1981. Fish and Fisheries of India. Hindustan Publishing Co., India.
3. Santhanam,R. 1980. Fisheries Science. Daya Publishing House, New Delhi.
4. Yadav, B.N. 1997. Fish and Fisheries. Daya Publishing House, New Delhi
5. Bal D.V. and Rao, K.V. 1990. Marine Fisheries of India. Tata McGraw Hill Publishing Co. Ltd., New York.
6. Upadhyay V. B.2015. Economic Zoology. Rastogi publications.

**ZOOEC-403 ENVIRONMENTALLY SOUND TECHNOLOGIES - 4**

**(Units under construction)**

## **ZOOPR-401 ANIMAL BEHAVIOUR, HISTOLOGY, HISTOCHEMISTRY AND PARASITOLOGY**

1. Study of mudballing behavior of burrowing crab.
2. To study food preference in *Tribolium castaneum*.
3. To study the different types of receptors in *Tribolium castaneum*.
4. To study location of receptors by antennaelectomy in *Tribolium castaneum*.
5. To study the effect of water temperature and pH on breathing rate of fish.
6. Study of different types of microtomes.
7. To study histological structure of different types of epithelial tissue using permanent slides.
8. To study histological structure of different types of muscle tissue using permanent slides.
9. To study histological structure of bone and cartilage using permanent slides.
10. Study of parasitic protozoan causing disease in humans.
11. Study of parasitic platyhelminthes causing diseases in humans.
12. Study of parasitic nematods causing diseases in humans.
13. Study of parasitic mites and ticks.

## **ZOOPR-402 ENTOMOLOGY, TOXICOLOGY AND ENVIRONMENTAL BIOLOGY**

1. Study of classification of class insecta up to orders using museum specimens.
2. Mounting of mouth parts of mosquito and housefly.
3. Study of modification of antennae in different insects.
4. Study of modification of legs in different insects.
5. Study of different systems of insect using charts/pictures.
6. Study of insect pest of crop, pulses and vegetable and their control.
7. Prepare a report on insect diversity of selected study site.
8. To study the toxic effect of irritant on breathing rate of fish.
9. Comparative analysis of water samples collected from polluted and non polluted water bodies.
10. Comparative analysis of soil samples collected from polluted and non polluted water bodies.
11. To study the effect of neem tree leaf extract on mosquito larvae
12. Study of effect of common carcinogens and teratogens on human body using charts and pictures.