HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN- 384265

Faculty of Science

M. Sc. Zoology

Syllabus/ scheme

Sem. – 3

Sem./CBCS/Grading pattern

w. e. f. June-2020

Date: 22/06/2020 Total pages: 26

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

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

CBSC 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 III

Course	Paper code	Paper title	Exam duration (Hours)	External marks	Internal marks	Total marks	Teaching hours per week	Credit points
Paper-I	ZOOCC-301	Animal Physiology	2.30	70	30	100	4	4
Paper-II	ZOOCC-302	Immunology and Endocrinology	2.30	70	30	100	4	4
Paper-III	ZOOCC-303	Advance Techniques in Zoology	2.30	70	30	100	4	4
Paper-IV	ZOOCC-304	Developmental Biology and Evolution	2.30	70	30	100	4	4
Practical Paper-I	ZOOPR-301	Animal Physiology, Immunology and Endocrinology	3/4	75		75	6	3
Practical Paper-II	ZOOPR-302	Advance Techniques in Zoology, Developmental Biology and Evolution	3/4	75		75	6	3
Elective Course	ZOOEC -301 **OR** ZOOEC -302 **OR** ZOOEC -303	Wildlife and Conservation Biology- 3 Fisheries and Aquaculture -3 Environmentally Sound Technologies-3	2.00	50		50	2	2
Total				480	120	600	30	24

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.

Section I	**Must be drawn from Unit 1 and 2**
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
Section II	**Must be drawn from Unit 3 and 4**
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.

Section I	**Must be drawn from Unit 1**
Q. 1	Two long question of 15 marks OR three short questions of 5 marks each from Unit 1.
	Must be drawn from Unit 2
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

ZOOCC-301 ANIMAL PHYSIOLOGY

Unit 1: Physiology of digestion, respiration and circulation

1. Physiology of digestion
2. Physiology of respiration
3. Composition of blood
4. Myogenic heart, cardiac cycle and ECG

Unit 2: Physiology of muscles, neurons and sensory mechanism

1. Types and functions of muscles, process of contraction and relaxation of muscles
2. Anatomy of central and peripheral nervous system; neurotransmitters and their physiological functions.
3. Types and functions of receptors: photoreceptors, chemoreceptors, mechanoreceptors, thermoreceptors.

Unit 3: Physiology of urino-genital system and thermoregulation

1. Excretory organs: anatomy and physiology
2. Reproductive organs: anatomy and physiology
3. Menstrual cycle, physiology of pregnancy
4. Thermoregulatory organs and their function

Unit 4: Physiological disorders

1. Disorders of digestive and respiratory system
2. Hematological and cardiac disorders
3. Muscular and neuronal disorders
4. Disorders of urino-genital systems

References

1. Bell, G.E. Davidson, J.N. and Emslie D. (1922) Smith Text Book of Physiology & Biochemistry
2. Dayson, (1964) A Text Book of General Physiology: Little Brown & Co. Boston.
3. Eckert R. and Randall D. (1983) Animal Physiology: 2nd Edn. W.H. Rexeman & Co.
4. Guyton, A.G. (1968) Textbook of Medical Physiology: 7th Edn. Saunders Pub.
5. Ganong W.F. (1981) Medical Physiology: 10th Edn. Lange Medical Publications.
6. Tortora Grabowski Principles of Anatomy and Physiology:, 9th Edn. John Willey &Sons.

ZOOCC-302 IMMUNOLOGY AND ENDOCRINOLOGY

Unit 1: Introduction to immune system

1. Introduction and history of immunology
2. Organs and cells of immune system
3. Antigen, antibody and their reactions
4. Types of immunity- innate, adaptive, humoral mediated and cell mediated

Unit 2: Reactions of immune system

1. Complement system: classical and alternative pathways
2. Major histocompatibility complex (MHC) structure and function
3. Cytokines and cytokine receptors
4. hypersensitivity and autoimmune diseases
5. AIDS

Unit 3: Introduction to endocrinology

1. Brief history of endocrinology
2. Hormones and neuroendocrine integration in homeostasis
3. Hormone synthesis
4. Hormone circulation and metabolism

Unit 4: Endocrine glands and their hormones

1. Nervous system hormones (hypothalamus, pituitary and pineal)
2. Thyroid and parathyroid gland and its hormones
3. Pancreas and its hormones
4. Adrenal gland and its hormones, Reproductive hormones
5. Gastro-Intestinal hormones and their functions.

References

1. Richard, Thomas, Barbara, Janis (2005) Kuby Immunology, W. H. Freeman and company, New York, USA.
2. Janeway, Travers, Walport and Shlomchik (2005) Immuno Biology- The immune system in health and disease, Garland Science Publishing, New York, USA.
3. David, Brostoff and Roitt (2006) Immunology, (7th Ed., 2006), Mosby & Elsevier Publishing, Canada, USA.
4. Mac Hadley. 1992. Endocrinology, 3 rd Edition. Prentice – Hall Inc. A Simon & Schuster Company, Englewood Cliffs, New Jersey. USA.
5. Ingleton, P.M. and Bangara, J.T. 1986. Fundamentals of comparative vertebrate endocrinology, Kluwer Academic Publishers.
6. Turner, C.D. and Bangara, J.T. 1986. General endocrinology. Saunders International Student edition. Toppan Company Limited. Tokyo.

ZOOCC-303 ADVANCE TECHNIQUES IN ZOOLOGY

Unit 1: Techniques for biodiversity assessment

1. Quantitative assessment of biodiversity: different types of transects, quadrates and data analysis.
2. Population census techniques for vertebrates.
3. Invertebrate sampling techniques
4. Phylogenetic analysis of DNA sequences.

Unit 2: Remote Sensing and Applications

1. Introduction to remote sensing, History and scope
2. Energy sources and EMR, RS sensors and platforms
3. Image processing and classification
4. Land cover and Land use analysis, Analysis of spatial data
5. RS applications in different fields

Unit 3: GIS Basics

1. Fundamentals of GIS and functions of GIS
2. Software for GIS (GIS lab)
3. Spatial data models
4. Presentation of GIS data

Unit 4: GIS Applications

1. Ecological modeling through GIS
2. Species distribution models
3. Fragmentation analysis
4. Applications of GIS

References

1. Krishnamurthy K. V. 2003 An Advanced Textbook on Biodiversity Principles and Practice. Oxford & IBH Publishing C. Pvt. Ltd. New Delhi.
2. Shantharam, S. and Montgomery, J.F. 1999. Biotechnology, Biosafety and Biodiversity. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

ZOOCC-304 DEVELOPMENTAL BIOLOGY AND EVOLUTION

Unit 1 Introduction to developmental biology

1. History and basic concept of developmental biology
2. Gametogenesis: spermatogenesis and oogenesis
3. Fertilization, Parthenogenesis
4. Early developmental process: cleavage and formation of blastula, gastrulation, neural tube formation, cell migration

Unit 2 Axis formation, limb development and hormonal control

1. Genetics of axis formation in drosophila
2. General concept of organogenesis: development of chick limb
3. Regeneration in animals: Epimorphosis and morphallaxis
4. The biology of ageing

Unit 3: Introduction to evolution

1. Brief history of evolution, Direct and indirect evidences of evolution
2. Experiments about origin of life: Miller-Urey experiment, Oparin-Haldane hypothesis
3. Theories of evolution
4. Gene pool, gene frequency, genetic drift and founder effect

Unit 4: Processes of evolution

1. Types of isolation, speciation
2. Adaptive radiation, Micro, macro and Mega evolution
3. Geological time scales and evolution of different faunal groups
4. Human evolution

References

1. Riddle M. (1996) Evolution. 2nd edn. Blackwell.
2. Piyanka E.R. (1994) Evolutionary Ecology 5th edn Harper Collins
3. Verma P. S. and Agrawal V. K. 2010 Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand & Company Ltd.
4. Gilbert, (2006) Developmental Biology, Sinauer Associates Inc., Massachusetts, USA. 2.
5. Wolpert (2006) Principles of Development, Beddington, Brockes, Jessell, Lawrence, Meyerowitz, (3rd Ed., 2006), Oxford University Press, New Delhi, India.
6. Kalthoff (2000) Analysis of Biological Development, McGraw-Hill Science, New Delhi, India.

ZOOEC-301 WILDLIFE AND CONSERVATION BIOLOGY – 3

Unit 1: Wildlife Research and Monitoring

1. Conventional Research & Monitoring techniques
2. Advanced research & Monitoring techniques
3. Camera trapping
4. Radio telemetry

Unit 2: Advances in wildlife Research

1. Noninvasive conservation genetics
2. Wildlife research case studies
3. Use of information technology in wildlife research (*in silico* wildlife research)
4. Citizen science approach
5. Wildlife forensics

References

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

ZOOEC-302 FISHERIES AND AQUACULTURE -3

Unit 1

1. Inland fisheries of India and Gujarat
2. Marine fisheries of India and Gujarat
3. Coral reefs and their ecological importance
4. Mangroves and their ecological importance

Unit 2

1. Pearl culture
2. Freshwater fish culture, induce breeding and preservation of fish
3. Prawn culture
4. By products of fishing industry

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. Econiomic Zoology. Rastogi publications.

ZOOEC-303 ENVIRONMENTALLY SOUND TECHNOLOGIES-3

(Units under construction)

ZOOPR-301 ANIMAL PHYSIOLOGY, IMMUNOLOGY AND ENDOCRINOLOGY

1. Total RBC count in blood sample.
2. Total WBC count in blood sample
3. Estimation of bleeding and clotting time.
4. Hemoglobin estimation in blood sample
5. Differential count of leucocytes.
6. Determination of blood group of given blood sample.
7. To study location of endocrine glands in animal body using charts
8. To study histology of endocrine glands using permanent slides.
9. To study various endocrine disorders via power point slide or photographs.
10. Preparation of report on prevalence of different endocrine diseases in Patan city.
11. Introduction to immunological test carried out in pathology laboratory.
12. Histology of lymphoid organs using permanent slides/charts
13. Effect of various digestive enzymes.
14. Study of haemin crystals.

ZOOPR-302 APPLIED ZOOLOGY, DEVELOPMENTAL BIOLOGY AND EVOLUTION

1. Generation of GIS enabled files.
2. Geo-referencing of toposheets.
3. Construction of a maps on the GIS platform
4. Data extraction using GIS
5. Processing & classification of satellite image
6. To study stages of gametogenesis using slides or charts.
7. To study embryonic development in fish, frog and chick using charts.
8. Study of different developmental stages of chick embryo using permanent slides or charts.
9. To study various larval stages of Arthropods.
10. To study various larval stages of Echinoderms.
11. To study evolution of heart in different vertebrates.
12. To study evolution of brain in different vertebrates.
13. Study of fossils
14. Study of human evolution
15. Calculation of examples of Hardy-Weinberg principle