

GULBARGA UNIVERSITY GULBARGA



SYLLABUS

for

M.Sc.

ZOOLOGY

(CHOICE BASED CREDIT BASED SYSTEM)

2017 ONWARDS

Proceedings of the Meeting of the Board of Studies in Zoology held on 08th March, 2017 to prepare Credit Based Choice Based Syllabus for M.Sc. Zoology Course for the Academic year 2017-18 onwards.

Members Present:

- | | |
|----------------------------|-----------------|
| 1. Prof. K.Vijaykumar | Chairman, BOS |
| 2. Dr.Murali Jadesh | Member |
| 3. Prof. B.B.Hosetti | External Member |
| 4. Prof. M.Venkateshwerulu | External Member |
| 5. Prof. Jacob Dass P | External Member |
| 6. Prof. P.M.Basha | External Member |
| 7. Prof. S. Ramakrishna | External Member |

1. The CBCS syllabus for the M.Sc. Zoology course was drafted after several deliberations and discussions during the meetings of the Departmental Council and placed in the Meeting of the Board of Studies in Zoology for approval and implementation from the academic year 2017-2018 and onwards (copy enclosed).
2. It was unanimously decided that the practical courses covering the theory papers mentioned in the scheme of teaching and examinations be evolved by the teacher(s) concerned during beginning of the every academic year.
3. Each candidate shall undertake compulsory “Animals in Nature” **Study Tour** covering different Institutions and natural biomes with a stress on Biodiversity study. The duration of this Tour shall be about 10 days. The Study Tour shall be undertaken during third Semester only and shall be completed within the two years period.

Scheme of Teaching and Examination

Semester	Paper No & Title	Teaching Hrs / week	Exam. Hrs.	Examination	Internal Assessment	Credits
<i>III</i>	3.1: HCT: Biology of Reproduction	04	03	80	20	04
	3.2: HCT: Animal physiology	04	03	80	20	04
	3.1: SCT: Environmental Biology	04	03	80	20	04
	3.1: OET: Human Physiology	04	03	80	20	04
	3.1: HCP: Practical based on 3.1	04	03	40	10	02
	3.2: HCP: Practical based on 3.2	04	03	40	10	02
	3.1: SCP: Practical based on 3.3	04	03	40	10	02
	3.1: OEP: Practical based on 3.1	04	03	40	10	02
<p><i>Compulsory field visit & Study Tour of about 10 days period be undertaken during III semester. Candidate has to submit the detailed tour report along with SCT 3.1 Examination.</i></p>						

***4.3: HC Project Commences from the beginning of III semester-**

HC: Hard Core; SC: Soft Core OE: Open Elective

Paper HCT 3.1
BIOLOGY OF REPRODUCTION

Preamble: Reproductive biology is a study mainly involving the reproductive system and sex organs.

It is closely related to reproductive endocrinology and infertility, reproductive physiology and developmental biology.

Unit I: Gonadal Development and Reproduction: **64 hrs**

- 1.1 Sexual Differentiation and development:
- 1.2 Sex determination, gonadal-sex determination,
- 1.3 Differentiation of sex accessory ducts and glands, D
- 1.4 Differentiation of external genitalia

Unit II: Male Reproduction:

- 2.1 Histoarchitecture of testis, spermatogenesis; Function of sertoli and Leydig cells; Seminiferous epithelial cycle and wave length, hormonal control of spermatogenesis.
- 2.2 Functional morphology and hormonal regulation of epididymis, vas deferens, prostate gland, seminal vesicle, Cowper's gland
- 2.3 Biology of spermatozoa & biochemistry of semen
- 2.4 Biological actions of androgens.

Unit III: Female Reproduction:

- 3.1 Anatomy of female reproductive system, histoarchitecture of the ovary,
- 3.2 Folliculogenesis, follicular atresia, ovulation, corpus luteum, estrous and menstrual cycle and their hormonal regulation, biological action of estrogens.
- 3.3 Implantation, gestation, parturition and lactation: types of implantation, sequential events and hormonal regulation, delayed implantation
- 3.4 Placenta-histophysiology and endocrine functions, endocrine control of Pregnancy and Parturition, Lactation-Development of mammary glands, Lactation and its hormonal control.

Unit IV: Modern trends in Reproduction:

- 4.1 Fertility control in male and females-Natural methods, barrier methods, intrauterine devices, hormonal contraceptives, surgical and immunological approaches:
- 4.2 Amniocentesis: ARTs-Ovulation induction, IVF, gamete intra-fallopian tube transfer, surrogate pregnancy, gestational carrier.
- 4.3 Reproductive toxicology: toxicology of male and female reproductive systems.
- 4.4 Effects of environmental chemicals and metals on reproductive systems.

REFERENCE BOOKS:

1. Adiyodi and Adiyodi 1977: Reproductive biology of invertebrates (IBH; New Delhi)
2. Adler. N.T. 1981: Neuroendocrinology of Reproduction.
3. Austin C.R & Short. R.V 1972: Reproduction in mammals (Cambridge University Press; London)
4. Balin. H and Glasser. S, 1976 : Reproductive Biology (Experia Medica Amsterdam)

5. Birkhead. R.T. David J.H and Pitnick S, 2009: Sperm Biology-An evolutionary perspective (Elsevier/ Academic press).
6. Chester-Jones I (1987): Fundamentals of Comparative vertebrate Endocrinology (Plenum Press: NY)
7. Gorbman A Dickhoff W.W. Vigna S R C Clark N.R and Ralph C I 1983: Comparative Endocrinology (John Willey and Sons; NY)
8. Gupta. 1999: Reproductive Immunology (Narosa publications)
9. John D.1995: Endocrinology and Metabolism (Academic press: USA)
10. Jones R.E. 1980. The Vertebrate Ovary ,Comparative biology and evolution (Plenum Press).
11. Jones R.E. 1991. Human Reproductive biology (II Ed). (Academic press: USA)
12. Johnson M.H. Evertitt B.J. & Brockmann H.J. 2008: Essential Reproduction 4th Edn (Blackwell Science; USA)
13. Knobil.E. and Neil. J.D. 1998 :L Encyclopidia of Reproduction-Vol. I-IV, Academic press
14. Knobil.E & Neil J.D 1994 : The physiology of Reproduction-II Ed, Vol. I & II, Reven Press Ltd
15. Peters H and Mc Matty K.P. 1980. The Ovary (Granada Publishing House; NY)
16. Richard E.J.1991. Human Reproductive biology (II Ed) (Academic Press; USA)
17. Sarkar. H.B.D 1996. Principles of Vertebrate Reproductive Biology
18. Schimdi 1971. Biology of Lactation (Academic press: USA)
19. Saidapur.S.K.1989. (Ed) Reproductive cycles of Indian vertebrates. (Allied Publishers Ltd. New Delhi)
20. Wooding P & Burton G. 2008. Comparative Placentation; Structure, functions & evolution (Springer).

PRACTICALS: 3.1 HCP: Practical Based on 3.1.

1. Demonstration of reproductive systems in crab, fish, frog, pigeon and rats.
2. Histological study of testis, ovary and accessory reproductive organs in rat.
3. Identification of types of placenta sections
4. Study of sperm morphology, abnormalities and sperm count in rat
5. Study of pseudopregnancy in rat
6. Study of contraceptive devices
7. Study of pregnancy detection test in clinical samples
8. Demonstration of Surgical techniques-
 - a) Ovariectomy
 - b) Hysterectomy in albino rat

Paper HCT 3.2
ANIMAL PHYSIOLOGY

Preamble: Animal physiology is the study of how animals work, or more specifically the physical and chemical processes that occur within animals. Examples of these processes include gas exchange, blood and circulation, osmoregulation, digestion, nervous and muscle systems and endocrinology.

Unit – I: Digestion and Respiration

64 hrs

- 1.1. Functional anatomy of digestive system.
- 1.2. Digestion and absorption. Neuroendocrine regulation of gastro – intestinal movements and secretions.
- 1.3. Breathing movements and exchange of respiratory gases at the pulmonary surface. Respiratory quotient Respiratory Pigments Transport of respiratory gases
- 1.4. Neural and hormonal control of breathing. Respiratory acidosis and alkalosis and regulation of blood PH.

Unit –II: Circulation and Excretion

- 2.1. Cardiac physiology: physiology of heartbeat, Rhythmicity, and diseases associated with heart.
- 2.2. Components of blood and functional significance. Cascade of biochemical reactions (factors) involving in blood coagulation.
- 2.3. Functional anatomy of mammalian kidney and its renal units. Physiology of urine formation. The significance of Henley’s loop. Role of hormones in renal physiology.
- 2.4. Formation of nitrogenous excretory products NH₃, Urea & Uric acid.

Unit – III: Nervous Coordination

- 3.1 Structure and types of of neuron. Glial cells and functions Fundamentals of nerve impulse-
- 3.2 Basic concepts of nerve inpluse, sodium potassium pump, resting potential , Action potential, role of ion channels.
- 3.3 Types of synapses- electrical and chemical, gap junctions , ligand gated channels and the mechanism of synaptic transmission, cholenergic adrenergic and GABAERGIC transmitters, Neuromuscular junction
- 3.4 Molecular biology of sodium, potassium, ionic channels, patch clamp studies and their importnace

Unit – IV: Muscular Physiology

- 4.1 Types of muscles: striated, nonstriated and cardiac muscles. Ultra structure of striated muscle.
- 4.2 Muscle contraction – Muscle proteins, sliding filament theory, Energetics of muscle contraction.
- 4.3 Defects in muscle function, muscle coordination diseases, muscular dytrpohy
- 4.4 Aging physiology concepts related to muscle function.

PRACTICALS 3.2 HCP Based on 3.2

1. Action of pepsin in digestion of proteins.
2. Estimation of salivary amylase activity.
3. Estimation of lipase activity.
4. Oxygen consumption estimation in an aquatic or terrestrial animal.
5. Demonstration of fermentation.
6. Action of insulin on blood sugar level.
7. Experiments on urine analysis in human urine sample:
 - a) Test for urea, blood cells, bile salts, albumin, ketone bodies and sugar in human urine sample.
8. Determination of cell fragility by osmotic hemolysis experiment.
9. Identification of relation between temperature and heart beat in freshwater mussel.
10. Water and ionic regulation of freshwater animal in different osmotic media.
11. The Study of changes in the earthworm's responsiveness to the stimulus of touch.

REFERENCE BOOKS

1. Animal Physiology ----- Samson & Writy
2. Animal Physiology ----- Nelsion & Nelsion
3. Animal Physiology ----- Medical Physiology-Guiton
4. Text book of Animal Physiology ----- Nagbhusan
5. Text book of Animal Physiology ----- Guize
6. Text book of Animal Physiology ----- A.K. Berry.

Paper SCT 3.1
ENVIRONMENTAL BIOLOGY

Preamble: Environmental Sciences are necessarily to be taught in an inter-disciplinary curriculum. There is need to strengthen the students to understand essential aspects of environmental sciences in diverse subject areas such as chemistry, biology, pollution, geosciences, atmospheric sciences, biodiversity, natural resources management and wildlife management. There is also an additional emphasis in providing opportunities to understand the integration of modern sciences such as geographical information systems (GIS) and remote sensing applications to environmental sciences. This integration has been enabled in the syllabus.

Unit – I: Fundamental of the Ecosystem

64 hrs

- 1.1. Structure and function of the Ecosystem – abiotic and biotic interactions, energy flow, cycling of nutrients in ecosystems (biogeochemical cycles, N C P)
- 1.2. Major types ecosystems – Aquatic (lentic and lotic ecosystems), terrestrial ecosystems (forest, grass land, desert ecosystems).
- 1.3. Primary production and decomposition in different ecosystems. Ecological pyramids
- 1.4. Population and Ecology: Characteristics of a population. population growth curves population regulation. Nature of communities; Community structure and attributes, levels of species diversity, edges ecology.

Unit – II: Environmental Pollution and Management

- 2.1. Environmental Pollution -- Water, Air and Soil Pollution – sources of pollutions, effects and control measures of pollutants.
- 2.2 Global Environmental Problems – Global Climate Change and biodiversity ; status; major drivers of biodiversity change.
- 2.3 Biodiversity change, biodiversity management approaches, Environmental Laws related
Related to water, air and soil
- 2.4 Natural resources and their management – Renewable and Non-renewable resources.

UNIT – III: Ecotoxicology

- 3.1. Classification of toxins, Assessment of toxicity – Acute and chronic toxicity, LC₅₀ and LD₅₀ assessment, Dose response relationship for toxicity assessment
- 3.2. Molecular mechanisms of toxicant action.
- 3.3. Biomagnifications – Bioaccumulation of toxic substance and risk assessment.

3.4. Impact of pollution on bioindicator species

Unit – IV: Waste Treatment Technology

- 4.1. Sewage and waste water treatment – Aerobic and anaerobic treatment technologies
- 4.2. Sources and causes of solid waste and treatment of solid waste.

- 4.3. Bioremediation – advantages and disadvantages, In-situ and ex-situ bioremediation of contaminated soils.
- 4.4 Vermicomposting technology use in waste treatment.

PRACTICALS SCP 3.1 based on 3.1

1. Collection and identification of animal biodiversity of selected ecosystem.
2. Physico-chemical analysis of soil pH, soil moisture soil, temperature, humidity estimation soil, soil organic matter.
3. Air Monitoring for Particulate Matter.
4. Water Monitoring - five important parameters from drinking water. 1) Dissolved Oxygen 2) Biological Oxygen demand (B O D) 3) Chemical Oxygen demand 4) Chlorides 5) Salinity.
5. Bio remediation of waste water using soil micro organisms ..
6. Bioconversion of municipal waste by vermi-composting.
7. Collection, preservation and estimation of Zooplankton.
8. Mapping of national parks and wild life sanctuaries in India with a note of important wild life fauna.
9. Estimation of LC₅₀ or LD₅₀ of an organo phosphorous pesticide.
10. Determination of pesticide residues in soil or water.

REFERENCE BOOKS:

1. Fundamentals of Ecology. E.P.Odum, G W Barrett.
2. Environmental Science . Willam .P.Cunninsham Barbora woodworth saigo.
3. The use of Earthworms in waste disposal by . Edward, C.A.
4. Introduction to Environmental Engineering & Science Gilbert M. Masters.
5. Essential of Ecology by colin R. Townsend Michael Begon John.L.Harper.
6. Environmental Biology -- A.G.Agarwal.
7. Environmental Science by G.Tyler Miller.
8. Toxicology -- Y.K.Lahir.

**Paper 3.1 OET:
HUMAN PHYSIOLOGY**

Preamble: The prime concern of this syllabus is to integrate the individual functions of all the cells and tissues and organs into functional whole, the human body. Since function is dependent on a structure, the curriculum lays stress on functional anatomy of the organs. It attempts to highlight the necessary bodily balances and internal bodily control so called homeostasis as well as present their abnormal function in disease. It provides a link between basic sciences and Medicine.

Unit-I:**64 hrs**

- 1.1 Introduction to physiology: Cell and general physiology.
- 1.2 Internal environment and homeostasis.
- 1.3 Functional organization of human body. Cell and its function.
- 1.4 Anatomy and physiology of skeletal and smooth muscles. Anatomy and physiology of cardiac muscles.

Unit-II: Nutrition and digestion

- 2.1 Basic nutritive materials, and vitamins, balance diet.
- 2.2 Functional morphology of the gastrointestinal tract. Physiology of digestion and absorption.
- 2.3 Malnutrition, over-nutrition and obesity.
- 2.4 Hyperacidity, amebeiosis, worms and gastroenteritis.

Unit-III: Circulation

- 3.1 Arteries, veins and capillaries and their diseases.
- 3.2 Blood flow and blood pressure. Regulation of blood circulation.
- 3.3 Composition of blood, blood groups, blood transfusion and artificial blood.
- 3.4 Cardiac arrhythmias, ECG myocardial infarction and cardiac arrest.

Unit-IV: Nervous system

- 4.1. General organization of the nervous system, division of the nervous system peripheral and central nervous system. Sensory and motor systems.
- 4.2 Structure and functional differentiation of brain. Deviated mental functions
- 4.3 Neuronal integration at circuit and associate level
- 4.4 Mental reasoning, physiology of dream, brain waves and their importance

REFERENCE BOOKS:

1. Text book of medical physiology: Guyton AC and Hall JE, Xth edition Saunders , Philadelphia, 2004.
2. Concise medical physiology: Chaudhuri SK, 4th edition, Central Book Agency, 2002, Kolkata.
3. Biological sciences: Taylor DJ, Green, NPO and Stout GW edited by Soper R, Cambridge University Press, 3rd edition 1997, Cambridge UK.
4. Animal physiology: Schmidt-Nielson K, 5th edition, Cambridge University Press, Cambridge UK.
5. Human physiology: Wiki books contributors.
http://en.wikibooks.org/wiki/Human_Physiology.
6. Human Physiology: An Integrated Approach with Interactive Physiology: Dee Unglaub Silverthorn DU, 3rd edition, Prentice Hall.