

B.SC. SEMESTER-III

Core Course No. : UZOTC 301

Core Course Title: PHYSIOLOGY AND BIOCHEMISTRY

CREDITS : 4

UNIVERSITY OF JAMMU

Syllabi and Course of Study in Zoology

For the examination to be held in Dec. 2017, Dec. 2018 and Dec. 2019

UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

1. Course /Paper Title	:	Physiology and Biochemistry (Theory)
2. Maximum Marks	:	100
i) External (Univ. Exam.)	:	80
ii) Internal Assessment	:	20
3. Minimum Pass Marks		
i) External	:	29
ii) Internal	:	07
4. Duration of Univ. Exam.	:	2½ Hrs.

UNIT-I PHYSIOLOGY OF NERVES, MUSCLES AND DIGESTION (13 hrs)

1.1 Nerves and Muscles

1.1.1 Structure of neuron

1.1.2 Restingmembranepotential, graded potential

1.1.3 Origin of action potential and its propagation in myelinated andnon-myelinated nerve fibres.

1.1.4 Ultra-structure of skeletal muscle

1.1.5Molecular and chemical basis of muscle contraction

1.2 Digestion

1.2.1 Structural organisation, histology and function of gastrointestinal tract(GIT)

1.2.2 Physiology of digestion and absorption of carbohydrates, lipids and proteins in the alimentary canal

1.2.3Role of gastro-intestinal hormones in the secretion and control of enzymes of GIT

UNIT-IIPHYSIOLOGY OF RESPIRATION AND EXCRETION (13 hrs)

2.1 Respiration

2.1.1 Pulmonary ventilation

2.1.2 Respiratory volumes and capacities

2.1.3 Mechanism of gaseous exchange and transport of O₂& CO₂ in blood.

2.1.4 Nervous control of respiration in mammals

2.2 Excretion

2.2.1 Structure of mammalian kidney and nephron.

2.2.2 Mechanism of urine formation in mammals:Counter-current mechanism

UNIT-III CARDIOVASCULAR SYSTEM

(13 hrs)

- 3.1 Composition of blood and its function.
- 3.2 Coagulation of blood and Haemostasis.
- 3.3 Structure of mammalian heart.
- 3.4 Origin and conduction of cardiac impulse.
- 3.5 Cardiac cycle.

UNIT-IV PHYSIOLOGY OF REPRODUCTION AND ENDOCRINE GLANDS

(13 hrs)

- 4.1 Hormonal control of Oogenesis and spermatogenesis in Mammals
- 4.2 Menstrual cycle and its hormonal control in humans
- 4.3 Structure and functions of different endocrine glands
 - 4.3.1 Pituitary
 - 4.3.2 Thyroid
 - 4.3.3 Parathyroid
 - 4.3.4 Adrenal gland
 - 4.3.5 Gonads

UNIT-V CARBOHYDRATE, LIPID AND PROTEIN METABOLISM

(13 hrs)

- 5.1 Carbohydrate metabolism
 - 5.1.1 Glycolysis
 - 5.1.2 Krebs' cycle
 - 5.1.3 Electron transport chain
 - 5.1.4 Gluconeogenesis
 - 5.1.5 Glycogen metabolism
- 5.2 Lipid metabolism
 - 5.2.1 Biosynthesis of fatty acids
 - 5.2.2 β -oxidation of fatty acids
- 5.3 Protein metabolism
 - 5.3.1 Transamination
 - 5.3.2 Deamination
 - 5.3.3 Urea Cycle.

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting atleast from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

Section A:Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B:Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C:Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

SUGGESTED READINGS

1. Tortora, G.J. and Derrickson, B.H. (2009). Principles of Anatomy and Physiology, XII Edition, John Wiley & Sons, Inc.
2. Widmaier, E.P., Raff, H. and Strang, K.T. (2008) Vander's Human Physiology, XI Edition, McGraw Hill
3. Guyton, A.C. and Hall, J.E. (2011). Textbook of Medical Physiology, XII Edition, Harcourt Asia Pvt. Ltd/W.B. Saunders Company
4. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
5. Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009). Principles of Biochemistry. IV Edition. W.H. Freeman and Co.
6. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc-GrawHill.
7. Wood, D.W Principles of Animal Physiology
8. Eckert -Animal physiology
9. Nagabhushnam- A text book of Animal Physiology.

B.SC. SEMESTER-III
PRACTICAL

Core Course No. : UZOPC 302

Core Course Title: PHYSIOLOGY AND BIOCHEMISTRY

CREDITS : 2

Max. Marks : 50

1. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland, testis and ovary.
2. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone and cartilage.
3. Simple lab. tests for detection of proteins, carbohydrates and fats.
4. Qualitative tests to identify functional groups of carbohydrates in given solutions (Glucose, Fructose, Sucrose, Lactose)
5. Study of activity of salivary amylase under optimum conditions.
6. Estimation of total protein in given solutions by Lowry's method.
7. Preparation of hemin and hemochromogen crystals.
8. Preparation of blood smears to study Erythrocytes and leucocytes.
9. Examination of human blood groups.
10. Determination of bleeding time and clotting of blood.
11. Viva voce.

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

External Practical Assessment: 50% (25 marks) shall be reserved for external assessment including 20% (5 marks) for viva and 80% (20 marks) for practical paper.

B.SC. SEMESTER-III

Skill Enhancement Course (S.E.C.) No.:UZOTS - 303

Skill Enhancement Course (S.E.C.) Title: APICULTURE

CREDITS : 4

UNIVERSITY OF JAMMU

Syllabi and Course of Study in Zoology

For the examination to be held in Dec. 2017, Dec. 2018 and Dec. 2019

UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

1. Course /Paper Title	:	Apiculture (Theory)
2. Maximum Marks	:	100
i) External (Univ. Exam.)	:	80
ii) Internal Assessment	:	20
3. Minimum Pass Marks		
i) External	:	29
ii) Internal	:	07
4. Duration of Univ. Exam.	:	2½ Hrs.

Unit 1: BIOLOGY OF BEES

(13hrs)

- 1.1 History, Classification and species of honey bee
- 1.2 Social Organization of Bee Colony
- 1.3 Morphology of honey bee with special reference to mouth parts and appendages of worker bee.
- 1.4 Life cycle of honey bee
- 1.5 Means of communication: Waggle Dance

Unit 2: REARING OF BEES

(13 hrs)

- 2.1 Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth Bee Pasturage
- 2.2 Selection of Bee Species for Apiculture
- 2.3 Bee Keeping Equipment
- 2.4 Methods of Extraction of Honey (Indigenous and Modern)
- 2.5 Processing of honey.
- 2.6 Bee venom & Royal jelly extraction.

Unit 3: BEE ENEMIES AND DISEASES

(13 hrs)

- 3.1 Bee enemies – Wax Moth, Ants, Wasps, Microorganisms, Pest:Diagnosis and Identification.

- 3.2 Mites attacking honey bees: Varroa mites, Mite Biology, Controlling Varroa Mites, Mechanical control, Biopesticides, Chemical (synthetic pesticide) treatments.
- 3.3 Bacterial disease – American Foulbrood, European Foulbrood
- 3.4 Viral disease - Chronic bee paralysis virus, Deformed Wing Virus, Kashmir Bee Virus.
- 3.5 Fungal disease - Chalkbrood, Stonebrood
- 3.6 Protozoan disease - Nosemosis

Unit 4: BEE ECONOMY

(13 hrs)

- 4.1 Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis etc).
- 4.2 Honey yield in national and international market.
- 4.3 Uses of honey in Indian medicine.
- 4.4 Other valuable by-products of honey bees.
- 4.5 Economics of Apiculture and Management.

Unit 5: ENTREPRENEURSHIP IN APICULTURE

(13 hrs)

- 5.1 Bee Keeping Industry – Recent Efforts.
- 5.2 Modern Methods in employing artificial bee hives for cross pollination in horticultural gardens.
- 5.3 Prospects of apiculture as self employment venture.
- 5.4 Preparing proposals (Layout and budget) for financial assistance and funding agencies.

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting at least from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

Section A: Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B: Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be

comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C: Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

SUGGESTED READINGS

1. Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.
2. Bisht D.S., Apiculture, ICAR Publication.
3. Singh S., Beekeeping in India, Indian council of Agricultural Research, NewDelhi. CBCS Undergraduate Program in Zoology 2015
4. Cherian and Ramanathan, S. Bee keeping in South India
5. Sharma P.L. and Singh, S.H. and Book of Bee keeping
6. Honey - A comprehensive survey - International Bee Research Association for House - CNRC (England)
7. Roger, A. Morse, 1990. The ABC and XYZ of Bee culture, 40th edition, A.I.Root& Co., Medina, Ohio 44256.
8. Prospective in Indian Apiculture - R.C. Mishra
9. Rearing queen bees in India - M.C. Suryanarayanaet. al.
10. Bee Keeping in India - G. K. Ghosh
11. Technology and value addition of Honey - Dr. D. M. Wakhle and K. D. Kamble.
12. ABC & XYZ of Bee culture - A. I. Root
13. Indian Bee Journal - All India Bee Keeping Association
14. Asian Bee Journal

B.SC. SEMESTER-IV

Core Course No. : UZOTC- 401
Core Course Title : Principles of Genetics and Evolutionary Biology
Credits : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Zoology
For the examination to be held in the years 2018, 2019and 2020
UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

1. Course /Paper Title : **Principles of Genetics and Evolutionary Biology (Theory)**
2. Maximum Marks : **100**

i) External (Univ. Exam.)	:	80
ii) Internal Assessment	:	20
3. Minimum Pass Marks		
i) External	:	29
ii) Internal	:	07
4. Duration of Univ. Exam.	:	2½ Hrs.

Unit-I CELL CYCLE, MENDELISM AND NEO-MENDELISM

(13 Hrs)

- 1.1. Cell cycle: Phases
 - 1.1.1. Mitosis
 - 1.1.2. Meiosis
- 1.2. Mendelism and Neo-mendelism
 - 1.2.1 Mendelian Experiments and Mendel's principles and laws of inheritance
 - 1.2.2 **Complementary and Supplementary ratios**, Incomplete dominance and Co-dominance
 - 1.2.3 Multiple alleles, Lethal alleles, Epistasis/polygenic inheritance, Pleiotropy.
 - 1.2.4 Sex-linked inheritance (Eye color in *Drosophilla*, Hemophilia in Humans)
 - 1.2.5 Extra chromosomal inheritance

Unit-II LINKAGE AND CROSSING OVER

(13 Hrs)

- 2.1 Linkage and linkage groups
 - 2.1.1 Complete and incomplete linkage.
 - 2.1.2 Linkage maps
- 2.2 Crossing over
 - 2.2.1 Cytological basis and mechanism of crossing over
 - 2.2.2 Recombination frequency
 - 2.2.3 Two and three factor crosses, interference and coincidence

Unit-III CHROMOSOMAL & GENE MUTATIONS AND MECHANISMS OF SEX DETERMINATION

(13 Hrs)

- 3.1 Chromosomal mutations
 - 3.1.1 Deletions
 - 3.1.2 Duplications
 - 3.1.3 Inversions
 - 3.1.4 Translocations
- 3.2 Numerical Chromosomal Changes
 - 3.2.1 Aneuploidy
 - 3.2.2 Polyploidy
- 3.3 Gene mutations
 - 3.3.1 Induced versus spontaneous mutations
- 3.4 DNA repair mechanisms.
- 3.5 Sex determination
 - 3.5.1 Chromosomal sex determination

3.5.2 Environmental sex determination

3.6 Sex-linked, sex-influenced and sex-limited characters

3.7 Dosage compensation: Lyon's hypothesis and X-inactivation.

Unit-IV EVOLUTIONARY BIOLOGY

4.1 Origin of life

4.1.1 Major events in the history of life (Chemogeny & Biogeny)

4.2 Theories of evolution & extinction

4.2.1 Lamarckism,

4.2.2 Darwinism

4.2.3 Neo-Darwinism

4.2.4 Mass extinction (major extinctions with special reference to K-T extinction).

4.3 Evidences of evolution

4.3.1 Concept and Evidences of evolution (direct and indirect)

4.3.2 Dating of fossils

4.3.3 Geological Time Scale

4.3.4 Phylogeny of humans

Unit-V Population genetics and Species Concept

5.1 Population Genetics

5.1.1 Gene pool and gene frequencies

5.1.2 Hardy-Weinberg equilibrium

5.1.3 Genetic drift

5.1.4 Mutation pressure

5.1.5 Gene flow

5.2 Species concept

5.2.1 Isolating mechanisms

5.2.2 Biological species concept (sibling, polymorphic, polytypic species), ring species

5.2.3 Mode of speciation (allopatric and sympatric)

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

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Section A: Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B: Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C: Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

SUGGESTED READINGS:

1. Cytology and Cytogenetics -C.P. Swanson. Prentice-Hall of India Pvt.Ltd., New Delhi.
2. Fundamental concepts of Cell biology -K.G. Purohit.
3. Gardner et al: Principles of Genetics (2006, John Wiley)
4. Griffith et al: An Introduction to Genetic Analysis (2008, Freeman)
5. Gene & Genetic Code -the chemical basis of Life- J.D.Charayil.
6. Hartl& Jones: Essential Genetics - A Genomic Perspective (2009, Jones & Bartlet)
7. Pierce: Genetics - A Conceptual Approach (2012, Freeman)
8. Russell: Genetics (2010, Benjamin Cummings)
9. Snustad& Simmons: Principles of Genetics (2012, John Wiley)
10. Moody: Introduction to Evolution (1978, Kalyani).
11. Rastogi: Organic Evolution (2007, Kedarnath&Ramnath)
12. Evolution -Lull. Organic Evolution, Richard Swanson, Light & Life Publishers.
13. Genetics-Verma, P.S. &V.K. Agarwal, S: Chand and Co.
14. Biology of Genetics-Lewis, C.D. &Lewin, R. McGraw Hill, Toppan Co. Ltd.
15. Molecular Genetics -Gunther S, StenMcmillian Pub. Co. Inc.
16. Genetics -Goodenough, V .N. Y. Holt, Rinchart& Winston.
17. Principles of Genetics -Gradner, Wiley Easten (P) Ltd. John Willey & Sons, Inc.
18. Genetics -Stickberger, Ayala, Stebbins & Valentine (W.H. Freeman). MacMillan Press.
19. Genetics and Origin of species -Dobzhansky (Columbia Univ. Press).
20. Animal cytology and evolution- White, M.J.D. Cambridge Univ. Press. 1973.

B.SC. SEMESTER-IV
PRACTICAL

Core Course No. : UZOPC- 402

Core Course Title: PRINCIPLES OF GENETICS AND EVOLUTIONARY BIOLOGY

Credits : 2

Max. Marks : 50

1. Study of various stages of mitosis from permanent slides.
2. Study of various stages of meiosis from permanent slides.
3. Preparation of permanent slides of mitosis from onion root tip.
4. Preparation of permanent slides of meiosis from grasshopper.
5. To study the Mendelian laws and their verification by Chi-square analysis using suitable examples.
6. Study of Human Karyotypes (normal and abnormal).
7. Study of fossil evidences from plaster cast models and pictures.
8. Study of living fossil through specimen (*Latimeria*)
9. Charts:
 - i. Phylogeny of horse with diagrams/cut outs of limbs and teeth.
 - ii. Darwin's Finches with diagrams/cut outs of beaks of different species.
10. Zoogeographical study through charts/photographs.
11. Study of homology and analogy from suitable specimens/ pictures.
12. Preparation of geological time scale chart/ report with special reference to dominant species of each division.
13. Viva-Voce.

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

External Practical Assessment: 50% (25 marks) shall be reserved for external assessment including 20% (5 marks) for viva and 80% (20 marks) for practical paper.

B.SC. SEMESTER-IV

Skill Enhancement Course No.: UZOTS -403
Skill Enhancement Course Title: AQUARIUM FISH KEEPING
CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Zoology
For the examination to be held in the years 2018, 2019 and 2020
UNDER CHOICE BASED CREDIT SYSTEM

1. Course /Paper Title	:	AQUARIUM FISH KEEPING (Theory)
2. Maximum Marks	:	100
i) External (Univ. Exam.)	:	80
ii) Internal Assessment	:	20
3. Minimum Pass Marks		
i) External	:	29
ii) Internal	:	07
4. Duration of Univ. Exam.	:	2½ Hrs.

Unit1: INTRODUCTION TO AQUARIUM FISH KEEPING (13hrs)

- 1.1 History of fish keeping
- 1.2 The potential scope of Aquarium Fish Industry as a cottage industry.
- 1.3 Introduction to aquarium and types of aquaria – All glass aquarium, Framed aquarium, Perspex aquarium.
- 1.4 Aquarium setup and accessories.

Unit 2: AQUARIUM FISHES (13hrs)

- 2.1 Exotic and Indigenous species of Aquarium Fishes.
- 2.2 Common characters and sexual dimorphism of Fresh water and Marine Aquariumfishes.
 - 2.2.1 Important freshwater ornamental fishes – Guppy, Gold fish, Gourami, Black molly, Sword tail
 - 2.2.2 Important marine ornamental fishes- Anemone (Clown) fish, Wrasses, Damsel, Angel fish, Butterfly fish

Unit 3: FOOD AND FEEDING OF AQUARIUM FISHES (13hrs)

- 3.1 Types of aquarium feed.
- 3.2 Live fish feed and its importance.
- 3.3 Preparation and formulation of artificialfish feeds.
- 3.4 Feeding methods and schedule.

Unit 4: FISH TRANSPORTATION (13hrs)

- 4.1 Live fish transport - Conditioning, packing, transport and quarantine methods.
- 4.2 Factors and principles associated with live fish transport.
- 4.3 Trade regulations and wild life act in relation to ornamental fishes.

Unit 5: Maintenance of Aquarium

(13hrs)

- 5.1 Budget for setting up and maintenance of Aquarium /ornamental fish farm.
- 5.2 Cleaning of aquarium.
- 5.3 Control of snail and algae.
- 5.4 Water quality requirements: Maintenance and Temperature control.
- 5.5 Biofilters in aquarium.

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

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SUGGESTED READINGS

- Zaidi, S.G.S (2002) Ornamental fish culture
- Mahapatra, B.K., Dutta S., Pailan, G.H.(2015) Ornamental Fish Breeding, Culture and Trade
- Ahilan, B., Felix, N., Santham, R., (2008) A text book of Aquaculture
- Dholakia A.D. (2010)Ornamental Fish culture and Aquarium Management
- David E. Boruchowitz (2001): The Simple Guide to Freshwater Aquariums (Second Edition)
- Vincent Hargreaves (2007), The Complete Book of the Freshwater Aquarium: A Comprehensive Reference Guide to More Than 600 Freshwater Fish and Plants

B.SC. SEMESTER-V

Discipline Specific Elective Course No. **UZOTE - 501**
Discipline Specific Elective Course Title: **APPLIED ZOOLOGY**

CREDITS : 4

UNIVERSITY OF JAMMU
Syllabi and Course of Study in Zoology
For the examination to be held in the years 2019, 2020 and 2021
UNDER CHOICE BASED CREDIT SYSTEM

1. Course /Paper Title	:	APPLIED ZOOLOGY (Theory)
2. Maximum Marks	:	100
i) External (Univ. Exam.)	:	80
ii) Internal Assessment	:	20
3. Minimum Pass Marks		
i) External	:	29
ii) Internal	:	07
4. Duration of Univ. Exam.	:	2½ Hrs.

Unit I INTRODUCTION TO PARASITOLOGY

- 1.1 Host types and their interdependence.
- 1.2 Symbiotic relationship and its types.
- 1.3 Concept of susceptibility and host-parasite specificity.
- 1.4 Concept of immunity.
- 1.5 Parasitic adaptations and degeneration.

Unit II EPIDEMIOLOGY OF PARASITIC DISEASES

- 2.1 Bacterial Diseases
 - 2.1.1 Transmission, Prevention and control of diseases: Tuberculosis and Typhoid
- 2.2 Protozoan Diseases
 - 2.2.1 Life history and pathogenicity and control of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosoma gambiense*.
- 2.3 Parasitic Helminthes
 - 2.3.1 Life history and pathogenicity and control of *Ancylostorna duodenale* and *Wuchereria bancrofti*

Unit III ANIMAL BIOTECHNOLOGY

- 3.1 Transgenic Animals and their applications
- 3.2 Gene transfer methods in Transgenesis
 - 3.2.1 Microinjection
 - 3.2.2 Retrovirus-Mediated Gene Transfer

- 3.2.3 Embryonic Stem cell-mediated gene transfer.
- 3.3 Animal propagation:
 - 3.3.1 Artificial insemination
 - 3.3.2 Animal Cloning.
 - 3.3.3 Stem cell technology.
 - 3.3.4 Embryo transfer techniques.

Unit IV ANIMAL HUSBANDRY AND POULTRY

- 4.1 Animal Husbandry
 - 4.1.1 Breeds of dairy cattle and their characteristics:
 - 4.1.1.1 Red sindhi
 - 4.1.1.2 Sahiwal
 - 4.1.1.3 Red dane
 - 4.1.1.4 Holstein-Friesian
 - 4.1.1.5 Jersey
 - 4.1.1.6 Murrah
 - 4.1.2 Induction of early puberty and synchronization of estrus in cattle.
 - 4.1.3 Integrated animal farming.
- 4.2 Poultry farming
 - 4.2.1 Principles of poultry breeding
 - 4.2.2 Breeds of poultry birds and their characteristics:
 - 4.2.2.1 Rhode Island Red
 - 4.2.2.2 white Leghorn
 - 4.2.2.3 Black Minorca
 - 4.2.2.4 Aseel
 - 4.2.2.5 Chittagong.
 - 4.2.3 Management of breeding stock and broilers
 - 4.2.4 Processing and preservation of eggs.

Unit V AQUACULTURE

- 5.1 Definition and scope of aquaculture
- 5.2 Genetic improvements in aquaculture industry
- 5.3 Induced breeding
- 5.4 Transportation of fish seed
- 5.5 Fishing gears: Cast net, Drag Net, Hook and Line, Gill nets and entangling nets
- 5.6 Composite fish culture
- 5.7 Prawn culture
- 5.8 Pearl culture

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting at least from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters : External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

Section A: Section-A shall be of 15 marks and will comprise of 5 short answer type questions, one from each of the units and carrying 3 marks each. Answers should be precise having 70 to 80 words only and without any detailed explanation (**All Compulsory**).

Section B: Section-B shall be of 35 marks and will comprise of 5 medium answer type questions, one from each of the units and carrying 7 marks each. Answers should be comprehensive having 250 to 300 words only and with detailed explanation (**All Compulsory**).

Section C: Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

SUGGESTED READINGS

- 1 Park, K. (2007). Preventive and Social Medicine. XVI Edition. B.B Publishers.
- 2 Arora, D. .R and Arora, B. (2001). Medical Parasitology. H Edition. CBS Publications and Distributors.
- 3 Kumar and Corton.'Pathological Basis of Diseases.
- 4 Dunham R.A. (2004). Aquaculture and Fisheries Biotechnology Genetic Approaches. CABI publications, U.K.
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- 6 Singh V P and Ramachandran , V (1985), Fresh Water fish culture ICAR New Delhi.
- 7 Jhingran, VP (1982) Fish and Fisheries of India Hindustan Pub. Corp. (India) New Delhi
- 8 Kurian C V and Sebastian V C , Prawns and prawn Fisheries of India Hindustan Publ Corp (India) New Delhi
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B.SC. SEMESTER-V

Core Course No. : UZOPC- 502
Core Course Title : APPLIED ZOOLOGY (PRACTICAL)
CREDITS : 2

- 1 Study of Sea anemone and hermit crab as an example of commensalism.
- 2 Study of Termite and *Trichonympha* as an example of mutualism.
- 3 Study of *Plasmodium vivax*, *Entamoeba histolytica*, *Trypanosoma gambiense*, *Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.
- 4 Preparation of stained slides and identification of bacteria from the curd culture.
- 5 Study of arthropod vectors associated with human diseases: *Pediculus*, *Culex*, *Anopheles*, *Aedes* and *Xenopsylla*.
- 6 Study of insect damage to different plant parts/stored grains through damaged products/photographs.
- 7 Identifying feature and economic importance of *Helicoverpa (Heliothis) Armigera*, *Papilio demoleus*, *Pyrilla perpusilla*, *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum* .
- 8 Morphometry and identification of locally available carp and cat fishes.
- 9 Visit to poultry farm, Dairyfarm and fish farm and submission of visit report.
- 10 Maintenance of freshwater aquarium
- 11 Viva-voce.

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

External Practical Assessment: 50% (25 marks) shall be reserved for external assessment including 20% (5 marks) for viva and 80% (20 marks) for practical paper.

- 3.2 Biology of viruses, classification, and mechanism of pathogenesis
- 3.3 Causative agent, pathogenesis and their control measures of the following communicable diseases
 - 3.3.1 Tuberculosis
 - 3.3.2 Measles
 - 3.3.3 Dengue
 - 3.3.4 Leprosy
 - 3.3.5 Ebola
 - 3.3.6 Hepatitis B

Unit 4: LIFE STYLE RELATED NON-COMMUNICABLE DISEASES (13 hours)

- 4.1 Different types of Life style related non-communicable diseases, their causes and prevention through dietary and lifestyle modifications
 - 4.1.1 Hypertension
 - 4.1.2 Coronary Heart diseases
 - 4.1.3 Stroke
 - 4.1.4 Diabetes mellitus
 - 4.1.5 Obesity
- 4.2 Concept of Mental Health diseases and their management
 - 4.2.1 Dipression
 - 4.2.2 Schizophrenia
 - 4.2.3 Bipolar disease
- 4.3 Emerging & re-emerging diseases

Unit 5: SOCIAL HEALTH PROBLEMS (13 hours)

- 5.1 Smoking, alcoholism, drug dependence and their deaddiction.
- 5.2 Acquired Immuno-Deficiency Syndrome (AIDS) - causes, treatment and prevention
- 5.3 Societal health and development.
- 5.4 Role of Voluntary organizations, self-help groups
- 5.5 Eco-friendly environmental practices-Waste, its types and their management.

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

Part A: Total weightage of Part A will be 10 marks and shall comprise of 8 short questions selecting at least from 2 to 3 units (50% of syllabus covered). A candidate will have to attend any 5 questions each carrying 2 marks.

Part-B: Total weightage of Part-B will be 10 marks and shall comprise of 2 long answer questions from first 2 to 3 units. A Candidate will have to attempt only 1 question of 10 marks.

Note 2: For paper setters :External End Semester University Examination

The External examinations in theory shall consist of the 3 sections.

1. Course /Paper Title	:	INSECT VECTORS AND DISEASES(Theory)
2. Maximum Marks	:	100
i) External (Univ. Exam.)	:	80
ii) Internal Assessment	:	20
3. Minimum Pass Marks		
i) External	:	29
ii) Internal	:	07
4. Duration of Univ. Exam.	:	2½ Hrs.

Unit I INTRODUCTION TO INSECTS VECTORS

(13 Hrs)

1.1 General Features of Insects

1.2 Morphological features

1.2.1 Head, Eyes and Types of antennae

1.2.2 Mouth parts with special reference to feeding habits

1.2.3 Types of Legs

1.3 Concept of Vectors

1.3.1 Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs

1.3.2 Host-vector relationship

1.3.3 Vectorial capacity

1.3.4 Adaptations as vectors

Unit II MOSQUITOES AND FLIES AS DISEASE VECTORS

(13 Hrs)

2.1 Mosquito-borne diseases:

2.1.1 Malaria

2.1.2 Dengue

2.1.3 Viral Encephalitis

2.2 Flies as disease vectors.

2.2.1 Sand fly-borne diseases

2.2.1.1 Visceral Leishmaniasis

2.2.1.2 Cutaneous Leishmaniasis

2.2.2 Study of house fly as important mechanical vector

2.2.2.1 Myiasis

2.2.2.2 Bacillary dysentery

Unit III BUGS AND FLEAS AS DISEASE VECTORS

(13 Hrs)

3.1 Blood-sucking bugs

3.1.1 Chagas disease

3.1.2 Bed bugs as mechanical vectors

3.2 Flea-borne diseases

3.2.1 Plague

3.2.2 Typhus fever

Unit IV LOUSE AS DISEASE VECTORS

(13 Hrs)

- 4.1 Human louse (Head, Body and Pubic louse) as important insect vectors
- 4.2 Study of louse-borne diseases:
 - 4.2.1 Louse borne Typhus fever
 - 4.2.2 Relapsing fever
 - 4.2.3 Trench fever
 - 4.2.4 Vagabond's disease
 - 4.2.5 Phthiriasis

Unit V INTRODUCTION TO VECTOR CONTROL

- 5.1 Vector control:
 - 5.1.1 Aims, objectives, goals and importance.
 - 5.1.2 Alternatives to the use of insecticides (chemical & microbial)
 - 5.1.3 Types of vector control - Selective, integrated and comprehensive vector control
- 5.2 Principles of Integrated Vector Management (IVM)
 - 5.2.1 General introduction - concept and definition of IVM-feasibility, merits and limitations
 - 5.2.2 Success stories - India, Thailand & Sri Lanka
 - 5.2.3 Key elements of IVM - role of vector control in controlling/preventing vector borne diseases.

Note: 1: There shall be one written theory paper of 100 marks. 20% marks shall be reserved for internal assessment (20 marks). 80% of the marks (80 marks) shall be reserved for external examination to be conducted by the University/Colleges. Theory paper will be set for 80 marks.

Internal Assessment Test (20 marks)

The internal assessment under Choice Based Credit System shall be of 1 hour duration and shall comprise of two parts.

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Section C: Total weightage of Section-C shall be 30 marks and will comprise of 5 long answer type questions, one from each of the units. A candidate will have to attempt only 2 questions from all the questions and will carry 15 marks each. Answers should be of 500 to 600 words with detailed analysis/explanation/critical evaluation to the question.

SUGGESTED READINGS

- 1 Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK.
- 2 Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge University Press, UK.
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- 5 Cemeron, D. Parasites and Parasitism
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- 8 Baker Parasitic Protozoa - Hutchinson Lib. Series
- 9 Hyman, H. The Invertebrate Protozoa Through Ctenophora
- 10 Gynab .L.H. (1951) the Invertebrates Planthyhemintnes, Vol.III
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B.SC. SEMESTER-VI

Core Course No. : **UZOPC- 602**
Core Course Title : **INSECT VECTORS AND DISEASES (PRACTICAL)**
CREDITS : **2**

1. Study of head, antennae and different kinds of mouth parts of insects
2. Study of following insect vectors through permanent slides/ photographs: *Aedes*, *Culex*, *Anopheles*, *Pediculus humanus capitis*, *Pediculus humanus corporis*, *Phthirus pubis*, *Xenopsyllacheopsis*, *Cimex lectularius*, *Phlebotomus argentipes*, *Musca domestica*, through permanent slides/Photographs.
3. Study of different diseases transmitted by above insect vectors.
4. Submission of a project report on any one of the insect vectors and disease transmitted
5. Viva-Voce

Note: There will be practical papers of 50 marks.

Internal Practical Assessment: 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 20% (5 marks) for internal test and 40% (10 marks) for day-to-day performance.

External Practical Assessment: 50% (25 marks) shall be reserved for external assessment including 20% (5 marks) for viva and 80% (20 marks) for practical paper.

Unit-III: Mulberry and Silkworm Diseases

(13 Hours)

- 3.1 Brief account of mulberry diseases and their control measures
 - 3.1.1 Mulberry leaf diseases
 - 3.1.2 Mulberry stem diseases
 - 3.1.3 Mulberry root diseases
- 3.2 A brief introduction to diseases of silkworm and their control measures
 - 3.2.1 Flacherie
 - 3.2.2 Grasserie
 - 3.2.3 Muscardine
 - 3.2.4 Pebrine
- 3.3 Introduction to disinfectants; types and formulations.
- 3.4 A brief introduction to silkworm seed production.

Unit IV: Rearing of Silkworms

(13 Hours)

- 4.1 Selection of mulberry variety and establishment of mulberry garden.
- 4.2 Rearing house and rearing appliances.
- 4.3 Disinfectants: Formalin, bleaching powder, RKO
- 4.4 Silkworm rearing technology: Early age and Late age rearing
- 4.5 Types of mountages.
- 4.6 Spinning, harvesting and storage of cocoons.

Unit-V: Silk Reeling and Sericulture Entrepreneurship

(13 Hours)

- 5.1 Silk Reeling methods :- Charkha, Cottage basin, multi-end, semi and fully automatics and improved CSRTI method.
- 5.2 Raw silk testing and grading and its types.
- 5.3 Brief introduction to silk throwing.
- 5.4 Silk weaving: Handloom and power loom weaving.
- 5.5 Sericulture Entrepreneurship
 - 5.5.1 Employment and income generation in sericulture; Role of women in sericulture; Bye products of Sericulture industry.
 - 5.5.2 Economics of silkworm rearing and silk reeling.
 - 5.5.3 Introduction to extension activities.
- 5.6 A visit to Sericulture Centre.

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SUGGESTED READINGS

- 1 Sericulture Manual-1 (Mulberry cultivation) (1972) Food and Agriculture Organization of the United Nations, Rome.
- 2 Sericulture Manual-2 (Silkworm rearing) (1972) Food and Agriculture Organization of the United Nations, Rome.
- 3 Sericulture Manual-3 (Silk reeling) (1972) Food and Agriculture Organization of the United Nations, Rome.
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- 5 Sarkar D.C. (1980); Sericulture in India, Central Silk Board, Government of India, Bangalore.
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- 17 Kumaresan, P. and Srinivasa, G. (2005) *Sericulture Extension Management and Economics*. Central Silk Board, Bangalore.
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