Syllabus

ZOO-75T-301- Animal Physiology & Biochemistry

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
V	ZOO-75T-301	Animal Physiology & Biochemistry			7	4
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
High Level Course	MJR	4	0	4	Lectures	

Regular Students-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	ZOO-75T-301 Animal Physiology & Biochemistry	CA- 1Hrs EoSE -3Hrs	CA- 20 Marks EoSE- 80 Marks	CA- 08 Marks EoSE-32 Marks

SYLLABUS

V Semester-Zoology

UG0101 -ZOO-75T-301- Animal Physiology & Biochemistry

Objectives of theCourse:

The learning objectives of this course are as follows:

- To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals.
- To expand their knowledge with respect to functioning of various organ systems such as muscular, nervous, digestive, circulatory, respiratory, excretory, reproductive and endocrine in animals.
- To instill the concept of hormonal regulation of physiology, metabolism and reproduction in animals.
- To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes.

Detailed Syllabus Semester V

ZOO-75T-301 - Animal Physiology & Biochemistry

Unit - I

Physiology of digestion:

Definition of digestion; various types of digestive enzymes and their digestive action in the alimentary canal, absorption and assimilation of the carbohydrates, proteins, and lipids. **5 Hrs**

Physiology of respiration:

Definition of respiration; mechanism of breathing; exchange of gases: transportation of oxygen and carbon dioxide in blood; regulation of respiration, respiratory pigments. **6 Hrs**

Physiology of blood circulation:

Composition and functions of blood; mechanism of blood clotting; heartbeat; cardiac cycle; blood pressure; body temperature regulation. **4 Hrs**

Unit -II

Physiology of excretion:

Kinds of nitrogenous excretory end products; Functional architecture of nephron, mechanism of urine formation, hormonal regulation of water and electrolyte balance (Homeostasis). **7 Hrs**

Physiology of nerve impulse:

Functional architecture of a neuron, origin and propagation of nerve impulse, synaptic transmission, reflex arc. **4 Hrs**

Physiology of muscle contraction:

Functional architecture of skeletal muscles; chemical and biophysical events during contraction and relaxation of muscle fibers. **4 Hrs**

Unit –III

Physiology of reproduction:

Control and regulations of testis and ovarian functions; female reproductive cycles, implantation, parturition, and lactation in mammals. Testes, and ovaries. **6 Hrs**

Physiology of endocrine glands:

Type of endocrine glands and their secretions and functions: Pituitary, adrenal, thyroid, pancreas. **6 Hrs**

Hormonal regulation:

Mechanism of hormone action, feedback mechanism, hypothalamic control of pituitary function. **3 Hrs**

Unit-IV

Carbohydrates:

Structure, classification and function of carbohydrates, Glycolysis, Krebs's cycle, and oxidative phosphorylation and gluconeogenesis. **6 Hrs**

Proteins:

Structure, classification and function of proteins, deamination, transamination, decarboxylation, ornithine cycle, Enzymes; definition, classification,inhibition, and regulation. **5 Hrs**

Lipids:

Structure, classification and functions of lipids; Beta-oxidation; brief account of biosynthesis of triglycerides. **4 Hrs**

Course Learning Outcomes:

By studying this course, students will be able to

- Have an enhanced knowledge and appreciation of animal physiology.
- Recognize and identify principal tissue structures and functions.
- Better understand the functions of important physiological systems including thenervous system, muscular system, endocrine and reproductive system.
- Understand how these separate systems interact to yield integrated physiological responses to maintain homeostasis in the body along with feedback mechanisms.
- Develop a strong foundation for research & employability skills using theknowledge of biochemistry.
- Improve their perspective of health through deep study of physiology and biochemistry.
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Suggested Books and References –

1. A Text Book of Medical Physiology (2017) Arthur C. Guyton MD, Eleventh ed.,JohnE. Hall, Harcourt Asia Ltd.
2. Animal Physiology, Roger Eckert and Randal, 4th ed, Freeman Co, New York.
3. Text Book of Animal Physiology, Veer Bal Rastogi, Kedarnath Ramnath, Meerut.
4. Animal Physiology, Eckert R., Randall D. J., Burggen W., French K., 1997,Burggren WW & Co. Ltd.
5. Practical Zoology, Lal SS, 2014, Rastogi Publications.
6. Lehninger Principles of Biochemistry, Nelson DL and Cox MM, 2013, 6th edition W. H. Freeman.
7. Animal Physiology and Biochemistry, Sastry KV. 2nd edition Rastogi Publications.
8. Animal Physiology, Verma PS, Tyagi BS, Agarwal VK, 2004, 6th edition S. Chand & Co.
9. Biochemistry of Biomolecules, Ritu Kamal 2006, Paragon International Publishers
10. Biochemistry, Voet D and Voet JG, 2011, 4th edition, John Wiley & Sons, Inc.
11. Concepts of Biochemistry, Gupta S.N., Rastogi Publications Meerut.
12. Zoology for Degree Students, Agarwal VK, S Chand and Company New Delhi.
13. Principles of Anatomy and Physiology, Tortora, G.J. and Derrickson, B.H., 2009, XII Edition, John Wiley & Sons, Inc.

Suggested E-resources:

1. National Institute of Science Communication & Information Resources (NISCAIR) http://nsdl.niscair.res.in/
2. National digital library of India (NDL. India) http://ndl.iitkgp.ac.in/
3. https://onlinecourses.swayam2.ac.in/cec19_bt02/preview
4. https://onlinecourses.nptel.ac.in/noc20_bt42/preview (Animal Physiology)
5. Virtual Labs (http//www.vlab.co.in)
6. http://www.ignouhelp.in/ignou-lse-05-study-material/ Animal Physiology (English Hindi)
   http://rastogipublications.com/Rastogi-Publications- SUCHIPATRA-2022-23-Mail.pdf
7. http://rastogipublications.com/Rastogi-Publications-SUCHIPATRA-2022-23- Mail.pdf
8. https://www.schandpublishing.com/books/higher-education /sciences /zoology-degree-students-semester-iv/9789352534104/
9. https://www.scribd.com/document/696830782/A-K-Jain-Physiology-Practical- Manual

Syllabus
ZOO-75P-302- Zoology Lab-V

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
V	ZOO-75P-302	Zoology Lab-V			7	2
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
High Level Course	MJR	0	2	2	Practical	

Regular Students-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Practical	ZOO-75P-302 Zoology Lab-V	CA- 1Hrs EoSE -4Hrs	CA- 10 Marks EoSE- 40 Marks	CA- 04 Marks EoSE-16 Marks

Practical Syllabus Semester V

UG0101 -ZOO-75P-302- Practicals based on Animal Physiology & Biochemistry

Animal Physiology

1. Counting of RBCs and WBCs using haemocytometer.
2. Estimation of hemoglobin by Sahli's haemometer.
3. Estimation of haematocrit value (PCV) / Blood Clotting/ Clotting Time/Blood Pressure
4. Preparation of blood smear to study different blood cell types using Wright's or Leishman stain.

Biochemistry

5. Demonstration of enzyme activity (catalase) in the liver.
6. Study the effect of pH and temperature on salivary amylase activity.
7. Study of histological sections of various organs and major endocrine glands: stomach, intestine, lungs, spleen, liver, kidney, spinal cord, pituitary, parathyroid, thyroid, pancreas, adrenal gland, testis, and ovary.
8. Detection of proteins in the animal tissue/food samples
9. Detection of carbohydrates in the animal tissue/food samples.
10. Detection of lipids in the animal tissue/food samples.
11. Demonstration of separation of amino acids from a mixture using paperchromatography/TLC.

Scheme of Practical Examination and Distribution of Marks

S.No.	Practical Exercises	Regular Students	Ex. /N.C. Students
1.	Major exercise (Physiology)	4	12
2.	Minor exercise (Physiology)	3	6
3.	Exercise on Biochemistry	3	6
4.	Identification and comments on Spots (1to 8)	16	16
5.	Report	4	----
6.	Viva Voce	5	10
7.	Class Record	5	
		10*+ 40 =50	50

Note:

***Internal marks for regular students only.**

1. With reference to microscopic slides, in case of non-availability, the exerciseshould be substituted with diagrams / photographs.
2. Candidates must keep a record of all work done in the practical class and submitthe same for inspection at the time of the practical examination.
3. Mounting material for permanent preparations would be as per the syllabus or asavailable through collection and culture methods.
4. Computer aided techniques should be adopted as per UGC guidelines.

Syllabus

ZOO-76T-303- Microbiology, Immunology & Biostatistics

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
VI	ZOO-76T-303	Microbiology, Immunology & Biostatistics			7	4
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
High Level Course	MJR	4	0	4	Lectures	

Regular Students-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Theory	ZOO-75T-303 Microbiology, Immunology & Biostatistics	CA- 1Hrs EoSE -3Hrs	CA- 20 Marks EoSE- 80 Marks	CA- 08 Marks EoSE-32 Marks

SYLLABUS

VI-Semester-Zoology

UG0101 -ZOO-76T-303- Microbiology, Immunology & Biostatistics

Objectives of the Course

The objectives of studying a combined course in Microbiology, Immunology, and Biostatistics are to develop a foundational understanding of microorganisms, the immune system, and statistical methods.

- Students will acquire practical skills in microbiological and immunological techniques, including culturing, staining, and identifying microbes, as well as conducting immunoassays.
- The course aims to help students understand the interplay between microbiology, immunology, and biostatistics, applying statistical analysis to interpret experimental data in these fields.
- It enhances abilities in designing experiments, collecting and analyzing data, and drawing valid conclusions, thereby fostering research capabilities.
- The course prepares students for careers in biomedical research, clinical diagnostics, public health, and related fields by understanding the applications of these disciplines in health and disease.

Detailed Syllabus Semester VI

ZOO- 76T-303: Microbiology, Immunology & Biostatistics

Unit-I

History of Microbiology:

Contributions of Anton van Leeuwenhoek, Louis Pasteur, Edward Jenner and Robert Koch. **2 Hrs**

Basic structural and functional characteristics of bacteria, fungus, cyanobacteria, rickettsiae, chlamydiae, mycoplasmas and virus. Structural organization of bacteria- flagella, capsule, cell wall, cell membrane, cytoplasm, chromosome, growth phases **4 Hrs**

Techniques in Microbiology:

Pure culture technique, growth conditions (temperature, pH, nutrients), Gram's staining, fungal staining **3 Hrs**

Bacterial diseases:

Causative agent, brief pathology, treatment, prevention of Diphtheria, meningitis, tuberculosis, botulism, tetanus, leprosy **3Hrs**

Viral diseases:

Causative agent, brief pathology, treatment, prevention of influenza,herpes, measles, chicken pox, small pox, rabies, polio, AIDS, covid-19. **3 Hrs**

Unit-II

Immunology:

Components of immune system different types of cells and organs involved. **3 Hrs**

Antigens: Essential features of antigen, antigenic determinants, Immunological valence, adjuvants, haptens **2 Hrs**

Antibodies: Nature and Primary structure of immunoglobulin; Types of immunoglobulin, IgG, IgM, IgA, IgD and IgE and their structure and functions **2 Hrs**

Antigen Antibody reactions: Precipitation and agglutination **2 Hrs**

Types of immunity: Active and passive immunity, Cell mediated immunity, humoral immunity, Auto immunity **3 Hrs**

Basic idea of interferon, Complement system and MHC **3 Hrs**

Unit III

Application of microbes:

Use of microbes in fermented foods, dairy and beverages:wine, beer, cheese, curd and vinegar **5 Hrs**

Use of microbes in waste water treatment, bioremediation (brief idea) **4 Hrs**

Types of vaccines: Live attenuated, inactivated vaccine, DNA and recombinant vaccine **3 Hrs**

Monoclonal antibodies production and application, Abzymes **3 Hrs**

Unit-IV

Biostatistics and its applications, variable vs attributes, population vs sample,arrangement of data, frequency distribution **3 Hrs**

Graphical representation of data: line diagram, bar diagram, pie chart, histogramand polygon **4 Hrs**

Measures of central tendency: arithmetic mean, median, mode **4 Hrs**

Standard deviation, standard error of mean **4 Hrs**

Course Learning Outcomes: After successful completion of the course, students willbe able to:

- Understand the basic concepts and applications of Microbiology, and Immunology and Biostatistics.
- Explain the structure and function of microorganisms.
- Describe the role of microbes in the environment, industry, and human health.
- Explain the principles and applications of immunological techniques.
- Apply appropriate statistical methods to analyze biological data, interpret results accurately, and make informed decisions based on statistical evidence.
- Gain proficiency in using statistical software for data management, analysis, and visualization, enabling them to handle complex datasets effectively in biomedical research contexts.

Suggested Books and References:

1. Fundamentals of microbiology by Edward Alcamo. Benjamin/Cummingspublishing company, Inc.
2. Prescott's Microbiology by Joanne. M. Willey, Linda Sherwood, Christoppher J.Woolverton,2017. McGraw-Hill Education
3. Kindt, T. J., Goldsby, R. A., Osborne, B. A., & Kuby, J. (2007). *KubyImmunology* (6th ed.). New York: W.H. Freeman and Company.
4. Owen, J. A., Punt, J., Stranford, S. A., & Jones, P. P. (2018). *Kuby Immunology* (8th ed.). New York: W.H. Freeman and Company.
5. Abbas, A.K. & Lichtman, A.H. (2001). Basic Immunology: Functions and Disorders of Immune System. US: W.B. Saunders.
6. Pagano, M., & Gauvreau, K. (2018). Principles of Biostatistics (2nd ed.). CRCPress.
7. Rosner, B. (2015). Fundamentals of Biostatistics (8th ed.). Cengage Learning.
8. Microbiology -concepts and applications (2023) Micheal Joseph Pelczar, EddieChin Sun Chan, Noel R. Krieg. McGraw-Hill Education
9. Delves, P.J., Martin, S.J., Burton, D.R., & Roitt, I.M (2011). Roitt's Essential Immunology (12thed.). New Jersey, USA: John Wiley & Sons Ltd

Suggested E-resources:

1. Microbiology Society: Offers educational resources, including articles andpractical resources for learning microbiology.
2. OpenStax - Microbiology Textbook: A free, peer-reviewed textbook that covers awide range of topics in microbiology.
3. MicrobeWiki: A student-edited resource that provides detailed information onvarious microorganisms.
4. Immunology Online Textbook: A comprehensive online textbook from NCBI thatcovers various aspects of immunology.
5. Janeway's Immunobiology: A highly regarded textbook available online thatprovides a deep dive into immunology.
6. Statistical Methods for the Analysis of Biomedical Data: An open-access book that focuses on statistical methods used in biostatistics.
7. OpenIntro Statistics: A free textbook that provides an introduction to statistics, including applications in biostatistics

Syllabus
ZOO-76P-304- Zoology Lab-VI

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
VI	ZOO-76P-304	Zoology Lab-VI			7	2
Level of Course	Type of the Course	Credit Distribution			Course Delivery Method	
		Theory	Practical	Total		
High Level Course	MJR	0	2	2	Practical	

Regular Students-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Passing Marks (CA + EoSE)
Practical	ZOO-76P-304 Zoology Lab-VI	CA- 1Hrs EoSE -4Hrs	CA- 10 Marks EoSE- 40 Marks	CA- 04 Marks EoSE-16 Marks

Practical Syllabus Semester VI

ZOO-76P-304- Practicals (based on Microbiology, Immunology & Biostatistics)

Microbiology

1. Preparation and use of culture media for microbes (NA and PDA).
2. Culture of microbes (bacteria and fungi) from food (curd/ spoiled food).
3. Gram's staining for bacteria.
4. Simple staining of bacteria.

Immunology

5. Agglutination reaction with reference to blood group.
6. Widal test to identify any pathogen in blood.
7. Differential leucocyte count (DLC) in the blood sample.

Biostatistics

8. Representation of data by using bar diagram/pie charts/Histograms.
9. Numericals based on biostatistical measurement: Mean, Mode and Median.
10. Numericals based on standard deviation, Student's T- test and Chi square test.
11. Educational trip to any Microbiology Lab/ Dairy/industry

Scheme of Practical Examination and Distribution of Marks

S.No.	Practical Exercises	Regular Students	Ex. /N.C. Students
1.	Major exercise (Microbiology)	4	12
2.	Minor exercise (Immunology)	3	6
3.	Minor Exercise (Biostatistics)	3	6
4.	Identification and comments on Spots(1 to 8)	16	16
5.	Report	4	---------
6.	Viva Voce	5	10
7.	Class Record	5	
		10*+40=50	50

Note:

***Internal marks for regular students only.**

1. In case of non-availability, the exercise should be substituted with diagrams/photographs.
2. Candidates must keep a record of all work done in the practical class and submit the same for inspection at the time of the practical examination.
3. Mounting materials for permanent preparation will be made available according to the course or through collection and preservation methods.
4. Computer-aided techniques should be adopted as per UGC guidelines.