B. Sc. (Zoology)

Programme Code: SCW03(Z)BSC

SYLLABUS

(As per NEP 2020 Guidelines)

Sunbeam College for Women
Autonomous Post Graduate College | Accredited 'A' Grade by NAAC
BHAGWANPUR, VARANASI-221005 (U.P.)

College Code: 120

Sunbeam College for Women

An Autonomous Post Graduate College

206, Bhagwanpur, Lanka, Varanasi - 221005 ▪ Mob.: 9721452110

www.sunbeamcollege.com ▪ info@sunbeamcollege.com

Semester-wise Tiles of the papers in B.Sc. (Zoology)

Year	Sem	Course Code	Paper Title	Theory/practical	Credits
1	I	BS2450101T	Cytology, Genetics and Infectious Diseases	Theory	04
		BS2450102P	Cell Biology & Cytogenetics Lab	Practical	02
	II	BS2450201T	Biochemistry and Physiology	Theory	04
		BS2450202P/R	Physiological, Biochemical &Haematology Lab	Practical /Field work	02
2	III	BS2450301T	Molecular Biology, Bioinstrumentation & Biotechniques	Theory	04
		BS2450302P	Bioinstrumentation & Molecular Biology Lab	Practical	02
	IV	BS2450401T	Gene Technology, immunology and Computational Biology	Theory	04
		BS2450402P/R	Genetic Engineering and Counselling Lab	Practical /Field work	02
3	V	BS2450501T	Diversity of Non-Chordates, Parasitology and Economic Zoology	Theory	04
		BS2450502T	Diversity of Chordates and Comparative Anatomy	Theory	04
		BS2450503P	Lab on Virtual Dissection, Anatomy, Economic Zoology and Parasitology	Practical	02
	VI	B050601T	Evolutionary and Developmental Biology	Theory	04
		B050602T	Ecology, Ethology, Environmental Science and Wildlife	Theory	04
		B050603P	Lab on Environmental Science, Behavioural Ecology, Developmental Biology, Wildlife, Ethology	Practical	02

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Subject prerequisite To study Zoology in undergraduate, a student must have studied Biology, Biotechnology or Life Science in Class 12.	
Programme Objectives (POs) 1. The programme has been designed in such a way so that the students get the flavour of both classical and modern aspects of Zoology/Animal Sciences. It aims to enable the students to study animal diversity in Indian subcontinent, environmental science and behavioural ecology. 2. The modern areas including cell biology and genetics, molecular biology, biochemistry, physiology followed by biostatistics, Evolutionary biology, bioinformatics and genetic engineering have been included to make the study of animals more interesting and relevant to human studies which is the requirement in recent times. 3. The lab courses have been designed in such a way that students will be trained to join public or private labs.	
Certificate Course in Medical Diagnostics & Public Health	
B.Sc I Programme Specific Outcomes (PSOs)	
PSO1	This course introduces System Biology and various functional components of an organism. Emphasis will be on physiological understanding abnormalities and anomalies associated with white blood cells and red blood cells. The course emphasizes cell identification, cell differentiation and cell morphology evaluation procedures. This will enhance hematology analytical skills along with skill of using many instruments
PSO 2	The students will learn the basic principles of genetics and how to prepare karyotypes to study the chromosomes.
PSO 3	How chromosomal aberrations are inherited in humans by pedigree analysis in families
PSO 4	The students will have hands-on training in the techniques like microscopy, centrifugation and chromatography, and various biochemical techniques, preparation of slides which will help them in getting employment in pathology labs and contribute to health care syste
PSO 5	The Certificate courses will enable students to apply for technical positions in government and private labs/institutes.
Diploma in Molecular Diagnostics and Genetic Counselling	
B.Sc II Programme Specific Outcomes (PSOs)	
PSO1	The student at the completion of the course will be able to have a detailed and conceptual understanding of molecular processes viz. DNA to trait. The differential regulation of genes in prokaryotes and eukaryotes leads to the development of an organism from an embryo.
PSO 2	The students will be able to understand and apply the principles and techniques of molecular biology which prepares students for further career in molecular biology. Independently execute a laboratory experiment using the standard methods and techniques
PSO 3	The principles of genetic engineering, gene cloning, immunology and related technologies will enable students to play an important role in applications of biotechnology in various fields like agriculture, forensic sciences, industry and human health and make a career out of it. Students can have their own start-ups as well.
PSO 4	The basic tools of bioinformatics will enable students to analyze large amount of genomic data and its application to evolutionary biology. Apply knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics existing software effectively to extract information from large databases and to use this information in computer modelling

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PSO 5	The Diploma courses will ensure employability in Hospitals/Diagnostics and Pathology labs with good hands-on training. It will also enable students to take up higher studies and Research as their career and work in renowned labs in the country and abroad.
Degree in Bachelor of Science	
B.Sc III Programme Specific Outcomes (PSOs	
PSO1	This programme aims to introduce students to animal diversity of invertebrates and vertebrates. The students will be taught about invertebrates and vertebrates using observational strategies, museum specimens and field reports.
PSO 2	A variety of interacting processes generate an organism's heterogeneous shapes, size, and structural features
PSO 3	Inclusion of ecology and environmental sciences will enrich students with our world which is crucial for human well being and prosperity. This section will provide new knowledge of the interdependence between people and nature that is vital for food production, maintaining clean air and water, and sustaining biodiversity in a changing climate
PSO 4	Students will also come to know about the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
PSO 5	The basic concepts of biosystematics, evolutionary biology and biodiversity will enable students to solve the biological problems related to environment.
PSO 6	At the end of the course the students will be capable enough to comprehend the reason behind such a huge diversity of animals and reason out why two animals are grouped together or remain separate due to similarities and differences which exist at many levels along with ecological, environmental and cellular inputs
PSO 7	The Degree courses will enable students to go for higher studies like Masters and Ph.D in Zoology and Allied subjects

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B.Sc. First Year

DETAILED SYLLABUS FOR

Certificate Course in Medical Diagnostics & Public Health

Subject prerequisite To study Zoology in undergraduate, a student must have studied Biology, Biotechnology or Life Science in Class 12
Programme Objectives (POs) 1. The programme has been designed in such a way so that the students get the flavour of both classical and modern aspects of Zoology/Animal Sciences. It aims to enable the students to study animal diversity in Indian subcontinent, environmental science and behavioural ecology. 2. The modern areas including cell biology and genetics, molecular biology, biochemistry, physiology followed by biostatistics, Evolutionary biology, bioinformatics and genetic engineering have been included to make the study of animals more interesting and relevant to human studies which is the requirement in recent times. 3. The lab courses have been designed in such a way that students will be trained to join public or private labs.

Certificate Course in Medical Diagnostics & Public Health	
B.Sc I Programme Specific Outcomes (PSOs)	
PSO1	This course introduces System Biology and various functional components of an organism. Emphasis will be on physiological understanding abnormalities and anomalies associated with white blood cells and red blood cells. The course emphasizes cell identification, cell differentiation and cell morphology evaluation procedures. This will enhance hematology analytical skills along with skill of using many instruments.
PSO2	The students will learn the basic principles of genetics and how to prepare karyotypes to study the chromosomes
PSO3	How chromosomal aberrations are inherited in humans by pedigree analysis in families.
PSO 4	The students will have hands-on training in the techniques like microscopy, centrifugation and chromatography, and various biochemical techniques, preparation of slides which will help them in getting employment in pathology labs and contribute to health care system.
PSO5	The Certificate courses will enable students to apply for technical positions in government and private labs/institutes.

Programme/Class: Certificate	Year: First	Semester: First
Subject: ZOOLOGY		
Course Code: BS2450101T	**Course Title**: Cytology, Genetics and Infectious Diseases	

Course outcomes:

The student at the completion of the course will be able to:

- Understand the structure and function of all the cell organelles.
- Know about the chromatin structure and its location.
- To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
- How one cell communicates with its neighboring cells?
- Understand the basic principles of genetics and how genes (earlier called factors) are inherited from one generation to another.
- Understand the Mendel's laws and the deviations from conventional patterns of inheritance.
- Comprehend how environment plays an important role by interacting with genetic factors.
- How to detect chromosomal aberrations in humans and study the pattern of inheritance by pedigree analysis in families.

Credits: 4	Core:Compulsory
Max. Marks: 25+75	Min. Passing Marks: as per rules

Total No. of Lectures-Tutorials-Practical (in hours per week): **L-T-P**:4-0-0

Unit	Topics	Total No. of Lectures (60)
I	**Structure and Function of Cell Organelles I** • Plasma membrane: chemical structure—lipids and proteins • Cell-cell interaction: cell adhesion molecules, cellular junctions • Endomembrane system: protein targeting and sorting, endocytosis, exocytosis Introduction to all national and international Biologists (Zoologists) who have contributed/contributing to Zoological and Life Sciences as a mark of tribute to ancient and modern biology will be included as part of the Continuous Internal Evaluation (CIE)	6
II	**Structure and Function of Cell Organelles II** • Cytoskeleton: microtubules, microfilaments, intermediate filaments • Mitochondria: Structure, oxidative phosphorylation • Peroxisome and ribosome: structure and function	6
III	**Nucleus and Chromatin Structure** • Structure and function of nucleus in eukaryotes • Chemical structure and base composition of DNA and RNA • DNA supercoiling, chromatin organization, structure of chromosomes	8

	• Types of DNA and RNA • DNA replication in prokaryotes and eukaryotes	
IV	**Cell cycle, Cell Division and Cell Signalling** • Cell division: mitosis and meiosis • Cell cycle and its regulation, Role of apoptosis in cancer • Signal transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors, JAK-STAT pathway	8
V	**Mendelism and Sex Determination** • Basic principles of heredity: Mendel's laws, monohybrid and dihybrid crosses • Complete and Incomplete Dominance • Penetrance and expressivity • Genic Sex-Determining Systems, Environmental Sex Determination, Sex Determination in Drosophila, Sex Determination in Humans • Sex-linked characteristics and Dosage compensation	8
VI	**Extensions of Mendelism, Genes and Environment** Extensions of Mendelism: Multiple Alleles, Gene Interaction • The Interaction Between Sex and Heredity: Sex-Influenced and Sex Limited Characteristics • Linkage and crossing over • Cytoplasmic Inheritance, Genetic Maternal Effects • Genomic Imprinting, Anticipation • Interaction Between Genes and Environment: Environmental Effects on Gene Expression, Inheritance of Continuous Characteristics	8
VII	**Human Chromosomes and Patterns of Inheritance** • Human karyotype • Chromosomal anomalies: Structural and numerical aberrations with examples; Gene mutation • Pedigree analysis • Patterns of inheritance: autosomal dominant, autosomal recessive, X-linked recessive, X-linked dominant	8
VIII	**Infectious Diseases** • Introduction to pathogenic organisms: viruses, bacteria, fungi, protozoa, and worms. • Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of	8

	common parasites: Trypanosoma, Giardia and Wuchereria	

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby Immunology. W H Freeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
9. Shetty Nandini Immunology Introductory Textbook. New Age International. (2005

Suggested Continuous Evaluation Methods:

Total Marks: 25

House Examination/Test: 10 Marks

Written Assignment/Presentation/Project / Term Papers/Seminar: 10

Marks Class performance/Participation: 5 Mark

Programme/Class: Certificate	**Year: First**	**Semester: First**
Subject: ZOOLOGY		
Course Code: BS2450102P	**Course Title**: Cell Biology & Cytogenetics Lab	

Course outcomes:

At the completion of the course students will learn Hands-on:

1. To use simple and compound microscopes.
2. To prepare slides and stain them to see the cell organelles.
3. To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
4. The chromosomal aberrations by preparing karyotypes.
5. How chromosomal aberrations are inherited in humans by pedigree analysis in families.
6. The antigen-antibody reaction

Credits: 2	**Core**:Compulsory
Max. Marks: 25+75	Min. Passing Marks: 10+25

Total No. of Lectures-Tutorials-Practical (in hours per week): **L-T-P**:0-0-4

Unit	**Topics**	**Total No. of Lectures (60)**
I	1. To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using Methylene blue. 2. To study the different stages of Mitosis in root tip of onion. 3. To study the different stages of Meiosis in grasshopper testis. 4. To prepare molecular models of nucleotides, amino acids, dipeptides using bead and stick method. 5. To check the permeability of cells using salt solution of different concentrations.	15

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II	1. Study of parasites (eg. Protozoans, helminths etc.) from permanent slides. 2. To learn the procedures for preparation of temporary and permanent stained/unstained slides	15
III	1. Study of mutant phenotypes of Drosophila. 2. Preparation of polytene chromosomes. 3. Study of sex chromatin (Barr bodies) in buccal smear and hair bud cells (Human). 4. Preparation of human karyotype and study the chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided. 5. To prepare family pedigrees. 6. Genetical exercises	**15**
IV	Virtual Labs (Suggestive sites) https://www.vlab.co.in https://zoologysan.blogspot.com www.vlab.iitb.ac.in/vlab www.onlinelabs.in www.powershow.com https://vlab.amrita.edu https://sites.dartmouth.edu	15

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W H Freeman (2007).
6. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi Course Books published in Hindi may be prescribed by the Universities and Colleges

Suggested Continuous Evaluation Methods:

Total Marks: 25

House Examination/Test: 10 Marks

Written Assignment/Presentation/Project / Term Papers/Seminar: 10 Marks Class performance/Participation: 5 Marks

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Programme: B.Sc.	Year: First	Semester: First
Subject: Science		
Course Code: 240111V	Course Title: Ornamental fish production and management	

Course outcomes: The course will impart basic knowledge of the ornamental fish industry and inculcate its scope as an avenue for career development as an entrepreneur. The basic aim is

1.To learn the fundamentals of aquarium fish industry.
2.To understand the biological features of aquarium fishes.
3. To know the food and feeding habits of aquarium fishes.
4. Student Will Get Aware About the Transportation of Fish
5. Students will have 'hands-on' experience through exposure to technology, production, functioning, or operation of an aquarium in the ornamental fish farms, hatcheries, and fish feed production plant as study tours or field visits.

Credits: 3	Vocational
Max. Marks: 25+75	Min. Passing Marks:10+25

Total No. of Lectures: 45

Unit	Topics	No. of Lectures
I	**Basics of aquarium**: Inception of the concept of aquarium; The potential scope of aquarium fish industry as a cottage industry; Different types and designs of aquarium: Design and construction of home and public aquaria (freshwater and marine), oceanarium. Aquarium accessories - aerator, diffuser, filters, lighting, thermostat and thermometer, feeding cup and feeding cone, light, internal and external decors.	12
II	**Biology of aquarium fishes :** Indigenous and exotic ornamental fishes . Biology (maturation, secondary sexual characters, breeding habits, spawning, parental care, fertilization and development of eggs) of Gold fish, Gourami, Guppy, Anemone fish , butterfly fish Barbs and Tetras, Angel fish, Cichlids. Hatchery management, breeding & larval rearing of live bearer and egg layers- fishes. Common diseases in aquarium fish.	10
III	**.Ornamental Feed and feeding management**: Introduction of aquarium feeds. Live food organisms and their culture. Feeding methods and frequency. Formulation of artificial feeds; Requirements and design for the commercial production of ornamental fishes in natural pomd; Freshwater aquarium plants: Common aquarium plants, morphology and multiplication	13
IV	**Aquarium Management**: Setting up of aquarium (selection of site, selection of fish, selection of substrate and filters, temperature acclimatization, quarantine measures), plants, selection of fishes, Quarantine measures. Aquarium maintenance and water quality management. Control of snail and algal growth. Handling, care, packing and transportation of fishes - Use of anesthetics. Temperature acclimation.	10

Suggested Readings:

1. Jhingran,V.G.(1982) Fish and Fisheries in India. Hindustan publication Corp, India. *Pandey,K.
2. J.P.Shukla (2013)Fish and Fisheries. Rastogi Publication.
3. Aquarium: Fish Keeping C BL Srivastava Published by KitabMahal
4. Marine Aquarium (Fish: Keeping and Breeding Them in Captivity)Boruchowitz, Davie. Published by Chelsea House Publications (1998)
5. Aquarium Setting Up (Fish: Keeping and Breeding Themin Captivity) Axelrod, Herbert R. Published by Chelsea House Publications (1998)
6.TheTropical Fresh water Aquarium Problem Solver: Practical and Expert Advice on Keeping Fish and Plants Sand ford, Gina Published by Voyageur Press (MN)(1998)
7. Saxena A. Aquarium Management.
8. Hunnam P., Milne A., Stebbing P. The living aquarium. ¬
9. CIFE. 1993. Training Manual on Culture of Live Food Organisms for AQUA Hatcheries. Central Institute of Fisheries Education, Versova, Mumbai. ¬
10. Paulraj R. 1997. Aquaculture Feed: Handbook on Aquafarming. MPEDA Publ.

Latest edition of the text books should be used.

This course can be opted as an elective by the students of following subjects: Open for all

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Suggested Continuous Evaluation Methods: Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:	
Assessment and Presentation of Assignment	(04 marks)
Class Test-I (Objective Questions)	(04 marks)
Class Test-II (Descriptive Questions)	(04 marks)
Class Test-III (Objective Questions)	(04 marks)
Class Test-IV (Descriptive Questions)	(04 marks)
Overall performance throughout the Semester (includes Attendance, Behaviour, Discipline, Participation in Different Activities)	(05 marks)

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Programme /Class: Certificate	Year: First	Semester: Second
Subject: ZOOLOGY		
Course Code: BS2450201T	**Course Title:** Biochemistry and Physiology	

Course outcomes:

The student at the completion of the course will learn:

- To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates
- How simple molecules together form complex macromolecules.
- To understand the thermodynamics of enzyme catalyzed reactions.
- Mechanisms of energy production at cellular and molecular levels.
- To understand systems biology and various functional components of an organism.
- To explore the complex network of these functional components.
- To comprehend the regulatory mechanisms for maintenance of function in the body

Credits: 4	Core:Compulsory
Max. Marks: 25+75	Min. Passing Marks: 10+25

Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P:4-0-0

Unit	Topics	Total No. of Lectures (60)
I	Structure and Function of Biomolecules • Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides,Polysaccharides and Glycoconjugates) • Lipids (saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids) • Structure, Classification and General properties of α-amino acids; Essential and non-essential α-amino acids, Levels of organization in proteins; Simple and conjugate proteins.	8
II	Enzyme Action and Regulation • Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action • Isozymes; Mechanism of enzyme action • Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Derivation of Michaelis-Menten equation, Concept of Km and Vmax, Lineweaver-Burk plot; Enzyme inhibition; • Allosteric enzymes and their kinetics; Regulation of enzyme action	8
III	Metabolism of Carbohydrates and Lipids • Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway • Glycogenolysis and Glycogenesis • Lipids --- Biosynthesis of palmitic acid and Ketogenesis • β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms	8
IV	Metabolism of Proteins and Nucleotides	6

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	• Catabolism of amino acids: Transamination, Deamination, Urea cycle • Nucleotides and vitamins • Review of mitochondrial respiratory chain, Oxidative phosphorylation, and its regulation	
V	Digestion and Respiration • Structural organization and functions of gastrointestinal tract and associated glands • Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Histology of trachea and lung • Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood Respiratory pigments, Dissociation curves and the factors influencing it; Control of respiration	7
VI	Circulation and Excretion • Components of blood and their functions • Haemostasis: Blood clotting system, Blood groups: Rh factor, ABO and MN • Structure of mammalian heart • Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation • Structure of kidney and its functional unit; Mechanism of urine formation	8
VII	Nervous System and Endocrinology • Structure of neuron, resting membrane potential • Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers • Types of synapse • Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them • Classification of hormones; Mechanism of Hormone action	8
VIII	Muscular System Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus	7

Suggested Readings:

1. Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
2. Zubayet al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press 14
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company. (2006).
6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee C C Human Physiology Volume 1 & 2. 11th edition. CBS Publishers(2016)

Suggested Continuous Evaluation Methods:

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Total Marks: 25 House Examination/Test: 10 Marks Written Assignment/Presentation/Project / Term Papers/Seminar: 10 Marks Class performance/Participation: 5 Mark

Programme/Class : Certificate	**Year: First**	**Semester: Second**
Subject: ZOOLOGY		
Course Code: BS2450202P/R	Course Title: Physiological, Biochemical & Hematology Lab	
Course outcomes: The student at the completion of the course will be able to: • Understand the structure of biomolecules like proteins, lipids and carbohydrates • Perform basic hematological laboratory testing, • Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.		
Credits: 2	Core:Compulsory	
Max. Marks: 25+75	Min. Passing Marks: 10-25	
Total No. of Lectures-Tutorials-Practical (in hours per week): L-T-P:0-0-4		
Unit	Topics	Total No. of Lectures (60)
I	1. Estimation of haemoglobin using Sahli's haemoglobinometer 2. Preparation of haemin and haemochromogen crystals 3. Counting of RBCs and WBCs using Haemocytometer 4. To study different mammalian blood cell types using Leishman stain. 5. Recording of blood pressure using a sphygmomanometer 6. Recording of blood glucose level by using glucometer	20
II	1. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid 2. Recording of simple muscle twitch with electrical stimulation (or Virtual) 3. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex)	15
III	1. Ninhydrin test for α-amino acids. 2. Benedict's test for reducing sugar and iodine test for starch. 3. Test for sugar and acetone in urine. 4. Qualitative tests of functional groups in carbohydrates, proteins and lipids. 5. Action of salivary amylase under optimum conditions.	10
IV	Virtual Labs (Suggestive sites) https://www.vlab.co.in https://zoologysan.blogspot.com www.vlab.iitb.ac.in/vlab www.onlinelabs.in www.powershow.com https://vlab.amrita.edu https://sites.dartmouth.edu	15
Suggested Readings:		

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1 Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
2. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
3. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
4. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
5. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition.Lippincott W. & Wilkins.
6. Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.
7. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi

Suggested Continuous Evaluation Methods:
Total Marks: 25
House Examination/Test: 10 Marks
Written Assignment/Presentation/Project / Term Papers/Seminar: 10 Marks Class performance/Participation: 5 Marks

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Programme: B.Sc.	Year: First	Semester: Second
Subject: Science		
Course Code: 240211V	Course Title: Diagonostic Laboratory Technology	

Course outcomes: After studying this course the student will be able to

1. Understand importance of medical diagnostics and its role in global market
2. Gain knowledge about essential concepts of medical diagnostics
3. Learn about diagnostic methods used to identify disease and its analysis and facilitate treatment procedure
4. Describe the components of body fluids, their characteristics and abnormalities
5. Explain diseases and diagnostic medical techniques used
6. Equip the skills required to handle diagnostic equipments

Credits: 3	Vocational
Max. Marks: 25+75	Min. Passing Marks:10+25

Total No. of Lectures: 45

Unit	Topics	No. of Lectures
I	**Introduction to medical diagnostics and its importance**. Brief historical perspective of medical diagnostics in context of India. Importance of medical diagnostics and employment opportunities. Elementary knowledge of computers	12
II	**Diagnostic methods used for analysis of body fluids:** **1. Analysis of blood** 1.1 Blood composition, Techniques of collection of blood 1.2 Preparation of blood smears 1.3 Differential leucocyte count using Leishman,s stain 1.4 Platelet count using hemocytometer 1.5 Erythrocyte sedimentation rate (E.S.R) 1.6 Packed cell volume (P.C.V) **2. Urine Analysis** 2.1 Pysical characteristics 2.2 Abnormal constituents	10
III	**Elementary idea of diseases** **Non infectious disease**-Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using, Glucometer/Kit. **Infectious disease**- Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis	13
IV	**Diagnostic medical Imaging Techniques** Tumors- Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT-Scan (using photographs).	10

Suggested Readings:

- Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
- Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, 2nd Edition, Bhalani Publishing House.
- Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
- Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders
- Robbins and Cortan, Pathologic Basis of Disease, VIII Edition, Saunders
- Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
- Sharda Rai, Astha Gupta, Ramdas Nayak, Essentials in Hematology & Clinical Pathology, 2012, First Edition.
- N. Swarup, S. Arora and S.C. Pathak; Laboratory techniques in modern biology; Kalyani Publishers; Ludhiana; India

.Latest edition of the text books should be used.

This course can be opted as an elective by the students of following subjects: Open for all

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Suggested Continuous Evaluation Methods: Continuous Internal Evaluation shall be based on allotted Assignment and Class Tests. The marks shall be as follows:	
Assessment and Presentation of Assignment	(04 marks)
Class Test-I (Objective Questions)	(04 marks)
Class Test-II (Descriptive Questions)	(04 marks)
Class Test-III (Objective Questions)	(04 marks)
Class Test-IV (Descriptive Questions)	(04 marks)
Overall performance throughout the Semester (includes Attendance, Behaviour, Discipline, Participation in Different Activities)	(05 marks)

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