





UNDERGRADUATE DEGREE PROGRAMME

B.Sc. BIOMEDICAL SCIENCES

(4Year UG Degree/ 3YEAR + 1YEAR -INTERNSHIP)

CURRICULUM & SYLLABUS

REGULATION 2026

Choice Based Credit System (CBCS)
&
Learning Outcomes Based Curriculum Framework (LOCF)

Effective from the Academic Year
2026 -2027

DEPARTMENT OF BIOMEDICAL SCIENCE

SCHOOL OF ALLIED HEALTH SCIENCES

BOARD OF STUDIES

CURRICULUM STRUCTURE

SEMESTER 1

Sl.No	Category	Course Titles	Hours/Credits							Maximum Marks				Total
			Lecture		Tutorial		Practical		Total	IA		UA		
			Hours	Credits	Hours	Credits	Hours	Credits	Credits	Theory	Practical	Theory	Practical	
1.1	Program Core	Fundamentals of biology	45	3	30	1	60	2	6	40	50	60	50	200
1.2	Program Core	Molecular biology	45	3	30	1	60	2	6	40	50	60	50	200
1.3	Program Core	Biochemistry	45	3	30	1	60	2	6	40	50	60	50	200
1.4	Generic Elective	Genetics	30	2	-	-	-	-	2	100	-		-	100
Total									**20**	**Total**				**700**

SEMESTER 2

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				Total
			Lecture		Tutorial		Practical		Total Credits	IA		UA		
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
2.1	Program Core	Physiology-I	45	3	30	1	60	2	6	40	50	60	50	200
2.2	Program Core	Pharmacology	45	3	30	1	60	2	6	40	50	60	50	200
2.3	Program Core	Microbiology	45	3	30	1	60	2	6	40	50	60	50	200
2.4	Generic Elective	Biomedical Instrumentation	30	2	-	-	-	-	2	100	-		-	100
Total									**20**	**Total**				**700**

SEMESTER 3

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				
			Lecture		Tutorial		Practical		Total Credits	IA		UA		Total
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
3.1	Program Core	Physiology-II	45	3	30	1	60	2	6	40	50	60	50	200
3.2	Program Core	Medical Biochemistry	45	3	30	1	60	2	6	40	50	60	50	200
3.3	Program Core	Applied Immunology	45	3	30	1	60	2	6	40	50	60	50	200
3.4	Generic Elective	Pathology	30	2	-	-	-	-	2	100	-		-	100
Total									**20**	**Total**				**700**

SEMESTER 4

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				
			Lecture		Tutorial		Practical		Total Credits	IA		UA		Total
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
4.1	Program Core	Bioprocess Technology	45	3	30	1	60	2	6	40	50	60	50	200
4.2	Program Core	Gene technology &human welfare	45	3	30	1	60	2	6	40	50	60	50	200
4.3	Program Core	Medical Lab Diagnostics	45	3	30	1	60	2	4	40	50	60	50	200
4.4	Generic Elective	Environmental Science	30	2	-	-	-	-	2	100	-		-	100
Total									**20**	**Total**				**700**

SEMESTER 5

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				
			Lecture		Tutorial		Practical		Total Credits	IA		UA		Total
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
5.1	Program Core	Cancer biology	45	3	30	1	60	2	6	40	50	60	50	200
5.2	Program Core	Nanobiology	45	3	30	1	60	2	6	40	50	60	50	200
5.3	Program Core	Applied Biotechnology	45	3	30	1	60	2	6	40	50	60	50	200
5.4	Generic Elective	Biosafety and regulatory affairs	30	2	-	-	-	-	2	100	-		-	100
Total									**20**	**Total**				**700**

SEMESTER 6

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				
			Lecture		Tutorial		Practical		Total Credits	IA		UA		Total
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
6.1	Program Core	Cell Culture	45	3	30	1	60	2	6	40	50	60	50	200
6.2	Program Core	Technology for forensic science	45	3	30	1	60	2	6	40	50	60	50	200
6.3	Program Core	Toxicology	45	3	30	1	60	2	6	40	50	60	50	200
6.4		Internship	-	-	-	-	-	2	2	-	-	-	100	100
Total									**20**	**Total**				**700**

SEMESTER 7

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				
			Lecture		Tutorial		Practical		Total Credits	IA		UA		Total
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
7.1	Program Specific Elective	Elective-1	45	3	30	1	60	2	6	40	50	60	50	200
7.2	Program Specific Elective	Elective-2	45	3	30	1	60	2	6	40	50	60	50	200
7.3	Program Specific Elective	Elective-3	45	3	30	1	60	2	6	40	50	60	50	200
7.4	Generic Elective	Biostatistics	30	2	-	-	-	-	2	100	-	-	-	100
Total									**20**	**Total**				**700**

SEMESTER 8

Sl. No	Category	Course Titles	Hours/Credits							Maximum Marks				
			Lecture		Tutorial		Practical		Total Credits	IA		UA		Total
			Hours	Credits	Hours	Credits	Hours	Credits		Theory	Practical	Theory	Practical	
8.1	Program Specific Elective	Elective - 4	45	3	30	1	60	2	6	40	50	60	50	200
8.2	Project	Project	-	-	-	-	-	14	14	-	40	-	60	100
Total									**20**	**Total**				**300**

SEMESTER 1

FUNDAMENTALS OF BIOLOGY

L	T	P	C
3	1	2	6

COURSE DESCRIPTION

This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of Bio-Medical Science.

COURSE OBJECTIVES

The objectives of this course are:

- To Use anatomical terminology to identify and describe locations of major organs of each system covered.
- To Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- To Describe the interdependency and interactions of the systems.
- To provide students with a comprehensive understanding of the principles and concepts of biology, including cell structure and function, genetics, evolution, and ecology.
- To develop students' ability to apply scientific methods and critical thinking skills to explore biological questions and solve problems in real-world contexts.

UNIT I DIVERSITY OF LIFE

Recognize what living things do, their properties and processes, Introduction to photosynthesis and Respiration, Levels of Biological organization, Chemistry of life- Biomolecules and their Importance, Carbohydrates. Lipids, Proteins, Nucleic acids, Enzymes and Metabolism, Forms of energy, The Structure and Hydrolysis of ATP.

UNIT II STRUCTURE AND FUNCTION OF CELL

Cell Structure and Function, the importance of cells, the first Prokaryotes, Comparing prokaryotic and eukaryotic cells, Panoramic view of Eukaryotic cells (plant & animal), Overview of cell organelles (identification), Brief functions of cell organelles. Tissue systems -Plant and animal tissue Structure and Function

UNIT III DIVERSITY IN PLANT AND ANIMAL KINGDOMS

Binomial and Hierarchical classification, Types of kingdoms, Universal tree of life, Introduction to animal diversity, Invertebrates, Vertebrates-Fishes/Amphibians/Reptiles/ Birds/Mammals, Plant diversity- Seed and Seedlings.

UNIT IV TRANSPORT IN PLANTS AND ANIMALS

Membrane structure results in selective permeability, Passive transport, Active transport, Bulk transport, Plant structure, growth and development, Vascular transport in plants, Plant nutrition, Animal nutrition, Blood Composition and Function, Blood vessel Structure and Function, Circulation and Gas Exchange.

UNIT V ORGANS AND ORGAN SYSTEM

Organs and organ systems, Digestive system, Respiratory system, Excretory system, Reproductive system, Nervous system.

COURSE OUTCOMES

Upon successful completion of the course student would be –

1. Able to Explain morphology, structure and functions of organs of the human body.
2. Able to Describe the various homeostatic mechanisms and their imbalances.
3. Able to Identify the various tissues and organs of different systems of human body.
4. Able to understand human organ anatomy, physiology and regulatory mechanisms.
5. Able to Understand the challenges such as disease and stress.

Practical

1. Study the parts of compound microscope.
2. Identification of the chloroplast.
3. Identification of the presence of starch.
4. Isolation of mitochondria.
5. Isolation of chloroplast DNA.
6. Estimation of Haemoglobin.
7. Identification of Human systems: Human digestive system, Human respiratory system.
8. Identification of Human systems: Human excretory system.

Text Books

1.Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2.Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York

Reference Books

1.Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2.Text book of Medical Physiology- Arthur C, Guyton and John .E. Hall. Miamisburg, OH, U.S.A.
3.Human Anatomy and Physiology, by Elaine N. Marieb and Katja N. Hoehn, ISBN13: 978-0134807423, 11th Edition

MOLECULAR BIOLOGY

L	T	P	C
3	1	2	6

COURSE DESCRIPTION

This course offers an in-depth study of the molecular mechanisms that underlie biological processes in living organisms. Students will explore the structure and function of nucleic acids and proteins, gene expression and regulation, DNA replication, repair, and recombination, as well as techniques used in molecular biology research. The course integrates theoretical knowledge with practical laboratory skills, emphasizing the application of molecular biology concepts to biotechnology, medicine, and genetic engineering. Through lectures, laboratory exercises, and research projects, students will gain a comprehensive understanding of how molecular biology drives the complexity of life at the cellular and molecular levels.

COURSE OBJECTIVES

The objectives of this course are:

- To understand concepts of genetic material and gene organization
- To understand the concepts of bacterial genetics
- To comprehend mutation and DNA repair mechanism
- To provide students with a detailed understanding of the molecular mechanisms governing the structure, function, and regulation of nucleic acids and proteins.
- To develop students' practical laboratory skills in molecular biology techniques, enabling them to apply these methods to research and biotechnological applications.

UNIT I CHEMICAL BASIS OF HEREDITY AND GENOME ORGANIZATION

Introduction, Experimental proof of DNA and RNA as genetic material; Structure and functions of DNA and RNA; Watson and Crick model of DNA and other forms for DNA, A and Z; Functions of DNA and RNA including Ribozymes; Prokaryotic genome Chromosomal and plasmid; Eukaryotic genome chromosomal DNA organization.

UNIT II REPLICATION AND TRANSCRIPTION IN PROKARYOTES AND EUKARYOTES

DNA Replication in Prokaryotic and Eukaryotic, Enzymes and proteins involved in replication, Gene, Gene expression, Mechanism of transcription Initiation elongation and termination in prokaryotes and eukaryotes; promoters; RNA polymerase, transcription factors, Post transcriptional; Transcriptional inhibitors; Modifications of eukaryotic mRNA 5’ capping and 3’ poly A tailing; mRNA Splicing.

UNIT III TRANSLATION AND REGULATION OF GENE EXPRESSION

Ribosomes; Genetic code, Features and Wobble hypothesis; Mechanism of translation in Prokaryotes and Eukaryotes, Post translational modifications of proteins. Regulation of Gene expression in Prokaryotes Operon concept, Lac operon and Tryptophan operon.

UNIT IV BACTERIAL GENETICS

Recombination in Prokaryotes Conjugation; F+, F-, Hfr and F' Cells, Transformation; Griffith’s experiment and mechanism, Transduction; Generalized and Specialized; Bacterial Transposons.

UNIT V MUTATION, DNA DAMAGE AND REPAIR

Types of mutations Base substitution, Frame shift mutation; Mutagens Physical & Chemical Mutagens; Reverse mutation in bacteria; DNA repair mechanism, Mismatch repair, photo reactivation, excision and SOS repair; Beneficial and harmful effects of mutations.

COURSE OUTCOMES

After successful completion of the program, the student will be able to

1. Describe the structure and functions of DNA and RNA, explain the experimental evidence for genetic material, and differentiate prokaryotic and eukaryotic genome organization.
2. Explain the mechanisms of DNA replication and transcription in prokaryotes and eukaryotes, and identify the roles of enzymes, promoters, RNA polymerases, transcription factors.
3. Explain the genetic code, wobble hypothesis, and mechanisms of translation, compare prokaryotic and eukaryotic protein synthesis, and analyze the regulation of gene expression.
4. Describe bacterial genetic recombination mechanisms and differentiate conjugation, transformation, and transduction.
5. Classify different types of mutations and mutagens, explain DNA damage and repair mechanisms, and evaluate the beneficial and harmful effects of mutations

Practical

1. Micropipette handling and measurement
2. Instruments used in Molecular Biology Experiments
3. Extraction of Plant Genomic DNA
4. Preparation of TAE/TBE buffer
5. Preparation of Agarose gel
6. Agarose gel electrophoresis
7. DNA gel image interpretation
8. Quantification of DNA

Text Books

1.Griffiths, A. J. F., Miller, J. H., Suzuki, D. T., Lewontin, R. C. &Gelbart, W. M.(2000) An Introduction to Genetic Analysis (7th Ed.), Freeman, New York.
2.Hartwell, L. H., Hood, L., Goldberg, M. L., Reynolds, A. E., Silver, L. M. & Veres, R. C. (2000) Genetics: From Genes to Genomes,Tata McGraw Hill, New Delhi.

Reference Books

1.Harvey, L., Arnold, B., Lawrence, S., Zipursky, Paul, M., David, B., & James, D. (2000). Molecular Cell Biology (4th Ed.). Freeman. New York.
2.Lodish, J. H & Baltimore, D. (1990). Molecular Cell Biology (2nd Ed.), Scientific American Books, New York.
3.Watson, J. D., Hopkins, N. H., Roberts, J. W., Steitz, J. A. & Weiner, A. M. (1987). Molecular Biology of the Gene (4th Ed.), Benjamin Cummins, Menlo Park.

BIOCHEMISTRY

L	T	P	C
3	1	2	6

COURSE DESCRIPTION

This course delves into the chemical processes and substances that occur within living organisms. Students will study the structure and function of biomolecules, metabolic pathways, and the regulation of biochemical processes. Emphasis is placed on understanding the molecular basis of life and the application of biochemistry in health, disease, and biotechnology.

COURSE OBJECTIVES

The objectives of this course are:

- To explain concepts and principles of Biochemistry and Microbiology
- To describe structures, classification morphology and growth of bacteria.
- To describe the methods of infection control.
- To identify the role of nurse in hospital infection control programme.
- To provide students with a comprehensive understanding of the chemical principles underlying biological processes, equipping them with foundational knowledge for careers in medicine, research, and biotechnology.

UNIT I CHEMICAL CONSTITUENTS OF LIFE

Biomolecules and the cell, Carbohydrates, Lipids, Proteins and amino acids, Nucleic acids and nucleotides, Enzymes, Vitamins.

UNIT II ENZYMES AND BIOENERGETICS

Enzymes: Classification and Mode of Action, Kinetics of enzyme-catalysed reaction, Brief Introduction to Bioenergetics.

UNIT III METABOLISMS

Metabolisms - Introduction to metabolism, Metabolism of carbohydrates- pathways of glucose (Glycolysis, lactic acid cycle, Gluconeogenesis, glycogenolysis, glycogenesis, HMP Shunt), Metabolism of lipids, Metabolism of amino acids – Urea cycle, Citric acid cycle, Electron transport chain.

UNIT IV INTEGRATION OF METABOLISM

Integration of metabolism, Metabolism of nucleotides – Purine biosynthesis and Salvage pathway, Mineral metabolism.

UNIT V CLINICAL BIOCHEMISTRY AND NUTRITION

Hormones, Organ function tests, Water, electrolyte and acid-base balance, Tissue proteins and body fluids, Nutrition.

COURSE OUTCOMES

Upon successful completion of the course student would be –

1. Describe the structure, properties, classification and biological functions of biomolecules, and explain their importance in cellular functions.
2. Classify enzymes based on their functions, explain their mode of action and enzyme kinetics, and interpret the principles of bioenergetics.

3. Explain the major metabolic pathways of biomolecules, and analyze their role in energy production and cellular metabolism.
4. Explain the interrelationship between major metabolic pathways and analyze the metabolism of nucleotides and minerals in maintaining normal cellular and physiological functions.
5. Describe the functions of hormones, organ function tests, body fluids, electrolytes and acid-base balance, and evaluate the role of proteins and nutrients in maintaining health.

Practical

1. Qualitative analysis of carbohydrates by Fehling's test
2. Qualitative analysis of carbohydrates by Iodine test
3. Estimation of protein by biuret method
4. Separation of amino acid by Thin layer chromatography
5. Separation of sugars by paper chromatography
6. Estimation of blood cholesterol
7. Estimation of total erythrocyte count
8. Estimation of total leukocyte count

Text Books

1.Lehninger Principles of Biochemistry, 5thedition (2012), David L. Nelson and Michael M. Cox; W. H. Freeman, ISBN-13: 978-0716771081.
2.Principles and Techniques of Practical Biochemistry, 5thedition (2000), Keith Wilson and John Walker; Cambridge University Press, ISBN -13: 978- 0521799652.

Reference Books

1.Biochemistry by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer ISBN: 978- 13.

GENETICS

L	T	P	C
2	0	0	2

COURSE DESCRIPTION

This course explores the principles and techniques of manipulating genetic material at the molecular level for various applications. Students will learn about gene cloning, recombinant DNA technology, gene editing tools like CRISPR-Cas9, and the ethical implications of genetic engineering. Emphasis is placed on hands-on laboratory skills and the application of molecular genetic techniques in biotechnology, medicine, and agriculture.

COURSE OBJECTIVES

The objectives of this course are:

- To impart knowledge about major events in the development of rDNA technology
- To acquire skills on techniques of construction of recombinant DNA - Cloning vectors and isolation of gene of interest.
- To familiarize with the concepts of constructing genomic DNA library and cDNA library
- To understand the principles and applications of Polymerase Chain Reaction (PCR).
- To explore the applications of Genetic Engineering in diseases diagnosis

UNIT I GENE EXPRESSION AND REGULATION

Replication, requirements and mechanism, Transcription-requirements and mechanism, Translation- requirements and mechanisms in prokaryotes and in eukaryotes, regulation of gene expression- lac and trp operon.

UNIT II REQUIREMENTS OF GENE CLONING

Requirements and steps involved in gene cloning, Isolation of gene/DNA fragments- Purification of genes: Mechanical shearing, restriction digestion. Enzymes involved in gene cloning: ligases, nucleases: Restriction enzymes - Outlines of bacterial restriction and modification systems – Classification of restriction enzymes - Type II restriction enzyme: Nomenclature, Production of DNA fragments with cohesive ends and blunt ends and their significance.

UNIT III VECTORS

Vectors -Plasmids, Bacteriophages, cosmids, bacterial artificial chromosomes (BACs), yeast artificial chromosomes (YACs) - vectors for construction of cDNA libraries. Multipurpose vectors - pUC 18/19, multiple cloning site. Site directed mutagenesis. Expression vectors – structure - promoters used in expression vectors - lac, tac, λpL, T7 promoters and their significance in constructing expression vectors. Vectors used for cloning into mammalian cells - SV40. Plant cloning vectors- Ti and Ri vectors.

UNIT IV DNA LIBRARIES

DNA libraries- cDNA synthesis - Mechanism of cDNA synthesis, Strategies used to obtain full length cDNA. Chemical synthesis - solid phase synthesis of oligonucleotides-Designing of gene from amino acid sequences, In vitro synthesis of gene, Genomic DNA library, Nucleic acid hybridization- Probe, radiolabeling, Blotting techniques- southern, western and northern blotting.

UNIT V CLONING STRATEGIES

Introduction of cloned genes into host - Transformation, transduction, transfection, electroporation, particle bombardment, microinjection, liposome mediated DNA delivery. Identification and screening of transformed cells. PCR-Concept and technology- Properties of primers -Taq DNA polymerase and its significance Inverse, multiplex PCR, RAPD, RFLP, AFLP and its significance. Real time PCR. Applications of genetic engineering.

COURSE OUTCOMES

Upon successful completion of the course student would be –

1. Explain gene expression and regulation in prokaryotes and eukaryotes.
2. Describe gene cloning steps and the role of restriction enzymes.
3. Classify cloning and expression vectors and their applications.
4. Explain DNA libraries, gene synthesis and blotting techniques.
5. Apply gene transfer and PCR techniques in genetic engineering.

Text books

1.Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, et al.
2.Genentech: The Beginnings of Biotech by Sally Smith Hughes
3.CRISPR-Cas: A Laboratory Manual by Jennifer A. Doudna and Prashant Mali.

Reference Books

1.Genetic Engineering: Principles and Methods by Jane K. Setlow and Alexander Hollaender.
2.Introduction to Genetic Engineering by Desmond S. T. Nicholl.

SEMESTER 2

PHYSIOLOGY – I

L	T	P	C
3	1	2	6

COURSE DESCRIPTION

This course introduces undergraduate students to the principles of human physiology, including homeostasis, cellular functions, body fluids, blood, nerve and muscle physiology, and the cardiovascular system. Students will develop an understanding of normal body functions and their importance in maintaining health and supporting clinical practice.

COURSE OBJECTIVE

The objectives of this course are:

- To understand the principles and concepts of human physiology and homeostasis.
- To describe the structure and normal functions of cells and tissues.
- To explain the composition and functions of blood and body fluids.
- To understand the basic physiology of skeletal, smooth, and cardiac muscles.
- To explain the structure and functions of neurons and the mechanism of nerve impulse transmission.
- To describe the normal functioning of the cardiovascular system, including the heart, blood vessels, cardiac cycle, and blood pressure.

UNIT I GENERAL PHYSIOLOGY

Introduction to human physiology, Homeostasis and its importance. Cell structure and functions, Cell membrane and transport mechanisms, Body fluid compartments
Membrane potential and resting potential. Action potential, Cell communication and receptors.

UNIT II BLOOD AND BODY FLUIDS

Composition and functions of blood, Plasma and plasma proteins. Red blood cells – structure and functions, Hemoglobin and its functions, White blood cells – types and functions, Platelets, Blood coagulation and clotting factors, Blood groups – ABO and Rh systems. Lymph and its functions.

UNIT III MUSCLE PHYSIOLOGY

Types of muscles, Structure of skeletal muscle, Neuromuscular junction,
Mechanism of muscle contraction, Sliding filament theory, Role of calcium and ATP in contraction, Types of muscle contraction, Smooth muscle physiology, Cardiac muscle physiology, Fatigue and rigor.

UNIT IV NERVE PHYSIOLOGY

Structure and functions of neurons, Types of nerve fibres, Resting membrane potential, Action potential, Conduction of nerve impulses, Synapse and synaptic transmission. Neurotransmitters. Sensory and motor nerves, Neuromuscular transmission.

UNIT V CARDIOVASCULAR SYSTEM

Structure and functions of heart, Properties of cardiac muscle, Cardiac cycle, Heart sounds, Cardiac output, Heart rate and its regulation, Blood pressure, Regulation of blood pressure, Pulse, ECG – principles and waves, Circulation through arteries, veins and capillaries.

COURSE OUTCOMES

After completing the course, students will be able to:

1. Describe basic physiological functions of cells and body fluids.
2. Explain the composition and functions of blood.
3. Describe nerve and muscle physiology.
4. Explain the normal functioning of the cardiovascular system.
5. Relate basic physiological concepts to common clinical conditions.

Practical

1. Recording of Arterial Blood Pressure.
2. Determination of RBC count.
3. Determination of WBC count.
4. Differential leucocyte count.
5. Determination of PCV & ESR.
6. Determination of Blood groups.
7. Determination of Bleeding and clotting time.
8. Measurement of Body Temperature.

Text Books

1. A.K. Jain – Textbook of Physiology, Avichal Publishing Company.
2. K. Sembulingam & Prema Sembulingam – Essentials of Medical Physiology, Jaypee Brothers Medical Publishers.
3. Indu Khurana – Medical Physiology, Elsevier.

Reference Books

1. Arthur C. Guyton & John E. Hall – Textbook of Medical Physiology, Elsevier.
2. Kim E. Barrett et al. – Ganong's Review of Medical Physiology, McGraw Hill.

PHARMACOLOGY

L	T	P	C
3	1	2	6

COURSE DESCRIPTION

This course introduces students to the principles of pharmacology, including drug actions, routes of administration, pharmacokinetics, pharmacodynamics, adverse effects, drug interactions, and the therapeutic uses of commonly used drugs. Emphasis is placed on developing a basic understanding of medicines relevant to allied health practice, safe medication handling, and rational use of drugs.

COURSE OBJECTIVES

The objectives of this course are:

- To introduce students to the principles and terminology of pharmacology.
- T explain drug absorption, distribution, metabolism, excretion, bioavailability, and elimination.
- To describe the actions and therapeutic uses of commonly used drugs.
- To familiarize students with important adverse effects, contraindications, and drug interactions.
- To develop basic knowledge of antimicrobial, endocrine, cardiovascular, respiratory, gastrointestinal, and nervous system drugs.

UNIT I INTRODUCTION TO PHARMACOLOGY

Nature and source of drugs, routes of drug administration, their advantages and disadvantages, receptor and receptor subtypes.

Unit II PHARMACOKINETICS

Drug absorption, distribution, metabolism, and excretion, bio-availability, first pass metabolism, excretion and kinetics of elimination, bio-availability, biological half-life of drug and its significance, drug-drug interactions.

UNIT III DRUGS ACTING ON MAJOR BODY SYSTEMS

Cardiovascular Drugs- Antihypertensive drugs, Antianginal drugs, Drugs used in heart failure, Antiarrhythmic drugs, Diuretics, Anticoagulants and antiplatelet drugs. Respiratory Drugs- Bronchodilators, Anti-asthmatic drugs, Antitussives
Expectorants and mucolytics, Antihistamines. Gastrointestinal Drugs: Antacids, Drugs for peptic ulcer, Laxatives and purgatives, Antidiarrhoeal drugs.

UNIT IV DRUGS ACTING ON ENDOCRINE SYSTEM AND BLOOD

Endocrine Drugs- Insulin and oral antidiabetic drugs, Thyroid hormones and antithyroid drugs, Corticosteroids, Sex hormones – basic concepts, Oral contraceptives. Drugs Affecting Blood- Haematinics, Iron preparations, Vitamin preparations, Anticoagulants, Antiplatelet drugs, Thrombolytic drugs.

UNIT V TYPES OF DRUGS

Antimicrobial, Anti-inflammatory and Other Commonly Used Drugs: Antimicrobial Drugs- General principles of antimicrobial therapy, Penicillins, Cephalosporins, Macrolides, Aminoglycosides, Fluoroquinolones, Tetracyclines, Sulfonamides, Antitubercular drugs, Antifungal drugs, Antiviral drugs, Antiseptics and disinfectants. Anti-inflammatory and Analgesic Drugs- NSAIDs, Paracetamol, Opioid analgesics. Other Important Drugs-

Antiepileptic drugs, Sedatives and hypnotics, Antidepressants, Antipsychotic drugs. Emergency drugs and their common indications.

COURSE OUTCOMES

After completing the course, students will be able to:

1. Describe the nature and sources of drugs, routes of drug administration, and basic drug–receptor interactions.
2. Explain drug absorption, distribution, metabolism, excretion, bioavailability, first-pass metabolism, half-life, elimination kinetics, and drug interactions.
3. Classify and explain the basic uses of commonly used cardiovascular, respiratory, and gastrointestinal drugs.
4. Describe the therapeutic uses and basic actions of drugs used for endocrine disorders and blood-related conditions.
5. Identify and explain the basic uses, important adverse effects, and precautions of commonly used, and emergency drugs.

Practical

1. Identification of common drugs and dosage forms.
2. Study of drug labels and package inserts.
3. Understanding prescriptions and medication charts.
4. Calculation of drug doses.
5. Calculation of dilution and concentration of medicines.
6. Demonstration of different routes of drug administration.
7. Study of commonly used antibiotics.
8. Identification of common adverse drug reactions.

Textbooks

1. K.D. Tripathi – Essentials of Medical Pharmacology, Jaypee Brothers Medical Publishers.
2. R.S. Satoskar, S.D. Bhandarkar & S.S. Ainapure – Pharmacology and Pharmacotherapeutics, Popular Prakashan.
3. H.P. Rang, M.M. Dale et al. – Rang & Dale's Pharmacology, Elsevier.

Reference Books

1. Bertram G. Katzung – Basic & Clinical Pharmacology, McGraw Hill.
2. Goodman & Gilman – The Pharmacological Basis of Therapeutics, McGraw Hill.

MICROBIOLOGY

L	T	P	C
3	1	2	6

COURSE DESCRIPTION

This course introduces students to the fundamentals of microbiology, including microorganisms, their classification, structure, growth, nutrition, and methods of identification. It also provides basic knowledge of sterilization, disinfection, infection, immunity, and medically important bacteria, viruses, fungi, and parasites, with emphasis on their relevance to healthcare and laboratory practice.

COURSE OBJECTIVES

The objectives of this course are:

- To introduce students to the basic concepts and scope of microbiology.
- To describe the structure, classification, growth, and characteristics of microorganisms.
- To explain basic laboratory methods used for the identification of microorganisms.
- To understand the principles of sterilization, disinfection, and infection control.
- To introduce students to common medically important microorganisms and the diseases they cause.

UNIT I INTRODUCTION TO MICROBIOLOGY AND MICROSCOPY

History and development of microbiology, Branches and applications of microbiology, Classification of microorganisms, General characteristics of bacteria, viruses, fungi and parasites, Microscopy types.

UNIT II BACTERIAL GROWTH, NUTRITION AND IDENTIFICATION

Nutritional requirements of bacteria, Types of culture media, Simple, enriched, enrichment, selective and differential media, Bacterial growth and growth curve, Factors affecting bacterial growth.

UNIT III STAINING, STERILIZATION AND DISINFECTION

Staining Methods- Principles of staining, Simple staining, Gram staining, Acid-fast staining, Special stains, Importance of staining in bacterial identification. Sterilization and Disinfection: Principles, Physical methods of sterilization- Moist heat, Dry heat, Filtration, Radiation. Chemical disinfectants, Antiseptics, Autoclave, Hot air oven, Biomedical waste management.

UNIT IV INFECTION AND IMMUNITY

Host–pathogen interaction, Innate immunity, Adaptive immunity, Antigen–antibody reactions, Vaccines and immunization, Infection control principles.

UNIT V VIRUSES, FUNGI AND PARASITES

Virology- General structure of viruses, Classification of viruses
Viral replication, Important viral infections: Influenza, Hepatitis, HIV/AIDS, Dengue, COVID-19. Medical Mycology- General characteristics of fungi, Yeasts and moulds- Candida, Aspergillus, Common fungal infections. Medical Parasitology- Introduction to parasites, Protozoa and helminths, Entamoeba histolytica, Giardia, Plasmodium.

COURSE OUTCOMES

After completion of the course, students will be able to:

1. Describe the basic concepts, classification, structure, and characteristics of microorganisms.

2. Explain microbial growth, nutrition, culture methods, and basic methods of microbial identification.
3. Demonstrate the principles of staining, sterilization, disinfection, and infection control.
4. Explain basic immune responses and identify important medically significant bacteria.
5. Describe common medically important viruses, fungi, and parasites and their associated infections.

Practical

1. Study of laboratory microscope and its components
2. Preparation of bacterial smear
3. Simple staining, Gram staining, Acid-fast staining
4. Preparation and identification of culture media
5. Demonstration of bacterial culture techniques
6. Antibiotic sensitivity test
7. Demonstration of autoclave and hot air oven
8. Identification of common fungi

Text Books

1. R. Ananthanarayan & R. Paniker – Textbook of Microbiology, Universities Press.
2. C.P. Baveja – Textbook of Microbiology, Arya Publications.
3. Prescott – Microbiology, McGraw Hill.

Reference Books

1. Mackie & McCartney – Practical Medical Microbiology, Elsevier.
2. Jawetz, Melnick & Adelberg – Medical Microbiology, McGraw Hill.

BIOMEDICAL INSTRUMENTATION

L	T	P	C
2	0	0	2

COURSE DESCRIPTION

This course introduces the principles, working mechanisms, and applications of biomedical instruments used in healthcare and medical laboratories. It covers instruments used for measuring physiological parameters, clinical diagnosis, patient monitoring, and laboratory investigations. The course provides basic knowledge of medical equipment and its importance in disease diagnosis and patient care.

COURSE OBJECTIVES

The objectives of this course are:

1. To introduce the principles of biomedical instrumentation.
2. To explain the working principles of common medical and laboratory instruments.
3. To describe instruments used for measuring physiological parameters.
4. To introduce diagnostic and monitoring equipment used in hospitals.
5. To create awareness about instrument calibration, maintenance, and safety.

UNIT I INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Importance of biomedical instrumentation. Basic components of biomedical instruments. Types of biomedical sensors and transducers. Measurement of temperature, pressure, and flow. Basic concepts of accuracy, precision, and calibration.

UNIT II DIAGNOSTIC LABORATORY INSTRUMENTS

Microscope: types and applications. Centrifuge: principle, types, and uses. Colorimeter and spectrophotometer. pH meter and analytical balance. Autoclave and hot air oven.

UNIT III PHYSIOLOGICAL MEASUREMENT INSTRUMENTS

Thermometer and digital temperature sensors. Blood pressure measuring instruments. Pulse oximeter and heart rate monitor. Electrocardiogram (ECG): principles. Electroencephalogram (EEG): introduction and applications.

UNIT IV MEDICAL IMAGING AND THERAPEUTIC EQUIPMENT

X-ray machine: principles. Ultrasound imaging: basic concepts. CT and MRI scanners: introduction and applications. Ventilators and infusion pumps. Defibrillators and pacemakers: principles.

UNIT V INSTRUMENT MAINTENANCE AND SAFETY

Calibration and routine maintenance of biomedical instruments. Electrical safety in medical equipment. Infection control and equipment handling. Biomedical waste management. Recent developments in biomedical instrumentation.

COURSE OUTCOMES

After completing this course, students will be able to:

1. Explain the principles and components of biomedical instruments.
2. Describe the working principles and applications of common laboratory instruments.
3. Identify instruments used for measuring physiological parameters.
4. Explain the principles of medical imaging and therapeutic equipment.
5. Recognize the importance of calibration, maintenance, and safety in biomedical instrumentation.

Textbooks

1. Khandpur, R. S. Handbook of Biomedical Instrumentation. McGraw Hill Education.
2. Carr, J. J., and Brown, J. M. Introduction to Biomedical Equipment Technology. Pearson.
3. Cromwell, L., Weibell, F. J., and Pfeiffer, E. A. Biomedical Instrumentation and Measurements. Prentice Hall.
4. Leslie, C. Biomedical Instrumentation: Technology and Applications. CRC Press.

Reference Books

1. Webster, J. G. Medical Instrumentation: Application and Design. Wiley.
2. Geddes, L. A., and Baker, L. E. Principles of Applied Biomedical Instrumentation. Wiley.
3. Enderle, J. D., and Bronzino, J. D. Introduction to Biomedical Engineering. Academic Press.