ANDHRA KESARI UNIVERSITY ::ONGOLE

Programme: B. Voc., Medical Laboratory Technology MAJOR
(w.e.f. Academic Year 2025–26)

COURSESTRUCTURE

Year	Semester	Paper No.	Major	Hours	Credits
I	I	1	Microbiology-1	3	3
			Practical	1	1
		2	Biochemistry-1	3	3
			Practical	1	1
	II	3	Microbiology-2	3	3
			Practical	1	1
		4	Pathology-1	3	3
			Practical	1	1
II	III	5	Biochemistry-2	3	3
			Practical	1	1
		6	Pathology-2	3	3
			Practical	1	1
		7	Human Anatomy-1	3	3
			Practical	1	1
	IV	8	Physiology-1	3	3
			Practical	1	1
		9	Classical Laboratory Practics-1	3	3
			Practical	1	1
		10	Human Anatomy-2	3	3
			Practical	1	1
III	V	11	Physiology-2	3	3
			Practical	1	1
		12 A	Clinical Laboratory Practices-2	3	3
			Practical	1	1
		OR			
		12 B	-----	3	3
				1	1
		13 A	Routine Laboratory Techniques	3	3
				1	1
		OR			
		13 B	-----	3	3

Not : In the III Year (during the V and VI Semesters), student are required to select a pair of electives form one of the **Two** specified domains. **For example : If set 'A' is chosen, course 12 to 15 to be chosen as 12A, 13A, 14A and 15A.** To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.

10/09/2025

SEMESTER-3
SYLLABUS
Course-5 Biochemistry-II
3 Hrs / Week

Course Learning Outcomes (CLO):

After completing this course, the learner will be able to:

1. Provide a good theoretical and practical education in understanding importance of water.
2. Understand the organization of a clinical laboratory including.
3. Lab information system, auto analyzers in laboratory for qualitative analysis.
4. Introduce various body fluids with their blood pH. Bio chemical composition and regulatory mechanism in
5. To provide knowledge about various body fluids with their importance in diagnosis of different diseases.

UNIT I

Water: Structure of water, solvents, properties of water, importance of water
Carbohydrates: Structure, classification and their functions in biological system.

UNIT II

Lipids: General structure of fatty acids and classification of lipids.
Aminoacids: Common structural features, physical and chemical properties, separation of amino acids and essential amino acids.
Proteins: Classification, structural organization and functions of proteins.

UNIT III

Enzymes: Definition, classification of enzymes, concept of active sites, general mode of action of enzymes, mechanism of enzyme activity, Coenzymes.

UNIT IV

Vitamins: Definition, classification of Vitamins. Importance of Vitamins, general mode of action of Vitamins, mechanism of Vitamins activity.

UNIT V

Nucleic acids: Structure, function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases and role of Nucleic acids.
Porphyrins: A brief account of Porphyrins.

PRACTICALS

- To study the phenomenon of imbibitions of water.
- To study the phenomenon of diffusion of water.
- To study the phenomenon of plasmolysis and deplasmolysis.
- To determine the osmotic pressure of cell sap by plasmolytic method.
- To study the qualitative analysis of carbohydrates.
- To study the qualitative analysis of proteins.
- To study the qualitative analysis of fats &oils.
- To study the structure of DNA and RNA from model/charts.
- To study the effects of temperature, pH and substrate concentration on enzyme activity.

Recommended Books/e-resources/LMS:

1. Essentials of Biochemistry, Second Edition, Dr. (Prof) Satyanarayana
2. Essentials of Biochemistry, 2nd Edition, Dr. Pankaja Naik
3. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson & Walker
4. An Introduction to Chemistry 8th Edition by Mark Bishop...
5. Clinical Chemistry made easy, 1st Edition by Hughes Fundamentals of Clinical Chemistry, 7th Edition by Carl Burtis Tietz

SEMESTER-3
Course-6 Pathology-II
3 Hrs / Week

After completing this course, the learner will be able to:

1. Provide knowledge about general principles, recording and labeling of histology specimens.
2. Gain knowledge about various fixatives for tissue embedding.
3. Enable the students to know about the working of microtome.
4. Learn about the methods of collection of museum specimens, preparation and their storage.

UNIT I

Introduction to Histopathology: General Principle, Reception, recording and labeling of histology specimens.
Fixation and various fixatives-Mode of action and indication preparation.
Processing of histological tissues for paraffin-embedding. Embedding and embedding media, Vacuum embedding.

UNIT II

Equipment used in Histopathology:
(1) Tissue Processor
(2) Microtome-various types, their working principle and maintenance.
(3) Micro to me knives and knife-sharpening.
(4) Automatic slide strainer
(5) Freezing microtome
(6) Cryostat

UNIT III

Equipments using Techniques :
Section cutting, cutting faults and remedies.
Decalcification-Methods, advantages and disadvantages, various types -their mechanisms of action.

UNIT IV

Major techniques used in Histopathology;
Routine staining procedures, mounting and mounting media. Dye chemistry, theory and practice of staining. Solvent mordents, accelerators and accentuators. Use of controls in various staining procedures.

UNIT V

- Preparation of Haematoxylin and Eosine
- Methods of preparation, staining technique for rapid diagnosis
- Histo-chemical staining
- Cyto-chemical staining
- Collection of Museum specimens Preparation and storage, methods of mounting

SEMESTER - III

7. HUMAN ANATOMY-1

3 Hrs / Week

TEACHING OBJECTIVES:

Anatomical Terminology: Students should be able to use and understand standard anatomical terms to describe body regions, directions, and structures.

Levels of Organization: Students should understand the hierarchical organization of the human body, from cells to tissues, organs, systems, and the whole organism.

Body Systems: Students should be able to identify and describe the major organ systems (e.g., skeletal, muscular, nervous, cardiovascular, respiratory, digestive, etc.) and their functions.

Anatomical Planes and Sections: Students should understand and be able to identify the different anatomical planes (sagittal, frontal, transverse) and sections used to visualize the body.

Skeletal System: Students should be able to identify the bones of the body, their articulations, and their functions.

Muscular System: Students should be able to identify the major muscles of the body, their origins, insertions, and actions.

Nervous System: Students should understand the structure and function of the brain, spinal cord, and peripheral nerves.

Cardiovascular System: Students should be able to identify the heart, blood vessels, and their functions in circulation.

Respiratory System: Students should be able to identify the structures of the respiratory tract and their roles in gas exchange

Learning Outcomes:

Identify and describe:

Major structures of the human body (cells, tissues, organs, systems).

The structural organization and functions of each body system.

The anatomical location and relationships of organs and structures.

The microscopic structure of tissues and organs.

The basic biological processes essential for maintaining homeostasis.

The key structural and functional changes to major body systems at different stages of the human lifespan.

Explain:

The relationship between structure and function in the human body.

How changes at the cellular level affect the function of tissues, organs, and body systems.

The role of the inflammatory process in maintaining body homeostasis during tissue injury, infection, and infectious disease.

COURSE-1 HUMAN ANATOMY-1

UNIT I

THE HUMAN BODY AS A WHOLE:

Definitions, Subdivisions of Anatomy, Terms of location and positions, Fundamental Planes, Vertebrate structure of man and organization of the body cells and tissues.

UNIT II

LOCOMOTION AND SUPPORT:

THE SKELETAL SYSTEM: Types of bones, structure of bone, divisions of the skeleton, Appendicular skeleton, Axial skeleton names of all the bones and their parts; joints -classification, types of movements with examples.

PRACTICALS : Demonstrations of all bones - showing parts.

Joints - X-rays of all normal bones and joints.

UNIT III

ANATOMY OF THE NERVOUS SYSTEM

CENTRAL NERVOUS SYSTEM: Spinal cord; Anatomy, functions reflex actions, Meninges, Main and Fundamental parts of Brain: Hind Brain, Midbrain Forebrain Brain, location, functions, coverings of brain.

Injuries to spinal cord and brain - excluded

UNIT IV

ANATOMY OF CIRCULATORY SYSTEM:

Heart size, location, coverings, chambers, blood supply, Blood vessels, General plan of circulation, pulmonary circuit - Names of arteries and veins and their positions

Only histology of lymphatic system - included

PRACTICAL: Demonstration to illustrate.

UNIT V

ANATOMY OF THE RESPIRATORY SYSTEM:

Organs of Respiratory System Nose-nasal cavity, Trachea, Bronchial Tree.

PNS & Larynx topics - excluded.

Pleurae and lungs, brief knowledge of parts and position.

PRACTICAL: Demonstration to illustrate.

Recommended Textbooks:

Reference books:

1. Ellen. N.Marieb (2007), Essentials of Human Anatomy and Physiology, Eighth Edition Pearson Education, New Delhi.

2. Arthur C. Guyton & John E. Hall (2006), Textbook of Medical Physiology, Tenth Edition,
W.B. Saunders Company, London.

SEMESTER - 4
COURSE-8 PHYSIOLOGY-1
3 Hrs/ Weeks

TECHING OBJECTIVES:

The teaching objectives of physiology aim to equip students with a comprehensive understanding of how the human body functions, encompassing normal physiological processes, the integration of organ systems, and the physiological basis of diseases, ultimately enabling them to apply this knowledge in clinical settings.

LEARNING OUTCOMES:

Basic Concepts: Students should be able to define fundamental physiological concepts and understand the mechanisms behind various bodily functions.

Organ Systems: Develop a thorough understanding of the structure and function of major organ systems (e.g., cardiovascular, respiratory, nervous, digestive) and their interactions.
Physiological Processes: Comprehend the mechanisms of homeostasis, including how the body maintains equilibrium and responds to changes in the environment.
Pathophysiology: Understand how physiological processes can be disrupted in disease states and the basis of common clinical conditions.
Interdisciplinary Nature of Physiology: Recognize the importance of integrating knowledge from other disciplines (e.g., chemistry, physics, genetics) to understand physiological processes.

SYLLABUS PAPER-8
PHYSIOLOGY-1
UNIT 1

HEMATOLOGY (16 hrs):

1. BLOOD: Composition, properties and functions of Blood.
2. RBC: Size, shape, functions, count, Physiological variations of RBC count Polycythemia, Erythropoiesis.
3. HAEMOGLOBIN: Function, concentration, Physiological variation of concentration, methods of determination of Hb.
4. WBC: Functions, production, life span, count, leukocytosis, Leukopenia, Leukemia, DLC.
5. PLATELET: Size, Shape, count, production, Functions, Thrombocytopenic Purpura, bleeding time, clotting time.
6. BLOOD GROUPS: ABO and Rh grouping, criteria of classification, Antigen and Antibodies, percentage of distribution, Determination of Blood groups. Landsteiner's Law, significance of Blood groups.

7. BLOOD TRANSFUSION: Indication, general qualities of a donor, matching of donor's blood with recipient's blood, universal donor and recipient concept. Blood grouping or typing, cross matching, mismatched blood transfusion causes and complications. Rh factor and Rh factor incompatibility transfusion and erythroblastosis of details.
8. HAEMOSTASIS: Vasoconstriction, platelet plug formation, blood coagulation Definition, clotting factors Mechanism of blood clotting Intrinsic and Extrinsic. Intravascular blood blotting, disorders of clotting, Vit. K deficiency bleeding, purpura, Hemophilia.
9. ANTICOAGULANTS: Classification, example and uses.
10. BLOOD BANK
11. BLOOD INDICES: Color index. MCH, MCV, MCHC.
12. ESR and PCV: Determination, definition, values, variations, factors affecting, significance.
13. BLOOD VOLUME: Normal value, determination of blood volume and regulation of blood volume.
14. LYMPH Lymphoid tissue formation, circulation, composition and functions of Lymph.

UNIT II

CARDIOVASCULAR SYSTEM (12 hrs):

1. Heart-brief description of function.
2. BLOOD PRESSURE: Definition, Normal values, physiological variations, factors affecting regulation of BP, Hypotension and Hypertension, Determination of BP.
3. PULSE: Jugular pulse, radial pulse.
4. HEART SOUNDS: Cause, characteristics and significance and phonocardiogram.
5. ECG: Definition, determination, significance, coronary circulation.

UNIT III

DIGESTIVE SYSTEM (8 hrs):

1. Functions of Digestive system. Physiological Anatomy of G.I.T. T.S. of Intestine, Nerve supply.
2. Saliva composition and Functions. Structure and functions of stomach. Properties, composition and functions of gastric juice. Functions of pancreas, composition, properties and functions of Pancreatic Juice. Functions of Liver, Properties, Composition and functions of bile. Gall bladder functions and its emptying; Jaundice. Functions of large intestine - composition and functions of succus entericus.
3. Defecation, stool, normal.

UNIT IV

RESPIRATORY SYSTEM (10 hrs):

1. Functions of Respiratory system, stages of Respiration.
2. Transportation of Respiratory Gases.
3. Transportation of O2: Direction, pressure gradient. Forms of transportation, Oxygenation of Hb. Quantity of O2 transported.
4. Transportation of CO2 Direction, pressure gradient, modes of transportation.
5. Spirometry: Spirogram, Spirometer.
6. LUNG VOLUMES: Tidal Volume, Inspiratory Reserve Volume, Expiratory Reserve Volume, Vital Capacity, Forced Expiratory Volume 1, Forced Expiratory Volume 2, Forced Expiratory Volume 3.

UNIT V

ENDOCRINE SYSTEM (12 hrs):

1. HORMONE: Definition, Local and General Hormones, properties of Hormones, Endocrine glands of the body and their location,
2. PITUITARY: Situation, Master Endocrine Gland; Anterior and Posterior Parts, Anterior pituitary Hormones, functions and regulation of secretion of each of them, Dwarfism Acromegaly, Gigantism.
3. POSTERIOR PITUITARY: ADH, and Oxytocin-source, functions, diabetes insipidus.
4. THYROID GLAND: Physiological Anatomy and location, Hormones secreted, Physiological functions, endocrine disorders - Hypo and Hyper secretion - Goitre, Cretinism, Myxedema, Grave's disease.
5. ADRENAL GLAND: Adrenal Cortex Hormones secreted: Gluco corticoids, Mineralocorticoids, sex steroids, functions of cortisol and Aldosterone.
6. Endocrine Disorders - Addison's disease, Cushing's syndrome, Conn's syndrome, Adrenogenital syndrome.
7. ADRENAL MEDULLA: Functions of adrenaline and Nor-Adrenaline.
8. PANCREAS: Hormones of Pancreas: Insulin-functions and actions, Glucagon functions and actions. Regulation of blood glucose level; Diabetes Mellitus.
9. PARATHYROID GLAND: PTH functions and actions. Hypo and Hyper secretion of PTH, tetany.
10. CALCITONIN: Functions and actions, Regulation of blood calcium level.

PRACTICALS

Study of Microscope and its uses
Collection of blood and study of hemocytometry
Hemoglobinometry
Determination of specific gravity of blood
White Blood Cell Count
Red Blood Cell Count
Determination of Blood Groups
Leishman's staining and differential WBC count
Determination of Erythrocyte Sedimentation Rate

References:

1. Textbook of Physiology for BDS students by Dr. Jain
2. Textbook of Physiology for BDS students by Dr. Sambulingam

SEMESTER - 4
COURSE-9 CLINICAL LABORATORY PRACTICES-1
3Hrs / Week

TEACHING OBJECTIVES:

Mastery of Laboratory Techniques: Students should be able to perform various laboratory tests and procedures with accuracy and efficiency, including sample collection, processing, and analysis.

Equipment Operation and Maintenance: Understanding the operation, maintenance, and troubleshooting of laboratory equipment is crucial.

Quality Control and Assurance: Implementing and adhering to quality control measures to ensure the reliability and accuracy of laboratory results is essential.

Data Analysis and Interpretation: Students should be able to analyze laboratory data, identify patterns, and draw appropriate conclusions.

Proficiency in Specific Laboratory Areas: Depending on the specialization, students should gain expertise in areas like hematology, clinical chemistry, microbiology, immunology, or molecular diagnostics.

LEARNERS OUTCOMES:

Proficiency in Laboratory Procedures: Students should gain competence in performing a wide range of clinical laboratory tests, including hematology, clinical chemistry, microbiology, immunology, and molecular diagnostics.

Understanding Scientific Principles: They should demonstrate a solid grasp of the scientific principles underlying laboratory testing, including technical, procedural, and problem-solving aspects.

Instrumentation and Equipment: Students should be able to operate and maintain sophisticated biomedical instrumentation used in the clinical laboratory.

Quality Control and Assurance: They should understand and be able to implement quality control and assurance practices to ensure accurate and reliable test results.

Data Interpretation: Students should be able to interpret laboratory results and correlate them with clinical findings to aid in diagnosis and treatment.

SYLLABUS
PAPER - 3 CLINICAL LABORATORY PRACTICES -1

UNIT I

Laboratory Services :

levels of laboratories Primary level, Secondary level and tertiary level. Reference laboratories, Research laboratories and specific disease reference laboratories.

UNIT II

Infrastructure in the laboratories :
a) Laboratory space : Reception, specimen collection, quality water supply, power supply, work area, specimen / sample / slide storage, cold storage, record room, washroom, biomedical waste room, fire safety, etc.
b) Personnel in the laboratory: Qualifications as per NABL document.

UNIT III

Maintanance of Equipment:
a) Equipment: Listing, cleaning, maintenance, SOP, verification of performance: Internal quality control.

b) Reagents and materials: Purchase, maintenance, storage, use.

UNIT IV

Specimen Collection, storage and Transport : General guidelines of collection, labeling, handling, transportation storage of specimens. Care in handling specimens. Accession list, Worksheet, Reporting test results, Specimen rejection record, Recording of Laboratory data, Maintenance of records.

UNIT V

Standard operating Procedure:
Definition, format, text of SOP, types of SOP.

Practicals :-

Writing SOP of equipment maintenance, practical procedures done in the laboratory
Internal/External quality control
Sample collection, labeling, storage, transportation

References: -

1. ICMR (2008) guidelines for good clinical laboratory practices.
2. Hospital waste Management: Chapter 13. Park's Textbook of Preventive and Social Medicine; 18th Ed.
3. NIH: DAIDS guidelines for Good Clinical Laboratory Practice Standards; 2011.
4. WHO: Good Clinical Laboratory Practice (GCLP), 2009.

SEMESTER - IV
COURSE-10 PHYSIOLOGY - 2
3Hrs / Week

TEACHING OBJECTIVES:

The teaching objectives of physiology aim to equip students with a comprehensive understanding of how the human body functions, encompassing normal physiological processes, the integration of organ systems, and the physiological basis of diseases, ultimately enabling them to apply this knowledge in clinical settings

LEARNING OUTCOMES:

Experimental Design and Analysis: Develop skills in designing experiments, collecting data, and interpreting physiological data.

Clinical Application: Apply physiological knowledge to understand and address clinical scenarios, including diagnosis and treatment.
Communication: Communicate physiological concepts effectively, both orally and in writing (e.g., journal-style reports).
Critical Thinking: Analyze physiological concepts critically, identify potential biases, and form well-supported conclusions.
Research Skills: Develop research skills, including literature review, data analysis, and interpretation of scientific findings.
Other Outcomes: Motivation for Lifelong Learning: Foster a sense of curiosity and motivation for continued learning and research in the field of physiology.
Teamwork and Collaboration: Develop skills in working collaboratively with others in scientific research and clinical settings.
Ethical Considerations: Understand the ethical implications of physiological research and practice.

SYLLABUS
10-PHYSIOLOGY - 2
UNIT I

NERVOUS SYSTEM (12hrs):

1. Functions of Nervous System in brief of all parts of CNS
2. EEG
3. CSF: formation, circulation, properties, composition and functions; lumbar puncture.

UNIT II

SPECIAL SENSES (6hrs):

1. VISION: functions of different parts of the eye. Refractive errors of eye and correction. Field of vision. Structure and functions of retina, Pupillary reflexes, color vision: color blindness, tests for color blindness.
2. HEARING: functions of outer, middle and inner ear, Deafness and Tests for deafness. Rinne's test. Weber's test.

UNIT III

Excretory System: Excretory Organs (10 hrs):

1. KIDNEYS: Functions of kidneys,
2. Functional unit nephron.
3. Mechanism of Urine Formation: GFR,

4. Selective Re absorption, substances reabsorbed, glucose, urea, amino acids, chlorides, H ions etc.
5. Properties and composition of normal urine, urine output. Names & Abnormal constituents in urine, Micturition, Cystourethrogram.
6. Diuretics, Renal Function Tests
7. Actions of ADH, aldosterone, PTH on kidneys.

UNIT IV

REPRODUCTIVE SYSTEM (6 hrs):

1. Functions of Reproductive system in male and female.
2. Semen secretion, composition, factors influencing, abnormalities, Oligozoospermia.
3. Ovulation, Menstrual cycle, Menstrual Fluid.
4. Pregnancy, Pregnancy tests.
5. Lactation factors affecting- composition of breast milk.

UNIT V

Muscle & Nerve Chapter - Included

PRACTICALS

Determination of packed cell volume
Calculation of Blood Indices
Fragility Test for R.B.C
Determination of Bleeding Time
Determination of Clotting Time
Blood Pressure Recording
Examination of arterial pulse included
Artificial Respiration
Determination of Vital Capacity

References:

1. Textbook of Physiology for BDS students by Dr. Jain
2. Textbook of Physiology for BDS students by Dr. Sambulingam