MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED HEALTHCARE SCIENCES AND TECHNOLOGY

Suraram X Roads, Jeedimetla,

Hyderabad-500055

Web: https://mrvv.edu.in/

Program

Bachelors of Medical Laboratory Technology

2025

SCHOOL OF ALLIED AND PUBLIC HEALTH SCIENCES AND TECHNOLOGY

Bachelor of Medical Laboratory Technology

Vision

To develop globally competent and socially responsible Medical Laboratory Science professionals equipped with advanced scientific knowledge, technical expertise, ethical values, and research capabilities to enhance diagnostic healthcare services and contribute to the advancement of modern medical science and patient-centered healthcare.

Mission

The B.Sc. MLT program aims to provide competency-based education and practical laboratory training to develop skilled and ethical medical laboratory professionals. It prepares students to deliver accurate, reliable, and quality diagnostic services using modern technologies and evidence-based practices. The program also promotes research, teamwork, professionalism, and lifelong learning to strengthen healthcare services and patient care.

Program Educational Objectives (PEOs)

- Apply comprehensive knowledge of medical laboratory sciences for accurate diagnosis and patient care in diverse healthcare settings.
- Demonstrate professional competence, ethical responsibility, and accountability in laboratory practice.
- Engage in multidisciplinary healthcare teams to improve clinical outcomes and healthcare delivery.
- Adapt to advancements in laboratory technologies including automation, molecular diagnostics, and quality assurance systems.

- Contribute to community health through disease prevention, health promotion, and evidence-based practices.

Pursue lifelong learning, research, and professional development in medical laboratory sciences.

PROGRAM OUTCOMES (POS)

Upon successful completion of the BMLS program, students will be able to:

- Apply scientific knowledge in professional healthcare practice.
- Demonstrate clinical and technical skills to deliver quality healthcare services.
- Collaborate effectively in interdisciplinary healthcare teams to improve societal health.
- Uphold ethical values and professionalism within the legal framework of society.
- Communicate effectively with healthcare teams and the community.
- Practice evidence-based medicine to ensure high-quality professional performance.
- Engage in continuous learning and adapt to technological advancements for professional growth.
- Exhibit entrepreneurial, leadership, and mentorship skills for independent and collaborative healthcare practice.
- Use information and communication technology appropriately in their professional field.
- Take responsibility for personal and professional development and maintain competency through continuous learning and application of new knowledge in patient care.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After successful completion of the BMLS program, students will be able to:

- Perform routine and specialized laboratory investigations in hematology, microbiology, clinical biochemistry, immunology, histopathology, cytology, and molecular diagnostics with accuracy and precision.
- Operate, calibrate, maintain, and troubleshoot laboratory instruments while following standard operating procedures and quality assurance protocols.
- Collect, process, analyze, and interpret clinical specimens while adhering to biosafety, infection control, and ethical laboratory practices.
- Apply laboratory findings for disease diagnosis, monitoring, and treatment evaluation in collaboration with healthcare professionals.
- Utilize modern laboratory technologies, digital health systems, and evidence-based practices to enhance diagnostic services and patient care.
- Demonstrate research aptitude, critical thinking, communication, leadership, and lifelong learning skills for professional growth and healthcare advancement.

COURSE OUTCOMES (COS)

At the end of the BMLS program, students will be able to:

- Understand the basic concepts of human anatomy, physiology, pathology, microbiology, hematology, biochemistry, immunology, and molecular biology.
- Perform laboratory investigations accurately using appropriate techniques, instruments, and quality control measures.
- Apply biosafety, infection control, and ethical principles in laboratory practices.

- Analyze and interpret laboratory results for clinical diagnosis and patient management.
- Communicate effectively with healthcare professionals and maintain proper laboratory documentation.
- Demonstrate research skills, critical thinking, teamwork, and professionalism in healthcare settings.
- Adapt to emerging technologies and engage in lifelong learning for continuous professional development.

MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED HEALTHCARE SCIENCES AND TECHNOLOGY

B.Sc. MEDICAL LABORATORY TECHNOLOGY

Course Structure

I year I semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810101	Human Anatomy-I	4	-	-	4	30	70	100
2	MLT3810102	Human Physiology- I	4	-	-	4	30	70	100
3	MLT3810103	Medical Bio- Chemistry-I	4	-	-	4	30	70	100
4	MLT3810104	Sociology	2	-	-	2	30	70	100
5	MLT3810105	English and Communication Skills	2	-	-	2	30	70	100
6	MLT3810106	Basics of Computers	1	-	1	2	30	70	100
7	MLT3810101P	Human Anatomy-I	-	-	2	2	30	70	100
8	MLT3810102P	Human Physiology- I	-	-	2	2	30	70	100
9	MLT3810107VA	Environmental awareness	2	-	-	2	100	-	100
TOTAL			**19**	**-**	**5**	**24**	**340**	**560**	**900**

II year I semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810201	Human Anatomy-II	4	-	-	4	30	70	100
2	MLT3810202	Human Physiology- II	4	-	-	4	30	70	100
3	MLT3810203	Psychology	3	-	-	3	30	70	100
4	MLT3810204	Pathology	2	-	1	3	30	70	100
5	MLT3810205	Microbiology	2	-	1	3	30	70	100
6	MLT3810201P	Human Anatomy-II Practical	-	-	2	2	30	70	100
7	MLT3810202P	Human Physiology- II Practical	-	-	1	1	30	70	100
8	MLT3810206VA	Stress Management	1	-	-	1	30	70	100
TOTAL			**16**	**-**	**5**	**21**	**340**	**560**	**900**

II YEAR III SEM

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810301	Hematology	4	-	2	6	30	70	100
2	MLT3810302	bacteriology	4	-	2	6	30	70	100
3	MLT3810303	Intermediary Metabolism	3	-	2	5	30	70	100
4	MLT3810304	Community Health	4	-	-	4	30	70	100
5	MLT3810305	Medical Law, Ethics & Medical Records	3	-	-	3	30	70	100
6	MLT3810306VA	Soft Skills Development	1	-	-	1	100	-	100
TOTAL			**19**	**-**	**6**	**25**	**250**	**350**	**600**

II YEAR IV SEM

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810401	Immunohematology and Blood Transfusion	4	-	1	5	30	70	100
2	MLT3810402	Virology	4	-	1	5	30	70	100
3	MLT3810403	Metabolic Disorders and Molecular Biology	3	-	1	4	30	70	100
4	MLT3810404	Clinical Pathology	4	-	1	5	30	70	100
5	MLT3810405VA	Health and Well-being	1	-	-	1	100	-	100
6		Clinical postings -I	-	-	3	3	30	70	100
TOTAL			16	-	7	23	250	350	600

III YEAR V SEM

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810501	Histopathology and Histo-Techniques	4	-	2	6	30	70	100
2	MLT3810502	Mycology and Parasitology	4	-	2	6	30	70	100
3	MLT3810503	Analytical Biochemistry	4	-	2	6	30	70	100
4	MLT3810504	Clinical Postings-II	-	-	4	4	30	70	100
5	MLT3810505VA	Interpersonal Communication	1	-	-	1	100	-	100
TOTAL			**13**	**-**	**10**	**23**	**220**	**280**	**500**

III YEAR VI SEM

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810601	Diagnostic Cytology	3	-	1	4	30	70	100
2	MLT3810602	Applied Microbiology	3	-	1	4	30	70	100
3	MLT3810603	Applied Clinical Biochemistry	3	-	1	4	30	70	100
4	MLT3810604	Research Methodology and Biostatistics	2	-	1	3	30	70	100
5	MLT3810605	Clinical Assessment and Practice	-	-	4	4	30	70	100
6	MLT3810606VA	Art of Being a Better Person	1	-	-	1	100	-	100

Course Code	Course Title	Credits/Week			Hours/Semester			Assessments		Total
		L	P	C	L	T/P	Total	INT	EXT	
	Internship	2	20	22	30	900	930	-	100	100
	Project work		06	06		270	270		100	100
Total		**2**	**26**	**28**	**30**	**1170**	**1200**	**-**	**200**	**00**

7		Clinical postings-III	-	-	2	2	100	-	-	
TOTAL			**12**	**-**	**10**	**22**	**250**	**350**	**600**	

Course Code	Course Title	Credits/Week			Hours/Semester			Assesments		Total
		L	P	C	L	T/P	Total	INT	EXT	
	Internship	2	20	22	30	900	930	-	100	100
	Project work		06	06		270	270		100	100
Total		**2**	**26**	**28**	**30**	**1170**	**1200**	**-**	**200**	**200**

IV YEAR VII SEM

IV YEAR VIII SEM

1.1 Under Graduate Programme

Course Code	Course Title	Credits/Week			Hours/Semester			Assessments		Total
		L	P	C	L	T/P	Total	INT	EXT	
	Internship	2	20	22	30	900	930	-	100	100
	Project work		06	06		270	270		100	100
Total		**2**	**26**	**28**	**30**	**1170**	**1200**	**-**	**200**	**00**

Sl. No.	Course	Duration	Eligibility for admission
1	Bachelor of Science (B.Sc.) Medical Laboratory Technology	4 years	Intermediate BiPC, 10+2 or equivalent

1.2 Medium of Instruction:

English shall be the medium of instruction for all subjects of study and for examinations.

1.3 Duration of the Course

Duration details are mentioned under clause no. 1.1 of this booklet.

1.4 Examination Regulations

1.4.1 Attendance:

75% of attendance (physical presence) is mandatory.

Medical leave or other types of sanctioned leaves will not be counted as physical presence.

Attendance will be counted from the date of commencement of the session to the last day of the closing of attendance before the final examination.

1.4.2 Internal Assessments:

a) Regular periodic assessment shall be conducted throughout the course. In each semester there will be two one hour internal assessments (10 marks each) and a continuous assessment (10 marks). Thus a total of 30 marks for the internal exam. (i.e. weightage for internal assessment shall be 30% of the total marks in each subject).

b) Exam pattern for internal assessment in each semester will be

- (a) Essay question 1 no. (5 marks)
- (b) Short questions 1 no. (2 marks)
- (c) Very short question 3 nos. (each carries 1 mark i.e. 1 × 3 = 3 marks)

Thus a total of 10 marks for one internal assessment.
Two such internal examinations will be conducted.

(c) Continuous assessment of the student will be done. Students overall attendance, performance in class, behaviour of the student, extra-curricular activities etc will be assessed. Continuous assessment carries 10 marks.

(d) Thus a total of 30 marks for the internal examination. (10 + 10 + 10 = 30 marks). A candidate should secure a minimum of 40% marks in the internal assessment in each subject to be eligible to appear for the University examination.

(e) For value added courses, only internal examination will be conducted. The minimum pass is 40% marks.

(f) For project both internal and external examination will be conducted.

1.4.3 University Examinations (External):

a) University Examination shall be conducted at the end of every semester.

b) A candidate who satisfies the requirement of attendance and internal assessment marks, as stipulated by the University shall be eligible to appear for the University Examination.

c) Examination will be of 3 hours duration (for theory). The question pattern for those subjects without practical examination (70 marks) will be:

(a) Three essay questions out of which the student should answer 2 questions each carrying 10 marks (i.e. 2 × 10 = 20 marks)

(b) Eight short note questions out of which the student should attempt six questions, each carrying 5 marks (6 × 5 = 30 marks)

(c) Ten very short questions each carrying 2 marks (i.e. 10 × 2 = 20 marks)

Thus a total of 70 marks.

d) The question pattern for practical examination:

- Spotters
- Major practical
- Minor practical
- Viva
- Practical record

The minimum pass for internal assessment is 40% and for the University Examination is 50% i.e. a student should score a total of 50% (adding the internal and external examination) to pass in each subject.

Year I Semester I

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810101	Human Anatomy-I	4	-	-	4	30	70	100
2	MLT3810102	Human Physiology- I	4	-	-	4	30	70	100
3	MLT3810103	Medical Bio- Chemistry-I	4	-	-	4	30	70	100
4	MLT3810104	Sociology	2	-	-	2	30	70	100
5	MLT3810105	English and Communication Skills	2	-	-	2	30	70	100
6	MLT3810106	Basics of Computers	1	-	1	2	30	70	100
7	MLT3810101P	Human Anatomy-I	-	-	2	2	30	70	100
8	MLT3810102P	Human Physiology- I	-	-	2	2	30	70	100
9	MLT3810107VA	Environmental awareness	2	-	-	2	100	-	100
TOTAL			19	-	5	24	340	560	900

Human Anatomy – I

L/T/P/C: 4/-/-/4

Course Outcomes (COs)

1. Describe the basic structure and organization of the human body.
2. Explain the anatomy of musculoskeletal and nervous systems.
3. Identify major organs and anatomical landmarks.
4. Correlate anatomical structures with their physiological functions.

Learning Outcomes (LOs)

1. Define anatomical terminology and body planes.
2. Illustrate bones, joints, and muscles of the body.
3. Explain structure of the nervous system.
4. Demonstrate identification of organs using models and specimens.

UNIT-I **8 hours**

GENERALANATOMY AND HISTOLOGY

1. Introduction to anatomy, anatomical terms, planes, axis.
2. General Anatomy: Fascia, Muscles, Bones, Joints, Vessels, Nerve
3. General Histology: Epithelial, Connective tissue, Muscle, Bone and cartilage, Nerve and vessels, Embryology

UNIT-II **16 hours**

UPPEREXTREMITY:

1. Osteology: Clavicle, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges.

2. Muscles: Origin, insertion, nerve supply and actions.

UNIT-III **12 hours**

BASIC ANATOMY OF UPPEREXTREMITY:

1. Joints: Shoulder girdle, shoulder joint, elbow joints, radio ulnar joint, wrist joint and joints of the hand.
2. Breast, pectoral region, axilla, cubital fossa, Arches of hand
3. Brachial plexus, nerves of upper extremity
4. Blood vessels and lymphatic drainage

UNIT-IV **16 hours**

CARDIOVASCULAR & RESPIRATORY ANATOMY

1. Thoracic wall
2. Anatomy of circulatory system
3. Heart: Anatomy of heart, blood Supply, nerve supply, conducting System and major blood vessels
4. Lungs: Basic Anatomy of lungs, bronchial tree, pleura, Broncho pulmonary segments, blood Supply and

2 nerve supply

5. Diaphragm: Origin, insertion, nerve supply and action.
6. Intercostal muscles and Accessory muscles of Respiration: Origin, insertion, nerve supply and action
7. Basic anatomy of Ribs and sternum

UNIT-V **8 hours**

SYSTEMIC ANATOMY

1. Digestive system:

- List the parts of the digestive system
- Basic Anatomy of stomach, liver, gallbladder, spleen, pancreas, intestines.

2. Urinary system: Basic Anatomy of kidney, urinary bladder

3. Endocrine system: Position and hormones secreted by each organ

4. Genital system: Basic anatomy of Male organs and female organs

RECOMMEMDEDTEXTBOOKS

1. Human Anatomy-Snell

2. Anatomy-Chaurasia, Volume-I,II &III

3. Neuro anatomy-Inderbir Singh

4. Human Anatomy-Kadasne, Volume-I,II&III

5. Neuro anatomy—Vishrsam Singh

6. Human Anatomy-Datta

Human Physiology - I

L/T/P/C: 4/-/-/4

Course Outcomes (COs)

1. Explain physiological mechanisms of body systems.
2. Describe functions of blood, nerve, and muscle tissues.
3. Interpret homeostatic mechanisms in the body.

4. Apply physiological concepts in laboratory practice.

Learning Outcomes (LOs)

1. Describe composition and functions of blood.
2. Explain nerve impulse transmission and muscle contraction.
3. Discuss cardiovascular and respiratory physiology.
4. Perform basic physiological experiments.

UNIT-I **10 hours**

GENERALPHYSIOLOGY

Cell:

1. Structure of cell membrane (a) Fluid mosaic model (b) Lipidbi-layer (c) Functions of cell membrane
2. Transport across cell membrane
    A. Basic mechanism of transport
        a) Channel proteins
        b) Carrier proteins
    B. Methods of transport
        a) Passive transport
        b) Active transport
3. Body fluids
        a) Intracellular fluid
        b) Extracellular fluid

c) Body electrolytes

d) Regulation of body fluid volume

4. Homeostasis

a) Regulation of body function

b) Homeostatic regulatory mechanism

BLOOD:

1. Composition of blood &it's volume
2. Plasma
3. Hemopoiesis: (a) Composition (b) Plasma protein
4. Erythrocytes: (a) Normal count (b) Structure of RBC (shape &size) (c) Functions of RBC

   (d) Hemoglobin (Normal Value, Fate, Function) (e) Anemia& polycythemia (f) ESR&PCV
5. Leukocytes (a) Classification (b) Functions of leukocytes
6. Platelets: (a) Normal count (b) Functions of thrombocytes (c) Blood Coagulation (d) Bleeding time &clotting

time

7. Blood group : (a) ABO system (b) Landsteiner's law (c) ABO incompatibility (d) Rh system (e) Rh

incompatibility& erythroblastosis fetalis

8. Blood transfusion: (a) Collection & storage of blood (b) Precautions (c) Cross matching

(d) Hazards of blood transfusion

NERVE:

1. Structure of a neuron
2. Classification of neurons
3. Electrical activity of neuron: (a) Resting membrane potential (b) Action potential
4. Nerve Injury: (a) Types of nerve Injury (b) Effect of nerve Injury (c) Regeneration of damaged nerve fiber

UNIT-II **18 hours**

MUSCLE PHYSIOLOGY

1. Classification
2. Properties of skeletal muscle
3. Structure of skeletal muscle (a) Sarcomere (b) Sarco tubular system (c) Neuro muscular junction& disease

1. affecting it

4. Mechanism of muscle contraction
5. Functions of skeletal muscle
6. Types of muscle contractions
7. Red & white muscles
8. Rigor mortis, muscular dystrophy, altered muscle tone, muscle cramp, atrophy, EMG

UNIT-III **16 hours**

CARDIOVASCULAR SYSTEM

1. Structure of heart & blood vessels
2. Properties of cardiac muscle
3. Origin &spread of cardiac pulse
4. Cardiac cycle &heart sounds

5. Cardiac out put: (a) Related terms (b) Regulation of cardiac output (c) Circulatory shock
6. Pulse &Heart rate and it's regulation
7. Blood pressure: (a) Definitions (b) Factors controlling & Influencing BP (c) Regulation of BP
8. Regional circulation: (a) Coronary circulation (b) Cerebral circulation
9. Normal ECG.

UNIT-IV **16 hours**

RESPIRATORYSYSTEM

1. Introduction, structure & function of RS: (a) Upper respiratory tract (b) Lower respiratory tract (c) Respiratory
1. membrane
2. Mechanism of breathing: (a) Mechanics of breathing (b) Respiratory pressure change
3. c) Compliance (d) Surfactant
4. Respiratory volumes & capacities
5. Pulmonary ventilation& Dead space
6. Nervous &chemical regulation of respiration
7. Pulmonary function test-direct& indirect method

RECOMMENDED TEXT BOOKS

1. Text book on Medical Physiology-Guyton
2. Textbook of Physiology-AK Jain (for MBBS students)
3. Human Physiology-C.C. Chatterjee
4. Essentials of Medical Physiology -Sembulingam, K.
5. Comprehensive Textbook of Medical Physiology: Vol-1 & 2 - Pal, Gopal Krushna

6. Physiology: Prep Manual for Undergraduates- Joshi, VijayaD.
7. Practical Physiology -Joshi, VijayaD.

Medical Bio-chemistry- I

L/T/P/C: 4/-/-/4

Course Outcomes (COs)

1. Explain biochemical composition of cells and tissues.
2. Describe metabolism of carbohydrates, proteins, and lipids.
3. Interpret biochemical reactions relevant to health.
4. Apply biochemical principles in diagnostics.

Learning Outcomes (LOs)

1. Define biomolecules and enzymes.
2. Explain metabolic pathways.
3. Discuss acid-base balance and buffers.
4. Perform basic biochemical laboratory procedures.

UNIT-I **10 hours**

CARBOHYDRATE CHEMISTRY

- Definition, general classification with examples; Composition and functions of Monosaccharides, Disaccharides
- ani Polysaccharides
- Anomers, Epimers, Enantiomers, Mutarotation

- Glycosaminoglycans (mucopolysaccharides)

LIPID CHEMISTRY

- Definition, classification with examples.
- Classification and Functions of Fatty acids, Phospholipids, Lipoprotein
- Structure and functions of Cholesterol
- Sources and functions of Ket one bodies

UNIT-II **14 hours**

AMINOACIDCHEMISTRY

- Definition, Classification of amino acids with examples.
- Definition, Classification of proteins with examples
- Structural organization of proteins
- Biologically important peptides

NUCLEICACIDSANDNUCLEOTIDECHEMISTRY

- Composition and Functions of Nitrogen bases, Nucleosides, Nucleotides
- Structure and Functions of DNA
- Structure, Types and Functions of RNA
- Differences between DNA and RNA

UNIT-III **14 hours**

ENZYMES

- Definition, Classification of enzymes with examples
- Active site, Enzyme specificity.
- Factors affecting enzyme activity

- Enzyme inhibition
- Iso enzymes and their clinical significance - LDH, creatine kinase, ALP

VITAMINS

- Definition, Classification
- Fat soluble Vitamins-Sources, RDA, Functions and Deficiency.
- Water soluble Vitamins- Sources, RDA, Functions and Deficiency

UNIT-IV **8 hours**

INTERMEDIARYMETABOILISM

- Glycolysis
- TCA cycle
- B-oxidation of fatty acids (Palmitic acid)
- Ketone body formation and utilization Urea cycle

UNIT-V **14 hours**

MINERALMETABOLIS

- Definition, Classification. Sources, RDA, Functions and Deficiency of Calcium, Phosphorous, Iron, Sodium,
- Potassium

CLINICALBIOCHEMISTRY

1. Normal and abnormal constituents of Urine and Blood and their clinical significance:
2. Normal constituents:
3. Organic: Urea, Uric acid, Creatinine

4. Inorganic: Ca, phosphate, chloride, electrolytes
5. Abnormal constituents:
6. Glucose, Ketone bodies, Protein, Blood, Bile salts, Bile pigments

RECOMMENDED BOOKS

1. Essentials of Biochemistry by U. Satyanarayana.
2. Text book of Biochemistry for Medical students. DM Vasudevan
3. Integrated textbook of Biochemistry Volume-l and II. Indumathi.
4. Textbook of Biochemistry for Medical students. MN Chatterjee and Rana Shinde.
5. Harper's Illustrated Biochemistry.
6. Essentials of Biochemistry. Pankaja Naik

Sociology

L/T/P/C: 2/-/-/2

Course Outcomes (COs)

1. Explain principles and concepts of sociology.
2. Describe social determinants of health.
3. Discuss healthcare delivery in society.
4. Apply sociological concepts in patient care.

Learning Outcomes (LOs)

1. Define sociology and community.

2. Explain family and social structures.
3. Discuss social health problems.
4. Describe role of healthcare workers in society

SUBJECT DISCRIPTION Sociology will introduce student to the basic sociology concepts, principles and social process, social institutions in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

UNIT 1

1. *Introduction:*

a. Meaning- Definition, Nature and Scope of Sociology

b. Methods of Sociological Investigations, Case Study, Social Survey,

1. Questionnaire and Interview methods.

c. Importance of its study with special reference to Health Care Professionals.

2. *Social Factors in health and disease situations:*

a. Role of Social factors in health

b. Role of social factor in illness

c. Decision making in taking treatment

UNIT-2

1. *Socialization:*

a. Definition and Meaning of Socialisation

b. Primary, Secondary and Anticipatory socialisation

c. Agencies of Socialisation

2. *Social Groups:*

a. Definition and Features of Social Group
b. Primary Social Group
c. Secondary Social Group
d. The role of Primary and Secondary Groups in Hospitals.

UNIT-3

1. *Family:*
    a. The family, meaning and definition
    b. Functions of family
    c. Changing family patterns
    d. Influence of Family on the individuals health, the effects of sickness in the family.
2. *Community:*
    a. Rural community: meaning and features- Health problems of rural community.
    b. Urban community: meaning and features – Health problems in urbanities.

UNIT-4

1. *Culture and Health:*
    a. Concept of Health
    b. Concept of Culture
    c. Cultural factors affecting Health and diseases
2. *Social Change:*
    a. Meaning of social change
    b. Factors of social change
    c. Human adaptation and social change
    d. Social planning and Health

UNIT-5

1. *Social Problems:*
    a. Population explosion
    b. Juvenile delinquency
    c. Alcoholism
    d. Unemployment
    e. Poverty
    f. Problems of women
2. *Social Security:*

1. Social security and social legislation

Recommended Books:

1. Principles of sociology - - - - - C.N. Shankar Rao
2. Sociology for physiotherapy students -- K.P Neeraj

English and Communication Skills

L/T/P/C: 2/-/-/2

Course Outcomes (COs)

1. To enhance the lexical and grammatical skills of the learners.
2. To develop reading competencies for academic and professional requirements.
3. To write effectively to meet professional needs.
4. To hone speaking and listening skills.
5. To enhance empathy and other vital interpersonal skills of the learners

.**Learning Outcomes (LOs)**

1. Demonstrate verbal and non-verbal communication.
2. Draft professional reports and letters.
3. Participate in presentations and discussions.
4. Communicate effectively with patients and colleagues.

UNIT 1: Sympathy (Poem) by Charles Mackay

Reading - Reading and its importance, techniques of effective reading.

Writing - Paragraph Writing (Topic sentence, Supporting sentences, and Conclusion)

Grammar - Parts of Speech (Parsing), Articles

Vocabulary - Pain and Symptoms, and Common Illness

ELCS LAB

CALL LAB: Phonetics - Vowel Sounds (Monophthongs and Diphthongs)

Listening - Introduction to listening, Purpose of Listening, and Barriers to effective listening

ICS LAB: Speaking - Self-introduction and Introducing others, JAM

UNIT 2: A Birthday Letter by Jawaharlal Nehru

Reading - Skimming and Scanning

Writing - Letter writing (Requests, Leave applications, Purchase letters, Letters in correspondence with medicalinsurance companies)

Grammar - Phrase, Clause and Sentence; Prepositions

Vocabulary - Body parts and diseases, Definitions / One-word substitutes

ELCS LAB

CALL LAB: Phonetics - Consonant Sounds

Listening - Listening for gist and specific information ICS LAB: Speaking - Small talk, Narration of anecdotes

UNIT 3: The secret of work by Swami Vivekananda

Reading - Making inferences and predictions Writing - E-mail writing

Grammar - Tenses, Reported speech

Vocabulary - Food and lifestyle, Instruments and Equipment

ELCS LAB

CALL LAB: Intonation

Listening - Listening and identifying facts and opinions

ICS LAB: Speaking - Role Plays (OET) (Giving and taking instructions, Interacting with and explaining processes, conditions and instructions to the patients and their attenders,

UNIT 4: All the world's a stage (Poem) by William Shakespeare

Reading - Reading for explicit and implicit meaning

Writing - Short essays: 2-Paragraph Essay, Thesis Statement Grammar - Subject-Verb agreement, Degrees of Comparison

Vocabulary - Caring and Emotions, Medical Abbreviations and Acronyms

ELCS LAB

CALL LAB: Consonant Clusters

Listening - Listen- Comprehend - Speak , Health Care

ICS LAB: Speaking - Formal Discussions, Physical Description/Personality

UNIT 5: Sister Nivedita: Calcutta's Angel of Mercy (Article/Essay) by Monidipa Dey

Reading - Intensive and Extensive Reading, Reading comprehension passages from OET and IELTS Writing - Report writing (Analyzing tests and Reporting patient condition)

Grammar – Voice, If conditionals

Vocabulary - Health, Hygiene and Wellness, Medical Vocabulary/Terminology

ELCS LAB

CALL LAB: Past Tense Markers and Plural Markers

Listening - Listening tasks from OET and IELTS

ICS LAB: Speaking - Conversation practice, Short oral presentations specifying the condition of the patient

TEXTBOOK:

English for nurses by Vijaya Laxmi Naidu. Nirali Prakashan. 2008.

RECOMMENDED BOOKS:

1. Practical English Usage by Michael Swan. OUP. 1995.
2. On Writing Well by William Zinsser, Harper Resource Book. 2001.
3. Cambridge English for nursing by Virginia Allum and Patricia Mc Garr. CUP. 2010.
4. English for nursing by Ross Wright and Bethany Cagnol. Pearson. 2001.
5. English for nursing-2 by Maris Spada Symonds and Ross Wright. Pearson. 2001.
6. Everyday English for International nurses by Joy Parkinson and Chris Brooker. Elsevier. 2004.
7. Oxford English for career Nurses by Tony Grice. Oxford University Press.

Basics of Computers

L/T/P/C: 1/-/2/2

COURSE OBJECTIVES:

1. To understand all components of a computer, different working environments and operations of a computer.
2. To learn to create different types of Word documents, MS Excel manipulations, and PowerPoint documents.
3. To understand basic requirements of computer network hardware, software and its network architecture.

Learning Outcomes (LOs)

1. Identify computer hardware and software.
2. Operate MS Office applications.
3. Use internet resources for academic purposes.
4. Maintain digital records and data.

UNIT – I

Introduction to computers:-Definition of Computer-Characteristics of computer- Components of Computer Hardware – Input & Output devices- Memories– RAM and ROM– MB, GB their conversions – Software : Application Software and Systems software- Data and Information –Different computer languages- Number systems- Binary and decimal conversions.

UNIT – II

MS WORD: Typing text in MS Word– Manipulating text¬– formatting text–using different font sizes, bold, italic– bullets and numbering –Pictures, Aligning the text and justify– choosing paper size– adjusting margins– header and footer, inserting page no's in a doc– printing a file with options– using spell check and grammar– find and replace– mail merge – insert tables in a document.

UNIT – III

MS EXCEL: Creating MS Excel-Cell editing, using formulas and functions, manipulating data with excel– using sort function to sort numbers and alphabets– drawing graphs and charts using data in excel.

MS POWERPOINT: Slide transition and animation-slides with sounds– inserting clip arts– Pictures, tablesand graphs.

UNIT – IV

Introduction to Computer Networks: Introduction, Computer Network Devices(Hubs, Switches, Routers, Gateway, Bridge,

Modems, Wireless Access Points, Firewalls & NIC), Types of computer Networks (LAN, MAN & WAN), Network Topologies (Star, Ring, Mesh, Tree, Hybrid Topologies), Internet Based Applications, Advantages & Disadvantages of Computer Networks, E-Mail, Components of E-Mail, Attaching Files in E-mail, Different Search Engines.

UNIT – V

Introduction to Artificial Intelligence & ML: History of AI, Sub Areas of AI, Applications of AI in Healthcare, Benefits of AI in Health Care, Challenges of AI in Healthcare, Introduction to Machine Learning, Applications of Machine Learning, Machine Learning Algorithms, Real world Machine Learning Use Cases.

RECOMMENDED BOOKS:

1. Computer Fundamentals by Goel, Anita Pearson
2. Computer Fundamentals : Concepts, Systems & Applications- 8th Edition by Priti Sinha, PradeepK., Sinha
3. MS-Office 2010 Training Guide by Prof. Satish Jain, M. Geetha
4. Computer Networks, Andrews S Tanenbaum, 5th Edition, Pearson Education
5. Artificial Intelligence : A modern Approach, Stuart J. Russell and Peter Norvig, Third Edition, PearsonEducation
6. Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow, Aurelien Geron-Oreilly,2ndEditi

Human Anatomy - I Practical

L/T/P/C: -/-/4/2

30 hours

Human anatomy practicals for physiotherapy students are essential for understanding the structure of the human body, its systems, and their functional relationships. These practicals focus on giving students hands-on experience in identifying anatomical structures, learning dissection techniques, and understanding the musculoskeletal, nervous, and cardiovascular systems, all of which are vital for effective physiotherapy practice.

GROSS SPECIMENS/SPOTTERS

UPPER EXTREMITY

- Identify the spotter- (Cross section of shoulder Joint, Elbow Joint, Wrist complex,Hand)
- Identify the bone- UPPER EXTREMITY BONES (Scapula, Clavicle, Humerus, Radius and Ulna, Carpals,
- Metacarpals and Phalanges) Including side determination
- Surface Anatomy of the Upper Extremity – UPPER EXTREMITY BONES AND MUSCLES
- Spotters of Blood vessels (Profunda Brachii, Brachial, Radial, Ulnar)
- Spotter of Nerves (Axillary, Musculocutaneous, Radial, Median, Ulnar)
- Gross Specimen of Heart, Lung
- Spotters of Bronchial tree, Bronchopulmonary segments

SYSTEMIC ANATOMY

- Gross Specimen/Spotter (Stomach, Liver, Gall Bladder, Spleen, Pancreas, Intestines,Kidney, Uterus)
- Cross section of Kidney

Human Physiology - I Practical

L/T/P/C: -/-/4/2

30 hours

These practical's typically align with the theoretical aspects of physiology and help students apply concepts to real-world clinical scenarios. Key Areas Covered in Human Physiology for this semester includes the following.

- Determination of blood group, bleeding time and clotting time
- Estimation of haemoglobin concentration
- Peripheral pulse determination
- Auscultation of Heart sounds
- Determination of blood pressure
- Auscultation of breath sounds
- Assessment of respiratory rate

Environmental Awareness

L/T/P/C: 2/-/-/2

Course Description:

This course introduces students to the fundamental concepts of environmental awareness, examining the relationship between humans and the environment. It emphasizes the impact of human activities on the planet and promotes sustainable practices. Students will explore key environmental issues, such as climate change, biodiversity, pollution, and resource conservation, and develop practical knowledge for contributing to environmental protection.

Course Objectives:

By the end of the course, students will be able to:

1. Understand the basic concepts of environmental science and sustainability.
2. Identify the major environmental challenges facing the world today.
3. Analyze the impact of human activities on ecosystems, biodiversity, and natural resources.
4. Explore global environmental policies and local solutions to environmental problems.
5. Implement sustainable practices in everyday life.

Unit 1

Introduction to Environmental Awareness

What is environmental awareness?

The importance of environmental education.

Key environmental concepts: ecosystems, biodiversity, sustainability.

Historical perspective on environmental awareness.

Unit 2

Earth's Ecosystems and Biodiversity

What are ecosystems?

Types of ecosystems: forests, oceans, wetlands, etc.

Importance of biodiversity.

Threats to biodiversity: habitat loss, invasive species, climate change.

Unit 3

Pollution and Its Impact

Types of pollution: air, water, soil, noise, and light pollution.

Causes and effects of pollution on health and ecosystems.

Case studies of major pollution events.

Unit 4

Climate Change and Global Warming

The science of climate change.

Greenhouse effect and human contributions.

Impacts of climate change: rising temperatures, sea levels, extreme weather.

Mitigation and adaptation strategies.

Unit 5

Resource Conservation

Renewable vs. non-renewable resources.

The importance of conserving water, energy, and other resources.

Techniques for conservation: recycling, energy efficiency, and water-saving practices.

Unit 6

Sustainable Agriculture and Food Systems

Environmental impact of conventional farming practices.

Sustainable agriculture: organic farming, permaculture, and agroecology.

The role of diet in environmental sustainability.

Unit 7

Waste Management

Types of waste: municipal, industrial, hazardous, electronic.

The 3 Rs: Reduce, Reuse, Recycle.

Landfills, incineration, and composting.

Zero waste lifestyle.

Unit 8

Water Conservation and Management

The global water crisis: causes and consequences.

Water management practices and policies.

The importance of clean water for all living organisms.

Unit 9

Environmental Policy and Legislation

Global environmental treaties: Paris Agreement, Kyoto Protocol.

National environmental policies and regulations.

Role of NGOs, governments, and individuals in policy development.

Unit 10

Green Technologies and Innovations

Introduction to renewable energy sources (solar, wind, hydro, etc.).

Electric vehicles and sustainable transportation.

Innovations in waste-to-energy and sustainable agriculture.

The Role of Individuals in Environmental Protection

How individual actions impact the environment.

Eco-friendly lifestyles: reducing waste, sustainable consumption, green travel.

Community action and grassroots movements.

Reference Textbook

Environmental Science: A Global Concern" by William P. Cunningham & Mary Ann Cunningh

Year I Semester II

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810201	Human Anatomy-II	4	-	-	4	30	70	100
2	MLT3810202	Human Physiology- II	4	-	-	4	30	70	100
3	MLT3810203	Psychology	3	-	-	3	30	70	100
4	MLT3810204	Pathology	2	-	1	3	30	70	100
5	MLT3810205	Microbiology	2	-	1	3	30	70	100
6	MLT3810201P	Human Anatomy-II Practical	-	-	2	2	30	70	100
7	MLT3810202P	Human Physiology- II Practical	-	-	1	1	30	70	100
8	MLT3810206VA	Stress Management	1	-	-	1	30	70	100

TOTAL	**16**	**-**	**5**	**21**	**340**	**560**	**900**

Human Anatomy - II

L/T/P/C: 4/-/-/4

Course Outcomes (COs)

1. Explain anatomy of cardiovascular and respiratory systems.
2. Describe digestive, urinary, and reproductive systems.
3. Identify organs and anatomical structures.
4. Correlate anatomy with clinical conditions.

Learning Outcomes (LOs)

1. Describe anatomy of thoracic and abdominal organs.
2. Explain structure of endocrine and reproductive systems.
3. Identify anatomical relations of organs.
4. Demonstrate anatomical knowledge in practical sessions.

UNIT-I **14 hours**

BASIC ANATOMY OF LOWER EXTREMITY:

1. Osteology including features, side determination, clinical and applied anatomy of the following lower extremity

1. bones Innominate bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.
2. Myology: Origin, insertion, nerve supply, action, function, clinical and applied anatomy
3. Gluteal Region

UNIT-II **10 hours**

BASIC ANATOMY OF LOWER EXTREMITY:

1. Arthrology: Joint structure, articulating components, relations, joint actions, Clinical and Applied Anatomy including Radiography

1. Hip Joint, Knee joint, Ankle joint, joints of the foot.
2. Femoral triangle, femoral canal and inguinal canal, Adductor canal, popliteal fossa, arches of foot
3. Lumbar plexus, Sacral plexus, Nerves of the Lower Extremity including cutaneous Nerves Blood vessels and lymphatic drainage

UNIT-III **14 hours**

BASIC ANATOMY OF VERTEBRAL COLUMN AND PELVIC GIRDLE:

1. Types of vertebrae
2. Basic Structure and features of Cervical, thoracic, lumbar, sacral and coccygeal vertebrae
3. Muscles of Trunk and Abdomen
4. Core muscle Anatomy
5. Joints of vertebral column, structure and composition of intervertebral disc including the Radiography Evaluation

6. Basic Joint structure, articulating components, relations, joint actions, Clinical and Applied Anatomy including Radiography of Sacro- Iliac joint
7. Basic Structure of Innominate bone Pelvic girdle and muscles of the pelvic floor including Applied Anatomy

UNIT-IV **10 hours**

BASIC ANATOMY OF HEAD AND NECK:

1. Bones of the skull and face
2. Muscles of the face and neck

UNIT-V **12 hours**

BASIC NEURO ANATOMY:

1. General organization of Nervous System
2. Central Nervous System-Gross structure of Brain and Spinal Cord
3. Diencephalon- Gross structure of Thalamus, Hypothalamus and Basal Ganglia
4. Cerebro-Spinal Fluid
5. Spinal Cord- Segmental features, Laminae, Nuclei
6. Spinal nerves
7. Basic blood supply to brain and spinal cord with clinical and applied anatomy
8. Peripheral Nervous system
9. Cranial nerves- Applied Anatomy

RECOMMEMDED TEXT BOOKS

1. Human Anatomy – Snell
2. Anatomy- Chaurasia, Volume- I,II & III
3. Neuro anatomy -- Inderbir Singh

4. Human Anatomy – Kadasne, Volume- I, II & III
5. Neuroanatomy -- Vishrsam Singh
6. Human Anatomy – Datta

Human Physiology - II

L/T/P/C: 4/-/-/4

Course Outcomes (COs)

1. Explain physiology of major organ systems.
2. Describe endocrine and reproductive physiology.
3. Analyze physiological regulation mechanisms.
4. Apply physiological principles in diagnostics.

Learning Outcomes (LOs)

1. Explain renal and digestive physiology.
2. Discuss endocrine gland functions.
3. Describe reproductive physiology.
4. Conduct physiology experiments and interpretation.

UNIT-I **14 hours**

NERVOUS SYSTEM-I

1. Introduction to nervous system - CNS, PNS and ANS
2. Neurotransmitters - Definition, fate of neurotransmitter, types
3. Synapse - Definition, type, structure, transmission of impulse across a synapse, properties.
4. Receptors and Sensation - Types of sensations, Classification of receptors, properties
5. Sensory System - Organization of the sensory system, sensory Homunculus
6. Pathophysiology of pain - Definitions, hyperalgesia and allodynia, deep pain, referred pain and its theories, management of chronic pain, endogenous opioid analgesic system functions of various parts of brain in brief.

UNIT-II **14 hours**

NERVOUS SYSTEM-II

1. Spinal cord - Introduction, effects of complete transection of the spinal cord, effects of hemi section of the
7. spinal cord (Brown-Sequard Syndrome)
2. Reflexes - Reflex action, reflex arc, classification, properties, types – superficial and deep reflexes
3. Regulation of tone, Posture and it's reflexes, Equilibrium and vestibular apparatus
4. Higher Functions - Learning, Memory, Speech
5. Autonomic Nervous System - Sympathetic division, Parasympathetic division, control of autonomic functions
6. Cerebrospinal fluid - Formation and circulation, composition, functions, applied aspect - Hydrocephalus, lumbarpuncture

UNIT-III **16 hours**

SPECIAL SENSES:

1. Vision - Anatomy of eye, visual pathway, pupillary reflexes, dark adaptation, light adaptation, photosensitivity
2. Hearing - Anatomy of ear, auditory pathway, tests for hearing - Watch test, Rinne's test, Weber's test, deafness, Audiometry
1. Taste and Smell: Taste sensations, taste pathway, olfactory pathway

ENDOCRINOLOGY:

1. Hormones - Definition, types, functions
2. Secretion, regulation, function and applied aspect of Hypothalamus, Pituitary Gland, Thyroid Gland, Parathyroid Gland, Pancreas, Adrenal Gland.

UNIT-IV **8 hours**

REPRODUCTIVE SYSTEM:

1. Sex determination and differentiation & it's abnormalities, puberty, importance of sex hormones
2. Female reproductive system - Internal & external genital organs, Oogenesis, Structure of egg, Follicle development, ovulation, menstrual cycle, menopause
3. Male reproductive system - Testes, accessory sex organs, Spermatogenesis, structure of sperm
4. Physiology of pregnancy - Fertilization, Implantation, Placenta (formation, function, hormones), maternal changes during pregnancy, pregnancy tests, infertility

UNIT-V **8 hours**

GASTROINTESTINAL SYSTEM:

1. Physiological stages of digestion

2. Liver function

EXCRETORY SYSTEM:

1. Kidneys-structure & function
2. Urine formation (to exclude concentration and dilution)
3. Juxtaglomerular apparatus
4. Fluid and electrolyte balance – Na, K, H2O
5. Renal circulation
6. Applied physiology: Types of bladders

RECOMMENDED TEXT BOOKS

1. Text book on Medical Physiology – Guyton
2. Textbook of Physiology – A K Jain

Psychology

L/T/P/C: 3/-/-/3

Course Outcomes (COs)

1. Explain principles of psychology.
2. Describe human behavior and mental processes.
3. Apply psychological concepts in healthcare.
4. Develop professional behavior and empathy.

Learning Outcomes (LOs)

1. Define psychology and behavior.

2. Explain learning, memory, and intelligence.
3. Discuss stress and coping mechanisms.
4. Apply communication and counseling techniques.

UNIT – I **8 hours**

1. Introduction to Psychology

a) Schools: Structuralism, functionalism, behaviourism, Psychoanalysis.
b) Methods: Introspection, observation, inventory and experimental method.
c) Branches: pure psychology and applied psychology
d) Psychology and physiotherapy

2. Growth and Development

3. Life span: Different stages of development (Infancy, childhood, adolescence, adulthood, middle age, old age).

4. Heredity and environment: role of heredity and environment in physical and psychological development, "Nature v/s Nurture controversy".

UNIT – II **16 hours**

1. Sensation, attention and perception

e) Sensation: Vision, Hearing, Olfactory, Gustatory and Cutaneous sensation, movement,equilibrium and visceral sense.
f) Attention: Types of attention, Determinants of attention (subjective determinants and objective determinants).

g) Perception: Gestalt principles of organization of perception (principle of figure ground and principles of grouping), factors influencing perception (past experience and context).

h) Illusion and hallucination: different types.

2. Motivation

1. Motivation cycle (need, drive, incentive, reward).
2. Classification of motives.
3. Abraham Maslow's theory of need hierarchy

UNIT – III **14 hours**

1. Frustration and conflict

i) Frustration: sources of frustration.

j) Conflict: types of conflict.

k) Management of frustration and conflict

2. Emotions

a) Three levels of analysis of emotion (physiological level, subjective state, and overt behavior).

b) Theories of emotion

c) Stress and management of stress.

3. Intelligence

a) Theories of intelligence.

b) Distribution of intelligence.

c) Assessment of intelligence

UNIT – IV **12 hours**

1. Learning

l) Factors effecting learning.

m) Theories of learning: trial and error learning, classical conditioning, Operant conditioning, insight learning, social learning theory.

n) The effective ways to learn: Massed/Spaced, Whole/Part, Recitation/Reading, Serial/Free recall, Incidental/Intentional learning, Knowledge of results, association, organization, and mnemonic methods.

2. Thinking

a) Reasoning: deductive and inductive reasoning

b) Problem solving: rules in problem solving (algorithm and heuristic)

c) Creative thinking: steps in creative thinking, traits of creative people

UNIT – V **10 hours**

1. Personality

a. Approaches to personality: type & trait, behavioristic, psychoanalytic and humanistic approach.

b. Personality assessment: observation, situational test, questionnaire, rating scale,interview, and projective techniques.

c. Defence Mechanisms: denial of reality, rationalization, projection, reaction formation, identification, repression, regression, intellectualization, undoing,introjection, acting out.

Recommended books:

1. Invitation to Psychology - Beena and Paremeshwaran.

2. General Psychology - S.K.Mangal.
3. Introduction to Health Psychology - Shelly E.Taylor.
4. Introduction to Psychology - Atkinson and Hilgard.
5. Introduction to Psychology - Morgan and king.
6. Psychology applied to modern life - Wayne Weiten Margareta L. Lord.
7. Psychology and Sociology for GNM and BPT student - Jacob

Pathology

L/T/P/C: 2/-/2/3

Course Outcomes (COs)

1. Explain mechanisms of disease processes.
2. Describe inflammation and tissue repair.
3. Identify pathological changes in organs.
4. Apply pathology concepts in diagnosis.

Learning Outcomes (LOs)

1. Define pathology and disease.
2. Explain cell injury and necrosis.
3. Discuss hemodynamic disorders.
4. Identify pathological specimens and slides.

1. Cellular adaptation, Cell injury & cell death: Introduction to pathology. **5 hours**

- Overview: Cellular response to stress and noxious stimuli. Cellular adaptations of growth and
- differentiation.
- Overview of cell injury and cell death.
- Causes of cell injury. Mechanisms of cell injury.
- Reversible and irreversible cell injury.
- Examples of cell injury and necrosis.

2. Inflammation: **7 hours**

- General features of inflammation Historical highlights
- Acute inflammation
- Chemical mediators of inflammation Outcomes of acute inflammation Morphologic patterns
- of acute inflammation Summary of acute inflammation
- Chronic inflammation

3. Immunity disorders: **3 hours**

- General features of the immune system Disorders of the immune system

4. Infectious diseases. - **5 hours**

- General principles of microbial pathogenesis viral infections.
- Bacterial infections-Rheumatic heart disease.
- Fungal infections.
- Parasitic infections.

5. Neoplasia: **7 hours**

- Definitions Nomenclature.
- Biology of tumor growth benign and malignant neoplasms Epidemiology.
- Carcinogenic agents and their cellular interactions Clinical features of tumors.

6. Environmental and nutritional disorders: 3 hours

- Environmental and disease.
- Common environmental and occupational exposures Nutrition and disease.
- Coronary artery disease.

RECOMMENDED TEXT BOOK:

1. Pathology, Harsh Mohan e.
2. Basic Pathology by Robbin

Microbiology

L/T/P/C: 2/-/2/3

Course Outcomes (COs)

1. Explain fundamentals of microbiology.
2. Identify microorganisms causing infections.
3. Describe sterilization and disinfection methods.
4. Apply microbiological techniques in diagnostics.

Learning Outcomes (LOs)

1. Classify bacteria, viruses, fungi, and parasites.
2. Explain microbial growth and control.
3. Demonstrate staining techniques.
4. Perform culture and sensitivity procedures.

1. Morphology :

- Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

2. Growth and nutrition:

- Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

3. Culture media:

- Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test.

4. Sterilization and Disinfection. -

- Principles and use of equipment of sterilization namely hot air oven, autoclave, and serum inspissate, pasteurization, antiseptic and disinfectants.

10 hours

5. Immunology: 6 hours

- Immunity, vaccines, types of vaccine and immunization schedule, principles, and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HBsAg (excluding technical details).

6. Systematic Bacteriology: 10 hours

- Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (excluding classification, antigenic structure, and pathogenicity), Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes.

7. Parasitology: 4 hours

- Morphology, life cycle, laboratory diagnosis of following parasites: E.histolytica, Plasmodium, tape worms, Intestinal nematodes.

8. Mycology: 3 hours

- Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi

9. Virology: **3 hours**

- General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

RECOMMENDED TEXT BOOKS:

1. Microbiology, Ananthanarayan and Paniker's,
2. CP. Baveja. Textbook of Microbiology for nurses.
3. A textbook of Microbiology-Chakraborty

Human Anatomy - II Practical

L/T/P/C: -/-/4/2

30 hours

GROSS SPECIMENS/SPOTTERS

SPINE, PELVIS AND LOWER EXTREMITY

1. Identify the **spotter**- Osteology- Identify the bone, LOWER EXTREMITY BONES (Innominate bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.) Including side determination, Spinal Segments, Vertebrae (Cervical, Thoracic, Lumbar, Sacral and Coccyx), Pelvis and Innominate Bones
2. **Surface Anatomy of the Spine and Lower Extremity** –Atlas, Axis, C-7 vertebrae, Spinous and Transverse process of vertebra, Locate the Innominate bone, ASIS and PSIS, Coccyx, Sacrum, Greater Trochanter, Condyles of femur,Patella, Tibial Tubercles and condyles, Shin Bone, Tarsal bones, Malleoli

3. Myology- **(cadaveric spotter)** Spotters of the lower extremity muscles including the origin, insertion, blood and nerve supply
4. Arthrology- (Cross section of Hip Joint, Knee Joint, Ankle Joint, Joints of Foot, Pelvic Joints, Joints of Spine, Intervertebral Joints, Facet Joints, Sacro-Iliac Joints)
5. Abdominal muscles, Pre and para vertebral muscles, pelvic floor muscles
6. Popliteal Fossa, Inguinal Canal, Arches of foot
7. Spotters of Blood vessels

NEURO ANATOMY

Identify the spotter

1. Cross Section of the Skull, Sinuses of skull,
2. Muscles of the skull and face
3. Triangles of the neck

SYSTEMIC ANATOMY

1. Gross Specimen/Spotter (Brain and Spinal Cord)
2. Cross section of brain and spinal cord
3. Identify the spinal nerves
4. Cranial Nerve

Human Physiology - II Practical

L/T/P/C: -/-/2/1

30 hours

1. Examination of superficial sensations
2. Examination of deep sensations

3. Examination of cortical sensations
4. Examination of reflexes
5. Cranial nerve examination
6. Examination of Balance and coordination

Stress Management

L/T/P/C: 1/-/-/1

Course Objectives:

By the end of the course, students will:

1. Understand what stress is and how it affects the body and mind.
2. Learn how to recognize personal stressors and individual responses to stress.
3. Explore various coping strategies to manage stress effectively.
4. Understand how lifestyle changes can reduce overall stress.
5. Learn how to manage stress in academic and professional settings.
6. Equip students with tools to build long-term resilience against stress.

Unit 1

- Introduction to Stress and Its Effects
- Definition of stress: Eustress vs. Distress
- Types of stress: Acute vs. Chronic
- The biology of stress (fight-or-flight response, hormones)
- Short-term and long-term effects on physical and mental health
- The role of perception and coping mechanisms

Unit 2

- Identifying Stressors and Personal Stress Responses
- Internal vs. external stressors (work, relationships, environment)

- Identifying stress patterns (thoughts, behaviours, physical reactions)
- Emotional regulation and its role in stress management
- The Stress Process: How stress develops and escalates

Unit 3

Coping Strategies and Stress Relief Techniques

- Problem-focused vs. emotion-focused coping
- Cognitive Behavioral Therapy (CBT) techniques for stress
- Relaxation techniques (deep breathing, progressive muscle relaxation)
- Time management and organization as stress-relief tools
- Developing a personal coping plan

Unit 4

- Lifestyle Changes for Managing Stress
- The role of physical activity and exercise
- Sleep hygiene and its connection to stress
- Nutrition and its impact on mental health
- Social support and healthy relationships
- Mindfulness and meditation practices

Unit 5

Stress Management at Work and School

- Managing work and school stress: Time management, prioritization
- Dealing with high-pressure environments and deadlines
- Building resilience and avoiding burnout
- The importance of taking breaks and practicing self-care

Unit 6

- Building Long-Term Stress Resilience

- Resilience theory and how to bounce back from adversity
- Developing a growth mindset to handle challenges
- Building emotional intelligence to cope with stress
- Integrating stress management into daily life

Reference Textbook

Stress Management: From Basic Science to Best Practice" by C. L. Cooper and Philip

Year 2 Semester III

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810301	Hematology	4	-	2	6	30	70	100
2	MLT3810302	Bacteriology	4	-	2	6	30	70	100
3	MLT3810303	Intermediary Metabolism	3	-	2	5	30	70	100
4	MLT3810304	Community Health	4	-	-	4	30	70	100
5	MLT3810305	Medical Law, Ethics & Medical Records	3	-	-	3	30	70	100
6	MLT3810306VA	Soft Skills Development	1	-	-	1	100	-	100
TOTAL			**19**	**-**	**6**	**25**	**250**	**350**	**600**

Hematology

L/T/P/C: 4/-/2/5

Course Outcomes (COs)

1. Explain hematopoiesis and blood disorders.
2. Perform hematological laboratory tests.
3. Interpret hematology reports.
4. Apply quality control in hematology.

Learning Outcomes (LOs)

1. Describe blood cell morphology.
2. Perform CBC and ESR estimation.
3. Identify anemia and leukemia findings.
4. Demonstrate blood film preparation and staining

UNIT-I Introduction to Hematology and Hemopoiesis **12 hours**

Blood composition; hemopoiesis; formed elements of blood and their functions; blood cell morphology and formation; normal hematological profiles and physiological variations; laboratory instrumentation, reagents, laboratory safety, and logbook maintenance.

UNIT-II Hemoglobin and Red Blood Cell Disorders **12 hours**

Hemoglobin: structure, synthesis and degradation; red cell indices; classification and laboratory diagnosis of anemias (iron deficiency, megaloblastic, hemolytic and other common anemias); ESR—principle, procedure and clinical significance; anticoagulants, blood collection and preservation.

UNIT-III- Special Hematological Investigations **10 hours**

Special investigations including fetal hemoglobin (HbF), HbA_2 estimation, G6PD deficiency screening, osmotic fragility test, sickling test, hemoglobin electrophoresis, plasma hemoglobin estimation, urinary hemosiderin, laboratory diagnosis of autoimmune and hemolytic anemias, blood parasites and LE cell phenomenon.

UNIT-IV Bone Marrow Examination, Automation and Leukemia **12 hours**

Bone marrow aspiration—indications, technique and smear preparation; staining methods (Wright stain, Prussian blue stain); automated hematology analyzers (Coulter principle), quality control and error identification; leukocyte abnormalities; definition and classification of leukemias; cytochemical stains used in leukemia diagnosis.

UNIT- V Hemostasis and Transfusion Medicine **10 hours**

Hemostasis and coagulation pathways; bleeding disorders; disseminated intravascular coagulation (DIC) and diagnostic tests; quantitative assays for clotting factors; Coombs test; erythroblastosis fetalis; blood transfusion compatibility testing and transfusion hazards; blood components, component preparation and storage methods.

Practicals: **(60Hours)**

1. Specimen collection, labeling, slide preparation
2. Manual counts: Hb, RBC, WBC, platelets, PCV
3. Blood smear prep & staining
4. RBC indices calculation

5. Preparation of stains and anticoagulants
6. Reticulocyte staining, thick/thin smears
7. Sickling test, aldehyde test, osmotic fragility
8. Iron profiling
9. Use of Coulter counter
10. Special stains: Prussian blue, MPO, PAS, NSE, CAE on bone marrow
11. BT (Bleeding Time), CT (Clotting Time), urinary hemosiderin testing

Recommended Text Books

1. Basics of Hematology by Lone Musharaf Manzoor & Mir Arjumand
2. Essentials of Haematology by Shirish M. Kawthalkar
3. Laboratory Techniques in Haematology edited by Renu Saxena & H.P. Pati

Bacteriology

L/T/P/C: 4/-/2/6

Course Outcomes (COs)

1. Explain medically important bacteria and their characteristics.

2. Perform bacteriological laboratory techniques.
3. Interpret culture and sensitivity results.
4. Apply infection control and biosafety measures.

Learning Outcomes (LOs)

1. Describe bacterial morphology and growth.
2. Perform staining and culture techniques.
3. Identify common pathogenic bacteria.
4. Conduct antibiotic sensitivity testing.

UNIT- I Preservation Methods & Bacterial Enumeration **10 hours**

Techniques like lyophilization for maintaining bacterial cultures.

Methods for total count and viable count of bacteria.

UNIT-II Evaluation of Antibacterial Agents **8 hours**

Assays such as MIC, Rideal-Walker test, Chick–Martin, and In-Use test.

UNIT- III Bacteriological Examination of Consumables **8 hours**

Testing water, milk, food, air, and pharmaceutical products.

UNIT IV Epidemiological Markers **14 hours**

Advanced methods including bacteriophage typing, serotyping, bacteriocin typing, plasmid analysis, RFLP, ribotyping, PFGE, DNA-DNA hybridization, PCR.

UNIT V- Laboratory Diagnosis of Common Infections: **20 hours**

Pyogenic infections, respiratory tract, urinary tract, sexually transmitted infections, food poisoning, bacteremia/septicaemia, enteric fever, gastroenteritis, meningitis.

Chronic infections like tuberculosis and leprosy

PRACTICAL

(60 hours)

1. Media preparation: Blood agar, Chocolate agar, MacConkey, Lowenstein-Jensen medium, Baird-Parker medium, Wilson-Blair/Bismuth sulfite medium, etc.
2. **Staining Methods**: Gram stain, Acid-fast stain (for Mycobacterium), Albert stain (C. diphtheriae), Capsular staining.
3. **Biochemical & Serological Tests**:
    1. Kirby–Bauer disc diffusion (antibiotic sensitivity testing),
    2. IMViC tests (for Enterobacteriaceae),
    3. Coagulase test (Staph. aureus),
    4. Catalase test,

5. Widal test (typhoid),
6. VDRL (syphilis).

4. **Specimen Examination**: Urine for UTIs, pus from wounds, throat swabs, and other clinical samples.
5. **Identification of Bacteria** through cultural, microscopic, biochemical, enzymatic, and serological methods

Recommended Text Books

1. Microbiology Theory for MLT by Namita Jaggi
2. Textbook of Microbiology for DMLT & Paramedical Courses by D.R. Arora
3. Medical Bacteriology for MLT Students by Matthew Taylor
4. Textbook of Microbiology for MLT by C.P. & V. Baveja

Intermediary Metabolism

L/T/P/C: 3/-/2/5

Course Outcomes (COs)

1. Explain metabolic pathways of nutrients.
2. Describe regulation of metabolism.
3. Interpret metabolic disorders.
4. Apply metabolic concepts in clinical biochemistry.

Learning Outcomes (LOs)

1. Explain carbohydrate metabolism.

2. Describe lipid and protein metabolism.
3. Discuss metabolic integration.
4. Interpret metabolic laboratory investigations.

UNIT- I Carbohydrate Metabolism **10 hours**

- Digestion and absorption of carbohydrates
- Key pathways: Glycolysis, TCA (Citric Acid) cycle, HMP (Pentose Phosphate) shunt, Gluconeogenesis, Glycogenesis & Glycogenolysis, Sorbitol (Polyol) pathway

UNIT- II Protein (Amino Acid) Metabolism **10 hours**

- Transamination and deamination
- Urea cycle, ammonia transport & toxicity
- Glucose–Alanine cycle
- Amino acid catabolism and biosynthesis
- Creatinine biosynthesis

UNIT-III Lipid Metabolism **10 hours**

- Lipid digestion and absorption
- Fatty acid oxidation (Beta, Omega, Alpha)
- Biosynthesis of fatty acids, cholesterol, triacylglycerols
- Lipoprotein metabolism (chylomicrons, VLDL, LDL, HDL): composition, function, apolipoproteins, dyslipidemias

UNIT- IV Nucleotide Metabolism **8 hours**

- Purine and pyrimidine biosynthesis and regulation
- Disorders: Gout, Lesch–Nyhan syndrome

UNIT- V Cellular Respiration **7 hours**

- Oxidative phosphorylation and the electron transport chain (ETC)

PRACTICALS

(60 hours)

1. **Analyte Estimation:** Glucose (GTT/GCT), Urea, Creatinine, Electrolytes, Bilirubin, Enzymes, Lipid Profile, Acid Phosphatase
2. **Separation Methods:** Serum Protein Electrophoresis, Chromatography
3. **Calibration Skills:** Standard curve preparation for multiple analytes
4. **Specimen Handling:** Collection techniques for various fluids and blood
5. **Urine Chemistry:** Physical, chemical analyses including glucose and ketones

Recommended Text Books

1. Biochemistry for Medical LaboratoryTechnology Students by Harbans Lal and Ashuma Sachdeva
2. Fundamentals of Biochemistry: Life at the Molecular Level by Voet, Voet & Pratt

Community Health

L/T/P/C: 3/-/-/3

Course Outcomes (COs)

1. Explain concepts of public health.
2. Describe epidemiology and disease prevention.
3. Apply community health principles.
4. Promote health awareness activities.

Learning Outcomes (LOs)

1. Define public health and epidemiology.
2. Explain communicable disease control.
3. Discuss maternal and child health.
4. Participate in community health programs.

UNIT-I: Epidemiology: **10 hours**

Definitions, concepts, community diagnosis, modes of disease transmission, prevention/control of diseases, morbidity/mortality indicators, screening tests, use of computers in epidemiology.

UNIT-II : Immunization: **7 hours**

Types of vaccines, immunoglobulins, national immunization schedules (EPI), related hazards.:

UNIT- III: Environment & Health: **10 hours**

Safe water, purification, standards, bacteriological testing, water conservation, waste and sewage disposal, housing standards, air/noise/radiation pollution and health impacts.

UNIT- IV : Reproductive & Child Health (RCH) **12 hours**:

Child survival/safe motherhood, immunization, ICDS, IMNCI, family planning methods, gender issues, national family welfare programs, health education methods and international organizations (WHO, UNICEF, Red Cross), Medical Termination of Pregnancy Act details

UNIT V: Lifestyle Disorders & Mental Health: 6 hours

Diabetes, hypertension, neurological disorders

(epilepsy, Alzheimer's, etc.), cancer, liver and kidney disorders, mental health issues (stress, anxiety, psychosis), substance abuse (smoking, alcohol)

Recommended Text Books

1. Community Medicine with Recent Advances by Suryakantha

2. Review of Preventive & Social Medicine by Dr. Vivek Jain

3. Park's Textbook of Preventive and Social Medicine

Medical Law, Ethics & Medical Records

L/T/P/C: 3/-/-/3

Course Outcomes (COs)

1. Explain legal and ethical principles in healthcare.
2. Describe medical record management.
3. Apply ethical practices in laboratories.
4. Maintain confidentiality and professional conduct**.**

Learning Outcomes (LOs)

1. Define medical ethics and laws.
2. Explain patient rights and consent.
3. Maintain medical records accurately.
4. Demonstrate professional ethics in practice.

MEDICAL LAW

UNIT-I 3 hours

- Medical ethics - Definition - Goal Scope
- Introduction to Code of conduct

UNIT-II **3 hours**

- Basic principles of medical ethics Confidentiality Malpractice and negligence - Rational and irrational drug therapy

UNIT-III **2 hours**

- Autonomy and informed consent - Right of patients
- Care of the terminally ill- Euthanasia

UNIT-IV **5 hours**

- Organ transplantation
- Medico legal aspects of medical records-Medico legal case and type-Records and document related to MLC-ownership of medical records-Confidentiality Privilege communication Release of medical information - Unauthorized disclosure retention of medical records - other various aspects.
- Professional Indemnity insurance policy

UNIT-V **2 hours**

- Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent

RECOMMENDED BOOKS:

1. Law relating to medical negligence and compensation- Dr. K.P.D.A. Prabakar & Dr.
3. J.Paulraj Joseph-2023
2. A textbook of medical jurisprudence and toxicology-Justice K Kannan -25 edition-1"
4. edition-2016
3. Law the doctor must know-Hitesh J Bhatt & Geetebdra Sharma-2017

4. Law on medical negligence and legal remedies-Dr. Annu Bahl Mehra & Harshit Kiran-2022

RECORD KEEPING

UNIT-I **2 hours**

- Commonly Used Prefixes, Suffixes and root words in Medical Terminology,
- Common Latin Terms used in Prescription Writing, Study of Standard Abbreviations.

UNIT-II **4 hours**

- Medical Records Management. Meaning, functions, principles of record keeping,
- Importance of medical records to patients, doctors, and hospitals, classification of records like coding system, indexing system, types of forms basic and special, legal aspects of medical records.

UNIT-III **3 hours**

- International Classification of Diseases (ICD), Electronic Medical Record (EMR),
- Records Management: Registers, forms, retention and preservation of MR, Role of MRD personnel.

UNIT-IV **4 hours**

- Medical Registers: Meaning, types, advantages of Medical Registers, registers used in various departments, Statutory registers and reports to be maintained-specimens

UNIT-V **2 hours**

- Medical Audit: its process, role and importance in hospitals.

RECOMMENDED BOOKS:

1. Davies, Juanita. Essentials of Medical Terminology. 3rd edition. New York. Delmar. 2008
2. Mogli. J.D. Medical Records: Organization & Management 2nd edition New Delhi Jaypee Brothers.

3. The body by Bilbirson Agreed for Occupance

ETHICS

UNIT-I **3 hours**

- Introduction to Public Health Ethics.
- Theories of Justice and Distribution of Public Health Resources.
- Principle for Public Health Ethics.

UNIT-II **2 hours**

- Priority-Setting and Resource Allocation at the Macro Level.
- Priority-Setting and Resource Allocation at the Micro Level.

UNIT-III **4 hours**

Medical Ethics, Legal Aspects and Medical Terminology.

1) Role Definition and Interaction, Ethical, Moral, and Legal Responsibilities

2) Medical terminology

3) Medical waste Management

UNIT-IV **4 hour**

- Contemporary Ethical and Legal Issues in Health Care: Legal regulation of a standalone diagnostic center, medico-legal cases and medical negligence, ethical aspects of health care.
- Balancing Individual and Community Interests.
- Ethics and Health Promotion.

UNIT-V **2 hours**

- Role of Human Rights in Public Health
- Ethics of Beath Promotion and Disease Prevention

RECOMMENDED BOOKS:

1. Ethics and Public Health Archana Rani Sahoo & Patitapahan Das-2017
2. Public Health, Ethics and Equity-Sudhir Anand, Fabienne Peter and Amartya Sen-2006
3. Nursing and healthcare ethics-Robinson & Doody-6 edition-2022
4. Ethics- William K. Frankena 2 edition-2015

Soft Skill Development

L/T/P/C: 1/-/-/1

Course Objectives:

By the end of the course, students will:

1. Improve their communication and interpersonal skills.
2. Develop emotional intelligence (EQ) and conflict resolution strategies.
3. Enhance their ability to work in teams and exhibit leadership qualities.
4. Gain confidence in public speaking and professional writing.
5. Master time management and personal organization strategies.

Reference Textbook

The 7 Habits of Highly Effective People" by Stephen R. Covey

Year II Semester IV

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL

1	MLT3810401	Immunohematology and Blood Transfusion	4	-	1	5	30	70	100
2	MLT3810402	Virology	4	-	1	5	30	70	100
3	MLT3810403	Metabolic Disorders and Molecular Biology	3	-	1	4	30	70	100
4	MLT3810404	Clinical Pathology	4	-	1	5	30	70	100
5	MLT3810405VA	Health and Well-being	1	-	-	1	100	-	100
6		Clinical postings -I	-	-	4	4	30	70	100
TOTAL			**16**	**-**	**8**	**24**	**250**	**350**	**600**

Immunohematology and Blood Transfusion

L/T/P/C: 4/-/2/5

Course Outcomes (COs)

1. Explain blood grouping and transfusion science.
2. Perform immunohematological investigations.
3. Identify transfusion reactions.
4. Apply safe transfusion practices.

Learning Outcomes (LOs)

1. Describe ABO and Rh blood groups.

2. Perform compatibility testing.
3. Explain blood component therapy.
4. Identify transfusion-related complications

COURSE OBJECTIVES

1. To acquire knowledge about blood banking and immunohematology.
2. To gain practical skills and proficiency in handling equipment used in blood banking,

UNIT 1: **14 hours**

History of Transfusion medicine, Care and selection of donors, Collection of blood from donors, Types of donors, Adverse donor reactions, Anticoagulants used to store blood, blood bag and its types.

UNIT 2: **10 hours**

Principles of Immunohematology, ABO Blood Group System, Subgroups and weaker variants of A and B, Rh typing and weaker variants in Rh system, Hemolytic disease of newborn, Bombay Phenotype, Various methods of blood groping.

UNIT 3: **14 hours**

Coombs' test : Direct & Indirect, Factors affecting Coombs test and sources of error. Compatibility testing : Major, Minor and Coombs crossmatch. Screening and Identification of antibodies.

UNIT 4: **10 hours**

Component Preparation & Indications. Preservation, storage and shelf life of blood components.

Apheresis- Definition, types of apheresis, machines and techniques. Screening of donor blood for TT: HIV, HbsAg, HCV, Malaria and Syphilis

UNIT 5: **12 hours**

Indications for Blood transfusion, Blood transfusion reactions and investigations of transfusion reaction. Equipment used in blood banking, Record Keeping, Quality control in Blood bank, Blood

donation drive.

IMMUNOHEMATOLOGY & BLOOD TRANSFUSION PRACTICALS

(30 hours)

1. Donor selection
2. Blood collection from Donor (Phlebotomy)
3. Pooled Cell Preparation
4. Blood Grouping by slide method
5. Blood grouping by Tube method
6. Du Test
7. Major Cross matching
8. Minor cross matching
9. Direct Coombs Test
10. Indirect Coombs Test

Recommended Text Books

1. Compendium of Transfusion Medicine by RN Makroo
2. Transfusion Medicine Technical Manual by RK Saran.
3. Textbook of MLT by Praful B Godkar.

REFERENCE BOOKS

1. Modern Blood Banking and transfusion practices – Denise Harmening.
2. AAB Technical manual.
3. Basics and applied concepts of Blood Banking and Transfusion practices – Katty D.Blancy.

Virology

L/T/P/C: 4/-/2/5

Course Outcomes (COs)

1. Explain structure and classification of viruses.
2. Describe viral diseases and diagnosis.
3. Apply virological techniques in laboratories.
4. Discuss prevention and control of viral infections.

Learning Outcomes (LOs)

1. Describe viral replication.
2. Identify medically important viruses.
3. Perform viral diagnostic procedures.
4. Explain vaccination and antiviral therapy.

COURSE OBJECTIVES:

1. To familiarize students with changes occurring in virus and its isolation in lab.
2. To provide an understanding of morphology of virus and diseases caused in humans.

UNIT I: **10 hours**

Introduction to Viruses: Introduction, classification of viruses, Viruses morphology, Chemical composition, cultivation of viruses, Reaction to physical and chemical agents & Methods of inactivation, viral pathogenesis, General routes of transmission, Infection of Host cell and Hostimmune response, Antiviral Chemotherapy-Interferons, Viral vaccines.

UNIT II: **14 hours**

Pox viruses: Variola, vaccinia, cowpox, Milker's node, Molluscum contagiosum.

Herpes viruses: Herpes Simplex virus, Varicella-Zoster, Cytomegalovirus, Epstein-Barr virus, Human Herpes virus 6, 7, 8. Adeno viruses; Adeno-associated viruses.

UNIT III: **14 hours**

Picorna viruses: Polio virus, Rhinovirus. Orthomyxo viruses: Influenza.

Paramyxoviruses: Parainfluenza virus, Mumps, Measles and Respiratory syncytial virus (RSV).

UNIT IV: **12 hours**

Arbo viruses. Rhabdo viruses: Rabies virus, Rabies-related viruses.

Hepatitis viruses: Hepatitis A (HAV), Hepatitis B (HBV) , Hepatitis C (HCV), Hepatitis D (HDV), Hepatitis E (HEV).

UNIT V: **10 hours**

Retroviruses: HIV. Miscellaneous viruses: Papillomaviruses, Coronaviruses, Rubella virus, Rota virus, viral hemorrhagic fevers, Slow virus Diseases. Oncogenic viruses.

VIROLOGY PRACTICALS

(30 hours)

1. Morphology of viruses
2. Cultivation and identification of viruses
3. Cultivation of viruses in embryonated eggs: different routes of inoculation.
4. Direct virus detection: Electron Microscope
5. Virus detection following biochemical amplification: PCR
6. Sero-diagnosis of viral infection

Recommended Text Books

1. Textbook of Medical Laboratory technology, Clinical lab and molecular diagnosis, Praful B
1. Godkar, 3rd edition, vol. 1 & 2.
2. Textbook of Microbiology, Ananthnarayan and Paniker's, 8th Edition.
3. C P Baveja, Textbook of Microbiology, Medical Microbiology, Fritz H. Kayser, 2005.

REFERENCE BOOKS:

1. Medical laboratory Technology Vol. I ,II, III by Mukherjee
2. Medical Laboratory manual for tropical countries Vol. II Microbiology by Monica Cheesbrough.

Metabolic Disorders and Molecular Biology

L/T/P/C: 3/-/2/4

Course Outcomes (COs)

1. Explain molecular basis of diseases.
2. Describe genetic and metabolic disorders.
3. Apply molecular diagnostic techniques.
4. Interpret molecular biology investigations.

Learning Outcomes (LOs)

1. Explain DNA and RNA structure.
2. Describe molecular techniques like PCR.
3. Discuss inherited metabolic disorders.
4. Interpret molecular diagnostic reports.

COURSE OBJECTIVES:

1. To develop a comprehensive understanding of metabolic pathways and disorders.
2. To provide students' knowledge on Molecular Biology, Tumor Markers, and Physiological Regulation.

UNIT I: **8 hours**

- Metabolism of Amino Acids: Deamination, decarboxylation and transamination, Urea cycle.
- Metabolism of glycine, phenylalanine, tyrosine and sulphur containing amino acids.

- Metabolic disorders.

UNIT II: **12 hours**

- Nucleic Acid Metabolism: Synthesis and degradation of Purine nucleotides. Synthesis and degradation of Pyrimidine nucleotides. Metabolic Disorders
- Iron Porphyrins and Bile Pigments: Chemistry of porphyrins, catabolism of Heme.
- Disorders of porphyrin metabolism, hemoglobinopathies.

UNIT III: **10 hours**

- Molecular Biology; Introduction of molecular biology DNA replication, cell cycle, DNA damage and DND repair mechanism, mutations, recombinant DNA technology, Lactose(lac)operon, Isolation ofDNA and RNA and Regulation of prokaryotic and eukaryotic gene expression.

UNIT IV: **8 hours**

- Tumor markers; Definition, classification of tumors, etiology of cancer, Carcinoembryonic antigen, alpha fetoprotein, tumor therapy, cancer antigen CA- 125, prostate specific antigen (PSA), Bence Jones proteins, Growing tumor cells, prevention of cancer.

UNIT V: **7 hours**

- Water & Electrolyte Balance: Body water compartments, osmotic pressure, regulation of body fluid osmolality and volume. Metabolism of water, sodium, potassium and chloride along with associated disorders. Acid Base Balance: Acids, bases, oxygen and carbon dioxide homeostasis, acid base balance, acidosis, and alkalosis.

METABOLIC DISORDERS AND MOLECULAR BIOLOGY PRACTICALS

(30 hours)

1. End Point Assays
    a. Estimation of serum inorganic Phosphorus
    b. Estimation of serum calcium
    c. Estimation of serum cholesterol
    d. Estimation of triglycerides
3. Kinetic Assays
    a. Alkaline phosphatase
    b. SGOT c.SGPT
4. Serum protein electrophoresis: Demonstration

Recommended Text Books

1. Essentials of Biochemistry by U.Satyanarayana.
2. Text book of Biochemistry for Medical students. DM Vasudevan
3. Integrated textbook of Biochemistry Volume –I and II. Indumathi.
5. Essentials of Biochemistry. Pankaja Naik.
6. Textbook of Biochemistry. Dr. Prasad R Manjeshwar

REFERENCE BOOKS

1. Medical Biochemistry Preparatory Manual for Undergraduates 2nd Edition 2021 by Sucheta P Dandekar and Abbas Ali Mahdi, Elsevier.
2. Manual of Practical Medical Biochemistry, Jones Evangeline, Jaypee Brothers Medical Publishers, 2Edition.
3. Practical Clinical Biochemistry. Harold Varley

4. Experimental Biochemistry: A student companion – Beedu Sashidhar Rao & Vijay Deshpande
5. Biochemical Methods – Sadasivam, S & Manickyam, A. New Age International Publishers

Clinical Pathology

Course Outcomes (COs)

1. Explain laboratory diagnosis of diseases.
2. Perform clinical pathology investigations.
3. Interpret urine and body fluid analysis.
4. Apply quality assurance in clinical pathology.

Learning Outcomes (LOs)

1. Perform urine examination.
2. Analyze body fluids and semen samples.
3. Identify abnormal findings microscopically.
4. Maintain laboratory records and safety.

L/T/P/C: 4/-/2/5

COURSE OBJECTIVES

1. To understand the collection of various body fluids.

2. To understand the concept of urine semen analysis and its lab diagnosis

UNIT 1 **14 hours**

- Urine Analysis: Physical examination of urine, Chemical examination of urine - Tests for glucose, ketones, proteins, bile salts, bile pigments, urobilinogen and blood. Microscopic examination of urine - various types of casts, normal and abnormal crystals.

UNIT 2 **12 hours**

- Cerebrospinal Fluid: Composition, functions, collection, indications, complications, contraindications of Lumbar puncture and in detail Laboratory diagnosis of CSF. Synovial fluid: Composition, functions, collection procedure and laboratory diagnosis.

UNIT 3 **8 hours**

- Collection and physical Examination, microbiological biochemical and microscopic examination of Pleural, peritoneal and pericardial fluid

UNIT 4 **14 hours**

- Semen analysis: Indications, collection, physical, microscopic examination and other laboratory tests. Gastric analysis: Indications, contraindications, collection, methods of gastric analysis and interpretation of results.

UNIT 5: **12 hours**

- Sputum examination: Indications, collection methods, physical examination, gram staining, AFB staining and other laboratory investigations. Stool examination: Physical, chemical and microscopic examination.

CLINICAL PATHOLOGY PRACTICALS

(30 hours)

1. Urine examination
2. Sputum examination
3. Semen examination
4. Stool examination
5. CSF examination

Recommended Text Books

1. Essentials of Clinical Pathology by Sirish M Kawthalkar
2. Essentials of Hematology & Clinical Pathology by RamdasNayak.
3. Textbook of MLT by Praful B Godkar.

REFERENCE BOOKS

1. Medical Laboratory Technology, Vol. 1 and 2 by Dr. Ramnik Sood
2. Medical laboratory Technology by K L Mukherjee.

Health and Well-being

L/T/P/C: 1/-/-/1

Course Description:

This course explores the holistic approach to health and well-being, focusing on physical, mental, and social aspects. Students will learn about health promotion strategies, the

importance of physical activity, nutrition, mental health awareness, and stress management. The course also addresses the impact of lifestyle choices and societal factors on overall health.

Course Objectives:

By the end of the course, students will be able to:

1. Understand the physical, mental, and social determinants of health.
2. Apply strategies for improving and maintaining physical health.
3. Recognize the importance of mental well-being and stress management techniques.
4. Understand the relationship between nutrition and overall health.
5. Develop practical skills for managing time, stress, and emotions.
6. Cultivate a balanced approach to achieving long-term health and well-being.

Unit 1

Introduction to Health and Well-being

- Overview of health and well-being concepts
- Dimensions of health: Physical, mental, social, and emotional
- The impact of lifestyle choices on health

Unit 2

Physical Health and Fitness

- Importance of physical activity for overall health
- Types of exercise: Aerobic, strength, flexibility, and balance
- Creating a personal fitness plan

Unit 3

Nutrition and Healthy Eating

- Basics of nutrition: Macronutrients and micronutrients
- Healthy eating habits and food groups
- Impact of nutrition on physical and mental health

Unit 4

Mental Health and Emotional Well-being

- Understanding mental health: Definitions, stigma, and myths
- Key aspects of emotional well-being
- Building emotional resilience

Unit 5

Stress Management Techniques

- Understanding stress and its effects on health
- Mindfulness and relaxation techniques
- Time management for stress reduction

Unit 6

Sleep and Recovery

- Importance of sleep for physical and mental health
- Sleep hygiene and healthy sleep habits
- Impact of sleep deprivation on overall well-being

Unit 7

Social Health and Relationships

- The role of social connections in well-being
- Healthy relationships: Communication, boundaries, and support
- Community involvement and social well-being

Unit 8

Substance Use and Addiction

- The impact of alcohol, tobacco, and drugs on health
- Understanding addiction and treatment options
- Preventive measures and harm reduction strategies

Unit 9

Chronic Diseases and Prevention

- Common chronic diseases (e.g., diabetes, heart disease)
- Risk factors and lifestyle modifications for prevention
- Screening, early detection, and health monitoring

Unit 10

Building Healthy Habits

- The psychology of habit formation
- Strategies for adopting and maintaining healthy habits
- Overcoming barriers to healthy behaviour changes

Reference Textbook

Health and Wellness" by S. L. Kaskutas & K. A. A.Nielson

Year III Semester V

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810501	Histopathology and Histo-Techniques	4	-	2	6	30	70	100
2	MLT3810502	Mycology and Parasitology	4	-	2	6	30	70	100
3	MLT3810503	Analytical Biochemistry	4	-	2	6	30	70	100
4	MLT3810504	Clinical Postings-II	-	-	4	4	30	70	100

5	MLT3810505VA	Interpersonal Communication	1	-	-	1	100	-	100
TOTAL			**13**	**-**	**10**	**23**	**220**	**280**	**500**

Histopathology and Histo-Techniques

L/T/P/C: 4/-/4/6

Course Outcomes (COs)

1. Explain tissue processing techniques.
2. Perform histological staining procedures.
3. Identify tissue morphology microscopically.
4. Apply histopathological techniques in diagnosis.

Learning Outcomes (LOs)

1. Describe fixation and processing methods.
2. Perform microtomy and staining.
3. Identify normal and abnormal tissues.
4. Demonstrate maintenance of histopathology equipment.

Introduction to Histopathology & Cytology: Laboratory organization, specimen reception, labeling, safety, equipment care.

Fixation Basics: Various fixatives used in histopathology/cytology, their preparation, mechanisms, and uses.

Tissue Grossing and Processing: From grossing to embedding (paraffin and others), decalcification of bones and teeth.

12 hours

Sectioning: Types of microtomes, knife types, maintenance, section cutting, and handling adhesives

12 hrs

Cryostat and Frozen Sections: Principles and clinical use for rapid diagnostics.

Staining Principles: Dye chemistry, types of dyes (acidic, basic, neutral), H&E staining, progressive/regressive/vital stains, mounting techniques.

16 hours

Special & Histochemical Stains:

- For lipids: Oil Red O, Sudan Black B.
- For proteins/nucleic acids: Feulgen reaction, Ninhydrin–Schiff, Millon's reaction, Methyl
- green–pyronin.
- For pigments: Perls' Prussian Blue (iron), Masson–Fontana (melanin).
- For amyloid: Highman's Congo Red.

- For mucin/glycogen: PAS, Alcian blue.

Connective Tissue & Elastic Fibers: Trichrome stains, elastic fiber/muscle striation demonstrations.

Decalcification: Methods and agents used for bone processing.

Identification of Microorganisms: Techniques for detecting bacteria, fungi, actinomycetes, viruses.

Cytology & Museum Work: Maintenance, record keeping, sex chromatin detection, telepathology.

Advanced Methods: Immunocytochemistry / Immunohistochemistry (IHC), including markers; Microwave processing; Quality control (internal & external); In-situ hybridization (ISH); Enzyme histochemistry (principles, enzyme types, applications); Neuropathological techniques; Immunofluorescence methods; Laboratory waste management.

12 hrs

PRACTICAL

Histopathology & Histotechniques

(45 hours)

1. Prepare fixatives and reagents.
2. Conduct manual tissue processing; perform paraffin embedding.
3. Section tissues using microtome.
4. Stain using H&E and mount slides correctly.
5. Manage grossing of specimens and slide screening.

Histocytopathology

1. Preparing and applying special stains: PAS, Alcian blue, Congo Red, Silver stain, AFB stain, Masson Trichrome, Martius Scarlet, Gram stain.
2. Assisting with FNAC (fine-needle aspiration cytology) and grossing.
3. Typing and screening histology / cytology reports.
4. Performing sex chromatin staining.
5. Operating IHC, immunofluorescence stains.
6. Using lab supervision skills and maintaining logbooks.

Recommended Text Books

1. Theory and Practice of Histological Techniques *by* Bancroft & Gamble
2. Textbook of Pathology by Harsh Mohan

Mycology and Parasitology

L/T/P/C: 4/-/2/5

Course Outcomes (COs)

1. Explain medically important fungi and parasites.
2. Perform laboratory diagnosis of infections.
3. Interpret parasitological findings.
4. Apply preventive measures for infections.

Learning Outcomes (LOs)

1. Classify fungi and parasites.
2. Perform microscopic identification.
3. Explain life cycles of parasites.
4. Demonstrate fungal culture techniques.

Mycology Basics: **6 hours**

Fungal classification, specimen collection, and types of growth media

Types of Fungal Infections: **16 hours**

Superficial and cutaneous mycoses (*Malassezia*, *Piedra*, *Dermatophytes*); Subcutaneous mycoses (*Mycetoma*, *Sporotrichosis*, *Rhinosporidium*); Systemic mycoses (*Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paracoccidioidomycosis*); Opportunistic fungi (*Aspergillus, Penicillosis, Zygomycosis, Pneumocystis*)

Laboratory Diagnosis: **10 hours**

Microscopy (KOH, Lactophenol cotton blue), culture characteristics, slide culture, germ tube, and serological tests.

Parasitology Fundamentals: Definitions, host-parasite relationships, specimen collection and preservation.

Protozoa: **14 hours**

Life cycles, pathogenicity, and diagnosis of Entamoeba histolytica, Giardia

lamblia, Balantidium coli, Toxoplasma, Leishmania, Plasmodium (malaria), with additional coverage in some programs of Trypanosoma, Cryptosporidium.

Helminths: **14 hours**

Morphology and diagnosis of cestodes (Taenia, Echinococcus, Diphyllobothrium, Hymenolepis), trematodes (Schistosoma, Fasciola), and nematodes (Ascaris, Hookworm, Trichuris, Enterobius, Trichinella, Wuchereria, Dracunculus).

Practical Techniques: Stool examination (ova/cysts), blood smear prep, concentration methods, culture techniques, and worm/egg counting.

PRACTICAL

(30 hours)

Parasitology

1. Saline/iodine mounts, thick and thin blood smears
2. Identification: cysts, trophozoites, larvae, ova, adult worms
3. Concentration techniques and culture of parasites

Mycology

1. Sample processing and staining (KOH mount, India ink, GMS)
2. Culture techniques, slide culture, germ tube test
3. Biochemical and microscopic identification

Recommended Text Books

1. Textbook of Microbiology for DMLT and Paramedical Courses by D.R. Arora
2. Clinical Microbiology & Parasitology for DMLT Students by Nanda Maheshwari
3. A Textbook of Medical Parasitology by Dr. Chin Bahadur Pun

Analytical Biochemistry

L/T/P/C: 4/-/2/5

Course Outcomes (COs)

1. Explain principles of analytical biochemistry.
2. Perform biochemical estimations.
3. Interpret biochemical test results.
4. Apply quality control measures.

Learning Outcomes (LOs)

1. Describe instrumentation in biochemistry.
2. Perform quantitative biochemical assays.
3. Interpret liver and renal function tests.
4. Demonstrate laboratory safety and quality assurance.

Nutritional Biochemistry: **14 hours**

- Vitamins: classification, chemistry, biochemical functions,deficiency diseases; Macro- & micro-minerals: sources, functions, deficiencies

Metabolism Overview **22 hours**

- Core pathways of carbohydrates, proteins, lipids, nucleotides, and bioenergetics via oxidative phosphorylation and ETC

Instrumentation & Analytical Techniques **12 hours**

- Fundamentals and applications of: Atomic absorption spectrophotometry; Fluorescence spectrophotometry; Ion-selective electrodes; Nephelometry & turbidimetry; Immunoassays (ELISA, RIA, CLIA); Electrophoresis & chromatography

PRACTICALS

1. Preparation of reagents and standard calibration curves for: Glucose, urea, protein, albumin, AST, ALT, uric acid, creatinine, ALP
2. Performing biochemical assays: Glucose (including GTT/GCT); Urea, creatinine, electrolytes (Na^+, K^+, Cl^-); Bilirubin, SGPT/ALT, SGOT/AST, ALP, Gamma-GT, Lipase, Amylase
3. Lipid profile (TC, TG, HDL-C, LDL-C)
4. Acid Phosphatase
5. Serum protein electrophoresis; Chromatography-based analyte separation
6. Operational proficiency with lab instrumentation such as spectrophotometers and colorimeters for quantitative analyses

7. Qualitative tests, including: Colorimetric reactions for carbohydrates, proteins, NPN compounds (e.g., urea, creatinine, uric acid)
8. Preparation of protein-free filtrates, identifying unknown carbohydrates and proteins
9. Urine analysis (normal vs. abnormal)

Recommended Text Books

1. Biochemistry for Medical Laboratory Technology Students by Harbans Lal & Ashuma Sachdeva
2. Textbook of Biochemistry for Allied and Healthcare Students by P. Ramamoorthy
3. A Textbook on Biochemistry for Paramedical Students by Dr. Kiran Dahiya

Clinical Postings I

L/T/P/C: -/-/8/4

Interpersonal Communication

L/T/P/C: 1/-/-/1

Course Description:

This course explores the fundamental principles, theories, and techniques of interpersonal communication. Students will examine both verbal and non-verbal communication strategies and apply these skills to improve personal and professional interactions. Through class discussions, role-playing, and group activities, students will develop a better understanding of effective communication in various social contexts.

Course Objectives:

By the end of the course, students will:

1. Understand the theories and principles of interpersonal communication.
2. Develop effective verbal and non-verbal communication skills.
3. Analyse and enhance communication in various interpersonal relationships (e.g., friendships, family, workplace).
4. Improve listening, empathy, and conflict-resolution skills.
5. Understand cultural and gender influences on communication.
6. Apply communication skills in real-world scenarios.

Unit 1

Introduction to Interpersonal Communication

- Overview of interpersonal communication theory.
- Key principles: sender, message, receiver, feedback, noise.
- Importance of communication in daily life.

Unit 2

Verbal Communication

- The role of language in communication.
- Choosing words carefully: Clarity, precision, and ambiguity.

- Influence of culture and context on verbal communication.

Unit 3

Non-Verbal Communication

- Body language, facial expressions, and gestures.
- Space, posture, and touch in communication.
- The role of non-verbal cues in conveying emotions

Unit 4

Listening Skills

- Types of listening: Active, passive, reflective.
- Barriers to effective listening.
- Developing empathy through listening.

Unit 5

Self-Disclosure and Relationship Development

- The importance of self-disclosure in relationships.
- The Johari Window model.
- How self-disclosure affects trust and intimacy.

Unit 6

Conflict in Interpersonal Communication

- Types of conflict: Productive vs. destructive.
- Conflict management styles.
- Strategies for resolving conflict in healthy ways.

Unit 7

Cultural and Gender Differences in Communication

- Cultural influences on communication styles.
- Gender communication differences.
- Strategies for effective cross-cultural communication.

Unit 8

Communication in Close Relationships

- Communication patterns in romantic relationships, family, and friendships.
- Managing expectations and maintaining healthy communication in intimate relationships.

Unit 9

Communication in the Workplace

- Interpersonal communication in professional settings.
- Navigating professional relationships and maintaining boundaries.
- Communication and leadership.

Unit 10

Digital Communication

- The role of technology in interpersonal communication.
- The impact of social media on relationships.
- Pros and cons of digital communication tools.

The Ethics of Communication

- Ethical dilemmas in communication.
- Honesty, transparency, and privacy in conversations.
- Balancing openness with respect for others' boundaries.

Reference Textbook:

"Interpersonal Communication: Everyday Encounters" (Author: Julia T. Wood, 9th Edition)

Year III Semester VI

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810601	Diagnostic Cytology	3	-	1	4	30	70	100
2	MLT3810602	Applied Microbiology	3	-	1	4	30	70	100
3	MLT3810603	Applied Clinical Biochemistry	3	-	1	4	30	70	100
4	MLT3810604	Research Methodology and Biostatistics	2	-	1	3	30	70	100
5	MLT3810605	Clinical Assessment and Practice	-	-	4	4	30	70	100

6	MLT3810606VA	Art of Being a Better Person	1	-	-	1	100	-	100
7		Clinical postings-III	-	-	4	4	30	70	100
TOTAL			**14**	**-**	**8**	**22**	**250**	**350**	**600**

Diagnostic Cytology

L/T/P/C: 3/-/2/4

Course Outcomes (COs)

1. Explain principles of cytology.
2. Perform cytological staining and preparation.
3. Identify abnormal cellular changes.
4. Apply cytology techniques in diagnosis.

Learning Outcomes (LOs)

1. Describe exfoliative and aspiration cytology.
2. Perform Pap staining technique.
3. Identify benign and malignant cells.

4. Prepare cytology smears for examination.

Cell Fundamentals: 4 hours

Normal cell structure and function; Cytologic features of malignancy classification

Specimen Handling: 4 hours

Types of cytology specimens (e.g., smears, cell blocks); Collection methods, preparation, and fixation techniques

Staining Methodologies: **Papanicolaou (Pap) stain**: **5 hours**

Principles, preparation, technique; May–Grünwald–Giemsa (MGG) stain; Shorr's stain; Aceto-Orcein stain

Site-Specific Cytology **10 hours**

Female genital tract: Anatomy, histology, physiology, normal cytology, cervical screening, hormonal cytology, cytological indices, benign vs. malignant changes, radiation effects, endometrial and ovarian cytology

Respiratory, Gastrointestinal, and Urinary tracts: **6 hours**

Anatomy, physiology, sample collection, smear prep, staining, cytology of normal vs. benign vs. malignant conditions

CSF & Body Cavity Fluids: **4 hours**

Cytology of cerebrospinal fluid (CSF) and effusions under

inflammatory, benign, and malignant conditions

Glands & Soft Tissue: **5 hours**

Fine-needle aspiration cytology (FNAC) of breast, thyroid, salivary glands, lymph nodes, nipple discharge—covering both benign and malignant cytological features

Automation in Cytology: **3 hours**

Fundamentals of **flow cytometry** and **image analysis**: principles, equipment, procedures, and evaluation techniques

Advanced Techniques: **4 hours**

Tissue culture: Equipment (laminar flow hood, CO_2 incubator, inverted microscope), cell line derivation/characterization, enzymatic digestion, subculturing, biochemical marker analysis, chromosomal/DNA content, immunological properties, and storage protocols (e.g., in liquid nitrogen)

Cytogenetics: Chromosome terminology, karyotyping methods, banding techniques, sex chromatin, chromosomes in neoplasia, and oncogene significance

Immunocytochemistry: Monoclonal antibody usage, fluorescence reactions

PRACTICALS

1. Preparing cytology smears; fixation and staining with Pap and MGG techniques
2. Hormonal cytology evaluations
3. Performing blood grouping, Rh typing, cross-matching, and infective agent screening

Recommended Text Books

1. Diagnostic Cytology by Pranab Dey
2. Basic and Advanced Laboratory Techniques in Histopathology and Cytology by Pranab Dey

Applied Microbiology

L/T/P/C: 3/-/2/4

Course Outcomes (COs)

1. Explain advanced microbiological techniques.
2. Perform diagnostic microbiology procedures.
3. Interpret microbiological reports.
4. Apply infection control and biosafety practices.

Learning Outcomes (LOs)

1. Perform microbial culture and identification.
2. Explain antimicrobial susceptibility testing.
3. Identify hospital-acquired infections.
4. Demonstrate biosafety measures in laboratories.

Isolation and Cultivation of microbes from various clinical and environmental specimens;

Techniques for growing bacteria, fungi from samples

10 hours

Use of Plasmids and Bacteriophages for identification, typing, and genetic studies;

Molecular tools in pathogen identification and typing

10 hours

Microbial Genomics and Diagnostics: Introduction to genetic approaches in diagnostics ; basic molecular tools that aid in microbial identification and epidemiology

10 hours

Principles of Microbial Nutrition: understanding growth requirements, media selection, andoptimization for diagnostics

7 hours

Practical Applications : Clinical and lab-oriented microbial diagnostics

8 hours

PRACTICALS

(30 hours)

1. Practicing universal precautions, safe collection, transport, and disposal of clinical specimens.
2. Operation and maintenance of the compound microscope and demonstration of sterilization procedures such as hot air ovens, bacterial filters, and autoclaving.
3. Preparation of bacterial smears and performing various staining techniques including Gram stain, acid-fast stain, spore stain, flagella, capsule (Albert stain).
4. Preparation of key culture media such as nutrient agar, blood agar, chocolate agar, MacConkey, Lowenstein–Jensen (LJ), Sabouraud Dextrose Agar (SDA), and Robertson's cooked meat medium, among others.
5. Observation of colony characteristics, perform biochemical tests for bacterial identification**,** and learn stock culture preservation.
6. Antibiotic susceptibility testing**,** anaerobic culture techniques **and apply** quality control protocols for media and reagents.

7. **Mycology Techniques:** Preparation of KOH mounts, LPCB preparations, and other staining methods to visualize fungi; Culture fungi, interpret growth, and perform slide cultures and the germ-tube test.
8. **Parasitology Methods:** Conducting stool examination for ova and parasites.
9. Preparing and examining thick and thin blood smears, identifying malarial forms (e.g., Leishmania Donovani bodies, malarial parasites).
10. **Serological & Immunodiagnostic Tests:** Collecting blood via venipuncture, separating serum, and preserving it for short and long terms.
11. Performing serological assays such as slide agglutination, Widal test, VDRL, CRP, ASLO, RF, ELISA, and skin tests.
12. **Instrumentation & Lab Equipment Maintenance:** Basics of laboratory instruments: care, usage, and maintenance of microscopes, centrifuges, water baths, autoclaves, incubators, pH meters, flume photometers, balances, microtomes and automated analyzers.

Applied Clinical Biochemistry

L/T/P/C: 3/-/2/4

Course Outcomes (COs)

1. Explain clinical biochemical investigations.
2. Perform advanced biochemical tests.
3. Interpret diagnostic biochemical data.

4. Apply automation in clinical biochemistry.

Learning Outcomes (LOs)

1. Analyze endocrine and cardiac markers.
2. Perform electrolyte and enzyme assays.
3. Interpret abnormal biochemical findings.
4. Operate automated analyzers.

Metabolism & Instrumentation: **18 hours**

Instrument-based methods: atomic absorption spectrophotometry, fluorescence spectrophotometry, ion-selective electrodes, nephelometry, turbidemetry, immunoassays (ELISA, RIA, CLIA), electrophoresis, and chromatography.

Organ Function Tests: **17 hours**

Liver, kidney, and pancreatic function analysis; cardiac markers; Hormonal biochemistry including measurement techniques (competitive binding assays like RIA/EIA/CLIA).

Clinical Specimen Handling: **10 hours**

Specimen types and collection protocols, factors affecting biochemical assay accuracy.

PRACTICALS

(30 hours)

Analytical Procedures:

1. Preparing and carrying out tests for glucose (including GTT/GCT), urea, creatinine, electrolytes, bilirubin, AST/ALT, ALP, GGT, lipase, amylase, lipid profile (TC, TG, HDL, LDL), acid phosphatase.

2. Performing serum protein electrophoresis and chromatography.
3. Generating standard calibration curves for analytes like glucose, urea, protein, enzymes, uric acid, creatinine

Research Methodology and Biostatistics

L/T/P/C: 2/-/2/3

Course Outcomes (COs)

1. Explain principles of research methodology.
2. Apply statistical methods in research.
3. Interpret research findings.
4. Develop scientific writing skills.

Learning Outcomes (LOs)

1. Define research design and sampling.
2. Calculate basic statistical measures.
3. Interpret data using graphs and tables.
4. Prepare research reports and presentations.

1. Introduction to Research Methodology: 3 hours

- Meaning of research; Objectives of research; Motivation in research; Types of researches and research approaches; Criteria for good research; Problems encountered by researchers in India

2. Identifying Research Problems: 3 hours

- **Research problem:** Conceptualizing Research: Research questions, hypotheses, constructs, variables
- **Testing of hypothesis:** Basic concepts concerning testing of hypothesis; Limitations of testing of hypothesis

3. Ethical issues in Research: 5 hours

- Introduction to research ethics (Historical background, Nuremberg, Belmont Report)
- Ethical principles: Autonomy, beneficence, non-maleficence, justice
- Informed Consent
- Privacy & Confidentiality: Data protection, anonymity, GDPR (General Data
- Protection Regulation) basics Vs, Digital Personal Data Protection Act 2023 of India
- Ethical Review process: Role of IRB/IEC, applications.
- Conflict of Interest: Financial, personal, institutional conflicts
- Animal research ethics: 3Rs, ethics of animal experimentation
- Components of ethical research plan: Plagiarism and Academic Misconduct
- (Fabrication, falsification, retractions); Authorship and Publication Ethics

4. Research Design: 3 hours

- Meaning of research design and its need.
- Quantitative vs. Qualitative Design,
- Experimental Designs: Randomized control trials, pre-post tests
- Quasi-Experimental Designs: Non-randomized designs, time series
- Non-Experimental Designs: Correlational, cross-sectional, case studies

5. Basic concepts of Biostatistics: **3 hours**

- **Introduction**: Definition and characteristics of statistics
- Importance of study of statistics; Branches of statistics; Statistics and health sciences; Descriptive and inferential statistics
- Variables and their types
- **Tabulation of data:**
- Basic principles of graphical representations
- Types of diagrams- histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, non- probability curve
- **Measures of central tendency:** Need for measure of central tendency; Definition and calculation of mean- ungrouped and grouped; Definition and calculation of Median;
- Definition and calculation of mode; Comparison of mean, median, and mode
- **Probability and standard deviation:** Meaning of probability or standard deviation;
- The binomial distribution; The normal distribution; Divergence from normality skewness and kurtosis

6. Types of Data: **3 hours**

Qualitative data ; Quantitative data

7. Research tools and data collection methods: **4 hours**

- **Measurement and scaling techniques:** Measurement in research; Scales in research sources of error in measurements; Technique of developing measurement tools; Meaning of scaling and its classification; Important scaling techniques
- **Methods of data collection:** Collection of primary data; Collection of data through questionnaires and schedules; Differences between questionnaires and schedules

8. Sampling Methods: 3 hours

- **Sampling fundamentals:** Need for sampling, and some fundamental definitions; Important sampling distributions
- **Sampling design:** Criteria for selecting procedure; Implications for sampling design; Steps in sampling design; Different types of sampling designs

9. Developing a research proposal 3 hours

- Introduction to Research Proposal; Selecting a Research Problem; Review of
- Literature; Formulating Research Objectives and Hypotheses; Research Questions;
- Theoretical or Conceptual Framework; Research Design and Methodology; Sampling
- Techniques and Sample Size; Data Collection Methods; Data Analysis Plan; Ethical Considerations; Limitations and Delimitations; References and Bibliography; Appendices (e.g., consent forms, tools, questionnaires)

RECOMMENDED BOOKS:

1. Methods in biostatistics by Mahajan
2. Research methodology by C R Kothari
3. Textbook of biostatistics by Sundar Rao
4. Textbook of biostatistics and research methodology by U. Satyanarayana

5. Creswell, J.W., & Creswell, J.D. (2023). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches
6. Shamoo, A.E., & Resnik, D.B. (2015). Responsible Conduct of Research.
7. Creswell, J.W. (2023). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches

Clinical Assessment and practice

L/T/P/C: -/-/8/4

Course Outcomes (COs)

1. Apply theoretical knowledge in clinical settings.
2. Demonstrate laboratory competencies.
3. Maintain professional ethics and communication.
4. Follow laboratory safety and quality protocols.

Learning Outcomes (LOs)

1. Perform routine laboratory investigations.
2. Maintain clinical records accurately.
3. Communicate effectively with healthcare teams.
4. Demonstrate safe laboratory practices.

Art of Being a Better Person

L/T/P/C: 1/-/-/1

Course Description:

This course explores what it means to live ethically, compassionately, and meaningfully as a human being. Students will engage in discussions about moral philosophy, empathy, self-awareness, and how to cultivate kindness, responsibility, and social engagement in everyday life.

Course Objectives:

By the end of the course, students will:

1. Understand foundational ethical principles that guide human behaviour.
2. Cultivate emotional intelligence and empathy.
3. Learn practical strategies for self-improvement and kindness.
4. Understand their role in society and how to make a positive impact.
5. Reflect on personal actions, relationships, and contributions to the community.

Unit 1

- Introduction to Being a Good Human
- Defining "goodness" and ethical living
- Overview of moral philosophies: Utilitarianism, Deontology, Virtue Ethics
- The role of self-awareness in personal growth
- **Activity:** Reflective journaling on what "being good" means to you.

Unit 2

- The Power of Empathy
- Understanding empathy vs. sympathy
- The science behind empathy and its benefits for social connections
- Techniques for cultivating empathy in everyday life
- **Activity**: Empathy-building exercises and discussions.

Unit 3

- Emotional Intelligence (EQ)
- What is Emotional Intelligence? (Self-awareness, self-regulation, motivation, empathy, and social skills)
- The role of EQ in personal and professional relationships
- Strategies to improve emotional intelligence
- **Activity:** Self-assessment of emotional intelligence and EQ development exercises.

Unit 4

- Compassion and Kindness
- The science of kindness: How kindness benefits us and others
- Practicing kindness in small, everyday actions
- Overcoming barriers to kindness (e.g., stress, biases, indifference)
- **Activity:** "Random Acts of Kindness" challenge.

Unit 5

- Personal Integrity and Honesty
- The importance of integrity in personal and professional life
- Consequences of dishonesty and lack of integrity
- How to align actions with values

- **Activity:** Case study discussion on ethical dilemmas and decision-making.

Unit 6

- Building Positive Relationships
- Communication skills for healthy relationships
- Setting boundaries and respecting others' boundaries
- Conflict resolution and forgiveness
- **Activity**: Role-playing scenarios to practice healthy communication.

Unit 7

- Responsibility and Accountability
- The concept of personal responsibility in life
- Accountability in both personal and community contexts
- How to take ownership of mistakes and learn from them
- **Activity:** Reflect on past mistakes and plan for growth.

Unit 8

- Contributing to the Community and Society
- The role of individuals in building strong communities
- Volunteering, activism, and social responsibility
- The impact of small, positive actions on a larger scale
- **Activity:** Brainstorming session on potential ways to contribute to the local community.

Unit 9

- Practicing Gratitude and Contentment

- The psychological and emotional benefits of gratitude
- Practicing contentment in a consumer-driven world
- Techniques for cultivating a mindset of abundance
- **Activity:** Gratitude journal and daily reflection.

Unit 10

- Living with Purpose and Meaning
- Discovering personal values and purpose
- The intersection of passion, skills, and service
- Creating a life plan that aligns with core values
- **Activity:** Create a personal mission statement.

Week 11

- Overcoming Negative Traits: Greed, Anger, and Envy
- The psychology behind negative emotions and traits
- How greed, anger, and envy affect our well-being
- Strategies for managing and transforming negative emotions
- **Activity:** Mindfulness meditation and reflection exercises.
- Bringing It All Together: A Life of Goodness
- Review of key learnings from the course
- Creating a vision for continuous personal growth
- How to maintain a positive and ethical life in a challenging world
- **Activity:** Final reflection paper or presentation on how students will apply the course's principles to their life.

Reference Textbook

1. How to Win Friends and Influence People" by Dale Carnegie
2. The Seven Habits of Highly Effective People" by Stephen R. Covey

Course Code	Course Title	Credits/Week			Hours/Semester			Assesments		Total
		L	P	C	L	T/P	Total	INT	EXT	
	Internship	3	26	29	45	1155	1200	-	100	100
Total		**3**	**26**	**29**	**45**	**1155**	**1200**	**-**	**100**	**100**

Year IV Semester VII

Internship-I

L/T/P/C: -/-/40/20

Course Outcomes (COs)

1. Develop practical laboratory skills.
2. Apply diagnostic procedures independently.
3. Demonstrate professional behavior.
4. Integrate theoretical and practical knowledge.

Learning Outcomes (LOs)

1. Perform routine laboratory tests independently.
2. Maintain laboratory quality assurance.
3. Demonstrate patient handling skills.

4. Follow ethical and safety guidelines.

Year IV Semester VIII

Course Code	Course Title	Credits/Week			Hours/Semester			Assesments		Total
		L	P	C	L	T/P	Total	INT	EXT	
	Internship	3	26	29	45	1155	1200	-	100	100
Total		**3**	**26**	**29**	**45**	**1155**	**1200**	**-**	**100**	**100**

Internship-II

L/T/P/C: -/-/20/10

Course Outcomes (COs)

1. Demonstrate advanced laboratory competencies.
2. Perform diagnostic procedures accurately.
3. Apply quality management systems.
4. Function effectively as a healthcare professional.

Learning Outcomes (LOs)

1. Operate laboratory instruments efficiently.
2. Interpret laboratory findings accurately.

3. Maintain professional ethics and teamwork.
4. Demonstrate readiness for professional practice.

Project

L/T/P/C: -/-/20/10

Course Outcomes (COs)

1. Apply research methodology in project work.
2. Analyze scientific data critically.
3. Develop scientific communication skills.
4. Present research findings effectively.

Learning Outcomes (LOs)

1. Select and define a research problem.
2. Collect and analyze data systematically.
3. Prepare scientific reports.
4. Present project findings confidently.