



MALLA REDDY VISHWAVIDYAPEETH

**SCHOOL OF ALLIED AND PUBLIC HEALTH
SCIENCES AND TECHNOLOGY**

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Program

Bachelor of Science (B.Sc.)

Medical Laboratory Technology

2025

MALLA REDDY VISHWAVIDYAPEETH**SCHOOL OF ALLIED AND PUBLIC HEALTH SCIENCES AND TECHNOLOGY****Bachelor of 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	-	2	2	30	70	100
7	MLT3810101P	Human Anatomy - I Practical	-	-	4	2	30	70	100
8	MLT3810102P	Human Physiology - I Practical	-	-	4	2	30	70	100
9	MLT3810107VA	Environmental Awareness	2	-	-	2	100	-	100
TOTAL			19	-	10	24	340	560	900

I year II 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	-	2	3	30	70	100
5	MLT3810205	Microbiology	2	-	2	3	30	70	100
6	MLT3810201P	Human Anatomy - II Practical	-	-	4	2	30	70	100
7	MLT3810202P	Human Physiology - II Practical	-	-	2	1	30	70	100
8	MLT3810206VA	Stress Management	1	-	-	1	100	-	100
TOTAL			16	-	10	21	310	490	800

II year III semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810301	Hematology	4	-	2	5	30	70	100
2	MLT3810302	Bacteriology	4	-	2	5	30	70	100
3	MLT3810303	Intermediary Metabolism	3	-	2	4	30	70	100
4	MLT3810304	Community Health	3	-	-	3	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			18		6	21	250	350	600

II year IV semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810401	Immunohematology and Blood Transfusion	4	-	2	5	30	70	100
2	MLT3810402	Virology	4	-	2	5	30	70	100
3	MLT3810403	Metabolic disorders and Molecular Biology	3	-	2	4	30	70	100
4	MLT3810404	Clinical Pathology	4	-	2	5	30	70	100
5	MLT3810405VA	Health and Well-being	1	-	-	1	100	-	100
TOTAL			16	-	8	20	220	280	500

III year - V semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810501	Histopathology and Histo-Techniques	4	-	4	6	30	70	100
2	MLT3810502	Mycology and Parasitology	4	-	2	5	30	70	100
3	MLT3810503	Analytical Biochemistry	4	-	2	5	30	70	100
4	MLT3810504	Clinical Postings I	-	-	8	4	30	70	100
5	MLT3810505VA	Interpersonal Communication	1	-	-	1	100	-	100
TOTAL			13		16	21	220	280	500

III year - VI semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810601	Diagnostic Cytology	3	-	2	4	30	70	100
2	MLT3810602	Applied Microbiology	3	-	2	4	30	70	100
3	MLT3810603	Applied Clinical Biochemistry	3	-	2	4	30	70	100
4	MLT3810604	Research Methodology and Biostatistics	2	-	2	3	30	70	100
5	MLT3810605	Clinical Assessment and practice	-	-	8	4	30	70	100
6	MLT3810606VA	Art of Being a Better Person	1	-	-	1	100		100
TOTAL			12		16	20	250	350	600

IV year – VII semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810701	Internship-I	-	-	40	20	30	70	100
2	MLT3810702VA	Healthy Eating for Healthy Living	1	-	-	1	100	-	100
TOTAL			1		40	21	130	70	200

IV year – VIII semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	MLT3810801	Internship-II	-	-	20	10	30	70	100
2	MLT3810802	Project	-	-	20	10	30	70	100
3	MLT3810803VA	Professionalism in the Workplace	1	-	-	1	100	-	100
TOTAL			1		40	21	160	140	300

1.1 Under Graduate Programme

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. $1 \times 3 = 3$ marks)

Thus a total of 10 marks for one internal assessment

Two such internal examinations will be conducted.

(b) 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. $2 \times 10 = 20$ marks) (b) Eight short note questions out of which the student should attempt six questions, each carrying 5 marks ($6 \times 5 = 30$ marks). (c) Ten very short questions each carrying 2 marks (i.e. $10 \times 2 = 20$ marks). Thus a total of 70 marks.
- d) The question pattern for practical examination (a) 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

Human Anatomy - I

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

UNIT-I

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

UPPEREXTREMITY:

1. Osteology: Clavicle, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges.
2. Muscles: Origin, insertion, nerve supply and actions.

UNIT-III

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

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 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

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

RECOMMENDEDTEXTBOOKS

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

UNIT-I

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

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 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

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 output: (a) Related terms (b) Regulation of cardiac output (c) Circulatory shock
6. Pulse & Heart rate and its 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

RESPIRATORY SYSTEM

1. Introduction, structure & function of RS: (a) Upper respiratory tract (b) Lower respiratory tract (c) Respiratory membrane
2. Mechanism of breathing: (a) Mechanics of breathing (b) Respiratory pressure change
c) Compliance (d) Surfactant
3. Respiratory volumes & capacities
4. Pulmonary ventilation & Dead space
5. Nervous & chemical regulation of respiration
6. 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 Krishna
6. Physiology: Prep Manual for Undergraduates- Joshi, VijayaD.
7. Practical Physiology -Joshi, VijayaD.

UNIT-I

CARBOHYDRATE CHEMISTRY

Definition, general classification with examples; Composition and functions of Monosaccharides, Disaccharides and 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 Ketone bodies

UNIT-II

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

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

INTERMEDIARY METABOLISM

Glycolysis

TCA cycle

B-oxidation of fatty acids (Palmitic acid)

Ketone body formation and utilization Urea cycle

UNIT-V

MINERAL METABOLISM

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

CLINICAL BIOCHEMISTRY

Normal and abnormal constituents of Urine and Blood and their clinical significance:

Normal constituents:

Organic: Urea, Uric acid, Creatinine

Inorganic: Ca, phosphate, chloride, electrolytes

Abnormal constituents:

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-I 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

SUBJECT DESCRIPTION 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, 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:*

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 Objectives:

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

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 medical insurance 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. 2007.

Basics of Computers

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

COURSE OBJECTIVES:

To understand all components of computer, different working environments and operations of computer.
To learn creating different types of word documents, MS Excel manipulations, Power point documents.
To understand basic requirements of computer network hardware, software and its network architecture.

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, tables and 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, Pradeep K., 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, Pearson Education
6. Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow, Aurelien Geron-Oreilly, 2nd Edition.

Human Anatomy - I Practical

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

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

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 Cunningham

Year I Semester II

Human Anatomy - II

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

UNIT-I

BASIC ANATOMY OF LOWER EXTREMITY:

1. Osteology including features, side determination, clinical and applied anatomy of the following lower extremity bones Innominate bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.
 2. Myology: Origin, insertion, nerve supply, action, function, clinical and applied anatomy
- Gluteal Region

UNIT-II

BASIC ANATOMY OF LOWER EXTREMITY:

1. Arthrology: Joint structure, articulating components, relations, joint actions, Clinical and Applied Anatomy including Radiography
2. Hip Joint, Knee joint, Ankle joint, joints of the foot.
3. Femoral triangle, femoral canal and inguinal canal, Adductor canal, popliteal fossa, arches of foot
4. Lumbar plexus, Sacral plexus, Nerves of the Lower Extremity including cutaneous Nerves
5. Blood vessels and lymphatic drainage

UNIT-III

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

BASIC ANATOMY OF HEAD AND NECK:

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

UNIT-V

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

RECOMMENDED 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 -- Vishram Singh
6. Human Anatomy – Datta

Human Physiology - II

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

UNIT-I

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
7. functions of various parts of brain in brief.

UNIT-II

NERVOUS SYSTEM-II

1. Spinal cord - Introduction, effects of complete transection of the spinal cord, effects of hemi section of the spinal cord (Brown-Sequard Syndrome)
2. Reflexes - Reflex action, reflex arc, classification, properties, types – superficial and deep reflexes
3. Regulation of tone, Posture and its 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, lumbar puncture

UNIT-III

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
3. 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

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

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

UNIT - I

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

1. Sensation, attention and perception

- a) Sensation: Vision, Hearing, Olfactory, Gustatory and Cutaneous sensation, movement, equilibrium and visceral sense.
- b) Attention: Types of attention, Determinants of attention (subjective determinants and objective determinants).
- c) Perception: Gestalt principles of organization of perception (principle of figure ground and principles of grouping), factors influencing perception (past experience and context).
- d) Illusion and hallucination: different types.

2. Motivation

- a) Motivation cycle (need, drive, incentive, reward).
- b) Classification of motives.
- c) Abraham Maslow's theory of need hierarchy

UNIT - III

1. Frustration and conflict

- a) Frustration: sources of frustration.
- b) Conflict: types of conflict.
- c) 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

1. Learning

- a) Factors effecting learning.
- b) Theories of learning: trial and error learning, classical conditioning, Operant conditioning, insight learning, social learning theory.
- c) 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

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 Anthikad

Pathology

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

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

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:

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:

General features of the immune system Disorders of the immune system

4. Infectious diseases. -

General principles of microbial pathogenesis viral infections.

Bacterial infections-Rheumatic heart disease.

Fungal infections.

Parasitic infections.

5. Neoplasia:

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:

Environmental and disease.

Common environmental and occupational exposures Nutrition and disease.

Coronary artery disease.

RECOMMENDED TEXT BOOK:

Pathology, Harsh Mohan e.

Basic Pathology by Robbin

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.

5. Immunology:

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:

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:

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

8. Mycology:

Morphology, diseases caused and lab diagnosis of following fungi. Candida,

Cryptococcus, Dermatophytes, opportunistic fungi

9. Virology:

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

GROSS SPECIMENS/SPOTTERS

SPINE, PELVIS AND LOWER EXTREMITY

7. Identify the **spotter**- Osteology- Identify the bone, LOWER EXTREMITY BONES (Iliac bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.) Including side determination, Spinal Segments, Vertebrae (Cervical, Thoracic, Lumbar, Sacral and Coccyx), Pelvis and Iliac Bones
8. **Surface Anatomy of the Spine and Lower Extremity** –Atlas, Axis, C-7 vertebrae, Spinous and Transverse process of vertebra, Locate the Iliac bone, ASIS and PSIS, Coccyx, Sacrum, Greater Trochanter, Condyles of femur, Patella, Tibial Tubercles and condyles, Shin Bone, Tarsal bones, Malleoli
9. Myology- (**cadaveric spotter**) Spotters of the lower extremity muscles including the origin, insertion, blood and nerve supply
10. 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)
11. Abdominal muscles, Pre and para vertebral muscles, pelvic floor muscles
12. Popliteal Fossa, Inguinal Canal, Arches of foot
13. 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

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 L. Merrit

Year 2 Semester III

Hematology

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

General Hematology

Blood composition, hemopoiesis, formed elements, functions

Hemoglobin: structure, synthesis, degradation

Blood cell morphology and formation; normal hematological profiles and variations

Anemias (iron deficiency, megaloblastic, etc.), red cell indices

ESR: principle, procedure, significance

Anticoagulants, blood collection, preservation

Romanowsky stains: types, principles, preparation

Lab instrumentation and reagent basics; logbook maintenance

Special Hematology

Tests such as: fetal Hb, G6PD deficiency, osmotic fragility, sickling

HbF and HbA₂ levels, hemoglobin electrophoresis

Plasma hemoglobin, hemosiderin in urine, autoimmune and hemolytic anemia diagnostics

Bone marrow aspiration: indications, techniques, smear staining (Wright, Prussian blue)

Blood parasites, LE cell phenomenon

Automation tools: Coulter counter, error identification and quality control

Leukocyte abnormalities, leukemia definitions and classifications

Cytochemical stains for leukemia

Hemostasis, coagulation pathways, bleeding disorders, DIC diagnostics

Quantitative assays for clotting factors

Coombs test, erythroblastosis fetalis, blood transfusion compatibility, hazards

Blood components: types and storage methods

Practicals:

Specimen collection, labeling, slide preparation

Manual counts: Hb, RBC, WBC, platelets, PCV

Blood smear prep & staining

RBC indices calculation

Preparation of stains and anticoagulants

Reticulocyte staining, thick/thin smears

Sickling test, aldehyde test, osmotic fragility

Iron profiling

Use of Coulter counter

Special stains: Prussian blue, MPO, PAS, NSE, CAE on bone marrow

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/-/2/5

Preservation Methods: Techniques like lyophilization for maintaining bacterial cultures.

Bacterial Enumeration: Methods for total count and viable count of bacteria.

Evaluation of Antibacterial Agents: Assays such as MIC, Rideal-Walker test, Chick–Martin, and In-Use test.

Bacteriological Examination of Consumables: Testing water, milk, food, air, and pharmaceutical products.

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

Laboratory Diagnosis of Common Infections:

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

Chronic infections like tuberculosis and leprosy

PRACTICAL

Media preparation: Blood agar, Chocolate agar, MacConkey, Lowenstein-Jensen medium, Baird-Parker medium, Wilson-Blair/Bismuth sulfite medium, etc.

Staining Methods: Gram stain, Acid-fast stain (for Mycobacterium), Albert stain (C. diphtheriae), Capsular staining.

Biochemical & Serological Tests:

- Kirby–Bauer disc diffusion (antibiotic sensitivity testing),

- IMViC tests (for Enterobacteriaceae),
- Coagulase test (Staph. aureus),
- Catalase test,
- Widal test (typhoid),
- VDRL (syphilis).

Specimen Examination: Urine for UTIs, pus from wounds, throat swabs, and other clinical samples.

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/-/2/4

Carbohydrate Metabolism

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

Protein (Amino Acid) Metabolism

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

Lipid Metabolism

- 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

Nucleotide Metabolism

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

Cellular Respiration

- Oxidative phosphorylation and the electron transport chain (ETC)

PRACTICALS

Analyte Estimation: Glucose (GTT/GCT), Urea, Creatinine, Electrolytes, Bilirubin, Enzymes, Lipid Profile, Acid Phosphatase

Separation Methods: Serum Protein Electrophoresis, Chromatography

Calibration Skills: Standard curve preparation for multiple analytes

Specimen Handling: Collection techniques for various fluids and blood

Urine Chemistry: Physical, chemical analyses including glucose and ketones

Recommended Text Books

1. Biochemistry for Medical Laboratory Technology 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

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

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

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

Reproductive & Child Health (RCH): 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

Lifestyle Disorders & Mental Health: 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

MEDICAL LAW

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

- 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

- 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. J.Paulraj Joseph-2023
2. A textbook of medical jurisprudence and toxicology-Justice K Kannan -25 edition-1" 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

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

UNIT-II

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

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

UNIT-IV

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

UNIT-V

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

RECOMMENDED BOOKS:

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

The body by Bilbirson Agreed for Occupance

ETHICS

UNIT-I

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

UNIT-II

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

UNIT-III

- 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

- 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

- Role of Human Rights in Public Health
- Ethics of Health 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.

Week 1

Introduction to Soft Skills

Definition of soft skills vs. hard skills

The importance of soft skills in the workplace

Key soft skills: communication, teamwork, adaptability, problem-solving, leadership, etc.

- **Activities:** Icebreakers, group discussions on soft skills in the workplace
- **Assignment:** Self-assessment on current soft skills

Week 2

Communication Skills

The communication process: sender, message, receiver, feedback

Active listening techniques

Body language and non-verbal cues

Effective speaking: tone, clarity, and pacing

Email and phone communication etiquette

- **Activities:** Role-playing scenarios (e.g., client interaction, conflict resolution)
- **Assignment:** Practice active listening and send an email incorporating effective communication principles.

Week 3

Emotional Intelligence (EQ)

What is emotional intelligence? (Self-awareness, self-regulation, motivation, empathy, and social skills)

Recognizing and managing your emotions

Understanding others' emotions and building empathy

Developing emotional resilience

- **Activities:** Emotional intelligence quizzes, group discussion on handling emotions in stressful situations
- **Assignment:** Journaling emotional responses and reflection on EQ practices.

Week 4

Teamwork and Collaboration

Roles and dynamics within teams

Effective communication in teams

Conflict resolution in teams

Building trust and fostering a collaborative environment

- **Activities:** Team exercises, problem-solving tasks, and brainstorming sessions
- **Assignment:** Work on a team project or task, and present it in class.

Week 5

Conflict Resolution

Sources of conflict (miscommunication, differing priorities, etc.)

Conflict resolution strategies (e.g., negotiation, mediation, compromise)

The role of active listening in resolving conflicts

Managing personal emotions during conflict

- **Activities:** Case studies, role-playing conflict resolution scenarios
- **Assignment:** Reflect on a personal or professional conflict and propose a resolution strategy.

Week 6

Time Management and Personal Organization

The importance of time management in personal and professional success

Prioritization techniques (e.g., Eisenhower Matrix, ABCDE method)

Tools for time management (digital calendars, to-do lists, Pomodoro technique)

Setting SMART goals

Managing procrastination and avoiding distractions

- **Activities:** Time-blocking exercises, goal-setting workshop
- **Assignment:** Create a personal time management plan and track daily productivity for a week.

Week 7

Leadership and Influence

Types of leadership (e.g., transformational, transactional, servant leadership)

Leading by example: qualities of effective leaders

Building and maintaining team morale

The art of persuasion and influence

- **Activities:** Leadership style assessment, group discussions on leadership challenges
- **Assignment:** Write a reflection on a leader you admire and why.

Week 8

Public Speaking and Presentation Skills

Overcoming fear of public speaking

Structuring a presentation (opening, body, conclusion)

Effective use of visual aids (PowerPoint, etc.)

Engaging the audience through storytelling, eye contact, and body language

- **Activities:** Group presentations, peer feedback sessions, impromptu speaking exercises
- **Assignment:** Prepare and deliver a short presentation (5-7 minutes) on a topic of choice.

Reference Textbook

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

Year 2 Semester IV

Immunohematology and Blood Transfusion

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

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:

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:

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 grouping.

UNIT 3

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:

Component Preparation & Indications. Preservation, storage and shelf life of blood components. Apheresis- Definition, types of apheresis, machines and techniques. Screening of donor blood for TTI : HIV, HbsAg, HCV, Malaria and Syphilis

UNIT 5:

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

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 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:

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 Host immune response, Antiviral Chemotherapy-Interferons, Viral vaccines.

UNIT II:

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:

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

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

UNIT IV:

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:

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

VIROLOGY PRACTICALS

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 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 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:

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

UNIT II:

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:

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

UNIT IV:

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:

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

1. End Point Assays

- a. Estimation of serum inorganic Phosphorus
- b. Estimation of serum calcium
- c. Estimation of serum cholesterol
- d. Estimation of triglycerides

2. Kinetic Assays

- a. Alkaline phosphatase
- b. SGOT c.SGPT

3. 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.
4. Essentials of Biochemistry. Pankaja Naik.
5. 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 & Manickam, A. New Age International Publishers

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

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

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

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

UNIT 4

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

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

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 3 Semester V

Histopathology and Histo-Techniques

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

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.

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

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.

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.

PRACTICAL

Histopathology & Histotechniques

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

Histocytopathology

Preparing and applying special stains: PAS, Alcian blue, Congo Red, Silver stain, AFB stain, Masson Trichrome, Martius Scarlet, Gram stain.

Assisting with FNAC (fine-needle aspiration cytology) and grossing.

Typing and screening histology / cytology reports.

Performing sex chromatin staining.

Operating IHC, immunofluorescence stains.

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**

Mycology Basics: Fungal classification, specimen collection, and types of growth media

Types of Fungal Infections: Superficial and cutaneous mycoses (*Malassezia*, *Piedra*, *Dermatophytes*); Subcutaneous mycoses (*Mycetoma*, *Sporotrichosis*, *Rhinosporidium*); Systemic mycoses (*Histoplasmosis*, *Blastomycosis*, *Coccidioidomycosis*, *Paracoccidioidomycosis*); Opportunistic fungi (*Aspergillus*, *Penicilliosis*, *Zygomycosis*, *Pneumocystis*)

Laboratory Diagnosis: 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: 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: 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

Parasitology

Saline/iodine mounts, thick and thin blood smears

Identification: cysts, trophozoites, larvae, ova, adult worms

Concentration techniques and culture of parasites

Mycology

Sample processing and staining (KOH mount, India ink, GMS)

Culture techniques, slide culture, germ tube test

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

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

Metabolism Overview

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

Instrumentation & Analytical Techniques

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

PRACTICALS

Preparation of reagents and standard calibration curves for: Glucose, urea, protein, albumin, AST, ALT, uric acid, creatinine, ALP

Performing biochemical assays: Glucose (including GTT/GCT); Urea, creatinine, electrolytes (Na^+ , K^+ , Cl^-); Bilirubin, SGPT/ALT, SGOT/AST, ALP, Gamma-GT, Lipase, Amylase

Lipid profile (TC, TG, HDL-C, LDL-C)

Acid Phosphatase

Serum protein electrophoresis; Chromatography-based analyte separation

Operational proficiency with lab instrumentation such as spectrophotometers and colorimeters for quantitative analyses

Qualitative tests, including: Colorimetric reactions for carbohydrates, proteins, NPN compounds (e.g., urea, creatinine, uric acid)

Preparation of protein-free filtrates, identifying unknown carbohydrates and proteins

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 3 Semester VI

Diagnostic Cytology

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

Cell Fundamentals: Normal cell structure and function; Cytologic features of malignancy classification

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

Staining Methodologies: Papanicolaou (Pap) stain: Principles, preparation, technique; May–Grünwald–Giemsa (MGG) stain; Shorr's stain; Aceto-Orcein stain

Site-Specific Cytology

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

CSF & Body Cavity Fluids: Cytology of cerebrospinal fluid (CSF) and effusions under inflammatory, benign, and malignant conditions

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

Automation in Cytology

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

Advanced Techniques

Tissue culture: Equipment (laminar flow hood, CO₂ 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

Preparing cytology smears; fixation and staining with Pap and MGG techniques

Hormonal cytology evaluations

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

Isolation and Cultivation of microbes from various clinical and environmental specimens; Techniques for growing bacteria, fungi from samples

Use of Plasmids and Bacteriophages for identification, typing, and genetic studies; Molecular tools in pathogen identification and typing

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

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

Practical Applications : Clinical and lab-oriented microbial diagnostics

PRACTICALS

Practicing universal precautions, safe collection, transport, and disposal of clinical specimens.

Operation and maintenance of the compound microscope and demonstration of sterilization procedures such as hot air ovens, bacterial filters, and autoclaving.

Preparation of bacterial smears and performing various staining techniques including Gram stain, acid-fast stain, spore stain, flagella, capsule (Albert stain).

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.

Observation of colony characteristics, perform biochemical tests for bacterial identification, and learn stock culture preservation.

Antibiotic susceptibility testing, anaerobic culture techniques **and apply** quality control protocols for media and reagents.

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.

Parasitology Methods: Conducting stool examination for ova and parasites. Preparing and examining thick and thin blood smears, identifying malarial forms (e.g., Leishmania Donovan bodies, malarial parasites).

Serological & Immunodiagnostic Tests: Collecting blood via venipuncture, separating serum, and preserving it for short and long terms.

Performing serological assays such as slide agglutination, Widal test, VDRL, CRP, ASLO, RF, ELISA, and skin tests.

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

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

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

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

PRACTICALS

Analytical Procedures: 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.

Performing serum protein electrophoresis and chromatography.

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

1. Introduction to Research Methodology

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

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

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

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

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: Qualitative data ; Quantitative data

7. Research tools and data collection methods

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

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

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

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 behavior.
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

Year 4 Semester VII

Internship-I

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

Healthy Eating for Healthy Living

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

Coure Description:

This course is designed to teach students the foundational principles of nutrition, the relationship between food and health, and practical strategies for making sustainable, healthy eating choices. Students will learn how to create balanced meals, understand dietary guidelines, and navigate the modern food environment to support long-term health and well-being.

Unit 1

Introduction to Nutrition and Healthy Eating

What is nutrition?

Overview of macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins, minerals).

The importance of hydration.

Understanding energy balance: Calories in vs. Calories out.

Introduction to MyPlate (or other dietary guidelines).

Unit 2

Building a Balanced Plate

The principles of meal planning.

Portion control and serving sizes.

Healthy fats vs. unhealthy fats.

Carbohydrates: Simple vs. complex sugars.

Protein sources: Animal vs. plant-based.

Unit 3

Reading Food Labels and Understanding Food Marketing

How to read food labels (nutritional facts, ingredients list, serving sizes).

Decoding food claims (low-fat, organic, non-GMO).

Understanding food marketing and its impact on consumer choices.

Navigating grocery stores and making informed decisions.

Unit 4

The Role of Fruits and Vegetables in Healthy Eating

The importance of fruits and vegetables in the diet.

Health benefits of fiber, antioxidants, and phytochemicals.

Incorporating more plant-based foods into your meals.

Seasonal and local produce: Why it matters.

Unit 5

Special Diets and Nutrition for Different Lifestyles

Overview of popular diets (e.g., Mediterranean, vegetarian, vegan, paleo, ketogenic).

Nutrition for athletes and active individuals.

Special considerations for children, seniors, and pregnant women.

Managing food allergies and intolerances (e.g., gluten, lactose).

Unit 6

Mindful Eating and Emotional Health

What is mindful eating?

The connection between emotions and eating habits.

Managing stress and emotional eating.

Developing a healthy relationship with food.

Unit 7

Sustainable Eating and Environmental Impact

The environmental impact of food choices (e.g., food miles, carbon footprint).

Sustainable eating practices: Local, seasonal, and organic foods.

Reducing food waste: Practical tips.

The role of plant-based eating in sustainability.

Unit 8

Putting It All Together: Creating a Sustainable, Healthy Eating Plan

Review of key concepts: Macronutrients, micronutrients, balanced eating, mindful eating.

Goal setting: How to set achievable health goals.

Meal prep and planning for a busy lifestyle.

Long-term strategies for maintaining a healthy diet.

Reference Textbook

1. Nutrition and You" by Joan Salge Blake
2. Understanding Nutrition" by Eleanor Noss Whitney and Sharon Rady Rolfes

Year 4 Semester VIII

Internship-II

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

Project

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

Professionalism in the Workplace

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

Course Description:

This course is designed to provide students with the foundational knowledge and skills required to demonstrate professionalism in a variety of workplace settings. Topics will include communication, ethics, accountability, time management, problem-solving, conflict resolution, and maintaining a positive and effective work ethic. Students will engage in practical activities that promote personal and professional growth.

Course Objectives:

By the end of this course, students will:

1. Understand the key elements of professional behavior in the workplace.
2. Demonstrate effective communication, both verbal and non-verbal, in a professional environment.
3. Learn to manage time effectively and handle workplace challenges with a positive attitude.
4. Cultivate emotional intelligence and adaptability in professional settings.
5. Understand workplace ethics, integrity, and how to make ethical decisions.
6. Develop skills for conflict resolution and teamwork in diverse work environments.

Unit 1

Introduction to Professionalism

What is professionalism?

Characteristics of a professional: Appearance, behaviour, and attitude

The importance of professional ethics and integrity

Unit 2

Effective Communication in the Workplace

Verbal and non-verbal communication

Active listening and responding

Communicating across cultures

Unit 3

Workplace Etiquette and Networking

Social etiquette in the workplace

Networking best practices

Building relationships with colleagues, managers, and clients

Unit 4

Time Management and Organization

Prioritizing tasks and setting goals

Managing deadlines and avoiding procrastination

Tools and techniques for effective time management

Unit 5

Accountability and Reliability

Taking responsibility for your actions

Being reliable and dependable in the workplace

How accountability affects professional reputation

Unit 6

Problem Solving and Decision Making

Approaches to critical thinking and decision-making

Strategies for solving workplace problems effectively

The role of creativity and innovation in problem-solving

Unit 7

Teamwork and Collaboration

Working with diverse teams

Building trust and collaboration in teams

Managing team conflicts and maintaining harmony

Unit 8

Conflict Resolution and Handling Difficult Conversations

Understanding conflict dynamics

Techniques for resolving conflicts professionally

Role-playing difficult conversations in the workplace

Unit 9

Ethical Dilemmas in the Workplace

Recognizing ethical challenges

Making decisions based on ethical principles

The role of transparency and honesty

Unit 10

Building Emotional Intelligence and Adaptability

What is emotional intelligence and why does it matter?

Developing self-awareness and self-regulation

Adapting to changing work environments

Reference Textbook

1. Professionalism: Skills for Workplace Success" by Deborah C. Dillon

2. The Professional Workplace: The Skills You Need to Succeed" by Ronald W. Holmes