MALLA REDDY VISHWAVIDYAPEETH

(Deemed to be University)

Suraram X Roads, Jeedimetla, Hyderabad 500055

School of Public Health, Emerging Healthcare & Technology

(SPHEHT)

COURSE STRUCTURE & SYLLABUS DOCUMENT

B.Sc. Cardiology Technology Non-Invasive (ECG, 2D ECHO, TMT & HOLTER)

Year 2025–29 Batch

Course Structure

I year I semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	MC		Human Anatomy - I	4	-	-	4
2	MC		Human Physiology - I	4	-	-	4
3	MS		Medical Biochemistry	4	-	-	4
4	MD		Sociology	2	-	-	2
5	AEC		English and Communication Skills	2	-	-	2
6	SEC		Basics of Computers	2	-	2	3
7	MC		Human Anatomy - I Practical	-	-	4	2
8	MC		Human Physiology - I Practical	-	-	4	2
9	VAC		Environmental Awareness	2	-	-	2
TOTAL				**20**	**-**	**10**	**25**
TOTAL CONTACT HOURS				**30**			

HUMAN ANATOMY – I

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

Learning Objective:

1. To understand the basic concepts of general anatomy, histology, and embryology.
2. To study the structure and organization of the upper extremity including bones, muscles, joints, nerves, and vessels.
3. To comprehend the anatomy of the cardiovascular and respiratory systems.
4. To gain knowledge of systemic anatomy including digestive, urinary, endocrine, and genital systems.

Learning Outcome:

1. Describe the structure and function of tissues, organs, and body systems.
2. Identify anatomical features of the upper limb, thoracic structures, and major organ systems.
3. Apply anatomical knowledge to understand clinical and diagnostic procedures.
4. Correlate anatomical structures with their physiological functions in health and disease.

UNIT-I

GENERALANATOMY AND HISTOLOGY

General Anatomy:

1. Fascia
2. Muscles
3. Bones
4. Joints
5. Vessels
6. Nerve

General Histology:

1. Epithelial
2. Connective tissue
3. Muscle
4. Bone and cartilage
5. Nerve and vessels
6. Embryology

UNIT-II

UPPEREXTREMITY:

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

3. *UNIT-III*

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&RESPIRATORYANATOMY

1. Thoracic wall
2. Mediastinum
3. Heart: Anatomy of heart, blood Supply, nerve supply, conducting System and major blood vessels

4. Lungs: Anatomy of lungs, bronchial tree, pleura, Broncho pulmonary segments, blood Supply and nerve supply
5. Diaphragm: Origin, insertion, nerve supply and action, openings in the diaphragm.
6. Intercostal muscles and Accessory muscles of Respiration: Origin, insertion, nerve supply and action
7. Ribs and sternum

UNIT-V

SYSTEMIC ANATOMY

1. Digestive system:

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

2. Urinary system:

- Anatomy of kidney, urinary bladder

3. Endocrine system:

- Position and hormones secreted by each organ

4. Genital system:

- Male organs and female organs

RECOMMEMDEDTEXTBOOKS

1. Human Anatomy-Snell
2. Anatomy-Chaurasia, Volume-I, II &III
3. Neuro anatomy-Inderbir Singh
4. Human Anatomy-Kadasne, Volume-I, II&III
5. Neuro anatomy—Vishrsam Singh
6. Human Anatomy-Datta
7.

HUMAN PHYSIOLOGY I

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

Learning Objective:

1. To understand the fundamental concepts of cell physiology, body fluids, and homeostasis.
2. To study the composition and functions of blood, nerve physiology, and muscle physiology.
3. To comprehend the functioning of the cardiovascular and respiratory systems, including ECG basics.
4. To gain knowledge of exercise physiology and physiological changes during physical activity.

Learning Outcome:

1. Explain the physiological mechanisms of cells, blood, nerves, and muscles.
2. Describe the functioning and regulation of the cardiovascular and respiratory systems.
3. Interpret basic physiological parameters such as ECG, blood pressure, and respiratory volumes.
4. Apply physiological principles to understand exercise responses and clinical conditions.

UNIT-I

GENERAL PHYSIOLOGY

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
4. Action potential
5. Propagation of nerve impulse
6. Properties of nerve fibers
7. Neuroglia-Types& functions
8. 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) Sarcotubular system
    c) Neuro muscular junction& disease affecting it
4. Excitation-Contraction coupling
5. Mechanism of muscle contraction
6. Functions of skeletal muscle
7. Types of muscle contractions
8. Red& white muscles
9. Rigor mortis, muscular dystrophy, altered muscle tone, muscle cramp, atrophy, EMG

UNIT-III

CARDIOVASCULARSYSTEM

1. Structure of heart & blood vessels
2. Properties of cardiac muscle
3. Origin &spread of cardiac pulse
4. Cardiac cycle &heart sounds
5. Cardiac out put
    a) Related terms
    b) Regulation of cardiac output
    c) Circulatory shock

6. Pulse &Heart rate and it's regulation
7. Blood pressure
    a) Definitions
    b) Factors controlling & Influencing BP
    c) Regulation of BP
8. Regional circulation
    a) Coronary circulation
    b) Cerebral circulation
9. Normal ECG

UNIT-IV

RESPIRATORYSYSTEM

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. Transport of respiratory gases
6. Nervous &chemical regulation of respiration
7. Pulmonary function test-direct& indirect method
8. Physiological changes with altitude &acclimatization

UNIT-V

EXERCISE PHYSIOLOGY

1. Basal Metabolic Rate & Respiratory Quotient
2. Energy metabolism
3. Fatigue
4. Oxygen debt
5. Acute cardiovascular changes during exercise; difference between mild, moderate &severe exercise
6. Concept of endurance
7. Acute respiratory changes during exercise
8. Concept of training/conditioning; effects of long-term exercise/training on the CVS&RS
9. Body temperature regulation during exercise
10. Hormonal &metabolic effects during exercise
11. Exercise for muscle strength, power, endurance and their effects on it. Physical fitness & its components

RECOMMENDED TEXTBOOKS

1. Text book on Medical Physiology-Guyton
2. Textbook of Physiology-AK Jain (for MBBS students)
3. Human Physiology-C.C. Chatterjee
4. Essentials of Medical Physiology -Sembulingam, K.

5. Comprehensive Textbook of Medical Physiology: Vol-1 & 2 - Pal, Gopal Krushna
6. Physiology: Prep Manual for Undergraduates- Joshi, VijayaD.
7. Practical Physiology -Joshi, VijayaD.

MEDICAL BIOCHEMISTRY

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

Learning Objective:

1. To understand the structure, classification, and functions of carbohydrates, lipids, proteins, and nucleic acids.
2. To study enzyme kinetics, vitamin functions, and their clinical significance.
3. To comprehend major metabolic pathways including glycolysis, TCA cycle, β-oxidation, and urea cycle.
4. To gain knowledge of minerals and clinical biochemistry parameters in blood and urine.

Learning Outcome:

1. Explain the biochemical structure and functions of biomolecules and their role in human physiology.
2. Describe enzyme activity, vitamin roles, and their importance in health and disease.
3. Interpret metabolic pathways and their relevance to energy production and metabolism.
4. Analyze normal and abnormal biochemical constituents of blood and urine for clinical correlation.

UNIT-I

CARBOHYDRATE CHEMISTRY

- Definition, general classification with examples
- Composition and functions of Monosaccharides, Disaccharides ani Polysaccharides
- Anomers, Epimers, Enantiomers, Mutarotation
- Glycosaminoglycans (mucopolysaccharides)

LIPID CHEMISTRY

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

UNIT-II

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

INTERMEDIARYMETABOILISM

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

UNIT-V

MINERALMETABOLIS

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

CLINICALBIOCHEMISTRY

- 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-l and II. Indumathi.
4. Textbook of Biochemistry for Medical students. MN Chatterjee and Rana Shinde.
5. Harper's Illustrated Biochemistry.
6. Essentials of Biochemistry. Pankaja Naik

SOCIOLOGY

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

Learning Objective:

1. To understand basic sociological concepts, methods, and their relevance to healthcare.
2. To study socialization, social groups, and the role of family and community in health and disease.
3. To analyze cultural, social, and environmental factors influencing health in rural and urban settings.
4. To gain knowledge of social problems, social change, and social security in relation to healthcare.

Learning Outcome:

1. Explain key sociological concepts and their application in healthcare practice.
2. Analyze the impact of social factors, family, and community on health and illness.
3. Assess the influence of culture and social change on health behaviors and healthcare delivery.
4. Identify major social problems and apply sociological understanding in promoting community health and well-being.

SUBJECT DISCRIPTION

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

UNIT 1

1. Introduction:

a. Meaning- Definition, Nature and Scope of Sociology
b. Methods of Sociological Investigations, Case Study, Social Survey, 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 Socialization
b. Primary, Secondary and Anticipatory socialization
c. Agencies of Socialization

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 individual's 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 Neeraja

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

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 **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

COURSE OUTCOMES:

- Construct grammatically correct sentences with appropriate vocabulary.
- Analyze, interpret and synthesize a diverse range of profession-specific concepts through better comprehension of the text.
- Draft various types of written communication pieces useful to their professional lives.
- Understand and apply norms of scientific communication, soft skills and positive interpersonal communication.
- Listen effectively and speak fluently in formal and informal situations, especially

in their workplace.

TEXTBOOK:

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

RECOMMENDED BOOKS:

- Practical English Usage by Michael Swan. OUP. 1995.
- On Writing Well by William Zinsser, Harper Resource Book. 2001.
- Cambridge English for nursing by Virginia Allum and Patricia Mc Garr. CUP. 2010.
- English for nursing by Ross Wright and Bethany Cagnol. Pearson. 2001.
- English for nursing-2 by Maris Spada Symonds and Ross Wright. Pearson. 2001.
- Everyday English for International nurses by Joy Parkinson and Chris Brooker. Elsevier. 2004.
- Oxford English for career Nurses by Tony Grice. Oxford University Press. 2007.

BASICS OF COMPUTERS

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

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.

COURSE OUTCOMES:

- At the end of the course the student will be able
- To understand peripherals of the computer how it works and understand various languages of the computer.
- To create any kind of presentations for presenting their knowledge anywhere in the form of document or ppt.
- To create excel sheets to save data and process the data efficiently.
- To understand basic requirements of computer network hardware, software and its network architecture.

RECOMMENDED BOOKS:

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

HUMAN ANATOMY - I Practical

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

Learning Objective:

1. To provide hands-on experience in identifying gross anatomical structures and specimens.
2. To develop skills in recognizing bones, muscles, vessels, nerves, and organs of different systems.
3. To understand surface anatomy and anatomical relationships relevant to clinical practice.
4. To enhance practical knowledge of musculoskeletal, cardiovascular, respiratory, and systemic anatomy.

Learning Outcome:

1. Identify and describe anatomical specimens, bones, muscles, nerves, and blood vessels accurately.
2. Demonstrate understanding of anatomical relationships through spotters and surface anatomy.

3. Correlate anatomical structures with their clinical and functional significance.
4. Apply anatomical knowledge effectively in clinical and physiotherapy practice.

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
- Myology- (cadaveric spotter) Spotters of the upper extremity muscles including the origin, insertion, blood and nerve supply
- Spotters of Blood vessels (Profunda Brachii, Brachial, Radial, Ulnar)
- Spotter of Nerves (Axillary, Musculocutaneous, Radial, Median, Ulnar)
- Structure and Parts of the Breast- Spotter Cardio-vascular and Respiratory Anatomy
- Gross Specimen of Heart, Lung
- Spotters of Bronchial tree, Bronchopulmonary segments
- Myology- (Diaphragm, Intercoastal muscles and Accessory Muscles)
- Systemic Anatomy
- Gross Specimen/Spotter (Stomach, Liver, Gall Bladder, Spleen, Pancreas, Intestines, Kidney, Uterus)
- Cross section of Kidney
- Spotters of Glands- (Pituitary Gland, Thyroid gland, Adrenal gland, Parathyroid, Pineal Gland)

HUMAN PHYSIOLOGY - I Practical

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

Learning Objective:

1. To develop practical skills in performing basic physiological measurements and clinical assessments.
2. To understand the principles behind hematological and cardiovascular investigations.
3. To gain hands-on experience in respiratory system examination techniques.
4. To apply physiological concepts in real-life clinical and health assessment scenarios.

Learning Outcome:

1. Perform and interpret basic physiological tests such as blood group, hemoglobin, and blood pressure.
2. Demonstrate skills in assessing pulse, heart sounds, respiratory rate, and breath sounds.
3. Evaluate anthropometric parameters like BMI and WHR for health assessment.
4. Correlate practical findings with underlying physiological principles and clinical relevance.

These practicals 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
- Estimation of hemoglobin concentration
- Peripheral pulse determination
- Auscultation of Heart sounds
- Determination of blood pressure
- Auscultation of breathe sounds
- Assessment of respiratory rate
- Anthropometric assessment (BMI & WHR)

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

Learning Outcome:

1. Explain key environmental concepts, ecosystems, and sustainability principles.
1. Identify and analyze environmental challenges and their effects on health and ecosystems.
2. Evaluate the role of human activities and policies in environmental degradation and conservation.
3. Apply sustainable practices and contribute to environmental protection in daily 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

I year II semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	MC		Human Anatomy - II	4	-	-	4
2	MC		Human Physiology - II	4	-	-	4
3	MS		Pathology	2	-	-	2
4	MD		Microbiology	3	-	-	3
5	MC		Cardiac Instrumentation	3	-	2	4
6	MC		Human Anatomy – II Practical	-	-	4	2
7	MC		Human Physiology – II Practical	-	-	2	1
8	VAC		Stress Management	1	-	-	1
TOTAL				**17**	**-**	**8**	**21**
TOTAL CONTACT HOURS				**25**			

Semester II

Human Anatomy-II

L-T-P-C: 4-0-0-4

Learning Objective:

1. To understand the detailed anatomy of the lower extremity, including bones, muscles, joints, and neurovascular structures.
2. To study the structure and function of the vertebral column, pelvic girdle, and core musculature.
3. To gain knowledge of head, neck, and special sense organ anatomy.
4. To comprehend the organization and structure of the central and peripheral nervous systems with clinical relevance.

Learning Outcome:

1. Describe the anatomical features and functional aspects of the lower extremity and its clinical applications.
2. Explain the anatomy of the vertebral column, pelvis, and trunk muscles in relation to movement and stability.
3. Identify structures of the head, neck, and sensory organs with their functional significance.
4. Analyze the organization of the nervous system and correlate neuroanatomy with clinical conditions.

UNIT-I

LOWER EXTREMITY:

1. Osteology including features, side determination, muscular attachment, 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

- Anterior compartment of thigh, Medial compartment and Posterior compartment
- Gluteal Region
- Anterior aspect of leg, medial and lateral aspect, Posterior aspect of leg
- Dorsum of foot

UNIT-II

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

VERTEBRAL COLUMN AND PELVIC GIRDLE:

1. Atypical and typical vertebra
2. Structure and features of Cervical, thoracic, lumbar, sacral and coccygeal vertebrae
3. Origin, insertion, nerve supply and actions of pre and para vertebral muscles
4. Muscles of Trunk and Abdomen
5. Core muscle Anatomy
6. Joints of vertebral column, structure and composition of intervertebral disc including the Radiography Evaluation
7. Joint structure, articulating components, relations, joint actions, Clinical and Applied Anatomy including Radiography of Sacro- Iliac joint
8. Structure of Innominate bone Pelvic girdle and muscles of the pelvic floor including Applied Anatomy

UNIT-IV

HEAD AND NECK:

1. Bones of the skull and face
2. Muscles of the face and neck
3. Triangles of the neck
4. Gross anatomy of eyeball, nose, ears and tongue

UNIT-V

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. Meninges and Coverings of spinal cord
5. Cerebro-Spinal Fluid and ventricles of brain
6. Spinal Cord- Segmental features, Laminae, Nuclei, Tracks of spinal cord
7. Spinal nerves, nerve root ganglia
8. Blood supply to brain and spinal cord with clinical and applied anatomy
9. Peripheral Nervous system
10. Cranial nerves- Course and applied Anatomy Neuromuscular junction

RECOMMEMDED TEXT BOOKS

1. Human Anatomy – Snell
2. Anatomy- Chaurasia, Volume- I, II & III
3. Neuro anatomy -- Inderbir Singh
4. Human Anatomy – Kadasne, Volume- I, II & III
5. Neuroanatomy -- Vishrsam Singh
6. Human Anatomy – Datt

HUMAN PHYSIOLOGY -II

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

Learning Objective:

1. To understand the structure and functions of the nervous system, including sensory and motor pathways.
2. To study special senses, endocrine system, and hormonal regulation of body functions.

3. To comprehend the physiology of the reproductive system, including pregnancy and lactation.
4. To gain knowledge of gastrointestinal and excretory system functions and their regulation.

Learning Outcome:

1. Explain the functional organization of the nervous system and interpret reflexes, pathways, and higher functions.
2. Describe the physiology of special senses and endocrine glands with clinical correlations.
3. Analyze reproductive physiology, including hormonal control, fertilization, and childbirth.
4. Interpret physiological mechanisms of digestion, renal function, and fluid-electrolyte balance.

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. Ascending Tracts - Definitions, Neuronal composition of ascending tracts, dorsal column, anterolateral tract
7. Pathophysiology of pain - Definitions, hyperalgesia and allodynia, deep pain, referred pain and its theories, management of chronic pain, endogenous opioid analgesic system
8. Motor Cortex - Cerebrum, cortical areas of brain, motor homunculus, cerebral dominance, connections, mapping the functional areas of brain
9. Descending Tracts - Pyramidal system, extrapyramidal system

UNIT-II

NERVOUS SYSTEM-II

1. Spinal cord - Introduction, effects of complete transection of the spinal cord, effects of hemisection of the spinal cord (Brown-Sequard Syndrome)
2. Reflexes - Reflex action, reflex arc, classification, properties, types - conditioned reflex, stretch reflex, inverse stretch reflex, withdrawal reflex, crossed extensor reflex, superficial reflexes (Plantar & Abdominal)

3. Connections, Functions and applied aspect of thalamus, hypothalamus, cerebellum, basal ganglia 4. Regulation of tone, Posture and it's reflexes, Equilibrium and vestibular apparatus
5. Limbic system, Reticular Activating System, Sleep and it's types, sleep disorders, Electroencephalogram (EEG)
6. Higher Functions - Learning, Memory, Speech
7. Autonomic Nervous System - Sympathetic division, Parasympathetic division, control of autonomic functions
8. Cerebrospinal fluid - Formation and circulation, composition and properties, 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, hormonal chemistry, regulation, hormone receptor, mechanism of action
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
5. Childbirth Physiology - Parturition, Lactation

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. Neural control of Micturition and diuresis
6. Applied physiology: Types of bladders

RECOMMENDED TEXTBOOKS

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

PATHOLOGY

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

Learning Objective:

1. To understand the basic concepts of pathology including cell injury, adaptation, and cell death.
2. To study the mechanisms and types of inflammation and immune system disorders.
3. To gain knowledge of infectious diseases and their pathogenesis.
4. To comprehend neoplasia, environmental, and nutritional factors affecting disease development.

Learning Outcome:

1. Explain the processes of cellular adaptation, injury, and mechanisms of cell death.
2. Describe inflammatory responses and immune disorders with their clinical implications.

3. Identify the causes and mechanisms of infectious diseases and their effects on the body.
4. Analyze tumor biology and the impact of environmental and nutritional factors on disease.

UNIT I

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.

UNIT II

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

UNIT III

Immunity disorders.

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

UNIT IV

Infectious diseases.

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

UNIT V

Neoplasia

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

UNIT VI

Environmental and nutritional disorders.

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

REFERENCE:

Pathology, Harsh Mohan e. Basic Pathology by Robbins

MICROBIOLOGY

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

Learning Objective:

1. To understand the morphology, classification, and growth characteristics of microorganisms.
2. To study principles of sterilization, disinfection, and laboratory diagnostic techniques.
3. To gain knowledge of immunology, vaccines, and common serological tests.
4. To comprehend the microbiology of bacteria, viruses, fungi, and parasites causing human diseases.

Learning Outcome:

1. Describe the structure, classification, and growth of microorganisms.
2. Apply sterilization, disinfection, and culture techniques in laboratory settings.
3. Interpret basic immunological concepts and common diagnostic tests.
4. Identify major pathogens and explain their role in causing human diseases with clinical relevance.

UNIT I

Morphology

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

UNIT II

Growth and nutrition.

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

UNIT III

Culture media.

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

UNIT IV

Sterilization and Disinfection.

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

UNIT V

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).

UNIT VI

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.

UNIT VII

Parasitology

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

UNIT VIII

Mycology

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

UNIT IX

Virology

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

REFERENCE:

a. Microbiology, Ananthanarayan and Paniker's,
b. CP. Baveja. Textbook of Microbiology for nurses.
c. A textbook of Microbiology-Chakraborty.

CARDIAC INSTRUMENTATION

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

Learning Objective:

1. To understand the principles and types of transducers, electrodes, and amplifiers used in biomedical instrumentation.
2. To study the measurement and recording of physiological signals such as ECG, PCG, blood pressure, and blood flow.
3. To gain knowledge of cardiac devices including pacemakers, defibrillators, and their functioning.
4. To comprehend the basic principles of imaging and life-support systems such as ultrasound, echocardiography, CT, MRI, and heart-lung machines.

Learning Outcome:

1. Explain the working principles of transducers, electrodes, and amplifiers in cardiac instrumentation.
2. Demonstrate understanding of physiological signal acquisition and measurement techniques.
3. Describe the operation and clinical applications of pacemakers and defibrillators.
4. Interpret the basic principles of cardiac imaging and life-support equipment used in clinical practice.

UNIT I:

TRANSDUCERS: Classification & Selection of transducers, Types: Pressure transducers: Resistive strain gauge, capacitance, Inductance and piezoelectric transducers; Photoelectric transducers: Photoconductive transducers.

UNIT II:

ELECTRODES & AMPLIFIERS: Principles of working and their characteristics, Half-cell potential, Types of electrodes: Surface electrodes, needle electrodes & microelectrodes; Amplifiers for biomedical instrumentation.

UNIT III:

PHYSIOLOGICAL SIGNALS & MEASUREMENTS: Basics of ECG, PCG and Instrumentation for measuring these signals, Measurement of blood pressure, Measurement of blood flow by Electromagnetic & Doppler methods.

UNIT IV:

CARDIAC PACEMAKERS: External and Implantable pacemakers, Types of triggering: Asynchronous and Synchronous, Pacemaker Electrodes.

Defibrillators: AC and DC defibrillators, Types of electrodes and their features, cardioverters.

UNIT V:

ULTRASOUND: Basic principles of Ultrasound, Principles of echocardiography. Heart-Lung Machine: Principle of working, Functional details of bubble, thin film& Membrane oxygenators. Principles of X-rays, CT & MRI.

REFERENCE BOOKS:

- Biomedical instrumentation, technology and application. R.S Chandpur

HUMAN ANATOMY PRACTICAL – II

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

Learning Objective:

1. To develop practical skills in identifying bones, joints, and anatomical landmarks of the spine, pelvis, and lower extremity.
2. To understand the anatomy of muscles, vessels, and nerves through cadaveric specimens and spotters.
3. To gain knowledge of joint structures and their functional and clinical relevance.
4. To enhance understanding of neuroanatomy and systemic anatomy through specimen identification.

Learning Outcome:

1. Identify and describe anatomical structures of the spine, pelvis, lower limb, and related landmarks accurately.
2. Demonstrate knowledge of muscle attachments, nerve supply, and vascular structures in practical settings.
3. Analyze joint structures and correlate them with movement and clinical conditions.
4. Recognize key neuroanatomical structures including brain, spinal cord, and cranial nerves with clinical relevance.

GROSS SPECIMENS/SPOTTERS

SPINE, PELVIS AND LOWER EXTREMITY

Identify the spotter- Osteology- Identify the bone, LOWER EXTREMITY BONES (Innominate bone, femur, tibia, fibula, patella, tarsals, metatarsals and phalanges.) Including side determination, Spinal Segments, Vertebrae (Cervical, Thoracic, Lumbar, Sacral and Coccyx), Pelvis and Innominate Bones

Surface Anatomy of the Spine and Lower Extremity –Atlas, Axis, C-7 vertebrae, Spinous and Transverse process of vertebra, Locate the Innominate bone, ASIS and PSIS, Coccyx, Sacrum, Greater Trochanter, Condyles of femur, Patella, Tibial Tubercles and condyles, Shin Bone, Tarsal bones, Malleoli

Myology- (cadaveric spotter) Spotters of the lower extremity muscles including the origin, insertion, blood and nerve supply

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)

Abdominal muscles, Pre and para vertebral muscles, pelvic floor muscles
Popliteal Fossa, Inguinal Canal, Arches of foot

Spotters of Blood vessels

NEURO-ANATOMY IDENTIFY THE SPOTTER

Cross Section of the Skull, Sinuses of skull, Muscles of the skull and face
Triangles of the neck

SYSTEMIC ANATOMY

Gross Specimen/Spotter (Brain and Spinal Cord) Cross section of brain and spinal cord
Identify the spinal nerves Cranial Nerves

HUMAN PHYSIOLOGY PRACTICAL – II
L/T/P/C: -/-/2/1

Learning Objective:

1. To develop skills in examining sensory functions including superficial, deep, and cortical sensations.
2. To understand and perform assessment of reflexes and their clinical significance.
3. To gain practical knowledge in cranial nerve examination techniques.
4. To assess balance, coordination, and neurological function in clinical settings.

Learning Outcome:

1. Perform and interpret sensory examinations including superficial, deep, and cortical sensations.
2. Demonstrate accurate assessment of reflexes and identify normal and abnormal responses.
3. Conduct cranial nerve examinations and correlate findings with neurological conditions.
4. Evaluate balance and coordination to assess overall neurological function.

Total Hours:

Examination of superficial sensations Examination of deep sensations Examination of cortical sensations Examination of reflexes
Cranial nerve examination
Examination of Balance and coordination

STRESS MANAGEMENT

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

Course Objectives:

- By the end of the course, students will:
- Understand what stress is and how it affects the body and mind.
- Learn how to recognize personal stressors and individual responses to stress.
- Explore various coping strategies to manage stress effectively.
- Understand how lifestyle changes can reduce overall stress.

- Learn how to manage stress in academic and professional settings.
- Equip students with tools to build long-term resilience against stress.

Learning Outcome:

1. Explain the concepts of stress, its types, and its physiological and psychological effects.
2. Identify personal stressors and analyze individual responses to stress in daily life.
3. Apply effective coping strategies and relaxation techniques to manage stress.
4. Demonstrate the ability to adopt healthy lifestyle practices and build long-term resilience

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

II year III semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	MC		Cardiac Anatomy and Physiology	2	-	2	3
2	MC		Pharmacology	2	-	-	2
3	MS		Medical Law, Ethics and Medical Records	3	-	-	3
4	MC		ECG and Holter Monitoring	3	-	2	4
5	SEC		TMT and it Clinical Applications	1	-	2	2
6	SI		Clinical Postings - I	-	-	8	4
7	VAC		Soft Skills Development	1	-	-	1
8	MS		Healthcare Administration	2		2	3
9	SEC		AI in Healthcare: Foundation	1	-	-	1
TOTAL				**15**	--	**16**	**23**
TOTAL CONTACT HOURS				**31**			

SEMESTER III

CARDIAC ANATOMY AND PHYSIOLOGY

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

COURSE OBJECTIVES:

1. To familiarize and introduce students to intense anatomical features of the heart and physiological changes during various pathological conditions.
2. To provide an understanding of certain conditions involving the dynamics of cardiac physiology.

Learning Outcome:

1. Describe the anatomical structure and functional organization of the heart and its associated vessels.
2. Explain cardiac physiology including cardiac cycle, heart sounds, conduction system, and regulation of heart rate.
3. Analyze factors affecting cardiac output and blood pressure with methods of measurement.
4. Correlate anatomical and physiological concepts with clinical conditions such as myocardial infarction, hypertension, and arrhythmias.

UNIT – I Anatomy of Heart

Structure of Pericardium – Layers of pericardium, blood supply, nerve supply.

External and Internal features of heart – surfaces and borders of heart, atria and ventricles, inter atrial septum and inter ventricular septum.

UNIT – II Structures of Heart

Great vessels of heart Aorta and its branches, pulmonary trunk, Superior and Inferior Vena Cava

Atrioventricular valves and semilunar valves.

Musculature of heart – properties of cardiac muscle.

Systemic and pulmonary Circulation

UNIT – III

Blood supply of heart – coronary circulation

Venous drainage of heart

Fetal Circulation of Heart.

Innervation of heart – Parasympathetic and sympathetic nerve supply.

UNIT – IV

Cardiac cycle – Heart sounds, Murmurs of Heart. Conduction system of heart – Factors affecting Heart Rate

Cardiac output, factors influencing cardiac output, methods to calculate cardiac output

UNIT – V

Circulatory shock.
Blood pressure – methods, factors affecting blood pressure.

Applied Anatomy and physiology – Myocardial infarction, hypertension, Bradycardia, tachycardia, Regurgitation of valves.

PRACTICALS:

Blood pressure measurement with sphygmomanometer

Auscultation of heart sounds and interpretation

Demonstration of Coronary arteries using cadaver heart

Analysis and interpretation of physiological condition fluctuation during cardiac pathologies

REFERENCES:

1. BD Chaurasia's Handbook of General Anatomy, B.D. Chaurasia, 2009, fourth edition.

2. Ross and Wilson Anatomy and Physiology in Health and Illness, Anne Waugh, Allison Wynn Grant, 2015, 12th edition

3. Basics of Medical Physiology D Venkatesh, H.H. Sudhakar, Third Edition

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

Learning Objective:

1. To understand the basic principles of pharmacokinetics and pharmacodynamics, including drug absorption, distribution, metabolism, and excretion. To study the classification, mechanism of action, and therapeutic uses of drugs acting on various body systems.
2. To gain knowledge about adverse drug reactions, drug interactions, and factors influencing drug response.
3. To develop practical understanding of experimental pharmacology and drug effects using laboratory models.

Learning Outcome:

1. Explain the pharmacological principles and mechanisms of action of drugs used in different systems of the body.
2. Classify drugs and describe their therapeutic uses, side effects, and contraindications.
3. Apply knowledge of pharmacology in selecting appropriate drugs for common clinical conditions.
4. Demonstrate basic experimental skills and interpret the effects of drugs using standard laboratory techniques.

UNIT-I

General Pharmacology

a) Absorption, distribution, metabolism and elimination of drugs,

b) routes of drug administration.

c) Adverse reactions to drugs.

d) Factors modifying drug response

UNIT-II

Autonomic nervous system & Peripheral nervous system

a) Sympathetic nervous system - sympathomimetics, sympatholytic

b) Parasympathetic - Cholinergics, Anticholinergics Drugs

c) Skeletal muscle relaxants

d) Local anesthetics

UNIT-III

Central nervous system

a) Drug therapy of various CNS disorders like epilepsy, depression.

b) Non-steroidal anti-inflammatory drugs

c) General
anesthetics
AUTOCOIDS

a) Histamine and anti histaminics

UNIT-IV

Cardiovascular system

a) Drug therapy of hypertension, shock, angina, cardiac arrhythmias

b) Diuretics

c) Coagulants and anticoagulants, antiplatelet drugs

d) Hypo-lipidemics

Gastrointestinal and respiratory system

a) Drug treatment of peptic ulcer

b) Drug therapy of bronchial asthma

UNIT-V

Hormones

a) Drug therapy of Diabetes

b) Corticosteroids

c) Chemotherapeutic agents - b-Lactam Antibiotics, fluoroquinolones, aminoglycoside, tetracyclines, chloramphericol

PRACTICALS

a) Study of laboratory animals and their handling (a. Frogs, b. Mice, c. Rats, d. Guinea pigs, e. Rabbits).

b) Study of laboratory appliances used in experimental pharmacology.

c) Study of use of anesthetics in laboratory animals.

d) Effects of skeletal muscle relaxants using rota-rod apparatus.

e) Effect of drugs on locomotor activity using actophotometer.

f) Anticonvulsant effect of drugs by MES and PTZ method.

g) Study of local anesthetics by different method

RECOMMENDED BOOKS:

1. Padmaja Uday kumar - Pharmacology for Dental & Allied Health Sciences - 4th edition, 2017.
2. Joginder Singh Pathania, Rupendra Kumar Bharti, Vikas Sood-Textbook of Pharmacology for Paramedical Students 2019
3. KD Tripathi- Essentials of Pharmacology - 8th edition, 2018.
4. HL Sharma & KK Sharma - Principles of Pharmacology - 3rd edition, 2017.

MEDICAL LAW/ ETHICS AND MEDICAL RECORDS

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

Learning Objective:

1. To understand the principles of medical law, ethics, and professional conduct in healthcare practice.
2. To study patient rights, informed consent, confidentiality, and medico-legal responsibilities.
3. To gain knowledge of medical records management, documentation systems, and legal aspects of record keeping.
4. To explore public health ethics, resource allocation, and contemporary ethical issues in healthcare.

Learning Outcome:

1. Explain legal and ethical principles governing medical practice and healthcare delivery.
2. Apply concepts of patient rights, informed consent, and confidentiality in clinical and public health settings.
3. Demonstrate effective medical record documentation, coding, and audit practices in compliance with legal standards.
4. Analyze ethical dilemmas and make informed decisions balancing individual, community, and professional responsibilities.

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 Beath Promotion and Disease Prevention

RECOMMENDED BOOKS:

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

ECG AND HOLTER MONITORING

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

COURSE OBJECTIVES:

1. To familiarize and introduce students to intense anatomical features of the heart and physiological changes during various pathological conditions.
2. To provide an understanding of certain conditions involving the dynamics of cardiac physiology.

Learning Outcome:

1. Interpret normal and abnormal ECG patterns, including waves, intervals, axis, rate, and rhythm.
2. Identify ECG changes associated with cardiac conditions such as myocardial infarction, angina, chamber enlargement, and hypertrophy.
3. Analyze and differentiate various arrhythmias, conduction abnormalities, and bundle branch blocks using ECG findings.
4. Demonstrate practical skills in ECG lead placement, machine handling, and basic interpretation of Holter monitoring data.

UNIT I:

ECG- Basic principles –The electrocardiographic paper; amplitude, frequency, rate & rhythm, the electrical field of heart, the leads; standard limb leads; precordial leads, the basic ECG deflections; the normal P wave, QRS complex, the genesis of QRS complex, transition zone, T wave, U wave, Segments and intervals of waves, rotation of heart, electrical Axis

ECG in CAD – Myocardial infarction, types of MI, STEMI, NSTEMI, ischemic Acuteness score, Localisation of MI, wellen's syndrome

UNIT II:

ECG in Angina -angina syndromes- stable angina, unstable angina, prinzmetal angina.

ECG in Bundle branch blocks- Right bundle branch blocks, left bundle branch blocks, fascicular blocks.

UNIT III:

Chamber enlargement – left atrial Enlargement, Right atrial enlargement **Hypertrophy-** Right ventricular hypertrophy, Left ventricular hypertrophy

UNIT IV:

Arrhythmias: Atrial arrhythmia- Atrial fibrillation, Atrial flutter, Atrial Premature complex, atrial Tachycardia and Supraventricular tachycardia.

Ventricular Arrhythmias- Atrial fibrillation, Atrial flutter, Atrial Premature complex, atrial Tachycardia, Brugada criteria.

AV nodal arrhythmias, Pacemaker rhythm

UNIT V:

ECG in miscellaneous conditions: cardiomyopathies, Pericarditis, Myocarditis, pulmonary thromboembolism, ECG in electrolyte imbalance

Brugada syndrome, Basics of Holter test- indications and interpretation.

PRACTICALS:

Machine setting and patient positioning ECG lead placement

ECG interpretation (identifying deflection, heart rate, rhythm, electrical axis deviation)

ECG in coronary artery disease

ECG in chamber abnormalities (bundle branch blocks, ventricular hypertrophy, atrial enlargement) ECG in conduction abnormalities

REFERENCES:

1. An introduction to electrocardiography – Leoschamroth, 8th edition.

2. The ECG made easy John R Hampton 8th edition

TMT AND ITS CLINICAL APPLICATIONS

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

Learning Objective:

1. To understand the principles, types, and safety aspects of treadmill (TMT) equipment and exercise.
2. To study the physiological and biomechanical responses during treadmill exercise.
3. To gain knowledge of treadmill stress testing protocols, indications, contraindications, and ECG monitoring.
4. To explore the clinical applications of treadmill testing in cardiopulmonary assessment, rehabilitation, and fitness training.

Learning Outcome:

1. Explain the principles and functioning of treadmill systems and apply safety precautions during testing.
2. Analyze cardiopulmonary and biomechanical responses to treadmill exercise.
3. Perform and interpret treadmill stress tests using standard protocols such as Bruce and Balke.
4. Apply treadmill-based assessment and training in clinical rehabilitation, sports, and fitness settings

1. Introduction to Treadmills: Types of treadmills: Manual vs. Motorized; Components and specifications; Safety features and precautions
2. Biomechanics and Physiology of Treadmill Exercise: Gait analysis on treadmill vs. overground; Cardiopulmonary response to treadmill activity; Muscle recruitment and joint kinetics
3. Treadmill in Cardiopulmonary Assessment: Treadmill stress testing protocols (e.g., Bruce, Balke, Naughton); Indications and contraindications; ECG monitoring and interpretation; VO_2 max and submaximal testing
4. Treadmill in Rehabilitation: Cardiac, Orthopedic, and neurological Rehabilitation
5. Treadmill in Sports and Fitness: Treadmill training for athletes; Interval and incline training; Performance tracking and biomechanical feedback
6. Clinical Case Studies and Practical Applications: Case-based learning: Assessment, protocol design, and outcome evaluation; Hands-on training with treadmill systems; Troubleshooting and maintenance

REFERENCE BOOKS:

1. Essentials of Cardiopulmonary Exercise Testing by Kerry J. Naismith, William D. McArdle
2. Gait Analysis: Normal and Pathological Function – Perry & Burnfield
3. Clinical Exercise Physiology by Ehrman et al.
4. Exercise Testing and Prescription: A Health-Related Approach by David C. Nieman
5. ACSM's Guidelines for Exercise Testing and Prescription (American College of Sports Medicine (ACSM))

CLINICAL POSTINGS I

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

Learning Objective:

1. To provide hands-on clinical exposure in cardiac diagnostic areas such as ECG, TMT, Holter monitoring, wards, and ICUs.
2. To understand anatomical and physiological aspects of the cardiovascular system through demonstrations and clinical observation.
3. To develop skills in ECG recording, interpretation, and identification of common cardiac abnormalities.
4. To enhance clinical reasoning through case discussions, seminars, and patient-based learning.

Learning Outcome:

1. Demonstrate practical skills in ECG lead placement, recording, and basic interpretation in clinical settings.
2. Identify and interpret common ECG changes in conditions such as coronary artery disease, arrhythmias, and electrolyte imbalance.
3. Correlate clinical findings with anatomical and physiological concepts of the cardiovascular system.
4. Exhibit professional behavior, maintain clinical records, and effectively participate in case discussions and patient care activities.

Demonstration of anatomical features through cadaver heart.

Demonstration of coronary arteries and their location.

Demonstration of Auscultation in heart sounds.

Physiology of Cardiovascular system

Introduction and interpretation of ECG in coronary artery

disease.

ECG in electrolyte imbalance, ECG in arrhythmia

Case Seminars

Hands on practice on ECG

Students are posted in the following departments,

ECG, TMT &Holter Monitoring, Wards, ICU's

Assessment Components:

- Logbook Evaluation
- Viva Voce / Case Discussion
- Practical Skills Check
- Clinical Observation Report

SOFT SKILLS DEVELOPMENT

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

COURSE OBJECTIVES:

- By the end of the course, students will:
- Improve their communication and interpersonal skills.
- Develop emotional intelligence (EQ) and conflict resolution strategies.
- Enhance their ability to work in teams and exhibit leadership qualities.
- Gain confidence in public speaking and professional writing.
- Master time management and personal organization strategies.

Learning Outcome:

1. Demonstrate effective verbal, non-verbal, and written communication skills in academic and professional settings.
2. Apply emotional intelligence and conflict resolution strategies to manage interpersonal relationships and workplace challenges.
3. Exhibit teamwork, leadership qualities, and collaborative skills in group activities and projects.
4. Utilize time management, organization, and public speaking skills to enhance personal productivity and professional performance.

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

HEALTHCARE ADMINISTRATION

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

Learning Objective

1. To understand the structure and functions of healthcare systems and organizations.
2. To learn principles of hospital administration and management practices.
3. To develop knowledge of healthcare quality and accreditation systems.
4. To understand human resource and financial management in healthcare institutions.
5. To gain knowledge of healthcare information systems, ethics, and legal responsibilities.

Learning Outcomes

1. Describe healthcare delivery systems and hospital organizational structures.
2. Apply management principles in healthcare administration and decision-making.
3. Explain quality assurance, patient safety, and accreditation standards in healthcare.
4. Demonstrate understanding of human resource and financial management concepts.
5. Interpret healthcare information systems and legal and ethical healthcare practices.

Theory Syllabus

UNIT I: INTRODUCTION TO HEALTHCARE ADMINISTRATION AND HEALTHCARE SYSTEMS (12 HRS)

- Concept, scope and importance of healthcare administration
- Evolution of healthcare services
- Healthcare delivery systems in India
- Public and private healthcare sectors
- Levels of healthcare: Primary, Secondary and Tertiary care
- Organizational structure of hospitals
- Departments and functions of hospitals
- Role of administrators in healthcare organizations
- Healthcare team and interdisciplinary coordination

UNIT II: PRINCIPLES OF HOSPITAL ADMINISTRATION AND MANAGEMENT (12 HRS)

- Principles and functions of management
- Planning, organizing, directing and controlling
- Leadership and decision making
- Communication in healthcare organizations
- Hospital administration and departmental management
- Time management and conflict management
- Materials management in hospitals
- Inventory control and supply chain concepts

UNIT III: HEALTHCARE QUALITY MANAGEMENT AND ACCREDITATION (12 HRS)

- Concepts of quality in healthcare
- Quality assurance and quality improvement
- Indicators of healthcare quality
- Total Quality Management (TQM)
- Patient safety principles
- Accreditation systems in healthcare
- National Accreditation Board for Hospitals (NABH) standards
- Biomedical equipment quality management concepts

- Infection control and risk management

UNIT IV: HUMAN RESOURCE AND FINANCIAL MANAGEMENT IN HEALTHCARE (12 HRS)

- Human resource management in hospitals
- Recruitment and staffing
- Training and performance appraisal
- Staff welfare and motivation
- Healthcare budgeting
- Hospital financial management basics
- Sources of hospital finance
- Cost concepts in healthcare services
- Resource allocation and utilization

UNIT V: HEALTHCARE INFORMATION SYSTEMS, LEGAL AND ETHICAL ISSUES (12 HRS)

- Medical records and documentation systems
- Electronic Health Records (EHR)
- Hospital Information Systems (HIS)
- Telemedicine and digital healthcare
- Health statistics and reporting systems
- Legal aspects in healthcare administration
- Patient rights and responsibilities
- Medical ethics and professional conduct
- Biomedical waste management regulations

AI in Healthcare: Foundation

Category: Skill Enhancement Course (SEC) | **L-T-P:** 1-0-0 | **Credits:** 1

Course Objectives

- · Explain fundamental artificial intelligence concepts, machine learning principles, and health data types without complex mathematics.
- · Identify and examine major clinical, diagnostic, public health, and operational AI use cases across the healthcare ecosystem.
- · Evaluate AI performance metrics, clinical validation strategies, algorithmic bias, and limitations of medical AI tools.
- · Apply ethical, legal, regulatory, and human-in-the-loop principles to ensure patient safety and privacy in AI deployment.

- · Demonstrate practical competency with no-code AI platforms to formulate a realistic solution for a discipline-specific healthcare challenge.

Course Outcomes: On completion, students will be able to:

- · **CO1:** Explain core AI concepts (machine learning, deep learning, NLP, generative AI) and their applications across healthcare systems in plain language.
- · **CO2:** Identify and describe major healthcare use cases of AI, including diagnostics, clinical decision support, drug discovery, public health surveillance, and hospital operations.
- · **CO3:** Critically evaluate AI tools by interpreting performance measures (accuracy, sensitivity, specificity) and recognizing bias and data-quality limitations.
- · **CO4:** Apply ethical, legal, and regulatory principles (privacy, consent, fairness, accountability, transparency) to healthcare AI implementation.
- · **CO5:** Use no-code AI tools responsibly to design and propose realistic AI solutions for discipline-specific healthcare challenges.

Graduate Attributes Addressed: GA1 (Disciplinary & Interdisciplinary Knowledge), GA2 (Critical Thinking & Problem Solving), GA3 (Digital & Technological Literacy), GA5 (Effective Communication), GA7 (Ethical Reasoning & Professional Integrity), GA9 (Entrepreneurship & Innovation Mindset), GA10 (Lifelong Learning & Self-Directed Growth)

Unit I: Introduction to AI and Health Data

- · Fundamental definitions and scope: What AI is and isn't; distinguishing AI, Machine Learning (ML), and Deep Learning (DL)
- · Basic principles of how machines learn patterns from data without advanced mathematics
- · Structure and taxonomy of health data: Electronic Health Records (EHR), medical imaging, genomics, and wearable sensor streams
- · Health data quality, data curation, and the principle of "garbage in, garbage out" in healthcare algorithms
- · **Practical/Hands-on Session:** Building and training a simple medical/healthcare image classifier using no-code platforms (e.g., Teachable Machine)

Unit II: AI Applications Across Healthcare Domains

- · Medical imaging applications in radiology, digital pathology, and ophthalmology
- · Clinical Decision Support Systems (CDSS), symptom checkers, and patient risk prediction models
- · Natural Language Processing (NLP) for unstructured clinical notes, voice recognition, and EHR documentation
- · Generative AI, LLMs, drug discovery workflows, public health surveillance, hospital operations, and AI-enabled telemedicine

- · **Practical/Case Demo Session:** Case demonstrations and critical group discussion on real-world AI deployment in clinical settings

Unit III: Evaluating AI Performance, Bias, and Validation

- · Interpreting performance metrics in plain clinical terms: accuracy, sensitivity, specificity, and false positives/negatives
- · Understanding overfitting, model generalizability across diverse patient populations, and performance degradation
- · Clinical validation frameworks, clinical trials for AI algorithms, and black-box explainability/interpretability
- · Identifying algorithmic bias, data representation gaps, and evaluating fitness-for-purpose
- · **Practical/Tutorial Session:** Critical appraisal exercise evaluating and critiquing a published AI tool's clinical claims

Unit IV: Ethics, Law, and Healthcare AI Governance

- · Patient data privacy, consent frameworks, and regulatory awareness (HIPAA, GDPR, and India's DPDP Act)
- · Algorithmic fairness, health equity, and preventing bias against vulnerable patient demographics
- · Clinical liability, accountability when AI systems err, and Software as a Medical Device (SaMD) regulatory oversight
- · Human-in-the-loop principles and maintaining practitioner oversight in automated healthcare decision-making
- · **Practical/Interactive Session:** Ethical dilemma role-play and decision-making scenario analysis

Unit V: Responsible Practice and Capstone Project

- · Prompt engineering techniques for generative AI tools (e.g., ChatGPT, Claude) in clinical and academic contexts
- · Managing AI hallucinations, fact-verification protocols, and ethical academic/professional use
- · Tracking fast-moving AI developments and future trajectories in medical technology
- · **Practical/Capstone Presentation:** Group formulation, design pitch, and presentation proposing a realistic AI solution to a domain-specific healthcare problem

Recommended Readings

Key Textbooks & Reference Books

1. **Topol, E.** (2019). *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*. Basic Books.
2. **Bohr, A., & Memarzadeh, K.** (Eds.). (2020). *Artificial Intelligence in Healthcare*. Academic Press.

3. **Agrawal, A., Gans, J., & Goldfarb, A.** (2018). *Prediction Machines: The Simple Economics of Artificial Intelligence*. Harvard Business Review Press.

Regulatory Reports & Ethical Guidelines

1. **World Health Organization.** (2021). *Ethics and governance of artificial intelligence for health: WHO guidance*. Geneva: World Health Organization.
2. **Ministry of Law and Justice, Government of India.** (2023). *The Digital Personal Data Protection Act, 2023 (DPDP Act)*. Gazette of India.
3. **U.S. Food and Drug Administration (FDA).** (2021). *Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD) Action Plan*.

Online Interactive & No-Code Resources

1. **Google Teachable Machine:**
   `[https://teachablemachine.withgoogle.com/](https://teachablemachine.withgoogle.com/)`
2. **Orange Data Mining (Visual Programming & Interactive Workflows):**
   `[https://orangedatamining.com/](https://orangedatamining.com/)`
3. **WHO / ITU Focus Group on Artificial Intelligence for Health (FG-AI4H) Resources:**
   `[https://www.who.int/initiatives/cih](https://www.who.int/initiatives/cih)`

II year IV semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	MC		Ultrasound physics and Doppler Principles	2	-	2	3
2	MC		Congenital Heart Disease I	2	-	2	3
3	MC		Basics of Echocardiography and cardiac pacemakers	2	-	2	3
4	SI		Clinical Postings - II	-	-	14	7
5	VAC		Health and Wellbeing	1	-	-	1
6	MS		Medical Coding	1	-	4	3
TOTAL				**8**	**-**	**24**	**20**
TOTAL CONTACT HOURS				**32**			

SEMESTER IV

ULTRASOUND PHYSICS AND DOPPLER PRINCIPLES

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

COURSE OBJECTIVES:

1. To understand the Physics and working principle under Ultrasound Instrument for better operation.
2. To make students analyze the working of the Ultrasound and troubleshoot on demand.

Learning Outcome:

1. Explain the physical principles of ultrasound, including wave propagation, tissue interaction, and image formation.
2. Differentiate types of transducers, display modes, and describe their applications in diagnostic imaging.
3. Analyze Doppler principles and interpret Doppler findings in clinical conditions, including blood flow and regurgitation.
4. Demonstrate basic operational skills of ultrasound equipment, including machine settings, image optimization, and identification of artifacts.

UNIT I:

Basics of Ultrasound & sound waves, propagation of ultrasound wave, properties of ultrasound, and interaction of Ultrasound with tissue: reflection, refraction, attenuation, scattering, acoustic impedances of media, specular and scattered echoes, image properties in ultrasound: Hyperechoic, hypoechoic, Anechoic, Clinical applications and Limitations of ultrasound

imaging.

UNIT II:

Transducers and the Production of Ultrasound Beams: Transducer design, types of transducers, high and low frequency transducers, piezoelectric effect, acoustic absorber, matching layer, pulse characteristics: resonant and non-resonant transducers, focal zone grating lobes and side lobes. Frensel and Fraunhofer zone, Q-factor, Pulse Repetition Frequency (PRF). Phased array transducer and linear array transducer

UNIT III:

Display modes: A-mode, B- mode, TM- mode and grey scale imaging. Principles of M-mode and Two-dimensional Echocardiography Components of echo machine, their controls and the protocols for maintaining the equipment.

Image quality in Ultrasound. Artefacts and its types in ultrasound.

UNIT IV:

Doppler instrumentation- doppler effect, doppler shift frequency, doppler equation, doppler

angle. Continuous and pulsed wave doppler: Applications and limitations Colour Flow Imaging: Applications and limitations, aliasing, Nyquist limit

Assessing severity of regurgitations, limitations of color flow, 'billiard ball effect', Proximal Isovelocity Surface Area (PISA), Tissue Doppler imaging and 3D echocardiograph

UNIT V:

The role of ultrasound in Transesophageal Echocardiography, Cardiac dysynchrony and Dobutamine Stress Echocardiography, Contrast Enhanced Ultrasound imaging, Ultrasound-guided interventions & procedures.

PRACTICALS:

Ultrasound machine and its components

Types of Transducers and its key features

Protocol for maintenance and upkeep of the equipment Machine

settings, controls and parameters

Role of echocardiography in Transesophageal Echocardiography and Dobutamine stress Echo

REFERENCES:

1. The physics of Radiology and imaging- K Thayalan, first edition:2014, Jaypee Brothers medical publishers (P) LTD.

2. The Washington manual of echocardiography- Wolters Kluwer, Lippincott Williams & Wilkins

CONGENITAL HEART DISEASE I

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

COURSE OBJECTIVE:

1. To acquire basic knowledge about embryology and formation of Heart tube.
2. To understand and interpret the occurrence of each congenital heart disease and their pathogenesis.

Learning Outcome:

1. Explain the embryological basis of normal and abnormal cardiac development leading to congenital heart diseases.
2. Describe fetal and postnatal circulation and correlate them with congenital cardiac abnormalities.
3. Identify and differentiate various acyanotic congenital heart diseases such as ASD, VSD, PDA, CoA, and AVSD.
4. Analyze clinical presentation and outline appropriate management strategies for common congenital heart conditions.

UNIT 1:

Embryology of heart

Vasculogenesis, angiogenesis, Formation of heart tube, cardiac looping, fate of venous sinosus, formation of cardiac septum, formation of pulmonary veins, formation of great vessels, embryology of conducting system.

UNIT 2:

Monozygotic and dizygotic twins, teratogens and birth defects

Fetal circulation, postnatal changes in circulation and congenital heart diseases.

Respiration, Classification of congenital heart diseases.

UNIT 3:

Atrial septal defect- types, causes, management- pharmacological and surgical Other acyanotic diseases

Acyanotic congenital heart disease – Ventricular septal defect, types, management, pharmacological and surgical.

UNIT 4:

Acyanotic heart diseases

PDA – Embryology, pathophysiology, hemodynamic classification, krichenko Classification

UNIT 5:

Co- A - types based on location, associated anomalies, management and surgical procedures.

AVSD – types of AVSD, associated anomalies, down syndrome, Management and surgical procedures

PRACTICALS:

- Study of normal heart anatomy using models.
- Basic understanding of heart development stages.
- Demonstration of fetal and postnatal circulation.
- Identification of ASD, VSD, PDA, CoA, and AVSD.
- Basic interpretation of echo images.
- Case discussion on common congenital heart diseases.
- Correlation of defects with symptoms.
- Observation of echo procedures.
- Overview of treatment methods (medical and surgical).

Reference books:

1. A Comprehensive Approach to Congenital Heart Diseases, 2nd edition, IB Vijayalakshmi
2. Clinical management of congenital heart diseases, Douglas S Moodie
3. Inderbir singh's, Human embryology, 11th edition

BASICS OF ECHOCARDIOGRAPHY AND CARDIAC PACEMAKERS

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

COURSE OBJECTIVES:

1. To acquire basic knowledge about the components and working of Cardiac pacemakers.
2. To introduce the concepts of basic echocardiographic views.

Learning Outcome:

1. Explain the principles, components, and functioning of temporary and permanent cardiac pacemakers, including their indications and modes.
2. Describe the basic echocardiographic views, modalities, and techniques used in cardiac imaging.
3. Identify and assess cardiac structures and chamber quantification using echocardiography.
4. Demonstrate practical understanding of pacemaker functioning, defibrillator operation, and basic echocardiographic procedures in clinical settings.

UNIT 1:

Basic concepts of pacemaker *Introduction over-view Pacemaker circuits, mode*

Pacing leads, electrical aspects of pacing, Power source, connections, Ohms law applications

PG circuits

UNIT 2:

Temporary pacemakers: Indication**,** components**,** modes, Procedures**,** pacing methods**,** lead testing, trouble-shootings**,** Complication

Permanent Pacemakers: Introduction, Cardiac hemodynamics, Basic components,

Classifications (NBG code), Indications, Physiology of cardiac pacing, Lead thresholds,

Factors affecting threshold

UNIT 3:

Implantable cardioverter Defibrillators Introduction: Sudden cardiac death, Indications
Contraindications

System components and functions

Implantation and testing

procedures

Device programming for arrhythmia recognition
Management and follow-up

UNIT 4:

Echocardiographic views and modalities

Acquisition techniques of Trans -Thoracic views, Acquisition techniques of Aortic arch view,

Acquisition techniques of subcoastal view

Modalities of Echo

Conventional echo, Doppler echo, Basics of stress echo, epicardial imaging,

intracardiac echocardiography- indications and contraindications.

UNIT 5:

Quantification of Right atrium, left atrium, Right ventricle, Left ventricle, Right ventricle.
- Assessment of temporary, permanent pacemaker in echo.

PRACTICALS:

Patient positioning and image viewing Identifying segmental analysis
Advanced Cardiac Life support algorithm

Types of pacemakers, lead placements and modes.

Positioning and steps involved in Defibrillator operation

Reference books:

Cardiac catheterization: William Grossman, Eric Topols, Morten B Kern

The echo manual- jae K. Oh, James B. Seward, A. Jamil Tajik

CLINICAL POSTINGS – II

L/T/P/C: -/-/14/7

Learning Objective:

1. To provide advanced clinical exposure in echocardiography, cardiac care units, and wards.
2. To develop skills in handling cardiac equipment, including echocardiography machines and pacemakers.
3. To understand patient care protocols, instrumentation sterilization, and monitoring of critically ill cardiac patients.
4. To enhance clinical competence through case presentations, logbook maintenance, and hands-on practice.

Learning Outcome:

1. Demonstrate proficiency in handling echocardiography equipment, patient positioning, and acquiring basic echo views.
2. Identify and assist in the management of cardiac patients, including post-PTCA and critically ill cases.
3. Apply knowledge of pacemakers, sterilization techniques, and clinical protocols in real-time settings.
4. Exhibit clinical reasoning, documentation skills, and effective participation in case discussions and presentations

Theory and Practical

Instrumentation handling and sterilization techniques. Cardiac pacemaker- types
Machine settings & patient positioning
Clinical practice and observation of critically ill cardiac patients Echo handling of post PTCA patients in ICCU
Observation and recording of Log and patient details Hands on practice of echo views.
Case presentations

Students are posted in the following departments,

ECHO, Wards, ICU's

Assessment Components:

- Logbook Evaluation
- Viva Voce / Case Discussion
- Practical Skills Check
- Clinical Observation Report

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:

Understand the physical, mental, and social determinants of health.
Apply strategies for improving and maintaining physical health.
Recognize the importance of mental well-being and stress management techniques.
Understand the relationship between nutrition and overall health.
Develop practical skills for managing time, stress, and emotions.

Cultivate a balanced approach to achieving long-term health and well-being.

Learning Outcome:

1. Explain the multidimensional aspects of health, including physical, mental, and social well-being.
2. Apply principles of nutrition, physical activity, and healthy lifestyle choices to promote overall health.
3. Demonstrate effective stress management, emotional regulation, and mental well-being strategies.
4. Develop and maintain healthy habits, including proper sleep, social relationships, and prevention of lifestyle-related diseases.

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

MEDICAL CODING

L/T/P/C: 1/-/4/3

Learning Objectives

After completion of this course, the student will be able to:

1. Understand the fundamentals, concepts, and importance of medical coding in healthcare systems.
2. Identify medical terminologies, disease classifications, and coding standards used in clinical documentation.
3. Develop knowledge regarding diagnostic and procedural coding systems used in healthcare practice.
4. Understand healthcare reimbursement, insurance claims, and compliance related to coding.
5. Apply coding principles for accurate medical record documentation and billing processes.

Learning Outcomes

At the end of the course, the student will be able to:

1. Explain the principles, scope, and significance of medical coding in healthcare.
2. Interpret medical terminologies, anatomy, physiology, and disease classifications for

coding purposes.
3. Apply diagnostic and procedural coding systems accurately in clinical cases.
4. Demonstrate understanding of healthcare reimbursement, insurance, and coding compliance standards.
5. Perform coding and documentation processes with accuracy and ethical responsibility.

Theory Syllabus

Unit I: Introduction to Medical Coding

- Definition, scope, and importance of medical coding
- History and evolution of medical coding systems
- Role of medical coders in healthcare organizations
- Healthcare documentation and medical records
- Ethics, confidentiality, and legal aspects of coding

Unit II: Medical Terminology and Basic Sciences for Coding

- Basics of medical terminology, prefixes, suffixes, and abbreviations
- Fundamentals of anatomy and physiology for coding
- Disease processes and clinical terminology
- Diagnostic procedures and laboratory terminology
- Pharmacological terminology relevant to coding

Unit III: Coding Systems and Classification

- Introduction to diagnostic and procedural coding systems
- Disease classification and coding standards
- Diagnostic coding principles and guidelines
- Procedure coding and documentation requirements
- Coding conventions, symbols, and modifiers

Unit IV: Healthcare Reimbursement and Compliance

- Basics of healthcare insurance and reimbursement systems
- Claims processing and billing cycle
- Documentation improvement and coding accuracy
- Compliance, auditing, and quality assurance in coding
- Fraud, abuse prevention, and legal regulations

Unit V: Applications of Medical Coding

- Coding of diseases and medical procedures in different specialties
- Inpatient and outpatient coding principles
- Case-based coding applications and exercises
- Electronic health records and coding software
- Career opportunities and professional standards in medical coding

Practical Syllabus

1. Identification and interpretation of medical terminologies and abbreviations.
2. Practice in anatomy and disease-based coding exercises.
3. Demonstration of diagnostic coding using standard classification systems.
4. Practice of procedural coding from clinical case records.
5. Coding of inpatient and outpatient medical records.
6. Preparation and verification of insurance claim documentation.
7. Use of coding manuals and electronic coding software.
8. Case study analysis for coding accuracy and compliance.
9. Practice in coding audits and error identification.
10. Preparation of coding reports and medical documentation review.

Recommended Books

1. ICD-10-CM Expert for Physicians
2. Medical Terminology for Health Professions
3. Understanding Health Insurance: A Guide to Billing and Reimbursement

4. Step-by-Step Medical Coding
5. Medical Coding Training: CPC Practice Exam

III year – V semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	MC		Clinical applications of Echo	2	-	2	3
2	MC		Myocardial, pericardial, Valvular and Ischemic Heart Diseases	2	-	2	3
3	MS		Congenital heart disease - II	2	-	2	3
4	SEC		Quality Assurance in Cardiology Technology	2	-	-	2
5	SI		Clinical Postings - III	-	-	14	7
6	VAC		Interpersonal Communication	1	-	-	1
7	MS		Emerging Healthcare Technologies	1	-	2	2
TOTAL				10	--	22	21
TOTAL CONTACT HOURS				32			

SEMESTER V

CLINICAL APPLICATIONS OF ECHO

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

COURSE OBJECTIVE:

1. Understanding Basic Principles and the different modes of echocardiography.
2. Develop skills in interpreting echocardiographic images and data.

Learning Outcome:

1. Interpret echocardiographic findings for cardiac chamber quantification and assessment of cardiomyopathies and pericardial diseases.
2. Analyze echocardiographic features of valvular heart diseases, coronary artery disease, and prosthetic valve function.
3. Apply advanced echocardiographic techniques such as transesophageal echo, Doppler imaging, strain analysis, and 3D echocardiography in clinical evaluation.
4. Evaluate stress echocardiography and contrast studies for diagnosis of cardiac conditions and demonstrate practical skills in echo image acquisition and analysis.

UNIT 1

Chamber quantification – RA, RV LA, LV

Assessment of ECHO in ischemic cardiomyopathy and non-ischemic cardiomyopathy

Assessment of pericardial disease in echocardiography.

UNIT II

Assessment of ECHO in CAD – systolic and diastolic function

Echo in rheumatic heart disease –Echo in mitral stenosis, mitral regurgitation, aortic stenosis, aortic regurgitation, pulmonary hypertension.

Prosthetic valves and its functional assessment in echo.

UNIT III

Introduction of 3D Echocardiogram and its application, Transesophageal echocardiography- indication, procedure, usefulness and complications and its management.

Tissue doppler, strain, strain rate and velocity vector imaging, studying

UNIT IV

Stress echocardiography – indications, contraindications, mechanism of diagnosis, applications and complications,

Chemically induced Dobutamine stress test – indications, contraindications, mechanism of diagnosis, applications and complications. Vasodilator (dipyridamole or Adenosine) Stress test – indications, contraindications, mechanism of diagnosis, applications and complication.

UNIT V

Dobutamine stress echocardiogram in aortic stenosis - indications, contraindications, mechanism of diagnosis, applications and complication.

Myocardial contrast study, bubble saline contrast – indications, contraindications, mechanism of diagnosis, applications and complications.

PRACTICAL

1. Analysis of Echocardiographic views
2. Basic views virtual representation
3. Techniques for Echo view placement and handling of probe
4. Case scenarios for Pathological assessment

REFERENCE BOOKS

1. 7th South Asian edition of Feigenbaum's echocardiography
2. 2nd edition Washington manual of echo cardiography.

MYOCARDIAL, PERICARDIAL, VALVULAR AND ISCHEMIC HEART DISEASES

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

COURSE OBJECTIVES:

1. Develop a detailed understanding of the pathophysiology, clinical presentation, and diagnostic techniques
2. Learn the principles of medical, interventional, and surgical management for the cardiac Conditions.

Learning Outcome:

1. Explain the pathophysiology, clinical features, and diagnostic approaches of ischemic, myocardial, pericardial, and valvular heart diseases.
2. Differentiate various cardiac conditions including coronary artery disease, cardiomyopathies, pericardial disorders, and heart failure.
3. Analyze diagnostic findings and correlate them with clinical presentations using tools such as echocardiography and other investigations.
4. Outline appropriate medical, interventional, and surgical management strategies for common cardiovascular diseases.

UNIT I

Coronary Artery Diseases-Causes, Pathophysiology and clinical prevention, Angina, unstable angina and Prinzmetal angina, Myocardial Infarction - Types and locations of Infarction, Treatment of Acute Infarction -Thrombolytic therapy, Complications of Myocardial Infarction and their Management.

Rheumatic Heart Diseases- Etiology, Pathophysiology, diagnosis & management, Structure of Valves and its function.

UNIT II

Myocardial Diseases-Myocarditis- Acute and Chronic, Dilated Cardiomyopathy, Restrictive Cardiomyopathy, Hypertrophic Cardiomyopathy, Masses and tumors of the heart; Constrictive Pericarditis, Pericardial effusion, Cardiac tamponade

UNIT III

Infective Endocarditis, Pulmonary Artery Hypertension, Aortic Diseases - Aneurysm, dissection, DeBakey and Standford classification; Types of Heart failure & general Management, Acute circulatory failure (shock) and its types.

UNIT IV

Mitral Stenosis – anatomy, pathophysiology, Treatment, other diagnosis
Mitral Regurgitation – pathophysiology, Treatment & diagnosis
Tricuspid Stenosis- anatomy, pathophysiology, Treatment, other diagnosis Tricuspid Regurgitation– pathophysiology, Treatment & diagnosis.

UNIT V

Aortic Stenosis– Anatomy, BAV, Classification, Pathophysiology, Treatment, Other Diagnosis
Aortic Regurgitation – Pathophysiology, Treatment, Other Diagnosis
Pulmonary Stenosis–Anatomy, Classification, Pathophysiology, Treatment, Other Diagnosis,
Pulmonary Regurgitation– Pathophysiology, Treatment & Diagnosis

PRACTICAL:

SPOTTERS & CASE SCENARIOS:

1. Ischemic Heart Diseases
2. Myo-Pericardial Diseases
3. Diseases of Aorta
4. Valvular Heart Diseases.
5. Basic Echo assessment.

REFERENCE BOOKS:

1. Textbook of Pathology, Harsh Mohan, Sixth edition, Jaypee Brothers medical Publishers (P) Ltd, Puducherry, 2010
2. Textbook of Pathology, B N Dutta, Second edition, Jaypee Brothers medical Publishers (P) Ltd, Puducherry, 2004
3. Comprehensive Cardiology, S Uma Devi, First Edition, Jaypee Brothers medical publishers.

CONGENITAL HEART DISEASE II

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

COURSE OBJECTIVE:

1. Advanced knowledge of the pathophysiology, anatomy, and physiology of complex congenital heart diseases
2. Diagnostic techniques for evaluating congenital heart diseases, including echocardiography, cardiac MRI, CT angiography.

Learning Outcome:

1. Explain the anatomy, pathophysiology, and clinical features of complex congenital heart diseases such as TOF, TGA, TAPVC, and DORV.
2. Interpret diagnostic findings using imaging modalities such as echocardiography, CT angiography, and cardiac MRI.
3. Differentiate various congenital cardiac anomalies and correlate them with their hemodynamic and clinical presentations.
4. Outline appropriate surgical and palliative management procedures for congenital heart diseases and evaluate their outcomes.

UNIT – I

Acyanotic heart diseases - PDA – Pathophysiology, hemodynamic classification, krichenko classification, Treatment and surgical procedures.

Co- A - Types based on location, associated anomalies, Treatment and surgical procedures. AVSD – Types of AVSD, associated anomalies, down syndrome, Treatment and surgical procedures

UNIT – II

Tetralogy of Fallot, Transposition of great arteries-TOF- Characteristics, etiology, developmental defect, absence of pulmonary valve, AP collaterals, associated anomalies, Treatment and surgical procedures

Transposition of the Great Arteries – Pathophysiology, DTGA, LTGA/ CC-TGA, associated malformation, Treatment and surgical procedures. *UNIT – III*

Double outlet right ventricle, Total Anomalous Pulmonary Venous Connection (TAPVC), DORV- Classification, associated anomalies, Treatment and surgical procedures, TAPVC- Classification of TAPVC, pathophysiology, sites of obstruction, associated anomalies and views, Treatment & surgical procedures, complication of surgery.

UNIT – IV

Congenital Valvular heart diseases, miscellaneous diseases-Hypoplastic left heart syndrome, Truncus arteriosus, AP window.

UNIT – V

Palliative procedures, Basic surgical treatments of cardiac diseases

Aorta-pulmonary shunts, PA banding, ASD & VSD closure, TOF repair and arterial switch (Jantene), Rastelli operation, Norwood operation, Glen-shunt and Hemi Fontan & Fontan procedures, pulmonary valvotomy, Co- A repair, LVOT obstruction repair.

PRACTICALS:

SPOTTERS & CASE SCENARIOS:

1. Transposition of great arteries.
2. Tetralogy of Fallot.
3. Patent ductus arteriosus.
4. Coarctation of aorta.

REFERENCE BOOKS:

1. Perloff's clinical recognition of congenital heart diseases, Joseph k Perloff, Ariane J. Marlli, 2012, 6 th edition.

2. Braunwald's heart diseases, A text book of cardiovascular medicine, Bonow, Mann, Zipes, Lippy, 2015, 10 th edition.

3. Comprehensive textbook of echocardiography, Navin C Nandha ,2015, 1st edition

4. Moss and Adam's heart diseases in infants, children and Adolescents including the fetus and young adult, Hugh D. alien, David J Driscoll, Robert E. Shaddy, Timothy F Feltes, copyright 2015, 8 th edition.

QUALITY ASSURANCE IN CARDIOLOGY TECHNOLOGY

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

Learning Objective:

1. To understand the principles, concepts, and importance of quality assurance (QA), quality control (QC), and quality improvement (QI) in cardiology.
2. To gain knowledge of QA practices in cardiac diagnostic modalities such as ECG, echocardiography, TMT, and Holter monitoring.
3. To study quality standards, safety protocols, and regulatory guidelines in cath labs, perfusion, and critical cardiac care.
4. To develop understanding of quality indicators, audits, risk management, and patient safety in cardiology services.

Learning Outcome:

1. Explain the concepts of QA, QC, and QI and their role in ensuring patient safety and quality cardiac care.

2. Apply quality assurance practices in various cardiac diagnostic and therapeutic procedures.
3. Evaluate equipment performance, safety protocols, and adherence to regulatory standards in cardiology settings.
4. Analyze quality indicators, conduct audits, and implement strategies for continuous improvement and risk reduction in healthcare.

Unit I – Introduction to Quality Assurance in Cardiology

- Definition, scope and objectives of quality assurance (QA) in healthcare
- Importance of QA in cardiology technology and patient safety
- Concepts of quality control (QC), quality improvement (QI), and accreditation
- Regulatory bodies and standards: NABH, NABL, JCI, ISO

Unit II – Quality Assurance in Cardiac Diagnostic Modalities

- **Electrocardiography (ECG):** calibration, lead placement accuracy, artifact reduction, machine maintenance
- **Echocardiography:** standardization of image acquisition, machine calibration, inter-observer variability, reproducibility
- **Stress Testing (TMT):** patient safety, monitoring protocols, equipment QA, infection control
- **Holter Monitoring & Ambulatory BP Monitoring:** data accuracy, analysis software reliability

Unit III – Quality Assurance in Cardiac Catheterization Laboratory

QA in invasive procedures: Angiography, Angioplasty, Electrophysiology studies

- Sterility protocols and infection control in Cath Lab
- Radiation safety standards & monitoring (ALARA principle, dosimetry)
- Equipment performance evaluation (pressure transducers, injectors, imaging systems)
- Emergency preparedness & crash cart management

Unit IV – QA in Perfusion & Critical Cardiac Care

- Principles of QA in cardiac perfusion technology (CPB machines, oxygenators, safety alarms)
- ECMO and assist device QA protocols
- ICU and CCU monitoring systems QA (ventilators, defibrillators, infusion pumps)
- Clinical documentation standards, error reduction, and audit process

Unit V – Quality Indicators, Audits & Patient Safety

- Quality indicators in cardiology (outcome measures, complication rates, mortality/morbidity audits)
- Clinical governance, internal & external audits
- Risk management and reporting of adverse cardiac events

- Evidence-based guidelines and standard operating procedures (SOPs)
- Ethical and legal issues in QA
- Continuous professional development and training for QA

Reference Books:

1. Quality Assurance in Healthcare – Avedis Donabedian
2. Quality Management in Healthcare – Connie Borror
3. Cardiac Technology Handbook – K. M. Varghese
4. Echocardiography and Quality Assurance Guidelines – ASE Guidelines

CLINICAL POSTINGS III
L/T/P/C: -/-/14/7

Learning Objective:

1. To provide comprehensive clinical exposure across ECG, TMT, Echocardiography, Cath Lab, wards, and ICU settings.
2. To develop advanced skills in cardiac diagnostic techniques, including echo assessment, ECG interpretation, and stress testing.
3. To understand interventional cardiology procedures such as angiography, angioplasty, pacemaker implantation, and valvular interventions.
4. To enhance clinical decision-making, patient management, and documentation through case-based learning and observation.

Learning Outcome:

1. Demonstrate proficiency in performing and interpreting ECG, echocardiography, and TMT findings in various cardiac conditions.
2. Identify and correlate clinical, imaging, and hemodynamic findings in cardiac diseases including CAD, cardiomyopathies, and congenital heart diseases.
3. Assist and understand interventional procedures such as coronary angiography, angioplasty, pacemaker implantation, and related cardiac interventions.
4. Exhibit strong clinical reasoning, professional behaviour, and effective documentation through case discussions and patient care activities.

Practical Aspects:

Echo: Chamber Assessment, Regional Wall Motion Abnormality (RWMA)

Left Ventricular Systolic Function, Left Ventricular Diastolic Function, Valve Pathology (Mitral, Tricuspid, Aortic, Pulmonary)

Congenital Heart Disease (Cyanotic, Acyanotic) Myopathies, Pericardial Effusion.

ECG-Myocardial Infraction, Disorders of Cardiac Rhythm, Conduction Blocks,

Drug and Electrolyte Effects, Congenital Heart Disease, Cardiac – Implantable

Electronic Devices. ICU-Coronary Artery Disease, Valvular Heart Disease,

Congenital Heart Disease Ischemic Cardiomyopathies, Pericardial, Myocardial

Disease

TMT- Hemodynamics, Protocol, Arrhythmias
Conduction Abnormalities, Myocardial Infraction Cath- Coronary Angiogram, Coronary Angioplasty

Cardiac Pacemaker Implantation, Balloon Valvuloplasty, TAVR, Pericardiocentesis

Students are posted in the following departments,

ECG, TMT, ECHO, CATH LAB, Wards, ICU's

Assessment Components:

- Logbook Evaluation
- Viva Voce / Case Discussion
- Practical Skills Check
- Clinical Observation Report

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

Learning Outcome:

1. Demonstrate effective verbal and non-verbal communication skills in personal and professional interactions.
2. Apply active listening, empathy, and conflict-resolution strategies to enhance interpersonal relationships.
3. Analyze the impact of cultural, gender, and contextual factors on communication and adapt communication styles accordingly.
4. Utilize ethical and appropriate communication techniques, including digital communication, 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

Emerging Healthcare Technologies

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

Learning Objectives

- To introduce students to emerging technologies transforming modern healthcare delivery.
- To develop understanding of digital health, artificial intelligence, robotics, and data-driven healthcare systems.
- To familiarize students with advanced diagnostic, monitoring, and therapeutic technologies.
- To provide practical exposure to healthcare informatics and smart medical devices.
- To promote awareness of ethical, legal, and safety considerations associated with healthcare technologies.

Learning Outcomes

At the end of the course, the student will be able to:

- Describe the role of emerging technologies in healthcare practice.
- Explain the applications of artificial intelligence, robotics, and digital health solutions in patient care.
- Identify the functions of modern diagnostic and monitoring technologies.
- Demonstrate basic competency in the use of healthcare information systems and smart medical devices.
- Discuss the advantages, limitations, and challenges of emerging healthcare technologies.
- Apply ethical, legal, and safety principles related to technology-enabled healthcare.
- Evaluate the impact of technological innovations on healthcare quality, accessibility, and patient outcomes.

Unit I: Introduction to Emerging Healthcare Technologies

- Evolution of healthcare technology
- Digital transformation in healthcare
- Current trends and future directions
- Technology adoption in healthcare settings

Unit II: Digital Health and Telemedicine

- Electronic Health Records (EHR)
- Telemedicine and telehealth services
- Mobile health (mHealth) applications
- Remote patient monitoring systems
- Wearable healthcare devices

Unit III: Artificial Intelligence and Data Analytics

- Introduction to Artificial Intelligence (AI)
- Machine learning applications in healthcare
- Clinical decision support systems
- Big data analytics in healthcare
- Predictive healthcare technologies

Unit IV: Robotics and Automation in Healthcare

- Medical and surgical robotics
- Robotic-assisted procedures
- Automation in hospitals and laboratories
- Rehabilitation and assistive robots
- Future scope of robotics in healthcare

Unit V: Advanced Diagnostic and Therapeutic Technologies

- Point-of-care diagnostic technologies
- Advanced imaging systems
- 3D printing in healthcare
- Virtual Reality (VR) and Augmented Reality (AR)
- Precision and personalized medicine

Unit VI: Smart Healthcare Systems and Future Innovations

- Internet of Medical Things (IoMT)
- Smart hospitals and connected healthcare
- Cloud computing in healthcare
- Cybersecurity and data protection
- Emerging innovations and future healthcare technologies

Practicals

- Demonstration of Electronic Health Record systems
- Use of telemedicine platforms
- Observation of wearable and remote monitoring devices
- Introduction to healthcare data management systems
- Demonstration of AI-enabled healthcare applications
- Observation of robotic healthcare systems

- Familiarization with VR/AR healthcare applications
- Demonstration of smart medical devices and IoMT technologies
- Case studies on emerging healthcare technologies
- Presentation and discussion on recent technological innovations in healthcare

III year – VI semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	MC		Community Medicine	2	-	2	3
2	MC		Research Methodology and Biostatistics	3	-	-	3
3	MS		Cardiac Cath and Intervention	2	-	2	3
4	MC		Arrhythmia Management	2	-	2	3
5	SI		Clinical Postings - IV	-	-	14	7
6	VAC		Art of Being a Better Person	1	-	-	1
7	MS		Management of Medical Emergencies	1	-	2	2
TOTAL				**11**	-	**22**	**22**
TOTAL CONTACT HOURS				**33**			

SEMESTER VI

COMMUNITY MEDICINE

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

COURSE OBJECTIVES:

1. To define Health and understand various concepts of Health
2. To know the Healthcare delivery system in India
3. To know various National Health Programmes of India
4. To have an overview of First Aid Principles and guidelines

Learning Outcome:

1. Explain the concepts, determinants, and dimensions of health and disease, including prevention strategies and epidemiological principles.
2. Analyze the structure and functioning of the healthcare delivery system in India, including primary, secondary, and tertiary care.
3. Identify and evaluate major National Health Programmes and their role in improving community health outcomes.
4. Demonstrate basic first aid skills and apply appropriate interventions in common emergency situations.

Unit I

Concepts & Dimensions of Health-Definition of health; Changing concepts of health-biomedical concept, ecological concept, psycho-social concept and holistic concept; Dimensions of Health – Physical dimension, mental dimension, social dimension etc., Spectrum of Health. Determinants of health & Concepts of Disease Causation-Determinants of Health – Biological determinants, Behavioral and socio-cultural conditions, Environmental & socio-economic conditions; Germ theory of disease; Epidemiological triad; Iceberg phenomenon of disease.

Unit II

Concepts of Prevention of disease -Levels of prevention – Primary prevention, secondary prevention, Tertiary prevention; Modes of intervention – Health promotion, Specific protection, Early diagnosis & treatment, Disability limitation, Rehabilitation. Basic terminologies in healthcare-Definitions of Mortality, Morbidity, Disability, Incidence, Prevalence, Incubation period, Period of communicability, Communicable diseases, non-communicable diseases,

Outbreak, Epidemic, Endemic, Sporadic, Pandemic, Zoonoses, Nosocomial infection, Opportunistic infection, Iatrogenic infection, Immunization.

Healthcare status in India-Common health problems in India – Communicable diseases, non-communicable diseases, MCH problems, Nutritional problems.

Unit III:

Evolution of healthcare delivery systems in India, Health for all; National health policy Health care of the Community-Levels of health care – Primary health care, secondary health care, tertiary health care, Referral system; Primary health care- principles of primary health care, elements of primary health care. Health Care Systems-Structure of health care delivery system in India; Primary health care in India at village level – Village health guides scheme, Local dais, ICDS Scheme, ASHA scheme; MPHS male & female.

Unit IV

National Health Programmes -Introduction; National Vector Borne Disease Control Programme; Revised National Tuberculosis Control Programme; National AIDS Control Programme; Universal Immunization Programme; National Rural Health Mission; Reproductive and Child Health Programme; National Nutritional Anemia Prophylaxis Programme; National Cancer Control Programme;

Unit V

Indigenous system of Medicine in India-AYUSH & role of AYUSH in delivering health care in India;

First aid-Basic principles & general guidelines; first aid in specific situations- Wound, bleeding, fracture, choking, burns, epistaxis, strains and sprain, animal bites (classification, causes and first aid), Cardio- pulmonary resuscitation.

PRACTICALS:

- Measurement of vital signs and BMI
- Health education and communication methods
- Community health and disease survey
- Levels of disease prevention demonstration
- Family health case study
- Visit to PHC/CHC and referral services
- Study of National Health Programmes
- Immunization practices and cold chain
- First aid and CPR training
- AYUSH and community health worker services

Reference Books:

1. Park K. Park's Text book of Preventive and Social Medicine.

27th edition; Banarsidas Bhanot Publishers

2. AH Suryakantha. Textbook of Community Medicine with recent advances.

6th edition; Jaypee publishers

3. Community Medicine simplified – Sreejith P.S Paras publishers 2nd edition.

4. Community Medicine Preparation Manual for Undergraduates – Bhalwar Rajvir, 2nd Edition, Elsevier publishers

RESEARCH METHODOLOGY AND BIOSTATISTICS

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

Learning Objective:

1. To understand fundamental concepts of research methodology, including research design, problem formulation, and hypothesis testing.
2. To develop knowledge of ethical principles and guidelines in conducting biomedical and clinical research.
3. To acquire basic skills in biostatistics, including data collection, analysis, and interpretation.
4. To learn the process of developing a structured research proposal using appropriate sampling and data collection methods.

Learning Outcome:

1. Formulate research problems, objectives, and hypotheses using appropriate research designs and methodologies.
2. Apply ethical principles, including informed consent and data confidentiality, in research practices.
3. Analyze and interpret data using basic biostatistical tools such as measures of central tendency, probability, and graphical representation.
4. Develop and present a complete research proposal incorporating sampling techniques, data collection methods, and analysis plans.

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

- ## 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

- ## 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

- ## 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

- ## 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

- **Types of Data:** Qualitative data; Quantitative data

- ## 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

- 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

- 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:

- Methods in biostatistics by Mahajan
- Research methodology by C R Kothari
- Textbook of biostatistics by Sundar Rao
- Textbook of biostatistics and research methodology by U. Satyanarayana
- Creswell, J.W., & Creswell, J.D. (2023). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches
- Shamoo, A.E., & Resnik, D.B. (2015). Responsible Conduct of Research.
- Creswell, J.W. (2023). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches

CARDIAC CATH AND INTERVENTION

COURSE OBJECTIVES:

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

1. Understanding Cardiac Catheterization and Diagnostic Techniques.

2. Learn the principles and different techniques of Interventional procedures.

Learning Outcome:

1. Demonstrate understanding of cardiac catheterization procedures, including right and left heart catheterization, and appropriate patient selection criteria.
2. Identify and effectively use cath lab equipment, monitoring systems, and interventional hardware while adhering to safety and sterilization protocols.
3. Interpret angiographic images and hemodynamic data to assess coronary and peripheral vascular conditions.
4. Apply knowledge of interventional techniques such as angioplasty,

stent placement, and temporary pacing in clinical scenarios, including recognition of indications, contraindications, and complications.

UNIT 1:

Cath lab-oriented machines-Generation of X- rays and basic physics – Cath lab equipment's Fluoroscopy, Movements of gantry and Cath table Angiographic views and basic maintenance of equipment's Cardiac radiology and radiation safety measures Power injector – Principles- Defibrillators – Intra Aortic balloon pump – Console room techniques.

UNIT 2:

Monitoring system in Cath lab -Monitors-Transducers- ECG-Pulse – Oximetry – NIBP- Noninvasive Blood pressure – Temporary pacemaker- IAP waveforms and recording systems – fluid filled catheter systems, pressure transducers and basic invasive pressure monitoring.

UNIT 3:

Cardiac catheterization Hardware's- Catheters- Used in diagnostic and intervention procedures- Guide wires- Used in various diagnostic and intervention procedures – Sheath indicator – hardware's cleaning and Packing- Techniques of sterilization – Advantages and Disadvantages of each setting up in the cardiac catheterization laboratory for a diagnostic study – Balloon and stents

UNIT 4:

Right heart catheterization, left heart catheterization, Arterial and Venous Access – Radial Artery Catheterization – Femoral artery Catheterization – Venous access- Sheath removal RHC- procedure, Cath position, oximetry at various levels, Angio done & interpretation

LHC – procedure, Cath position, oximetry at various levels, Angio done & interpretation.

UNIT 5:

Coronary Angiogram and Peripheral angiogram-CAG – Procedure, materials used, type and amount of dye used, indications, contraindication and complications, various pictures recorded in various angles and gross interpretation, Peripheral angiogram- procedure, indication and contraindication.

PRACTICALS:

1. Understanding patient selection criteria, including indications and contraindications for cardiac catheterization.
2. Understanding angiography techniques for visualizing coronary anatomy
3. Interpretation of imaging results to guide interventions.
4. Detailed overview of common interventions such as angioplasty, stent placement

REFERENCES BOOKS:

1. Grossman's cardiac Catheterization, Angiographic and interventions, Donald S Baim, 2006, Seventh edition

2. Invasive Cardiology, A Manual for Cath lab, personnel, Sandy Watson and kennath A Gorski, 2011, Third edition

3. Chistens physics of diagnostic radiology, Thomas S Curry III, Robert C Murry Jr, James E Dowdey, 1990, Fourth edition

ARRHYTHMIA MANAGEMENT

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

COURSE OBJECTIVE:

1. Understand the clinical significance of different types of arrhythmias
2. Develop Acute and chronic Arrhythmia Management Skill.

Learning Outcome:

1. Identify and interpret various cardiac arrhythmias using ECG and correlate them with clinical conditions.
2. Demonstrate proficiency in Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) protocols, including CPR and use of AED.
3. Apply appropriate airway management, drug administration, and emergency interventions in acute and chronic arrhythmia cases.
4. Analyze vital parameters and arterial blood gas (ABG) findings to support clinical decision-making in emergency cardiac care**.**

UNIT-I:

Basic life support – Adult, pediatric, pregnancy CPR, Foreign body airway obstruction – Chocking – Adult, Pediatric, pregnancy, Automated electrical defibrillator.

UNIT- II:

ACLS – Cardiac arrest algorithm, post cardiac algorithm, Airway management – OPA, NPA, LMA, Endotracheal Tube, combi tube, Difficult airway intubation.

UNIT –III:

Patient history taking-Insertion techniques, contraindications & indications of Central venous access, intravenous, intramuscular, intraosseous, subcutaneous, defibrillator. Brady arrhythmia, heart block, tachyarrhythmia, stroke, MI.

UNIT –IV:

Arterial blood gas; respiratory acidosis, respiratory alkalosis, metabolic acidosis, metabolic alkalosis, Compensated and uncompensated MUD PILES, Anion gap. Basic first aid – environmental, medical and traumatic emergencies

UNIT –V:

Blood pressure, Pulse oximetry, Temperature, Capnography.

PRACTICALS:

1. Drug administration- [Intravenous, Intramuscular, Subcutaneous].
2. Intubation, CPR techniques in adult, pediatric and pregnant women.
3. How to use AED, ECG interpretation, ABG interpretation. 4.Defibrillation vs cardioversion.

REFERENCES BOOKS:

1. Tintinalli's Emergency Medicine-A Comprehensive Study Guide, 9th Edition; Judith E. Tintinalli Publisher.
2. Nancy Caroline's Emergency Care in the Streets-Volume 1; Nancy L. Caroline publisher.
3. The Textbook of Emergency Cardiovascular Care and CPR; John M. Field publisher.

CLINICAL POSTINGS IV

L/T/P/C: -/-/14/7

Learning Objective:

1. To provide advanced clinical exposure in cardiac emergency care, catheterization procedures, and critical care settings.
2. To develop hands-on skills in life-saving techniques including BLS, ACLS, airway management, and defibrillation.
3. To enhance understanding of interventional cardiology procedures such as coronary angiography, use of guidewires, balloons, and stents.
4. To strengthen clinical assessment, case presentation, and decision-making skills through real-time patient care and observation.

Learning Outcome:

1. Demonstrate competency in performing and assisting with emergency procedures including CPR, airway management, and defibrillation.
2. Interpret clinical data such as ECG, ABG, and vital parameters to manage cardiac and

emergency conditions effectively.
3. Assist in cardiac catheterization procedures and understand the use of interventional devices like balloons, stents, and guidewires.
4. Exhibit effective clinical reasoning, documentation, and communication skills through case presentations and patient management.

Defibrillators – Intra Aortic balloon pump –Console room techniques Guide wires- Used in various diagnostic and intervention
Coronary Angiogram – Procedure, materials used type and amount of dye used in Coronary Angiogram Types of – Balloon and stents
Case presentation & seminar

Basic life support – Adult, pediatric, pregnancy CPR, Foreign body airway obstruction – Chocking – Adult, Pediatric, pregnancy, Automated electrical defibrillator, ACLS – Cardiac arrest algorithm, post cardiac algorithm
Airway management – OPA, NPA, LMA, Endotracheal Tube, combi tube, Difficult airway intubation, Patient history taking, Insertion techniques, contraindications & indications of Central venous access, intravenous, intramuscular, intraosseous, subcutaneous, defibrillator. Brady arrhythmia, heart block, tachyarrhythmia, stroke, MI Arterial blood gas; respiratory acidosis, respiratory alkalosis, metabolic acidosis, metabolic alkalosis, Compensated and uncompensated MUD PILES, Anion gap. Basic first aid –
environmental, medical and traumatic emergencies, Blood pressure, Pulse oximetry, Temperature, Capnography.

Students are posted in the following departments,

ECG, TMT, ECHO, CATH LAB, Wards, ICU's

Assessment Components:

- Logbook Evaluation
- Viva Voce / Case Discussion
- Practical Skills Check
- Clinical Observation Report

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

Learning Outcome:
1. Demonstrate understanding of ethical principles, emotional intelligence, and empathy in

personal and social contexts.
2. Apply effective communication, conflict resolution, and relationship-building skills in everyday interactions.
3. Exhibit personal integrity, responsibility, and accountability in decision-making and behavior.
4. Practice self-reflection, gratitude, and purposeful living to contribute positively to society and personal well-being.

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.

Unit 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

How to Win Friends and Influence People" by Dale Carnegie

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

Management of Medical Emergencies

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

Learning Objectives

- To introduce the principles of emergency patient assessment and management.
- To develop practical skills in recognizing and responding to medical emergencies.
- To train students in basic life support, airway management, and emergency care procedures.
- To familiarize students with emergency equipment, medications, and monitoring devices.
- To enhance teamwork, communication, and decision-making during emergency

situations.

Learning Outcomes

At the end of the course, the student will be able to:

- Recognize common medical emergencies and initiate appropriate actions.
- Perform Basic Life Support (BLS) and assist in resuscitation procedures.
- Demonstrate airway management and oxygen administration techniques.
- Assist in the management of cardiovascular, respiratory, neurological, and traumatic emergencies.
- Operate emergency equipment safely and effectively.
- Communicate and document emergency events accurately.
- Participate effectively in emergency response teams and mock drills.

Unit I: Fundamentals of Medical Emergencies

- Introduction to medical emergencies
- Emergency response systems
- Primary and secondary assessment
- Triage and patient prioritization

Unit II: Basic Life Support and Airway Management

- Adult and pediatric BLS
- CPR techniques
- Airway maintenance
- Oxygen therapy
- AED operation

Unit III: Cardiovascular and Respiratory Emergencies

- Cardiac arrest
- Shock
- Acute coronary syndrome
- Respiratory distress
- Asthma and airway obstruction

Unit IV: Neurological, Metabolic and Trauma Emergencies

- Seizures
- Stroke
- Hypoglycemia and hyperglycemia
- Poisoning and anaphylaxis
- Trauma and hemorrhage control

Practicals

- Vital signs assessment and monitoring
- Basic Life Support (BLS) practice
- CPR on manikins
- AED demonstration and practice
- Airway management techniques
- Oxygen delivery methods
- Emergency drug tray familiarization

- Patient transfer and positioning
- Mock code blue drills
- Emergency documentation and reporting

IV year – VII semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	SI		Internship-I	-	-	36	18
2	RP		Project- I	-	-	4	2
TOTAL				**-**	-	**40**	**20**
TOTAL CONTACT HOURS				**40**			

SEMESTER VII

INTERNSHIP I
L/T/P/C: -/-/36/18

Learning Objective:

1. To provide extensive hands-on clinical exposure across various cardiology departments including ECG, TMT, ECHO, Cath Lab, ICU, and Emergency.
2. To develop practical skills in performing, assisting, and observing diagnostic and interventional cardiac procedures.
3. To enhance patient care skills, clinical documentation, and interdisciplinary coordination in hospital settings.
4. To build professional competence, ethical practice, and effective communication in real-time healthcare environments.

Learning Outcome:

1. Demonstrate proficiency in assisting and performing basic cardiac diagnostic procedures such as ECG, TMT, Holter monitoring, and echocardiography.
2. Apply clinical knowledge in patient care across ICU, wards, and emergency settings with appropriate safety and ethical standards.
3. Interpret basic clinical findings and contribute to patient management under supervision in various cardiology units.
4. Exhibit professionalism, effective communication, and accurate documentation through active participation in clinical activities.

Students are posted in the following units of CTVS department by monitoring and assisting the various procedures in,

- ECG
- TMT
- HOLTER MONITORING
- ECHO
- CATH LAB
- ICU's
- Wards
- Emergency Department
- Medical Records Department

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

Learning Objective:

1. To develop skills in conducting comprehensive literature reviews using reputed scientific journals.
2. To formulate relevant and researchable questions in the field of specialization.
3. To understand the process of designing a research study and obtaining ethical and scientific approvals.
4. To build academic writing skills for preparing a structured review article.

Learning Outcome:

1. Perform systematic literature searches and critically analyze scientific research articles.
2. Formulate clear research questions and design an appropriate research methodology.
3. Demonstrate understanding of ethical considerations and approval processes in research.
4. Prepare and present a well-structured review article based on evidence from literature.

- Should undertake extensive literature search from reputed journals in their specialization.
- Formulate a research question.
- Design a research study and get it approved from all scientific committees
- Student need to get a review article done based on the literature search

IV year – VIII semester

S.NO	CATEGORY	SUBJECT CODE	SUBJECT	L	T	P	C
1	SI		Internship-II	-	-	34	17
2	RP		Project - II	-	-	6	3
TOTAL				**-**	-	**40**	**20**
TOTAL CONTACT HOURS				**40**			

SEMESTER VIII

INTERNSHIP II
L/T/P/C: -/-/34/17

Learning Objective:

1. To provide advanced clinical exposure and independent participation in various cardiology departments.
2. To strengthen practical skills in performing and assisting cardiac diagnostic and interventional procedures.
3. To enhance clinical decision-making, patient management, and emergency response skills.
4. To develop professional competence, ethical practice, and effective communication in multidisciplinary healthcare settings.

Learning Outcome:

1. Perform and assist cardiac diagnostic procedures such as ECG, TMT, Holter monitoring, and echocardiography with greater independence.
2. Apply clinical knowledge to manage patients effectively in ICU, wards, and emergency settings.
3. Interpret diagnostic findings and contribute to clinical decision-making under supervision.
4. Demonstrate professionalism, leadership, teamwork, and accurate clinical documentation in real-world practice.

Students are posted in the following units of CTVS department by monitoring and assisting the various procedures in,

- ECG
- TMT
- HOLTER MONITORING
- ECHO
- CATH LAB
- ICU's
- Wards
- Emergency Department
- Medical Records Department

PROJECT II
L/T/P/C: -/-/6/3

Learning Objective:

1. To conduct an independent research study based on the foundation developed in Project I.
2. To apply appropriate research methodology, data collection, and analysis techniques.
3. To develop skills in scientific writing and preparation of a dissertation/thesis.
4. To enhance critical thinking and presentation skills for defending research work.

Learning Outcome:

1. Execute an independent research project, including data collection, analysis, and interpretation.
2. Apply ethical principles and research standards throughout the study.
3. Prepare and submit a well-structured dissertation/thesis following academic guidelines.
4. Effectively present and defend research findings with clarity and scientific reasoning.

- As continuation of project I, students should do an independent research project
- They should submit the Dissertation/Thesis and defend it.