MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED AND PUBLIC HEALTH SCIENCES AND TECHNOLOGY

Suraram X Roads, Jeedimetla,
Hyderabad-500055
Web: https://mrvv.edu.in/

Program

Bachelor of Science (B.Sc.)

Cardio Perfusion Technology

2025

VISION

- To be a center of excellence in Cardio Perfusion Technology education, cardiovascular research, and advanced clinical perfusion practice.
- To develop highly competent perfusion technologists specialized in cardiopulmonary bypass, ECMO, and extracorporeal circulation.
- To promote innovation and research in perfusion sciences, cardiac surgery support, and life support technologies.
- To produce ethical, skilled, and patient-centered perfusion professionals for modern healthcare systems.
- To provide advanced cardiovascular and extracorporeal life support services with safety, precision, and quality care.
- To contribute to global healthcare through excellence in perfusion management and critical cardiac care.
- To encourage lifelong learning, leadership, and evidence-based perfusion practice.
- To advance patient safety and quality assurance in cardiac perfusion and critical care services

MISSION

- To provide high-quality education and hands-on clinical training in cardiopulmonary bypass, extracorporeal circulation, and perfusion technology.
- To develop skilled perfusion professionals with expertise in heart-lung machine operation, ECMO, ventricular assist devices, and transplantation support.
- To train students in patient monitoring, anticoagulation management, hemodynamic monitoring, and perfusion safety protocols.
- To promote ethical values, patient safety, teamwork, and professional responsibility in perfusion and cardiac surgical care.
- To encourage research, innovation, and evidence-based practice in cardiovascular perfusion sciences and extracorporeal technologies.
- To prepare graduates capable of handling emergency cardiac procedures, critical care situations, and advanced perfusion techniques efficiently.
- To strengthen communication, leadership, and multidisciplinary collaboration skills required in cardiac operation theatres and intensive care units.
- To prepare perfusion graduates who meet national and international standards in cardiovascular healthcare and perfusion practice
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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the B.Sc. Cardio Perfusion Technology program will be able to:

- Apply advanced knowledge of anatomy, physiology, pharmacology, perfusion science, and biomedical technology in cardiac surgical procedures.

- Perform cardiopulmonary bypass, extracorporeal circulation, ECMO, and organ support procedures safely and effectively.
- Operate and troubleshoot heart-lung machines, oxygenators, perfusion pumps, and monitoring systems during surgeries.
- Demonstrate professional ethics, communication skills, teamwork, and leadership in cardiac operation theatres and critical care settings.
- Engage in research, innovation, and continuous professional development related to perfusion sciences and extracorporeal technologies.
- Contribute to patient-centered cardiac care with commitment to quality assurance, infection control, and patient safety standards.
- Adapt to emerging trends such as minimally invasive perfusion systems, transplantation support, and mechanical circulatory assist devices.
- Participate effectively in multidisciplinary healthcare teams involved in cardiovascular surgery and critical care management.

PROGRAM OUTCOMES (POs)

At the end of the program, the graduate will be able to:

- Apply knowledge of medical sciences, cardiovascular physiology, and perfusion technology in clinical perfusion practice.
- Understand and operate heart-lung machines, ECMO systems, oxygenators, perfusion pumps, and monitoring devices safely and effectively.
- Perform cardiopulmonary bypass procedures with adherence to perfusion protocols, safety standards, and patient care guidelines.
- Analyze hemodynamic, physiological, and blood gas parameters during cardiac and specialized surgeries.
- Demonstrate competency in extracorporeal circulation, emergency perfusion management, and critical care support.
- Monitor anticoagulation, temperature regulation, fluid balance, and perfusion parameters during surgical procedures.
- Apply infection control, sterilization, and biomedical safety measures in perfusion practice and operation theatre management.
- Communicate effectively with cardiac surgeons, anesthetists, nurses, and multidisciplinary healthcare teams.
- Maintain ethical, legal, and professional standards in cardiovascular healthcare and perfusion services.
- Utilize research methodology, evidence-based perfusion practices, and modern technologies for improving patient outcomes.
- Demonstrate leadership, decision-making, crisis management, and lifelong learning abilities in perfusion practice.
- Contribute to community health and advanced cardiac care services with professionalism and social responsibility.

PROGRAM SPECIFIC OUTCOMES (PSOs)

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

- Operate and manage cardiopulmonary bypass circuits, oxygenators, heat exchangers, pumps, and perfusion-related equipment during cardiac surgeries.
- Assist in advanced extracorporeal life support procedures including ECMO, ventricular assist devices, organ transplantation, and mechanical circulatory support.
- Monitor anticoagulation, activated clotting time (ACT), blood gases, hemodynamics, and patient physiological parameters during perfusion procedures.
- Apply principles of perfusion safety, infection control, sterilization, quality assurance, and risk management in cardiac operation theatres.
- Perform troubleshooting and preventive maintenance of perfusion equipment and extracorporeal circulation systems.
- Participate effectively in cardiac critical care, emergency bypass procedures, and specialized cardiovascular surgeries.
- Utilize modern perfusion technologies, evidence-based practices, and research skills for advancement in cardiovascular sciences.
- Demonstrate professional competency in patient care, communication, teamwork, and ethical perfusion practice.

MALLA REDDY VISHWAVIDYAPEETH

SCHOOL OF ALLIED AND PUBLIC HEALTH SCIENCES AND TECHNOLOGY

BACHELOR OF CARDIO PERFUSION TECHNOLOGY

COURSE STRUCTURE

I year I semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310101	Human Anatomy - I	4	-	-	4	30	70	100
2	BCT3310102	Human Physiology - I	4	-	-	4	30	70	100
3	BCT3310103	Medical Bio-chemistry	4	-	-	4	30	70	100
4	BCT3310104	Sociology	2	-	-	2	30	70	100
5	BCT3310105	English and Communication Skills	2	-	-	2	30	70	100
6	BCT3310106	Basics of Computers	1	-	2	2	30	70	100
7	BCT3310101P	Human Anatomy - I Practical	-	-	4	2	30	70	100
8	BCT3310102P	Human Physiology - I Practical	-	-	4	2	30	70	100
9	BCT3310107VA	Environmental Awareness	2	-	-	2	100	-	100
TOTAL			**19**	**-**	**10**	**24**	**340**	**560**	**900**

I year II semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310201	Human Anatomy – II	4	-	-	4	30	70	100
2	BCT3310202	Human Physiology - II	4	-	-	4	30	70	100
3	BCT3310203	Pathology	2	-	-	2	30	70	100
4	BCT3310204	Microbiology	3	-	-	3	30	70	100
5	BCT3310201P	Human Anatomy – II Practical	-	-	4	2	30	70	100
6	BCT3310202P	Human Physiology – II Practical	-	-	2	1	30	70	100
7	BCT3310205	Introduction to Perfusion equipment	3	-	-	3	30	70	100
8	BCT3310206	Medical Physics	2	-	-	2	30	70	100
9	BCT3310207VA	Stress Management	1	-	-	1	100	-	100
TOTAL			**19**	**-**	**6**	**22**	**340**	**560**	**900**

II year III semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310301	Pharmacology	3	-	-	3	30	70	100
2	BCT3310302	Medical Law, Ethics and Medical Records	3	-	-	3	30	70	100
3	BCT3310303	Health Care Administration	2	-	-	2	30	70	100
4	BCT3310304	Perfusion Circuit Management	3	-	4	5	30	70	100
5	BCT3310305	Clinical Application of Perfusion Techniques	3	-	-	3	30	70	100
6	BCT3310306VA	Soft Skills Development	1	-	-	1	100	-	100
7	BCT3310307	Clinical Postings - I	-	-	14	7	100	-	100
TOTAL			**15**	**-**	**18**	**24**	**350**	**350**	**700**

II year IV semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310401	CABG and Patient Management	3	-	-	3	30	70	100
2	BCT3310402	Advanced Perfusion Technology	3	-	4	5	30	70	100
3	BCT3310403	Critical Care & Emergency Management	3	-	-	3	30	70	100
4	BCT3310404VA	Health and Well-being	1	-	-	1	100	-	100
5	BCT3310405	Clinical Postings - II	-	-	16	8	100	-	100
TOTAL			**10**	**-**	**20**	**20**	**290**	**210**	**500**

III year – V semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310501	Pediatric & Adult Perfusion Management	3	-	-	3	30	70	100
2	BCT3310502	Hemodynamic Monitoring	3	-	-	3	30	70	100
3	BCT3310503	Perfusion in Specialized Surgeries	3	-	4	5	30	70	100
4	BCT3310504	CPR And Life Support	3	-	-	3	30	70	100
5	BCT3310505VA	Interpersonal Communication	1	-	-	1	100	-	100
6	BCT3310506	Clinical Postings - III	-	-	16	8	100	-	100
TOTAL			**13**	**-**	**20**	**23**	**320**	**280**	**600**

III year – VI semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310601	Medicine Relevant To Perfusion Technology	3	-	-	3	30	70	100
2	BCT3310602	Transplantation and ECMO Techniques	3	-	4	5	30	70	100
3	BCT3310603	Research Methodology and Biostatistics	3	-	-	3	30	70	100
4	BCT3310604VA	Art of Being a Better Person	1	-	-	1	100	-	100
5	BCT3310605	Clinical Postings - IV	-	-	16	8	100	-	100
TOTAL			**10**	**-**	**20**	**20**	**290**	**210**	**500**

IV year – VII semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310701	Internship-I	-	-	40	20	30	70	100
2	BCT3310702	Project - I	-	-	2	1	100	-	100
3	BCT3310703VA	Healthy Eating for Healthy Living	1	-	-	1	100	-	100
TOTAL			**1**		**42**	**22**	**230**	**70**	**300**

IV year – VIII semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310801	Internship-II	-	-	20	10	30	70	100
2	BCT3310802	Project - II	-	-	20	10	30	70	100
3	BCT3310803VA	Professionalism in the Workplace	1	-	-	1	100	-	100
TOTAL			**1**	-	**40**	**21**	**160**	**140**	**300**

1.1 Under Graduate Programme

Sl. No.	Course	Duration	Eligibility for admission
1	B.Sc. Cardio Perfusion Technology	4 Years (3 Years + 1 Year Internship)	10+2 or equivalent

1.2. Medium of Instruction:

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

1.3. Duration of the Course

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

1.4 Examination Regulations

1.4.1 Attendance: 75% of attendance (physical presence) is mandatory.

Medical leave or other types of sanctioned leaves will not be counted as physical presence. Attendance will be counted from the date of commencement of the session to the last day of the closing of attendance before the final examination.

1.4.2 Internal Assessments:

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

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

(a) Short questions 3 nos. out of which the student should write two questions each carrying 5 marks (i.e. 2 x 510 marks). Two such internal examinations will be conducted.

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

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

(e) For value added courses, only internal examination will be conducted. The assessment comprised of five assignments/presentations/case presentations each carrying 10 (i.e. 5 x 10 = 50 marks). Final examination will be for 50 marks with 5 questions each carrying 10 marks (5 x 10 = 50 marks). The minimum pass is 40% marks.

1.4.3 University Examinations (External):

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

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

c) Examination will be of 3 hours duration (for theory). The question pattern for those subjects without practical examination (70 marks) will be (a) Three essay questions out of which the student should answer 2 questions each carrying 10 marks (i.e. 2 x 10 = 20 marks) (b) Eight short note questions out of which the student should attempt

six questions, each carrying 5 marks (6 x 5 = 30 marks). (c) Ten very short questions each carrying 2 marks (i.e. 10 x 2 = 20 marks). Thus a total of 70 marks.

d) The question pattern for practical examination (a) Spotters/major practical/minor practical/Viva/practical record.

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

I year I semester

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2	BCT3310102	Human Physiology - I	4	-	-	4	30	70	100
3	BCT3310103	Medical Bio-chemistry	4	-	-	4	30	70	100
4	BCT3310104	Sociology	2	-	-	2	30	70	100
5	BCT3310105	English and Communication Skills	2	-	-	2	30	70	100
6	BCT3310106	Basics of Computers	1	-	2	2	30	70	100
7	BCT3310101P	Human Anatomy - I Practical	-	-	4	2	30	70	100
8	BCT3310102P	Human Physiology - I Practical	-	-	4	2	30	70	100
9	BCT3310107VA	Environmental Awareness	2	-	-	2	100	-	100
TOTAL			19	-	10	24	340	560	900

SEMESTER-I

HUMAN ANATOMY – I

L/T/P/C

4/-/-/4

Learning Objective:

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

Learning Outcome:

Describe the structure and function of tissues, organs, and body systems.

Identify anatomical features of the upper limb, thoracic structures, and major organ systems.
Apply anatomical knowledge to understand clinical and diagnostic procedures.
Correlate anatomical structures with their physiological functions in health and disease.

UNIT-I **(12 hours)**

GENERAL ANATOMY 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.

UNIT-III(12 hours)

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 extremityBlood vessels and lymphatic drainage

UNIT-IV (12 hours)

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 (12 hours)

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

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 (12 hours)

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

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 of blood transfusion

9. **NERVE:**

1. Structure of a neuron
2. Classification of neurons
3. Electrical activity of neuron
    a) Resting membrane potential
    b) Action potential
4. Propagation of nerve impulse
5. Properties of nerve fibers
6. Neuroglia-Types& functions
7. Nerve Injury
    a) Types of nerve Injury
    b) Effect of nerve Injury
    c) Regeneration of damaged nerve fiber

UNIT-II (12 hours)

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((12 hours)

CARDIOVASCULAR SYSTEM

1. Structure of heart & blood vessels
2. Properties of cardiac muscle
3. Origin &spread of cardiac pulse
4. Cardiac cycle &heart sounds
5. Cardiac out put
    a) Related terms
    b) Regulation of cardiac output
    c) Circulatory shock
6. Pulse &Heart rate and it's regulation
7. Blood pressure
    a) Definitions
    b) Factors controlling & Influencing BP
    c) Regulation of BP
8. Regional circulation
    a) Coronary circulation
    b) Cerebral circulation
9. Normal ECG.

UNIT-V (12 hours)

EXERCISEPHYSIOLOGY

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 TEXT BOOKS

1. Text book on Medical Physiology-Guyton

2. Textbook of Physiology-AK Jain (for MBBS students)

3. Human Physiology-C.C. Chatterjee

4. Essentials of Medical Physiology -Sembulingam, K.

5. Comprehensive Textbook of Medical Physiology: Vol-1 & 2 - Pal, Gopal Krushna

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

7. Practical Physiology -Joshi, VijayaD.

MEDICAL 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 (12 hours)

CARBOHYDRATE CHEMISTRY

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

LIPID CHEMISTRY

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

UNIT-II(12 hours)

AMINOACIDCHEMISTRY

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

NUCLEICACIDSANDNUCLEOTIDECHEMISTRY

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

UNIT-III(12 hours)

ENZYMES

- Definition, Classification of enzymes with examples
- Active site, Enzyme specificity.
- Factors affecting enzyme activity
- Enzyme inhibition
- Iso enzymes and their clinical significance - LDH, creatine kinase, ALP

VITAMINS

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

UNIT-IV(12 hours)

INTERMEDIARYMETABOILISM

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

UNIT-V (12 hours)

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 Nai

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 (6 hours)

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 **(6 hours)**

1. Socialization:

a. Definition and Meaning of Socialisation
b. Primary, Secondary and Anticipatory socialisation
c. Agencies of Socialisation

2. Social Groups:

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

UNIT-3 **(6 hours)**

1. Family:

a. The family, meaning and definition
b. Functions of family
c. Changing family patterns
d. Influence of Family on the individuals health, the effects of sickness in the family.

2. Community:

a. Rural community: meaning and features- Health problems of rural community.
b. Urban community: meaning and features – Health problems in urbanities.

UNIT-4 **(6 hours)**

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 **(6 hours)**

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 **(6 hours)**
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 **(6 hours)**
Reading - Skimming and Scanning Writing - Letter writing (Requests, Leave applications, Purchase letters, Letters in correspondence with medical insurance companies) Grammar - Phrase, Clause and Sentence; Prepositions Vocabulary - Body parts and diseases, Definitions / One-word substitutes **ELCS LAB** CALL LAB: Phonetics - Consonant Sounds Listening - Listening for gist and specific information ICS LAB: Speaking - Small talk, Narration of anecdotes

UNIT 3: The secret of work by Swami Vivekananda(6 hours)
Reading - Making inferences and predictions Writing - E-mail writing Grammar - Tenses, Reported speech Vocabulary - Food and lifestyle, Instruments and Equipment **ELCS LAB** CALL LAB: Intonation Listening - Listening and identifying facts and opinions ICS LAB: Speaking - Role Plays (OET) (Giving and taking instructions, interacting with and explaining processes, conditions and instructions to the patients and their attenders.

UNIT 4: All the world's a stage (Poem) by William Shakespeare(6 hours)
Reading - Reading for explicit and implicit meaning Writing - Short essays: 2-Paragraph Essay, Thesis Statement Grammar - Subject-Verb agreement, Degrees of Comparison Vocabulary - Caring and Emotions, Medical Abbreviations and Acronyms **ELCS LAB** CALL LAB: Consonant Clusters Listening - Listen- Comprehend - Speak, Health Care ICS LAB: Speaking - Formal Discussions, Physical Description/Personality

UNIT 5: Sister Nivedita: Calcutta's Angel of Mercy (Article/Essay) by Monidipa Dey(6 hours)
Reading - Intensive and Extensive Reading, reading comprehension passages from OET and IELTS Writing - Report writing (Analyzing tests and Reporting patient condition) Grammar – Voice, If conditionals Vocabulary - Health, Hygiene and Wellness, Medical Vocabulary/Terminology **ELCS LAB** CALL LAB: Past Tense Markers and Plural Markers Listening - Listening tasks from OET and IELTS ICS LAB: Speaking - Conversation practice, Short oral presentations specifying the condition of the patient

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 COMPUTER

L/T/P/C

1/-/2/2

COURSE OBJECTIVES

To understand all components of computer, different working environments and operations of computer.

To learn creating different types of word documents, MS Excel manipulations, Power point documents.

To understand basic requirements of computer network hardware, software and its network architecture.

UNIT – I**(6 HOURS)**

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(6 HOURS)

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(6 HOURS)

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(6 HOURS)

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(6 HOURS)

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 MachineLearning, 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 ofthe computer.

To create any kind of presentations for presenting their knowledge anywhere in the form ofdocument or ppt.

To create excel sheets to save data and process the data efficiently.

To understand basic requirements of computer network hardware, software and itsnetwork 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, PearsonEducation
- 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.

Total Hours: 30 hours

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

GROSS SPECIMENS/SPOTTERS

- Upper Extremity
- Identify the spotter- (Cross section of shoulder Joint, Elbow Joint, Wrist complex,Hand)
- Identify the bone- UPPER EXTREMITY BONES (Scapula, Clavicle, Humerus, Radius and Ulna, Carpals, Metacarpals and Phalanges) Including side determination
- Surface Anatomy of the Upper Extremity – UPPER EXTREMITY BONES AND MUSCLES
- 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.

Total Hours: 30 hours

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 haemoglobin 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 AWARENES

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**(3 hours)**

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 **(3 hours)**

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 **(3 hours)**

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**(3 hours)**

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 **(3 hours)**

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 **(3 hours)**

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 **(3 hours)**

Waste Management

Types of waste: municipal, industrial, hazardous, electronic. The 3 Rs: Reduce, Reuse, Recycle.
Landfills, incineration, and composting. Zero waste lifestyle.

Unit 8 **(3 hours)**

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 **(3 hours)**

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**(3 hours)**

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

SEMESTER-II

HUMAN ANATOMY – II

L/T/P/C
4/-/-/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 **(12 hours)**

LOWER EXTREMITY:

1. 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 (12 hours)

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

4. Blood vessels andlymphaticdrainage

UNIT-III (12 hours)

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 join

8. Structure of Innominate bone Pelvic girdle and muscles of the pelvic floor including Applied Anatomy

UNIT-IV(12 hours)

HEAD AND NECK:

1. Bones of the skull and face

2. Muscles of the face and neck

3. Triangles of the neck Gross anatomy of eyeball,nose, ears and tongue

UNIT-V (12 hours)

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

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 – Datta

HUMAN PHYSIOLOGY -II L/T/P/C

4/-/-/4

Learning Objective:

To understand the structure and functions of the nervous system, including sensory and motor pathways.
To study special senses, endocrine system, and hormonal regulation of body functions.
To comprehend the physiology of the reproductive system, including pregnancy and lactation.
To gain knowledge of gastrointestinal and excretory system functions and their regulation.

Learning Outcome:

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

UNIT-I (12 hours)

NERVOUS SYSTEM-I

1. Introduction to nervous system - CNS, PNS and ANS

2. Neurotransmitters - Definition, fate of neurotransmitter, types
3. Synapse - Definition, type, structure, transmission of impulse across a synapse, properties.

4. Receptors and Sensation - Types of sensations, Classification of receptors, properties
5. Sensory System - Organization of the sensory system, sensory Homunculus

6. 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
Descending Tracts - Pyramidal system, extrapyramidal system

UNIT-II **(**12 hours)

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 (12 hours)

SPECIAL SENSES:

1. Vision - Anatomy of eye, visual pathway, pupillary reflexes, dark adaptation, light adaptation, photosensitivity

2. Hearing - Anatomy of ear, auditory pathway, tests for hearing - Watch test, Rinne's test, Weber's test, deafness, Audiometry

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 (12 hours)

REPRODUCTIVE SYSTEM:
1. Sex determination and differentiation & it's abnormalities, puberty, importance of sex hormones
2. Female reproductive system - Internal & external genital organs, Oogenesis, Structure of egg, Follicle development, ovulation, menstrual cycle, menopause
3. Male reproductive system - Testes, accessory sex organs, Spermatogenesis, structure of sperm

4. Physiology of pregnancy - Fertilization, Implantation, Placenta (formation, function, hormones), maternal changes during pregnancy, pregnancy tests, infertility

5. Childbirth Physiology - Parturition, Lactation

UNIT-V (12 hours)

GASTROINTESTINAL SYSTEM:

1. Physiological stages of digestion
2. Liver function

EXCRETORY SYSTEM:

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

RECOMMENDED TEXT BOOKS

Text book on Medical Physiology-Guyton

Textbook of Physiology-AK Jain (for MBBS students)

Human Physiology-C.C. Chatterjee

Essentials of Medical Physiology -Sembulingam, K.

Comprehensive Textbook of Medical Physiology: Vol-1 & 2 - Pal, Gopal Krushna

Physiology: Prep Manual for Undergraduates- Joshi, VijayaD.

Practical Physiology -Joshi, VijayaD

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**(5 hours)**

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**(5 hours)**

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**(5 hours)**

Immunity disorders. -

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

UNIT IV**(5 hours)**

Infectious diseases. -

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

- Parasitic infections.

UNIT V**(5 hours)**

Neoplasia. -

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

UNIT VI**(5 hours)**

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 **(5 hours)**

Morphology -

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

UNIT II **(5 hours)**

Growth and nutrition. -

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

UNIT III **(5 hours)**

Culture media. -

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

UNIT IV **(5 hours)**

Sterilization and Disinfection. -

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

UNIT V **(5 hours)**

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 **(5 hours)**

- Morphology, cultivation, diseases caused, laboratory diagnosis including specimen

collection of the following bacteria (excluding classification, antigenic structure, and pathogenicity),

- Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella,
  E. coli, Klebsiella, Proteus,
- Vibrio cholerae, Pseudomonas & Spirochetes.

UNIT VII **(5 hours)**

Parasitology. -

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

UNIT VIII **(5 hours)**

Mycology. -

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

UNIT IX **(5 hours)**

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.

HUMAN ANATOMY PRACTICAL – II

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.

Total Hours: 30 hours

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

GROSS SPECIMENS/SPOTTERS

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

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

Total Hours: 30 hours

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

Examination of superficial sensations

Examination of deep sensations

Examination of cortical sensations

Examination of reflexes

Cranial nerve examination

Examination of Balance and coordination

INTRODUCTION TO PERFUSION EQUIPMENT

L/T/P/C

3/-/-/3

Learning Objectives

To provide knowledge of operation theatre concepts and extracorporeal circulation.

To understand the components and functioning of the heart-lung machine.

To explain oxygenators, heat exchangers, and monitoring systems used in CPB.

To develop understanding of safety devices, anticoagulation monitoring, and cardioplegia systems.

To familiarize students with sterilization, maintenance, and recent advances in perfusion technology.

Learning Outcomes

Explain the design and functioning of operation theatres and CPB systems.

Identify the components and working principles of heart-lung machines and oxygenators.

Demonstrate knowledge of monitoring systems, safety devices, and anticoagulation techniques.

Understand sterilization, maintenance, and troubleshooting of perfusion equipment.

Describe recent advancements such as ECMO and mini-cardiopulmonary bypass systems.

UNIT – I- (3 hours)

CONCEPT OF OPERATION THEATRES:

Layout and designs, walls, ceilings, floor, ceiling, lightning, ventilation, airflow, temperature and humidity, operating table

UNIT II – (9 hours)

HISTORY AND BASICS OF EXTRACORPOREAL CIRCULATION

- History and evolution of cardiopulmonary bypass (Gibbon, DeWall, etc.)
- Hypothermic Cardiac Surgery
- Indications and contraindications of CPB

UNIT III – (9 hours)

COMPONENTS OF THE HEART-LUNG MACHINE

- Detailed parts of the heart-lung machine
- Roller and centrifugal pumps: principles, mechanisms, advantages/disadvantages
- Tubing: types, materials, sizes, and flow dynamics

- Priming fluids and their role
- Cannulation techniques and devices (arterial, venous)
- Components of CPB, Cardioplegia.

UNIT IV – (9 hours)

OXYGENATORS AND HEAT EXCHANGE SYSTEMS

- Types of oxygenators: bubble, membrane, and hollow-fiber
- Working principles and gas exchange process
- Heat exchangers: principles of heat transfer and control
- Heater–cooler units: function and integration into circuit
- Filters and bubble traps: arterial line filter, cardiotomy reservoir filter

UNIT V – (9 hours)

MONITORING AND SAFETY DEVICES

- Monitoring systems: pressure sensors, temperature probes, flow meters
- Alarms and safety interlocks in perfusion machines
- Venous reservoir level indicators
- Anticoagulation monitoring: ACT, blood gas analyzers
- Cardioplegia delivery system: components and types

UNIT VI -(9 hours)

BIOCOMPATIBILITY, STERILIZATION, AND MAINTENANCE

- Materials used in perfusion circuits: biocompatibility and surface coatings
- Sterilization and disinfection procedures for perfusion equipment, special equipments: sharp/semi sharp, microsurgical equipments, air powered equipments, lensed equipments, laparoscopic equipments, cautery machines, tourniquets and other common equipments
- Single-use vs reusable components, Washing, cleaning, packing.
- Preventive maintenance, calibration, and troubleshooting
- Recent advancements in perfusion technology (ECMO, mini-CPB)

Reference:

1. Manual of Clinical Perfusion (2nd Edition Updates) Bryan V, Lich CCP.
2. Cardiopulmonary bypass Reeds & Clarke.

MEDICAL PHYSICS L/T/P/C

2/-/-/2

Learning Objectives

To provide basic knowledge of physics principles used in medicine and healthcare.

To explain the applications of mechanics, heat, sound, light, electricity, and radiation in medical science.

To introduce biomedical instruments and modern imaging modalities such as X-ray, CT, MRI, and ultrasound.

To develop understanding of radiation safety, dosimetry, and protection measures in hospitals.

To enhance analytical skills related to diagnostic and therapeutic medical equipment.

Learning Outcomes

Understand the basic concepts of medical physics and their clinical applications.

Explain the working principles of biomedical instruments and medical imaging systems.

Describe radiation physics, dosimetry, and radiation protection methods.

Apply physics concepts in patient monitoring, diagnosis, and treatment procedures.

Follow safety standards and proper handling of medical equipment in healthcare settings.

UNITI:(3 hours)

FUNDAMENTALS OF PHYSICS IN MEDICINE

Basic Units and Measurements – SI units, derived units, dimensions, conversions
Mechanics and Motion – types of motion, Newton’s laws, vectors, scalars, linear/angular momentum
Fluid Mechanics – pressure, Pascal’s law, Bernoulli's principle, applications in blood flow and respiratory systems
Bio-Mechanics Basics – center of gravity, torque, levers (applications in human body)

UNIT II:(3 hours)

HEAT, TEMPERATURE, AND THERMODYNAMICS

Temperature Scales – Celsius, Kelvin, Fahrenheit
Heat Transfer Mechanisms – conduction, convection, radiation
Thermal Expansion and Clinical Devices
First and Second Law of Thermodynamics – energy conservation and entropy in physiological systems
Applications in Sterilization and Cryogenics

UNIT III: (3 hours)

SOUND AND ULTRASONICS IN MEDICINE

Nature of Sound – frequency, wavelength, velocity, amplitude
Acoustics of the Human Ear
Medical Applications – stethoscope principles
Ultrasound imaging – A-mode, B-mode, M-mode
Doppler effect and fetal monitoring

UNIT IV: (3 hours)
LIGHT, OPTICS AND LASERS IN MEDICINE

Nature of Light and Refraction
Lenses and Optics in Vision – human eye structure, myopia, hyperopia, correction
Medical Optical Instruments – microscope, endoscope, ophthalmoscope
Laser in Medicine – laser types, properties, applications in dermatology, ophthalmology, surgery

UNIT V:(3 hours)
ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC WAVES

Basic Electrical Concepts – voltage, current, resistance, Ohm's law
AC and DC Current – frequency, impedance, circuits
Capacitors and Inductors – applications in defibrillators, pacemakers
Electromagnetic Radiation – spectrum, visible light, X-rays, UV, IR
Magnetic Fields – MRI principle and application

UNIT VI:(3 hours)
RADIATION PHYSICS AND PROTECTION

Radioactivity – alpha, beta, gamma radiation

Nuclear Physics Basics – atomic structure, isotopes, half-life
X-rays and Imaging – X-ray production, attenuation, interaction with tissues, CT scan principle
Radiation Dosimetry – units: Gray, Sievert, Becquerel
Radiation Hazards & Protection – ALARA principle, shielding, time-distance- shielding concept, safety standards and regulatory bodies (ICRP, AERB)

UNIT VII:(3 hours)

BIOMEDICAL INSTRUMENTATION BASICS

Transducers and Sensors – temperature, pressure, ECG, EEG, EMG sensors
Basic Monitoring Equipment – ECG, pulse oximeter, defibrillator, ventilators
Electrical Safety in Hospitals – grounding, leakage currents, isolation techniques

UNIT VIII:(3 hours)
PRINCIPLES AND APPLICATIONS OF MODERN IMAGING MODALITIES

Computed Tomography (CT) – principle, image formation, applications
Magnetic Resonance Imaging (MRI) – principle, contrast mechanisms, applications
Positron Emission Tomography (PET) – principle, radioisotopes used
Digital Radiography – CR vs DR, image acquisition and processing

Recommended Textbooks & References

"Medical Physics" by A. K. Bhattacharya
"Basic Radiological Physics" by Dr. K Thayalan
"Physics for Radiographers" by John L. Ball & Tony Price
"Introduction to Biomedical Engineering" by John Enderle
ICRP and AERB Radiation Safety Guidelines

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:

Explain the concepts of stress, its types, and its physiological and psychological effects.

Identify personal stressors and analyze individual responses to stress in daily life.

Apply effective coping strategies and relaxation techniques to manage stress.

Demonstrate the ability to adopt healthy lifestyle practices and build long-term resilience

Unit 1 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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. Merritt

II year III semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310301	Pharmacology	3	-	-	3	30	70	100
2	BCT3310302	Medical Law, Ethics and Medical Records	3	-	-	3	30	70	100
3	BCT3310303	Health Care Administration	2	-	-	2	30	70	100
4	BCT3310304	Perfusion Circuit Management	3	-	4	5	30	70	100
5	BCT3310305	Basics of Perfusion Technology	3	-	-	3	30	70	100
6	BCT3310306VA	Soft Skills Development	1	-	-	1	100	-	100
7	BCT3310307	Clinical Postings - I	-	-	14	7	100	-	100
TOTAL			**15**	**-**	**18**	**24**	**350**	**350**	**700**

SEMESTER-III

PHARMACOLOGY

L/T/P/C

3/-/-/3

Learning Objective:

1. To understand the basic principles of pharmacokinetics and pharmacodynamics, including drug absorption, distribution, metabolism, and excretion.
2. To study the classification, mechanism of action, and therapeutic uses of drugs acting on various body systems.
3. To gain knowledge about adverse drug reactions, drug interactions, and factors influencing drug response.
4. 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.

Demonstrate basic experimental skills and interpret the effects of drugs using standard laboratory techniques

UNIT-I**(7 hours)**

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

e) UNIT-II **(7 hours)**

Autonomic nervous system & Peripheral nervous system

a) Sympathetic nervous system - sympathomimetics, sympatholytics

b) Parasympathetic - Cholinergics, Anticholinergics Drugs

c) Skeletal muscle relaxants

d) Local anaesthetics

UNIT-III**(7 hours)**

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**(7 hours)**

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**(7 hours)**

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**(3 hours)**

Medical ethics - Definition - Goal Scope

Introduction to Code of conduct

UNIT-II**(3 hours)**

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

UNIT-III**(3 hours)**

Autonomy and informed consent - Right of patients

Care of the terminally ill- Euthanasia

UNIT-IV**(3 hours)**

Organ transplantation

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

Professional Indemnity insurance policy

UNIT-V**(3 hours)**

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

RECOMMENDED BOOKS:

1. Law relating to medical negligence and compensation- Dr. K.P.D.A. Prabakar & Dr. 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**(3 hours)**

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

UNIT-II**(3 hours)**

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

UNIT-III**(3 hours)**

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

UNIT-IV**(3 hours)**

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

UNIT-V **(3 hours)**

- 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.

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ETHICS

UNIT-I **(3 hours)**

Introduction to Public Health Ethics.

Theories of Justice and Distribution of Public Health Resources.

Principle for Public Health Ethics.

UNIT-II **(3 hours)**

Priority-Setting and Resource Allocation at the Macro Level.

Priority-Setting and Resource Allocation at the Micro Level.

UNIT-III **(3 hours)**

Medical Ethics, Legal Aspects and Medical Terminology.

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

2) Medical terminology

Medical waste Management

UNIT-IV**(3 hours)**

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**(3 hours)**

Role of Human Rights in Public Health

Ethics of Beath Promotion and Disease Prevention

RECOMMENDED BOOKS:

1. Ethics and Public Health Archana Rani Sahoo & Patitapahan Das-2017

2. Public Health, Ethics and Equity-Sudhir Anand, Fabienne Peter and Amartya Sen-2006

3. Nursing and healthcare ethics-Robinson & Doody-6 edition-2022

4. Ethics- William K. Frankena 2 edition-2015

HEALTH CARE ADMINISTRATION

L/T/P/C

2/-/-/2

Course Objectives

- Understand basics of health care administration.
- Learn hospital organization and management systems.
- Gain knowledge of finance, HR, and health policies.
- Understand patient safety and quality improvement.
- Develop leadership and communication skills.

Learning Outcomes

- Explain health care organization and administration.
- Apply management principles in hospital settings.
- Understand patient safety and quality standards.
- Identify legal and ethical issues in health care.
- Demonstrate leadership and communication skills.

UNIT I: (6 Hours)

INTRODUCTION TO HEALTH CARE SYSTEMS

- Overview of health care organizations: hospitals, systems, and clinics
- Governance and leadership in health care organizations
- Decision-making and communication flows in hospitals

UNIT II (6 Hours)

HEALTH CARE POLICIES AND MANAGEMENT

- Health care policies and regulations
- Financial management and budgeting
- Health insurance and reimbursement
- Health information systems

UNIT III: (6 Hours)

HUMAN RESOURCES IN HEALTH CARE

- Health care workforce: challenges and trends
- Workforce planning and job analysis
- Recruitment and selection in health care
- Employee retention and turnover
- Orientation, training, and professional development
- Performance appraisal systems

- Workplace safety, wellness, and burnout prevention
- HR analytics and strategic planning

UNIT IV (6 Hours)

QUALITY IMPROVEMENT AND PATIENT SAFETY

- Health care errors and adverse events
- Root cause analysis (RCA) and failure mode and effects analysis (FMEA)
- Quality measurement and performance indicators
- Lean and Six Sigma in health care
- Accreditation and regulatory requirements
- Reporting systems and learning from errors

UNIT V (6 Hours)

LEGAL, ETHICAL, AND STRATEGIC ISSUES IN HEALTH CARE

- Legal and ethical issues in health care
- Strategic planning and marketing
- Emerging trends in health care

Recommended Text Books/Reading

1. Hospital Administration and Human Resource Management – Sharma, D.C
2. Principles of Hospital Administration and Planning – B.M. Sakharkar
3. Essentials of Hospital Management & Administration – S.L. Goel and R.K. Sharma
4. Health Care Management: Organization Design and Behaviour – Shortell & Kaluzny
5. Organizational Behaviour in Health Care – Nancy Borkowski
6. Introduction to Healthcare Quality Management – Patrice Spath
7. Patient Safety and Healthcare Improvement at a Glance – Sukhmeet Panesar et al.

PERFUSION CIRCUIT MANAGEMENT

L/T/P/C

3/-/4/5

Learning Objectives

- To provide knowledge of perfusion circuit design and management during cardiopulmonary bypass.
- To understand priming techniques, hypothermia management, and anticoagulation monitoring.
- To explain blood gas analysis, filtration systems, and blood conservation methods in perfusion practice.
- To develop practical skills in handling perfusion equipment, troubleshooting, and safety protocols.
- To enhance professional, ethical, and documentation skills in the perfusion setting.

Learning Outcomes

- Explain the design, components, and functioning of perfusion circuits.
- Perform basic perfusion circuit setup, priming, and monitoring procedures.
- Interpret blood gas values and anticoagulation parameters during CPB.
- Identify and manage complications related to perfusion and circuit management.
- Demonstrate safe, ethical, and professional practices in perfusion technology.

UNIT I: (9 Hours)
CIRCUIT DESIGN & SELECTION

- Design considerations for perfusion circuits (adult, pediatric, neonatal)
- Circuit components: tubing characteristics, oxygenator, filters, reservoirs
- Criteria for selecting disposables vs. reusable components
- Safety features: occlusion settings, air-handling mechanisms

UNIT II:(9 Hours)

PRIMING & HYPOTHERMIA MANAGEMENT

- Pre-bypass checklist and priming protocol
- Priming fluids: crystalloids, colloids, plasma expanders & rheological impacts
- Hypothermia methods: rationale, temperature monitoring sites, rewarming techniques
- Effects of temperature on blood viscosity and perfusion dynamics.

UNIT III: (9 Hours)

BLOOD GAS & ANTICOAGULATION MONITORING

- Blood-gas interpretation: pH, PCO_2/PO_2, electrolytes, hemoglobin, saturation, BE
- Anticoagulation protocols during bypass: heparin, protamine, ACT & aPTT monitoring, platelet dysfunction management
- Protocols for coagulopathies and heparin-less bypass

UNIT IV: (9 Hours)

MICROEMBOLI, FILTRATION & HEMOCONSERVATION

- Embolic hazards: gaseous and particulate microemboli sources and physiology
- Filters: arterial, cardiotomy, leukocyte-depleting, micro-pore & depth filters
- Blood conservation techniques: ultrafiltration (conventional/modified), cell salvage, ultrafiltration devices

UNIT V: (9 Hours)

PUMP TYPES, CONDUCT OF CPB & TROUBLESHOOTING

- Pump mechanisms and selection: roller, centrifugal, diagonal; pulsatile vs. non-pulsatile perfusion.
- Conduct of CPB: cannulation protocols, starting, maintaining, and terminating bypass
- Managing complications: mechanical/electrical failures, perfusion accidents, safety protocols
- Termination protocols: ventilation initiation, inotropic support, de-airing before separation from bypass

PRACTICAL (60 hours)

- Understanding Basic Perfusion Techniques and Perfusion Circuit Management
- Understanding oxygenators, filters, reservoirs, and tubing sets
- Sterilization and safety protocols in perfusion
- Documentation and recording of perfusion procedures
- Ethical and professional practices in the perfusion setting
- Perfusion equipment troubleshooting and maintenance basics

References

- Cardiopulmonary Bypass: Principles and Practice – Glenn P. Gravlee
- Basics of Perfusion and cardiopulmonary Bypass

Basics of Perfusion Technology

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

Learning Objectives

1. Understand the principles of diagnostic investigations used in cardiac care.
2. Explain ECG interpretation and cardiovascular imaging techniques.
3. Understand laboratory investigations related to perfusion technology.
4. Describe monitoring systems and instrumentation used during cardiopulmonary bypass.
5. Understand hemodynamic, hematologic, and hemostatic monitoring in perfusion practice.
6. Apply safety precautions and monitoring principles during cardiac procedures.

Learning Outcomes

1. · Identify normal and abnormal findings in chest X-ray and ECG.
2. · Explain angiography, echocardiography, and nuclear cardiology investigations.
3. · Interpret common laboratory investigations related to perfusion practice.
4. · Describe the principles and functions of monitoring devices and instrumentation.
5. · Explain hemodynamic, hematologic, and coagulation monitoring techniques.
6. · Demonstrate knowledge of monitoring and patient safety during perfusion procedures

UNIT-I (9Hours)

CHEST X-RAY AND ELECTROCARDIOGRAPHY

· Normal chest X-ray
· Postero-anterior view and views in different positions
· Identification of borders of heart
· Cardiomegaly, pneumothorax, hydrothorax, pleural effusion
· Normal electrocardiogram and different waves
· Significance of ECG waves
· Atrial arrhythmias
· Ventricular arrhythmias
· Heart blocks

UNIT II (9 Hours)

ANGIOGRAPHY AND ECHOCARDIOGRAPHY

Angiography

- Coronary angiography
- Peripheral angiography
- Normal coronary arteries and branches in different views
- Indications and limitations of angiography
- Cerebral, renal, and limb angiography

Echocardiography

- Transthoracic echocardiography
- Transesophageal echocardiography
- Indications and applications
- Different echo views and interpretation

UNIT III:(9 Hours)

LABORATORY INVESTIGATIONS RELATED TO PERFUSION TECHNOLOGY

- Hemoglobin estimation
- Blood grouping
- Urine analysis
- Renal function tests (RFT)
- Liver function tests (LFT)
- PT, INR, and APTT
- Spirometry for lung function
- Activated clotting time (ACT)
- Thromboelastography (TEG)

UNIT IV: (9 Hours)

MONITORING AND INSTRUMENTATION

· Concepts of monitoring
· ECG machine instrumentation
· Pressure transducers
· Syringe and peristaltic pumps
· Monitors and ventilators
· Pulse oximeters
· Temperature probes and thermoregulatory monitoring
· Defibrillators and fibrillator

UNIT V: (9 Hours)

HEMODYNAMIC, HEMOSTATIC AND HEMATOLOGIC MONITORING

- Hemodynamic monitoring
- Hemostatic monitoring
- Hematologic monitoring
- Interpretation of monitoring parameters
- Monitoring during cardiopulmonary bypass

References

- Cardiopulmonary Bypass: Principles and Practice – Glenn P. Gravlee

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.
   Utilize time management, organization, and public speaking

   skills to enhance personal productivity and professional

   performance.

Unit 1 **(2 hours)**

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

Unit 2 **(2 hours)**

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.

Unit 3**(2 hours)**

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.

Unit 4 **(2 hours)**

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.

Unit 5**(2 hours)**

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.

Unit 6**(2 hours)**

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.

Unit 7**(2 hours)**

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.

Unit 8**(2 hours)**

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

CLINICAL POSTINGS I

L/T/P/C

-/-/14/7

Course Objectives

- To provide basic clinical exposure to perfusion practices in different hospital departments.
- To develop understanding of perfusion circuit management and basic perfusion techniques.
- To familiarize students with clinical applications of perfusion technology in patient care.
- To improve observation, communication, and professional skills in clinical settings.
- To enhance knowledge of OT, ICU, ward, and emergency department protocols.

Learning Outcomes

- Understand the functioning of perfusion circuits and basic perfusion procedures.
- Observe and assist in clinical perfusion techniques under supervision.
- Identify the roles of perfusionists in OT, ICU, wards, and emergency care.
- Demonstrate proper documentation and clinical observation skills.
- Follow professional ethics, safety measures, and teamwork in hospital practice.

Total hours : 150 hours

- Understanding the Perfusion Circuit Management
- Observing the Basic Perfusion Techniques
- Understanding the Clinical Application of Perfusion Techniques

Students are posted in the following departments,

- OT, ICU's, Wards, Emergency department

Assessment Components:

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

II year IV semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310401	Applied Perfusion Technology	3	-	-	3	30	70	100
2	BCT3310402	Advanced Perfusion Technology	3	-	4	5	30	70	100
3	BCT3310403	Critical Care & Emergency Management	3	-	-	3	30	70	100
4	BCT3310404VA	Health and Well-being	1	-	-	1	100	-	100
5	BCT3310405	Clinical Postings - II	-	-	16	8	100	-	100
TOTAL			10	-	20	20	290	210	500

SEMESTER- IV

APPLIED PERFUSION TECHNOLOGY

L/T/P/C

3/-/-/3

LEARNING OBJECTIVES

1. Understand pharmacology and drugs used during CPB.
2. Explain monitoring and conduct of cardiopulmonary bypass.
3. Describe oxygenation, heat exchangers, and priming techniques.
4. Understand hemodilution and perfusion safety measures.
5. Explain blood conservation and ultrafiltration techniques.
6. Describe microemboli and filtration systems used during CPB

LEARNING OUTCOMES

1. Explain drugs and pharmacological principles related to CPB.
2. Demonstrate knowledge of CPB monitoring and perfusion management.
3. Describe oxygenators, heat exchangers, and priming solutions.
4. Explain hemodilution and safety during cardiopulmonary bypass.
5. Identify complications associated with CPB and their management.
6. Explain blood conservation and filtration methods used in extracorporeal circulation.

UNIT I (9 HOURS)

PHARMACOKINETICS AND DRUGS USED DURING CPB

- Pharmacokinetics during CPB
- Hemodilution, hypothermia, and acid-base status
- Drug sequestration and pharmacodynamics
- Tissue protein binding and tissue penetration
- Effects of temperature and age on drugs
- Anesthetic agents and opioids
- Neuromuscular blocking drugs
- Antibiotics used during CPB
- Antithrombotic and antiplatelet drugs
- Beta blockers and vasodilators
- Calcium channel blockers and nitrates
- Premedication drugs used during CPB

UNIT II –(9 HOURS)

CONDUCT AND MONITORING OF CARDIOPULMONARY BYPASS

- Conduct of cardiopulmonary bypass
- ECG monitoring
- Arterial blood pressure monitoring
- Central venous pressure (CVP)
- Pulmonary wedge pressure
- Pressure measurements during CPB
- Arterial pump flow rate
- Suction pump flow monitoring
- Temperature monitoring
- Biochemical monitoring
- Computer-linked monitoring systems

UNIT III – (9 HOURS)

ADEQUACY OF PERFUSION, OXYGENATION AND HEAT EXCHANGERS

- Adequacy of perfusion
- Factors affecting tissue perfusion
- Monitoring of perfusion adequacy
- Principles of oxygenation
- Bubble oxygenators
- Membrane oxygenators
- Assessment of oxygenator function
- Comparison of oxygenators
- Principles of heat exchangers
- Function and management of heat exchangers

UNIT IV –(9 HOURS)

PRIMING FLUIDS, HEMODILUTION AND PERFUSION SAFETY

- Priming fluids used during CPB
- Crystalloids and colloids
- Dextrose solutions
- Balanced salt solutions
- Mannitol and plasma expanders
- Dextrans, gelatins, and hetastarch
- Hemodilution and its physiological effects
- Advantages and complications of hemodilution
- Perfusion safety during CPB
- Coagulopathies during bypass
- Mechanical and electrical failures
- Accidents and perfusion-related management

UNIT V –(9 HOURS)

BLOOD CONSERVATION AND FILTRATION TECHNIQUES

- Blood conservation during CPB
- Hemofiltration and dialysis during CPB
- Modified ultrafiltration
- Reverse autologous priming
- Microemboli during CPB
- Gaseous and particulate emboli
- Filters used in CPB circuits
- Micropore filtration during CPB

References

- Gravlee GP et al. – *Cardiopulmonary Bypass: Principles and Practice*
- Kaplan JA – *Cardiac Anesthesia: In Cardiac and Noncardiac Surgery*
- Gravlee GP et al. – *Hensley's Practical Approach to Cardiac Anesthesia*

ADVANCED PERFUSION TECHNOLOGY

L/T/P/C

3/-/4/5

Course Objectives

- To provide advanced knowledge of cardiopulmonary bypass and modern perfusion technologies.
- To explain myocardial protection, organ preservation, and anticoagulation monitoring techniques.
- To develop understanding of ECMO, VADs, IABP, and mechanical circulatory support systems.
- To familiarize students with minimally invasive, robotic, and off-pump cardiac surgery perfusion techniques.
- To enhance skills in advanced monitoring, safety protocols, blood conservation, and quality assurance in perfusion practice.

Learning Outcomes

- Explain advanced principles and techniques used in cardiopulmonary bypass.
- Demonstrate knowledge of myocardial protection and organ preservation strategies.
- Understand the setup, monitoring, and troubleshooting of ECMO and mechanical circulatory support devices.
- Describe perfusion management in minimally invasive and robotic cardiac surgeries.
- Apply advanced monitoring systems, safety standards, and quality assurance protocols in perfusion technology

UNIT 1(9 Hours)

ADVANCED CONCEPTS IN CARDIOPULMONARY BYPASS (CPB)

- Advanced principles of CPB (laminar vs turbulent flow, shear stress, pressure-flow relationships)
- Pulsatile vs non-pulsatile perfusion
- Biocompatible circuits and coated tubing
- Ultrafiltration techniques:
    1. Conventional ultrafiltration (CUF)
    2. Modified ultrafiltration (MUF)
- Hemodilution and hematocrit management strategies
- Advanced anticoagulation monitoring (TEG, Heparin assay)

UNIT 2: (9 Hours)

MYOCARDIAL PROTECTION & ORGAN PRESERVATION

- Advanced cardioplegia strategies:
    1. Blood vs crystalloid cardioplegia
    2. Antegrade vs retrograde delivery
    3. Del Nido and Custodiol cardioplegia
- Techniques for organ protection (renal, neurological, pulmonary)
- Temperature management (deep hypothermia, controlled rewarming)
- Ischemia-reperfusion injury management

UNIT 3:(9 Hours)

MECHANICAL CIRCULATORY SUPPORT (MCS)

- Intra-aortic balloon pump (IABP): indications, timing, management
- Ventricular assist devices (VADs): types, short vs long-term use
- ECMO (Extracorporeal Membrane Oxygenation):
    1. VV and VA ECMO principles
    2. Cannulation, oxygenator function, flows, monitoring
    3. ECMO weaning and troubleshooting
- Total artificial heart and implantable devices (overview)

UNIT 4:(9 Hours)

MINIMALLY INVASIVE AND ROBOTIC PERFUSION

- Perfusion considerations in:
    1. Minimally Invasive Cardiac Surgery (MICS)
    2. Port-access and robotic CABG
- Endoscopic vessel harvesting
- Sutureless anastomosis and hybrid procedures
- Off-pump coronary artery bypass (OPCAB): perfusionist’s role
- Perioperative perfusion support in transcatheter valve implantation (TAVI)

UNIT 5: (9 Hours)

INNOVATIONS, MONITORING & SAFETY IN PERFUSION

- Continuous online monitoring: SvO_2, DO_2, VO_2, lactate
- Goal-directed perfusion and indexed flow management
- Blood conservation strategies and autotransfusion
- Simulation in perfusion training
- Safety protocols and checklists
- Regulatory standards and quality assurance in perfusion

Reference:

- Gravlee GP et al. – Cardiopulmonary Bypass: Principles and Practice
- Kermode J – Advanced Perfusion Techniques in Cardiac Surgery
- Glower DD – Mechanical Circulatory Support: Principles and Applications
- Darowski M – Advanced Monitoring and Management of Perfusion
- ELSO Red Book (by Extracorporeal Life Support Organization)
- Latest guidelines & updates from:
- American Society of ExtraCorporeal Technology (AmSECT)
- ELSO Guidelines
- Perfusion Journal
- Journal of ExtraCorporeal Technology

PRACTICALS

Course Objectives

To provide practical knowledge of advanced perfusion techniques and equipment.

To develop understanding of ECMO, IABP, VADs, and perfusion monitoring systems.

To train students in safety protocols, sterilization, and quality control procedures.

To enhance practical skills in documentation and maintenance of perfusion records.

To improve professional and technical competency in advanced perfusion practice.

Learning Outcomes

Demonstrate basic setup and handling of advanced perfusion devices.

Understand monitoring of oxygen delivery and perfusion parameters.

Apply safety protocols and sterilization techniques in perfusion practice.

Maintain proper perfusion documentation and logbook records.

Perform quality control and troubleshooting in perfusion technology.

Total hours 60 Hours

- Setup and comparison of pulsatile vs non-pulsatile flow
- Observation of Intra-Aortic Balloon Pump (IABP)
- Demonstration of ECMO
- Basic setup and demonstration of Ventricular Assist Devices (VADs)
- Real-time monitoring of oxygen delivery (DO_2), oxygen consumption (VO_2), and SvO_2
- Use of checklists and safety protocols in perfusion
- Sterilization and maintenance of advanced perfusion equipment
- Perfusion documentation and CPB logbook maintenance
- Quality control and auditing in perfusion practice

Reference:

- Gravlee GP – Cardiopulmonary Bypass: Principles and Practice

CRITICAL CARE & EMERGENCY MANAGEMENT

L/T/P/C

3/-/-/3

Course Objectives

- To provide knowledge of critical care and emergency management in cardiac settings.
- To develop understanding of hemodynamic monitoring and mechanical ventilation.
- To explain emergency management protocols for cardiac and respiratory emergencies.
- To familiarize students with postoperative cardiac ICU care and supportive devices.
- To enhance knowledge of critical care drugs, fluid therapy, and emergency medications.

Learning Outcomes

- Explain the principles of critical care and ICU management.
- Interpret hemodynamic and respiratory monitoring parameters effectively.
- Apply emergency management and resuscitation protocols in critical situations.
- Understand postoperative cardiac ICU care and management of complications.
- Identify commonly used emergency drugs and their clinical applications

UNIT 1 (9Hours)

BASICS OF CRITICAL CARE

- Introduction to intensive care and emergency medicine
- ICU structure and environment
- Types of ICUs: Medical, Surgical, Cardiac, Neuro, Pediatric
- Basic life support (BLS) and advanced cardiac life support (ACLS)
- Infection control practices in ICU
- Roles and responsibilities of the perfusion technologist in ICU settings

UNIT 2 :(9Hours)

HEMODYNAMIC AND RESPIRATORY MONITORING

- Arterial and central venous pressure monitoring
- Pulmonary artery catheterization (Swan-Ganz)
- ECG monitoring and interpretation of arrhythmias
- Oxygenation and ventilation parameters (ABG, SpO_2, $ETCO_2$)
- Mechanical ventilation basics: modes, settings, alarms
- Weaning from mechanical ventilation

UNIT 3 :(9Hours)

EMERGENCY MANAGEMENT

- Cardiac arrest and resuscitation protocols
- Shock: classification, causes, and management (hypovolemic, cardiogenic, septic)
- Acute coronary syndromes (STEMI/NSTEMI) and emergency PCI
- Cardiac tamponade and pericardiocentesis
- Emergency airway management and intubation techniques
- Recognition and initial management of stroke

UNIT 4::(9Hours)

POSTOPERATIVE CARDIAC ICU MANAGEMENT

- Postoperative care of CABG and valve replacement patients
- Common post-cardiac surgery complications: bleeding, arrhythmia, low cardiac output
- Chest drain management
- Temporary pacing and pacemaker troubleshooting
- IABP and ECMO monitoring in ICU
- Blood transfusion protocols and fluid management

UNIT 5:(9Hours)

DRUGS IN CRITICAL CARE & EMERGENCY

- Inotropes and vasopressors (dopamine, dobutamine, adrenaline, noradrenaline)
- Anti-arrhythmic drugs and emergency medications
- Sedation, analgesia, and neuromuscular blockers in ICU
- Antiplatelet, anticoagulants, and thrombolytics
- Electrolyte and fluid therapy
- Crash cart preparation and emergency drug tray handling

Reference:

- David W. Chang – Clinical Application of Mechanical Ventilation
- Tulay Koru-Sengul – Essentials of Critical Care Nursing
- Yadav B – Textbook of Emergency and Critical Care Medicine
- Sharma S – Textbook of Critical Care for Paramedics and Nurses

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.

Learning 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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

Mental Health and Emotional Well-being

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

Building emotional resilience

Unit 5 **(2 hours)**

Stress Management Techniques Understanding stress and its effects on health Mindfulness and relaxation techniques

Time management for stress reduction

Unit 6 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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 **(2 hours)**

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

CLINICAL POSTINGS II L/T/P/C

-/-/16/8

Course Objectives

- To provide advanced clinical exposure in cardiac surgery and perfusion practices.
- To develop understanding of CABG procedures and patient management.
- To familiarize students with advanced perfusion techniques and critical care management.
- To enhance observation and practical skills in emergency and ICU settings.
- To improve professional communication, teamwork, and clinical documentation skills.

Learning Outcomes

- Understand CABG procedures and postoperative patient management.
- Observe advanced perfusion techniques and emergency care procedures.
- Identify the role of perfusionists in OT, ICU, wards, and emergency departments.
- Demonstrate clinical observation, documentation, and professional skills.

Total Hours 180 hours

Observing,

- Coronary Artery Bypass Grafting (CABG) & Patient Management
- Advanced Perfusion Techniques
- Critical Care and Emergency Management

Students are posted in the following departments,

- OT, ICU's, Wards, Emergency department

Assessment Components:

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

III year – V semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310501	Pediatric & Adult Perfusion Management	3	-	-	3	30	70	100
2	BCT3310502	Hemodynamic Monitoring	3	-	-	3	30	70	100
3	BCT3310503	Perfusion in Specialized Surgeries	3	-	4	5	30	70	100
4	BCT3310504	CPR And Life Support	3	-	-	3	30	70	100
5	BCT3310505VA	Interpersonal Communication	1	-	-	1	100	-	100
6	BCT3310506	Clinical Postings - III	-	-	16	8	100	-	100
TOTAL			13	-	20	23	320	280	600

SEMESTER- V

PEDIATRIC AND ADULT PERFUSION MANAGEMENT L/T/P/C

3/-/-/3

Course Objectives

- To provide knowledge of pediatric and adult perfusion management during cardiopulmonary bypass.
- To explain perfusion techniques used in congenital and adult cardiac surgeries.
- To develop understanding of monitoring, myocardial protection, and ultrafiltration techniques.
- To familiarize students with postoperative management and emergency troubleshooting in perfusion practice.
- To enhance clinical decision-making and documentation skills in pediatric and adult perfusion care.

Learning Outcomes

- Explain the principles of pediatric and adult perfusion management.
- Describe perfusion strategies used in congenital and adult cardiac surgeries.
- Understand monitoring, weaning, and blood conservation techniques during CPB.
- Identify postoperative complications and emergency management procedures.
- Demonstrate proper documentation and professional practices in perfusion management.

Unit 1(9 Hours)

Basics of Pediatric and Adult Perfusion

- Overview of pediatric vs adult cardiovascular anatomy and physiology
- Developmental differences in circulation
- Indications for cardiopulmonary bypass in pediatric and adult patients
- Perfusion-related challenges in different age groups

Unit 2 (9 Hours)

Pediatric Perfusion Techniques

- Perfusion strategies in congenital heart diseases (ASD, VSD, TOF, TGA, TAPVR)
- Miniaturized circuits: design and management
- Pediatric flow rate and perfusion parameter calculations
- Myocardial protection in pediatric patients (Del Nido, DHCA, pH-stat vs alpha-stat)
- Modified ultrafiltration (MUF) in pediatric cases

Unit 3 (9 Hours)

Adult Perfusion Techniques

- Perfusion during CABG, valve replacement, and aortic surgeries
- Anticoagulation and hemodilution strategies in adults
- Cardioplegia: blood vs crystalloid, warm vs cold
- Temperature and metabolic control during CPB
- Ultrafiltration and fluid balance in adults

Unit 4 (9 Hours)

Monitoring and Weaning in Pediatric and Adult Cases

- Hemodynamic and metabolic monitoring during CPB
- Venting and de-airing techniques
- Weaning from bypass: pediatric vs adult approaches
- Inotropes and rhythm control
- Blood conservation and transfusion practices

Unit 5 (9 Hours)

Postoperative Management and Emergencies

- ICU management after CPB in pediatric and adult patients
- Role of perfusionist in postoperative care

- Use of ECMO and IABP in children and adults
- Emergency troubleshooting: air embolism, pump failure, hypotension
- Case documentation and perfusion record-keeping

Reference:

- Gravlee GP – Cardiopulmonary Bypass: Principles and Practice
- Mavroudis & Backer – Pediatric Cardiac Surgery
- Moss & Adams – heart disease in Infants, Children, and Adolescents
- ELSO Red Book – Guidelines for ECMO Practice

HEMODYNAMIC MONITORING

L/T/P/C

3/-/-/3

Course Objectives

- To provide knowledge of hemodynamic principles and cardiovascular physiology.
- To explain non-invasive and invasive hemodynamic monitoring techniques.
- To develop understanding of monitoring methods used during cardiopulmonary bypass.
- To familiarize students with advanced monitoring devices and metabolic indicators.
- To enhance skills in waveform interpretation, troubleshooting, and documentation.

Learning Outcomes

- Explain the basic principles of hemodynamics and circulation.
- Identify and interpret invasive and non-invasive monitoring parameters.
- Understand advanced perfusion monitoring techniques during CPB.
- Recognize abnormal hemodynamic trends and related complications.
- Demonstrate proper troubleshooting and documentation of monitoring data

Unit 1 (9 Hours)

Introduction to Hemodynamics

- Definition and principles of hemodynamics
- Cardiac output, stroke volume, preload, afterload, contractility
- Factors affecting systemic and pulmonary circulation
- Vascular resistance (SVR, PVR)
- Physiology of blood pressure and heart sounds

Unit 2 (9 Hours)

Non-Invasive Hemodynamic Monitoring

- Blood pressure monitoring (manual, oscillometric)
- Pulse oximetry (SpO_2): principle, limitations
- Capnography ($ETCO_2$)
- Jugular venous pressure (JVP) assessment
- Doppler echocardiography in perfusion monitoring
- Impedance cardiography

Unit 3 (9 Hours)

Invasive Hemodynamic Monitoring

- Arterial line (A-line) monitoring
- Central venous pressure (CVP) monitoring

- Pulmonary artery catheterization (Swan-Ganz): measurements and waveforms
- Cardiac output measurement (thermodilution, Fick method)
- Pressure-volume loops and preload responsiveness
- Mixed venous oxygen saturation (SvO_2)

Unit 4 (9 Hours)

Advanced Monitoring Techniques in Perfusion

- Monitoring during cardiopulmonary bypass (CPB)
    1. Arterial and venous pressures
    2. Flow rate monitoring
    3. Line pressure alarms and bubble detection
    4. Venous reservoir levels
- Near-infrared spectroscopy (NIRS) and cerebral oximetry
- Lactate monitoring and metabolic indicators
- Temperature monitoring (core vs peripheral)

Unit 5 (9 Hours)

Hemodynamic Interpretation, Troubleshooting & Documentation

- Interpretation of waveforms and pressure tracings
- Identification of abnormal hemodynamic trends
- Clinical decision-making based on monitoring data
- Complications of invasive monitoring
- Troubleshooting monitoring equipment
- Hemodynamic charting and electronic data documentation

Reference:

- Understanding Hemodynamics - Antonio M. Gotto
- Essentials of Cardiopulmonary Monitoring - Michael R. Pinsky
- Cardiopulmonary Bypass: Principles and Practice - Gravlee GP

PERFUSION IN SPECIALIZED SURGERIES

L/T/P/C

3/-/4/5

Course Objectives

- To provide knowledge of perfusion techniques used in specialized and complex surgeries.
- To explain perfusion management in congenital, aortic, transplant, and non-cardiac surgeries.
- To develop understanding of hypothermia, cerebral perfusion, and organ preservation techniques.
- To familiarize students with mechanical circulatory support systems and advanced monitoring methods.
- To enhance clinical observation, crisis management, and professional skills in specialized perfusion practice.

Learning Outcomes

- Explain the principles of specialized perfusion in complex surgical procedures.
- Understand perfusion modifications required in pediatric, aortic, and transplant surgeries.
- Identify the role of perfusionists in mechanical circulatory support and ECMO integration.
- Recognize complications and apply crisis management strategies during specialized perfusion.
- Demonstrate professional observation and documentation skills in OT and ICU settings.

UNIT 1 (9 Hours)

INTRODUCTION TO SPECIALIZED PERFUSION

- Overview of perfusion beyond routine cardiac surgery
- Classification of specialized surgeries requiring perfusion support
- Principles of adapting cardiopulmonary bypass (CPB) to unique surgical needs
- Safety and ethical considerations in complex perfusion scenarios

UNIT 2 (9 Hours)

PERFUSION IN CONGENITAL HEART SURGERY

- Perfusion modifications in pediatric and neonatal cases
- Use of deep hypothermic circulatory arrest (DHCA)
- Myocardial protection in pediatric patients
- Oxygenator and circuit size selection for pediatric perfusion

UNIT 3 (9 Hours)

PERFUSION IN AORTIC AND MAJOR VESSEL SURGERIES

- CPB techniques in aortic aneurysm and dissection repair
- Selective cerebral perfusion and antegrade/retrograde cerebral perfusion

- Hypothermia management in aortic arch surgeries
- Cannulation strategies in major vessel repairs

UNIT 4 **(**9 Hours)

PERFUSION IN TRANSPLANTATION AND MECHANICAL CIRCULATORY SUPPORT

- Principles of perfusion in heart transplantation
- Principles of perfusion in lung transplantation
- Organ preservation and transport techniques
- Role of perfusionist in VAD (Ventricular Assist Device) and TAH (Total Artificial Heart) implantation
- Integration with ECMO in transplant patients

UNIT 5 **(**9 Hours)

PERFUSION IN NON-CARDIAC AND COMPLEX SURGERIES

- CPB-assisted tumor resections (e.g., atrial myxoma, mediastinal tumors)
- Perfusion in major trauma surgeries with cardiac involvement
- Support for minimally invasive cardiac surgery (MICS)
- Role in robotic cardiac surgeries
- Hypothermic and normothermic regional perfusion in organ salvage

UNIT 6 **(**9 Hours)
CRISIS MANAGEMENT & ADVANCES

- Managing complications during specialized perfusion
- Hemodilution, coagulopathy, and blood conservation in complex cases
- Advances in monitoring (near-infrared spectroscopy, advanced hemodynamic monitors)
- Emerging technologies in specialized perfusion (miniaturized CPB, biocompatible circuits)

RECOMMENDED REFERENCE BOOKS:

- Gravlee GP, "Cardiopulmonary Bypass: Principles and Practice" – Latest edition
- Baker, "Manual of Perfusion Technology"
- Khonsari & Sintek, "Cardiopulmonary Bypass in Adults"

- Brooker, "Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population"
- M. Darowski, "Advances in Extracorporeal Circulation"

PRACTICALS:

Course Objectives

Understand OT protocols and workflow

Observe adult and paediatric surgeries

Learn post-operative ICU care

Identify OT and ICU equipment

Understand patient monitoring procedures

Correlate theory with clinical practice

Follow sterile and safety protocols

Develop professional clinical skills

Learning Outcomes

Understand OT protocols and sterile techniques

Observe perioperative patient management

Identify adult and paediatric cardiac surgical procedures

Understand ICU monitoring and post-operative care

Correlate perfusion practices with surgical procedures

Total hours : 64 hours

- Observation in OT
- Observing Post Surgical Procedures in Critical Care and ICU
- Observing the various Adult and Paediatric Procedures in OT Complex

Reference:

Cardiopulmonary Bypass: Principles and Practice- Gravlee GP

CPR And Life Support

L/T/P/C

3/-/-/3

Learning Objectives

- To understand the principles of intensive care management in critically ill patients.
- To study monitoring techniques and supportive care in ICU.
- To learn the management of cardiovascular, respiratory, renal, and neurological emergencies.
- To acquire knowledge of cardiopulmonary resuscitation and airway management.
- To understand Advanced Cardiac Life Support (ACLS) protocols and emergency interventions.
- To develop skills in first aid and basic life support techniques.

Learning Outcomes

- Explain monitoring and management procedures in intensive care units.
- Describe supportive care for mechanically ventilated and critically ill patients.
- Demonstrate understanding of CPR and airway management techniques.
- Identify emergency management strategies in cardiac and respiratory failure.
- Discuss ACLS protocols, ECG interpretation, and defibrillation techniques.
- Apply first aid principles and resuscitation methods during emergencies

UNIT-I (9 Hours)

Cardiovascular, Renal and Neurological Emergencies

- Acid-base disorders
- Electrolyte imbalance
- Cardiovascular failure
- Inotropic support
- Vasodilator drugs
- Renal failure
- Liver failure
- Head injury
- Principles of transfusion therapy

UNIT-II (9 Hours)

Intensive Care Monitoring and General Patient Care

- Central venous access
- ECG monitoring
- Invasive hemodynamic monitoring
- Cardiac arrhythmia recognition
- Care of mechanically ventilated patients
- Tracheostomy and humidification
- Arterial and venous lines
- Radiography and chest physiotherapy

-

UNIT-III (9 Hours)

Intensive Care UNIT Management

- Management of myocardial infarction
- Unstable angina
- Fluid management
- Parenteral nutrition
- Infectious diseases in ICU
- Antibiotics in ICU
- Respiratory failure
- Oxygen therapy
- Mechanical ventilation
-

UNIT-IV (9 Hours)

Basic Life Support and CPR

- Basic life support
- Airway management
- Adequate breathing and circulation
- Adult one-rescuer CPR
- Adult two-rescuer CPR
- Mouth-to-mouth breathing
- Bag and mask ventilation
- External chest compression
- CPR equipment

UNIT-V (9 Hours)

ACLS and First Aid Techniques

- Airway management techniques
- Mouth-to-mask ventilation
- Endotracheal intubation
- ECG interpretation in ACLS
- Dysrhythmia therapy
- Electrical therapy and defibrillation
- Cardiovascular pharmacology in ACLS
- Mega code management
- First aid techniques

Reference:

- Understanding Hemodynamics - Antonio M. Gotto
- Essentials of Cardiopulmonary Monitoring - Michael R. Pinsky
- Cardiopulmonary Bypass: Principles and Practice - Gravlee GP

CLINICAL POSTINGS III L/T/P/C

-/-/16/8

Course Outcomes

After completion of this posting, students will be able to:

1. Describe adult and paediatric perfusion procedures observed in clinical practice.
2. Explain perfusion techniques used in specialized surgeries.
3. Identify the roles of OT, ICU, wards, and emergency department in patient care.
4. Maintain proper logbook and clinical records.
5. Present and discuss clinical cases in viva voce sessions.
6. Demonstrate professional ethics, discipline, and patient safety awareness.

Learning Objectives

- Observe adult and paediatric perfusion procedures in clinical settings
- Understand perfusion techniques used in specialized cardiac surgeries
- Gain exposure to functioning of OT, ICU, wards, and emergency department
- Observe patient monitoring and perioperative management
- Develop skills in clinical observation and documentation
- Understand teamwork in multidisciplinary hospital care
- Learn basic interpretation of clinical situations in perfusion practice
- Maintain professional behaviour in hospital environment

Total hours : 130 hours

Observing,

- Paediatric & Adult Perfusion
- Perfusion in Specialized Surgeries

Students are posted in the following departments,

- OT, ICU's, Wards, Emergency department

Assessment Components:

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

IVyear – VI semester

S.NO	SUBJECT CODE	SUBJECT	L	T	P	C	Max. Marks		
							INT	EXT	TOTAL
1	BCT3310601	Medicine Relevant To Perfusion Technology	3	-	-	3	30	70	100
2	BCT3310602	Transplantation and ECMO Techniques	3	-	4	5	30	70	100
3	BCT3310603	Research Methodology and Biostatistics	3	-	-	3	30	70	100
4	BCT3310604VA	Art of Being a Better Person	1	-	-	1	100	-	100
5	BCT3310605	Clinical Postings - IV	-	-	16	8	100	-	100
TOTAL			10	-	20	20	290	210	500

SEMESTER- VI

MEDICINE RELEVANT TO PERFUSION TECHNOLOGY

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

Learning Objectives

- To understand medical conditions related to perfusion technology.
- To study cardiovascular diseases requiring cardiac surgical intervention.
- To learn hematological disorders and coagulation abnormalities.
- To understand respiratory and renal disorders relevant to perfusion practice.
- To acquire knowledge of neurological and systemic disorders affecting cardiac surgery.
- To develop understanding of special patient populations in perfusion care.

Learning Outcomes

- Explain cardiovascular diseases related to perfusion technology.
- Describe hematological disorders and laboratory investigations.
- Interpret respiratory function tests and pulmonary disorders.
- Discuss renal disorders and their management in cardiac patients.
- Understand neurological and systemic disorders influencing perfusion procedures.
- Apply knowledge in managing special patient groups during cardiac surgery.

UNIT-I (9 HOURS)

Cardiovascular System

- Ischaemic heart diseases
- Rheumatic heart disease

- Congenital heart disease
- Hypertension
- Aortic aneurysms
- Cardiomyopathy
- Peripheral vascular disease
- Pulmonary edema and LV failure

UNIT-II (9 HOURS)

Hematology

- Anaemia
- Bleeding disorders
- Coagulation abnormalities
- Platelet disorders
- Laboratory tests used in bleeding disorders
- Blood investigations related to cardiac surgery

UNIT-III (9 HOURS)

Respiratory System

- Chronic obstructive pulmonary disease (COPD)
- Obstructive pulmonary disease
- Restrictive pulmonary disease
- Pulmonary function tests (PFT)
- Interpretation of pulmonary function tests
- Respiratory assessment in cardiac patients

UNIT-IV (9 HOURS)

Renal System & Central Nervous System

- Acute renal failure (ARF)
- Chronic renal failure (CRF)
- End-stage renal disease
- Dialysis and renal transplantation
- Autonomic nervous system
- Sympathetic nervous system
- Parasympathetic nervous system
- CNS disorders and etiology

UNIT-V (9 HOURS)

Systemic Disorders and Special Patient Care

- Diabetes mellitus
- Obesity
- Pregnancy
- Pediatric patients (neonate and infant)

- Elderly patients
- Risk factors in special patient groups
- Preoperative assessment and care

Reference:

1. Cardiopulmonary Bypass and Mechanical Support: Principles and Practice *Authors:* Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider
2. Manual of Clinical Perfusion *Authors:* Dr. Nicholas C. Chesebro, Dr. Charles C. Reed, Dr. Stuart W. Jamieson
3. Clinical Perfusion for Cardiac Surgery: A Step-by-Step Guide to the Fundamentals *Authors:* Madhav Swaminathan, Stanton K. Shernan, Kai Matthes
4. Cardiopulmonary Bypass *Author:* Sunit Kumar Ghosh

TRANSPLANTATION AND ECMO TECHNIQUES

L/T/P/C

3/-/4/5

Learning Objectives

Understand principles of organ transplantation (heart and lung)
Learn role of ECMO as a bridge to transplant
Understand ECMO use during transplant surgery
Gain knowledge of post-transplant ECMO management
Learn advanced techniques like EVLP and NRP
Understand ethical and legal aspects of transplantation and ECMO
Develop basic troubleshooting skills in ECMO systems
Observe clinical ECMO management and perfusion support

Learning Outcomes

After completion of this course, students will be able to:
Explain principles of organ transplantation and organ allocation.
Describe ECMO as a bridge to transplant in clinical practice.
Understand intraoperative ECMO and perfusion management during transplant surgery.
Identify post-transplant ECMO indications and complications.
Explain emerging technologies like EVLP, NRP, and mobile ECMO.
Demonstrate understanding of ECMO components, operation, and troubleshooting.
Recognize ethical, legal, and documentation requirements in ECMO and transplantation

Unit 1: (3 hours)

Overview of Organ Transplantation

- Principles of organ transplantation (Heart, Lung, Heart-Lung)
- Indications for heart and lung transplant
- Role of ECMO in bridging to transplant
- Types of transplant candidates supported by ECMO
- Organ allocation criteria

Unit 2: (3 hours)

ECMO as a Bridge to Transplant

- VA-ECMO vs. VV-ECMO in pre-transplant support
- Selection criteria and contraindications
- Duration, outcomes, and ethical considerations
- Management of patients on ECMO waiting for transplant
- Case studies and transplant outcomes data

Unit 3:(3 hours)

ECMO During Transplant Surgery

- Cannulation strategies and perfusion considerations
- Intraoperative management during heart/lung transplantation
- Anticoagulation strategies and ACT management
- Coordination with transplant and perfusion teams
- Transitioning from ECMO to cardiopulmonary bypass (CPB)

Unit 4: (3 hours)

Post-Transplant ECMO Support

- Indications for ECMO after transplantation
- Weaning strategies and ECMO-related complications
- Graft dysfunction management
- Monitoring parameters and imaging guidance
- Infection control and immunosuppressive considerations

Unit 5: (3 hours)

Emerging Practices and Ethics

- Ex-vivo lung perfusion (EVLP) and heart perfusion platforms
- Normothermic regional perfusion (NRP) in DCD transplantation
- Transport ECMO and mobile ECMO units
- Legal and ethical issues in transplant and ECMO overlap
- Quality assurance and documentation protocols

PRACTICALS:

Total Practical Hours: 64 hours

- Introduction of ECMO, its Principles, Types of ECMO and its Components
- Uses of ECMO
- Observing the working of ECMO

- Observation of ECMO Management
- Understanding the troubleshooting and common issues associated with ECMO

Reference:

- Extracorporeal Life Support: The ELSO Red Book (5th ed.) -Bartlett et al.
- Cardiopulmonary Bypass: Principles and Practice - Gravlee GP
- Manual of Perioperative Care in Adult Cardiac Surgery - Robert M. Boja

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

Total hours: 45 hours

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

Variable 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

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.

Learning 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.

Practice self-reflection, gratitude, and purposeful living to contribute positively

to society and personal well-being.

Unit 1**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

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**(1 hour)**

Living with Purpose and Meaning

Discovering personal values and purpose

The intersection of passion, skills, and service Creating a life plan that aligns with core values Activity: Create a personal mission statement.

Week 11**(1 hour)**

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

CLINICAL POSTINGS IV

L/T/P/C

-/-/16/8

Learning Objectives

1. To provide advanced clinical exposure in cardiopulmonary bypass, extracorporeal circulation, and critical care perfusion practices.
2. To develop practical skills in handling heart-lung machines, ECMO systems, and perfusion monitoring techniques.
3. To enhance understanding of perfusion procedures including cannulation, anticoagulation management, myocardial protection, and blood conservation techniques.
4. To strengthen clinical decision-making, patient monitoring, and emergency management skills during cardiac surgical procedures.

Learning Outcomes

1. Demonstrate competency in assisting and performing perfusion-related procedures during cardiac surgeries and ECMO support.
2. Monitor and interpret hemodynamic parameters, ACT, ABG, temperature, and perfusion flow during extracorporeal circulation.
3. Assist in the preparation and management of CPB circuits, oxygenators, cannulas, and perfusion equipment.
4. Exhibit effective clinical reasoning, documentation, communication, and case presentation skills in perfusion practice

Total hours : 130 hours

- Observing the various procedures in OT complex
- Observing the Pre-Operative, Intra-Operative and Post-Operative procedures
- Understanding and Observing the Transplantation and ECMO Technique

Students are posted in the following departments,

- OT, ICU’s, Wards, Emergency department

Assessment Components:

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

SEMESTER VII

HEALTHY EATING FOR HEALTHY LIVING

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

Learning Objective:

1. To understand the basic concepts of food, nutrition, nutrients, and their role in maintaining health.
2. To acquire knowledge about macronutrients, micronutrients, and their functions, sources, and deficiency disorders.
3. To develop skills in nutritional assessment and planning balanced diets for different age groups and conditions.
4. To understand food safety, hygiene practices, and the role of nutrition in preventing lifestyle diseases.

Learning Outcome:

1. Explain the importance of nutrients and classify foods based on their nutritional value and functions.
2. Apply principles of balanced diet and meal planning for individuals across different life stages and health conditions.
3. Assess nutritional status using basic methods and interpret dietary requirements based on RDA guidelines.

Practice safe food handling, promote healthy eating habits, and prevent nutrition-related and lifestyle diseases.

UNIT I – (2 hours)
Introduction to Food and Nutrition

- Definitions: Food, Nutrition, Health, Nutrients
- Functions of food
- Classification of nutrients (macro & micronutrients)
- Food groups and food pyramid
- Concept of a balanced diet

UNIT II – (2 hours)

Macronutrients and Micronutrients

- **Macronutrients**:
    1. Carbohydrates: functions, sources, energy value
    2. Proteins: types, functions, sources
    3. Fats: types, functions, dietary sources
- **Micronutrients**:
    1. Vitamins: A, B-complex, C, D, E, K – sources, deficiency disorders
    2. Minerals: Calcium, Iron, Iodine, Zinc – functions and sources

UNIT III – (2 hours)

Nutritional Requirements and Assessment

1. Nutritional needs across the lifespan:
    a. Infants, children, adolescents
    b. Pregnant & lactating women
    c. Elderly population
2. Recommended Dietary Allowances (RDA – Indian context)
3. Methods of nutritional assessment:
    a. Anthropometry (BMI, MUAC)
    b. Dietary surveys (24-hour recall, food frequency questionnaire)

UNIT IV – (2 hours)

Meal Planning and Diet in Health & Disease

- Principles of meal planning
- Balanced diet planning for different age groups and lifestyles
- Diet modification in common conditions:
    1. Obesity
    2. Diabetes mellitus
    3. Hypertension
    4. Anemia
- Nutrition during stress and infections

UNIT V – (2 hours)

Food Hygiene and Safety

- Food safety concepts
- Personal hygiene and hand hygiene
- Safe food handling and storage
- Common foodborne illnesses
- Reading and interpreting food labels (FSSAI guidelines)
- Food adulteration and detection techniques

UNIT VI (2 hours)

Lifestyle and Functional Foods

- Role of nutrition in lifestyle diseases
- Dietary patterns and behavioral changes
- Functional foods and nutraceuticals (e.g. probiotics, antioxidants)
- Importance of hydration, sleep, and physical activity
- Role of traditional Indian diets and medicinal ingredients (turmeric, ginger, etc.)

Reference books:

1. Nutrition and You" by Joan Salge Blake

2. Understanding Nutrition" by Eleanor Noss Whitney and Sharon Rady Rolfes

INTERNSHIP I

L/T/P/C

-/-/40/20

Course Objectives

- To provide clinical exposure in various units of the CTVS department.
- To develop skills in assisting and monitoring patient care procedures.
- To understand OT, ICU, ward, and emergency department protocols.
- To familiarize students with medical records and documentation systems.
- To improve communication and professional skills in clinical settings.

Learning Outcomes

- Understand the functioning of different CTVS clinical units.
- Assist in patient care and clinical procedures under supervision.
- Follow infection control, safety, and OT protocols effectively.
- Maintain proper medical records and clinical documentation.
- Demonstrate professional behavior and teamwork in hospital settings.

Total hours: 340 hours

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

- OT Complex
- ICU's
- Wards
- Emergency Department
- Medical Records Department

PROJECT I

L/T/P/C

-/-/2/1

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.

Total hours: 15 hours

- 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

SEMESTER VIII

PROFESSIONALISM IN THE WORK PLACE **L/T/P/C**

1/-/-/1

Learning Objective:

To understand the core principles and values of professionalism in healthcare settings.
To develop knowledge of ethical practices, patient rights, and handling ethical dilemmas.
To enhance communication skills, emotional intelligence, and teamwork in professional environments.
To build competencies in workplace behaviour, career development, and continuous professional growth.

Learning Outcome:

Demonstrate professional behaviour, integrity, and accountability in healthcare and workplace settings.
Apply ethical principles and make informed decisions in real-world clinical and professional scenarios.
Exhibit effective communication, emotional intelligence, and teamwork in interactions with patients and colleagues.
Develop career readiness skills, including professional presentation, lifelong learning, and adherence to workplace standards

UNIT I: (2 hours)

Fundamentals of Professionalism in Healthcare

- Definitions and importance of professionalism
- Patient-centred care and the healthcare professional's role
- Key professional values: integrity, accountability, reliability, respect, confidentiality
- Personal grooming and workplace appearance

UNIT II:(2 hours)
Ethical Foundations & Professional Ethics

- Introduction to professional ethics in healthcare
- Ethical principles: beneficence, non-maleficence, autonomy, justice
- Confidentiality, honesty, transparency, and accountability

  Handling ethical dilemmas in real-world scenarios

UNIT III:(2 hours)
Communication Skills & Emotional Intelligence

- Internal and external communication: clarity, tone, and empathy
- Emotional intelligence: self-awareness, emotion regulation, empathy
- Active listening, non-verbal cues, therapeutic patient communication
- Professionalism in sensitive situations: difficult patients, grieving families

UNIT IV:(2 hours)

Interpersonal Relationships & Teamwork

- Building effective relationships with colleagues and other professionals
- Understanding diverse patient and team backgrounds: cultural competence and sensitivity
- Conflict resolution strategies and assertiveness skills
- Trust-building, empathy, and resolution of workplace challenges

UNIT V: (2 hours)

Professional Behavior & Workplace Conduct

- Time management, punctuality, organization, and responsibility
- Accountability, self-management, and personal growth
- Maintaining professional boundaries and upholding patient rights
- Modeling behavior for workplace culture and leadership

UNIT VI:

Career Development & Professional Presentation

- Presentation skills: resumes, interviews, professional presence
- Ethical and respectful use of social media/professional platforms
- Continuing education, lifelong learning, and reflective practice
- Navigating career paths and workplace feedback systems

Reference books:

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

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

INTERNSHIP II

L/T/P/C

-/-/20/10

Course Objectives

- To provide clinical exposure in various units of the CTVS department.
- To develop skills in assisting and monitoring patient care procedures.
- To understand OT, ICU, ward, and emergency department protocols.
- To familiarize students with medical records and documentation systems.
- To improve communication and professional skills in clinical settings.

Learning Outcomes

- Understand the functioning of different CTVS clinical units.
- Assist in patient care and clinical procedures under supervision.
- Follow infection control, safety, and OT protocols effectively.
- Maintain proper medical records and clinical documentation.
- Demonstrate professional behavior and teamwork in hospital settings

Total hours: 150 hours

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

- OT Complex
- ICU's
- Wards
- Emergency Department
- Medical Records Department

PROJECT II

L/T/P/C

-/-/20/10

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.

Total hours: 150 hours

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