

**CURRICULUM FOR
BS CARDIAC PERFUSION
TECHNOLOGY**

SCHEME OF STUDIES

Semester/Year	Name of Subject	COURSE CODE	Credits
First	MEDICAL BIOCHEMISTRY-I	PMS-601	4(3+1)
	HUMAN PHYSIOLOGY-I	PMS-602	4(3+1)
	HUMAN ANATOMY-I	PMS-603	4(3+1)
	ENGLISH-I	PMS-604	2(2+0)
	PAK STUDIES	PMS-605	2(2+0)
	COMPUTER SKILLS	PMS-606	2(2+0)
Second	MEDICAL MEDICAL BIOCHEMISTRY-II	PMS-607	4(3+1)
	HUMAN PHYSIOLOGY-II	PMS-608	4(3+1)
	HUMAN ANATOMY-II	PMS-609	4(3+1)
	ENGLISH-II	PMS-610	2(2+0)
	ISLAMIC STUDIES	PMS-611	2(2+0)
Third	HEMATOLOGY-I	MLT-601	3(2+1)
	MEDICAL MICROBIOLOGY-I	PMS-613	3(2+1)
	CARDIOPULMONARY ANATOMY	CAR-601	3(2+1)
	GENERAL PHARMACOLOGY-I	PMS-614	3(2+1)
	COMMUNICATION SKILLS	PMS-615	2(2+0)
	GENERAL PATHOLOGY-I	PMS-612	3(2+1)
Fourth	PATHOLOGY-II	PMS-617	3(2+1)
	MEDICAL MICROBIOLOGY-II	PMS-618	2(2+0)
	ELECTROCARDIOGRAPHY-I	CAR-602	3(2+1)
	CARDIOPULMONARY PHYSIOLOGY	CAR-603	3(2+1)
	HEMATOLOGY-II	MLT-604	2(1+1)
	PHARMACOLOGY-II	PMS-616	3(2+1)

	BEHAVIOURALSCIENCES	PMS-619	2(2+0)
			18
Fifth	CLINICALMEDICINE	CP-601	3(2+1)
	PERFUSIONTECHNOLOGY-I	CP-602	3(2+1)
	ECHOCARDIOGRAPHY	CP-603	3(2+1)
	ELECTROCARDIOGRAPHY-II	CAR-607	3(2+1)
	VENTRICULARASSISTANT DEVICES	CP-604	3(2+1)
	MEDICALPHYSICS	CAR-609	3(2+1)
			18
Sixth	ECMO	CP-605	3(2+1)
	PHARMACOLOGYRELATEDTO PERFUSION	CP-606	3(2+1)
	CARDIACSURGERY	CAR-618	3(2+1)
	DIAGNOSTIC EQUIPMENTS IN CARDIOLOGY	CAR-611	3(2+1)
	CRITICALCARE	CAR-616	3(2+1)
	PULMONARYDISEASES	CAR-613	3(2+1)
			18
Seventh	PERFUSIONTECHNOLOGY-II	CP-607	3(2+1)
	HEARTDISEASES	CAR-615	3(2+1)
	RESEARCH METHODOLOGY	PMS-621	3(2+1)
	FUNDAMENTALOFINFECTION CONTROL	PMS-624	3(2+1)
	EPIDEMIOLOGY	PMS-623	2(2)
	BIOSTATISTICS	PMS-622	3(2+1)
			17
Eight	RESEARCH PROJECT	PMS-626	6(6)
	SEMINAR	PMS-627	1(1)
	SUBJECTOF OWN INTEREST	CP-609	4(2+2)

	BIOETHICS	PMS-625	2(2+0)
	TOTAL- 124-136		13
	TOTALCREDITHOURS		135

Course objectives:

After successful completion of this course, students will be able to,

- Describe the chemical composition, biochemical role, digestion and absorption of macro and micro molecules of the cell.
- Discuss different biochemical reactions in cell.
- Explain mechanism of action of hormones.

Course Detail:

Biochemical composition and functions of the cell membrane; Chemistry of signals and receptors; Structure and function of Carbohydrates, Proteins and lipids; biochemical functions of vitamins; biochemical function of Sodium, potassium, chloride, calcium, phosphorus, magnesium, sulfur, iodine and fluoride; Composition and function of saliva, gastric juice, gastric acid (HCL), pancreatic juice, bile and intestinal secretion; Digestion and absorption of proteins, carbohydrates, lipids, vitamins and minerals; Body buffers and their mechanism of action; Acid base regulation in human body; Biochemical mechanisms for control of water and electrolyte balance; Mechanism of action of hormones.

Practical:

- Good laboratory Practices
- Preparation of Solutions
- Principles of Medical Biochemistry analyzers (spectrophotometer, flame photometer)
- Determination of Cholesterol, Tg, HDL, LDL, sugar, calcium and phosphorus in blood
- Introduction to electrophoresis, PCR, gel documentation
- How to operate centrifuge, water bath and microscope

Recommended Books:

- Harper's Medical Biochemistry Robert K. Murray, Daryl K. Granner 28th edition 2009
- Medical Biochemistry Mushtaq Ahmad vol. I and II 8th edition 2013

Course Objectives:

After successful completion of this course, students will be able to,

- Describe the basic concepts of physiology beginning from the cell organization to organ system function.
- Discuss the organization of cell, tissue, organ and system with respect to their functions.
- Explain the physiology of Respiration, G.I.T, Urinary system and Endocrine system

Course Detail:

Functional organization of human body, Mechanism of Homeostasis, Cell structure and its function, function of different Tissue, Functions of the skin, Types and function of muscle, Neuromuscular junction, functions of the endocrine glands, Breathing Mechanism, Exchange of respiratory Gaseous, Transport of respiratory gases, Function of different part of Digestive system, Function of liver and pancreas, Digestion and Absorption in Gastrointestinal tract, Patho-Physiology of Gastrointestinal Disorders, Formation of Urine by the Kidney, Glomerular filtration, Renal and associated mechanism for controlling ECF, Regulation of Acid-Base Balance, Male Reproductive System (Male), Prostate gland, Spermatogenesis, Female Reproductive System, Menstrual Cycle and Pregnancy and parturition, Mammary Glands and Lactation and Fertility Control

Practicals:

1. Introduction to microscope
2. Bleeding time
3. Clotting time
4. WBCs count
5. RBCs count
6. Platelets count
7. Reticulocytes count

Recommended Books:

- Essentials of Medical Physiology K Sembulingam, Prema Sembulingam Sixth Edition 2013
- Concise Physiology Dr. Raja Shahzad 1st Edition 2012
- Guyton And Hall Textbook Of Medical Physiology John E. Hall, Arthur C. Guyton Professor and Chair 2006
- Ross and Wilson Anatomy and Physiology in Health And Illness 11th Edition Anne Waugh,
- Allison Grant 2010

Course Objectives:

After successful completion of this course, students will be able to,

- Identify the principle structures of tissues, organs and systems.
- Discuss the different concepts and terms of general anatomy including skeleton and Musculo skeletal system.
- Explain the anatomy of Thorax, Abdomen and pelvis.

Course contents:

General Anatomy; Descriptive Anatomic terms, Basic structures, Musculo skeletal system (Axial and Appendicular), Different bones of the human body and their surface markings, General concepts, parts , classifications of bones, Structural, Regional and functional classification of joints, Characteristics, Classifications, Movements of synovial joints. Muscular System (skeletal, Cardiac, smooth)**Thoracic wall:** Structure of the anterior thoracic wall, Muscles of thorax, Diaphragm **Thoracic cavity:** Mediastinum, Trachea, lungs, pleura , bronchi, blood supply and lymphatics, Heart and thoracic vessels **Abdominal wall:** Skin, nerve and blood supply, Muscles of anterior abdominal wall, Inguinal canal **Abdominal cavity:** General Arrangement of the Abdominal Visceras, Peritoneum, Omenta, mesenteries, GIT and its blood supply, Accessory Organs (Liver, Spleen, Gall bladder, Pancreas), Genitourinary System (Kidneys, Ureters) **The pelvic wall:** Anterior, posterior wall, diaphragm. **Pelvic cavity:** Uterus, Ovaries, Fallopian tubes, urinary bladder, Male genital organs, Female genital organs, Muscles of pelvic region, blood supply, nerve supply.

Practicals:

1. Study Axial, Appendicular skeleton and musculoskeletal system on human skeletal models.
2. Study and identification of the anatomy of Thorax, Abdomen and Pelvis through:
3. Human Models
4. Video demonstrations

Recommended Books:

- Clinical Anatomy (By regions) 9th edition, Richard S. Snell
- Netter Atlas of human anatomy 5th Edition Saunders.
- Gray's Anatomy for students 2nd Edition Drake VogalMitcell.

PMS-604 ENGLISH –I Credit Hours: 2+0

Course Objective:

After successful completion of this course, students will be able to,

- Compose a well-constructed essay that develops a clearly defined claim of interpretation which is supported by close textual reading.
- Utilize literary terminology, critical methods, and various lenses of interpretation in their writing.
- Apply the rules of English grammar.
- Adhere to the formatting and documenting conventions of our discipline

Course Contents:

Vocabulary Building Skills: Antonyms, Synonyms, Homonyms, One word Substitute, Prefixes and suffixes, Idioms and phrasal verbs, Logical connectors, Check spellings, Practical Grammar & Writing Skill: Parts of Speech, Tenses, Paragraph writing: Practice in writing a good, unified and coherent paragraph, Précis writing and comprehension, Translations skills: Urdu to English, Reading skills: Skimming and scanning, intensive and extensive, and speed reading, summary and comprehension Paragraphs, Presentations skills: Developing, Oral Presentations skill, Personality development (emphasis on content, style and pronunciation)

Recommended books:

- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19431350 6.
- Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 019 4534030.

Course Objectives

After successful completion of this course, students will be able to,

- Develop vision of Historical Perspective, Government, Politics, Contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.
- Inculcate patriotism in the hearts of students so that they may become a good citizen..

Course Contents:

Historical Perspective: Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah, Factors leading to Muslim separatism, People and Land, Indus Civilization, Muslim advent, Location and Geo-Physical features. Government and Politics in Pakistan, Political and constitutional phases: 1947-58, 1958-71, 1971-77, 1977-88, 1988-99, 1999 onward Contemporary Pakistan: Economic institutions and issues, Society and social structure, Ethnicity, Foreign policy of Pakistan and challenges, Futuristic outlook of Pakistan

Recommended Books:

- Akbar, S. Zaidi. *Issue in Pakistan's Economy*. Karachi: Oxford University Press, 2000.
- Mehmood, Safdar. *Pakistan Kayyun Toota*, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
- Amin, Tahir. *Ethno- National Movement in Pakistan*, Islamabad: Institute of Policy Studies, Islamabad.
- Afzal, M. Rafique. *Political Parties in Pakistan*, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.

Course objectives:

After successful completion of this course, students will be able to,

- Use technology ethically, safely, securely, and legally.
- Identify and analyze computer hardware, software, and network components.
- Design basic business web pages using current HTML/CSS coding standards.
- Install, configure, and remove software and hardware.

Course Contents:

INTRODUCTION TO COMPUTER: I/O devices –memories, Networking – LAN,WAN,MAN (only basic ideas), TYPING TEXT IN MS WORD: Manipulating text, Formatting text - using different font sizes, bold, italics, Bullets and numbering, Pictures, file insertion, Aligning the text and justify, Choosing paper size - Adjusting margins, Header and footer, inserting page No s in a document, Printing a file with options, Using spell check and grammar, CREATING TABLE IN MS EXCEL: Cell editing-Using formulas and functions, Manipulating data with excel, PREPARING NEW SLIDES USING MS- POWER POINT: Inserting slides – Slide transition and animation, Using templates, Different text and font sizes –Slides with sounds – Inserting clips arts, pictures, tables and graphs- Presenting using wizards, INTRODUCTION TO INTERNET Using search engine – Google search – Exploring the next using Internet Explorer and Navigator and Download of files and images – E-mail ID creation, Sending messages- Attaching files.

Practicals:

- Typing a text and aligning the text with different format using MS –Word
- Inserting a table with proper alignment and using MS-Word
- Create mail merge document using MS-Word to prepare greetings for 10 friends
- Preparing a Slide show with transition, animation and sound effect using MS-Power point
- Creating a worksheet using MS-Excel with data and use of functions
- Using MS-Excel prepare a worksheet with text, date time and data
- Preparing a chart and pie diagrams using MS-Excel
- Internet for searching, uploading files, downloading files and creating e-mail ID
- C language writing programs using functions

Recommended Books:

- CAMBRIDGE IGCSE® COMPUTER SCIENCE STUDY AND REVISION GUIDE (pb)2016

- Computer science by Muhammad Ashraf, edition 1st 2010

2ndSemesterCourses

1. Medical Biochemistry-II
2. Human Physiology-II
3. HumanAnatomy-II
4. English-II
5. Islamic Studies

Course Objectives:

After successful completion of this course, students will be able to,

- Describe the synthesis of proteins, lipids, nucleic acids, carbohydrates and their role in metabolic pathways along with their regulation
- Discuss the clinical role of enzymes in human being.
- Interpret and apply nutritional concepts to evaluate and improve the nutritional health of individuals with medical conditions.

Course Contents:

Balance food, Major food groups, Nutritional status of Pakistanianation, Metabolic changes in starvation, Protein energy malnutrition, Regulation of food intake, Obesity; metabolism of carbohydrates (Citric Acid Cycle, Glycolysis, Pentose Phosphate Pathway), proteins (urea and corie cycle), nucleotides (uric acid formation) and lipids (beta oxidation); Respiratory chain and oxidative phosphorylation, components of respiratory chain, electron carriers, ATP synthesis coupled with electron flow, phosphorylation of ADP coupled to electron transfer; clinical diagnostic enzymology: clinical significance of ALT, AST, ALP, LDH, CK, CKMB, Pancreatic lipase and amylase, cholinesterase, G6PD, GGT.

Practicals:

- Determination of liver, cardiac, pancreatic enzymes
- Determination of urea and uric acid

Recommended Books:

- Harper's Medical Biochemistry Robert K. Murray, Daryl K. Granner 28th edition 2009
- Medical Biochemistry Mushtaq Ahmad vol. I and II 8th edition 2013

Course Objectives:

After successful completion of this course, students will be able to,

- Demonstrate a systematic and coherent knowledge of the physiological functioning of the central nervous system, special senses (CNS & SS), cardiovascular system and respiratory system.
- Describe the formation of the formed element components of blood.
- Identify the components and function of the lymphatic system and discuss the role of the innate immune response against pathogens

Course Contents:

Physiology of Nervous System, Function of various cranial nerves, Function of somatic motor nervous system, Function of the autonomic nervous system, function of neurons, neuroglial cells and their components. Resting membrane potential and an action potential, function of a synapse and reflex arc, function of the specialized sense organs: Eye, physiology of site, accommodation, optic nerve and optic chiasma, Ear, functions of the internal, middle and external ear, Physiology of the hearing and balance, Smell, physiology of olfactory nerve. Taste, physiology of taste, Location of the taste buds, Physiology of speech, Blood: Composition and function of Blood, haematopoiesis, Blood grouping, Coagulation mechanism, Physiology of Cardiovascular system, The Physiology of Pulmonary Systemic Circulation: Arteries Veins, Local Control of Blood Vessels, Nervous Control of Blood Vessels, Regulation of Arterial Pressure, The function of Lymphatic System, tonsils, lymph nodes, the spleen and the thymus, Classification and physiology of Immune system, Antigens and Antibodies, Primary and secondary responses to an antigen, Antibody-mediated immunity and cell-mediated immunity, Role of lymphocyte in immunity regulation.

Practicals:

- Spirometry
- Electrocardiography
- Blood Pressure Measurement
- Normal and abnormal ECG interpretation
- Pulse rate measurement
- Heart sounds

Recommended Books:

- EssentialsofMedicalPhysiologyKSembulingam,PremaSembulingamSixthEdition2013
- GuytonAndHallTextbookOfMedicalPhysiologyJohnE.Hall,ArthurC.GuytonProfessorandChair2006
- RossandWilsonAnatomyandPhysiologyinHealthAndIllness11thEditionAnneWaugh,AllisonGrant2010

Course Objectives:

After successful completion of this course, students will be able to,

- Identify bones of the upper limb and bony landmarks that articulate at each joint with all muscular compartments of the upper limb.
- Discuss bones of the lower limb and bony landmarks that articulate at each joint with all muscular compartments of the lower limb and identify these structures on radiographic images.
- Describe the topographical and functional anatomy of the head and neck, in particular the arrangement, relations and structure of the major skeletal, muscular and neurovascular components of the head and neck.

Course contents:

The upper limb Bones of shoulder girdle and Arm, Muscles, Axilla, Brachial plexus, Cubital fossa, the forearm, hand bones, Blood supply, Nerve supply, lymphatics **The lower limb** Fascia, Bones of the thigh, leg and foot, Muscles, Femoral triangle, Blood, Nerve, Lymphatic supply **Head and neck** Skull and facial bones, Cranial nerves, cranial cavity, Scalp, Meninges, Brain, Orbit, Muscles of the Neck, arterial and venous supply of the head and neck, The autonomic nervous system in the head and neck, Salivary Glands

Practicals:

Identification of the structures and the anatomy of Upper limb, Lower limb, Head and Neck through:

1. Human Models
2. Video demonstration
3. Study radiographs of upper limb, lower limb, and skull

Recommended Books:

- Clinical Anatomy (By regions) 9th edition, Richard S. Snell
- Ross and Wilson Anatomy and Physiology in health and illness 11th Edition Waugh Grant.
- Netter Atlas of human anatomy 5th Edition Saunders.
- Gray's Anatomy for students 2nd Edition Drake VogalMitcell

Course Objectives:

After successful completion of this course, students will be able to,

- Develop writing, reading and listening skills.
- Demonstrate integrative and independent thinking, originality, imagination, experimentation, problem solving, or risk taking in thought, expression, or intellectual engagement.
- Participate in discussions by listening to others' perspectives, asking productive questions, and articulating original ideas.

Course contents:

Writing Skill: CV and job application, Technical Report writing, Writing styles, Changing narration: Converting a dialogue into a report, Converting a story into a news report, Converting a graph or picture into a short report or story, Active and Passive voice, Letter / memo writing and minutes of the meeting, use of library and internet recourses, Essay writing, Phrases - Types and functions, Clauses - Types and functions, Punctuation: Tenses - Types, Structure, Function, Conversion into negative and interrogative. Speaking Skill: Group Discussion (Various topics given by the teacher), Presentation by the students (individually), Role Play Activities for improving Speaking. Listening Skill: Listening Various Documentaries, Movies, and online listening activities to improve the listening as well as pronunciation of the words.

Recommended Books:

- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492.
- Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.

Course Objectives:

After successful completion of this course, students will be able to,

- Recognize basic concept of Islam (faith, pillars and systems etc.) and express their impact on society.
- Present Islam as complete code of life and demonstrate understanding of Islamic Ethics.
- Demonstrate the role of a medical professional in Islam.

Course Contents:

Fundamental beliefs of Islam, Belief of Tawheed, Belief in Prophethood, Belief in the Day of Judgment, Worships, Salaat/Prayer, Zakat/Obligatory Charity, Saum/Fasting, Hajj/ Pilgrimage, Jihad, Importance of Paramedics In Islam, Ethics, Religion and Ethics, Higher Intents/Objectives of Islamic Sharia and Human Health, Importance and Virtues of Medical Profession, Contribution and Achievements of Muslim Doctors, Knowledge of the Rights, Wisdom and Prudence, Sympathy/Empathy, Responsible Life, Patience, Humbleness, Self Respect, Forgiveness, Kindhearted, Beneficence, Self Confidence, Observing Promise, Equality, Relation among the Doctors, Jealousy, Backbiting, Envy, Etiquettes of Gathering, Relation between a Doctor and a Patient, Gentle Speaking, Mercy and Affection, Consoling the Patient, To inquire the health of Patient, Character building of the Patient, Responsibilities of a Doctor

Recommended Books:

- Islamiyat (Compulsory) for Khyber Medical University, Medical Colleges and Allied Institutes

3rdSemester

- 1. Hematology-I**
- 2. Medical Microbiology-I**
- 3. CardiopulmonaryAnatomy**
- 4. Pharmacology- I**
- 5. Communication Skills**
- 6. General Pathology-I**

(2+1)Course Objectives:

- To introduce the students about the basic concepts in Hematology and acquire skill in practical work to produce students steeped in knowledge of Hematology.
- To equip students with latest advancements in the field of hematology.

Course Contents:

Introduction to hematology, physiology of blood and composition, introduction to bone marrow, structure and function of bone marrow, blood formation in the body (Intra-uterine and extra-uterine), factors governing hematopoiesis, erythropoiesis, different stages and factor effecting on erythropoiesis, granulopoiesis, different stages and factor effecting on granulopoiesis, megakariopoiesis, different stages and factor effecting on megakariopoiesis, introduction to hemoglobin structure, synthesis and function, complete blood count and its importance, morphology of red blood cells and white blood cells, introduction to anemia and classification of anemia, introduction to hemolysis (physiological and pathological), introduction to WBC disorders, introduction to leukemia, etiology, pathogenesis and its classification, leukocytosis, leukopenia, neutrophilia, condition related to neutrophilia, neutropenia, condition related to neutropenia, eosinophilia, condition related to eosinophilia, eosinopenia, condition related to eosinopenia, monocytosis, condition related to monocytosis, monocytopenia, condition related to monocytopenia, lymphocytosis, condition related to lymphocytosis, lymphopenia, condition related to lymphopenia, basophilia, condition related to basophillia, introduction to hemostasis, mechanism of hemostasis, function of platelets and coagulation factors, coagulation cascade, quantitative disorder of platelets, , qualitative disorder of platelets.

Practical:

- Collection of Blood Sample
- Preparation and Staining of Peripheral Blood Smear
- Total Leucocyte Count; Red Blood Cell Count, determination of Absolute Values; differential Leucocyte Count; Platelets count and Reticulocytes count
- To determine the ESR
- Determine Bleeding Time; Prothrombin Time; Activated partial thromboplastin time

Recommended Books:

- Essential of Hematology, A. V Hoff Brand, 6th edition 2006
- Clinical Hematology, G.C Degrunchi, 5th edition 2002
- Practical Hematology, Dacie J.V. 10th edition 2012

Course objectives:

- To introduce the students with basic concepts in bacteriology and mycology
- To introduce the students with common bacterial and fungal infections
- To introduce the students with diagnosis of common bacterial and fungal infections

Course contents:

Historical review and scope of microbiology, sterilization, disinfection and antisepsis, structure and function of prokaryotic cell, difference between prokaryotic and eukaryotic cell, bacterial growth and metabolism, bacterial classification, normal microbial flora of human body, mechanism of bacterial pathogenesis, host-parasite interaction, Immune response to infection, common bacterial pathogen prevailing in Pakistan, introduction to fungi, fungal characteristics, morphology, structure, replication and classification, mechanism of fungal pathogenesis, common fungal pathogen prevailing in Pakistan.

Practicals:

- Introduction and demonstration of Laboratory Equipments used in Microbiology.
- Inoculation and isolation of pure bacterial culture and its antibiotic susceptibility testing.
- Demonstration of different types of physical and chemical methods of sterilization, and disinfection.
- Students should be thorough to work with compound microscope.
- Detection of motility: Hanging drop examinations with motile bacteria, non-motile bacteria.
- Simple staining methods of pure culture and mixed culture.
- Gram's staining of pure culture and mixed culture.
- AFB staining of Normal smear, AFB positive smear.
- KOH preparation for fungal hyphae.
- Germ tube test for yeast identification.
- Gram stain for candida.

Recommended books:

- Sherris Medical Microbiology: An Introduction to Infectious Diseases. Ryan, K. J., Ray, C. G., 4th ed. McGraw-Hill, 2003.
- Clinical Microbiology Made Ridiculously Simple. Gladwin, M., & Trattler, B., 3rd ed. MedMaster, 2004.
- Medical Microbiology and Infection at a Glance. Gillespie, S., H., Bamford, K., B., 4th ed. Wiley-Blackwell, 2012.
- Medical Microbiology, Kayser, F., H., & Bienz, K., A., Thieme, 2005.
- Review of Medical Microbiology and Immunology. Levinson, W., 10th ed. McGraw Hill Professional, 2008.
- Jawetz, Melnick, & Adelberg's Medical Microbiology. Brooks, G., Carroll, K., C., Butel, J., & Morse, S., 26th ed. McGraw-Hill Medical, 2012.

Course Objectives:

- To identify the bones, structures and their relations with other structures
- To examine the respiratory and cardiovascular system
- To analyze the effects of physical and pathological diseases on normal anatomy of systems.
- To explain clinical procedures related to cardiac and pulmonary anatomy
- To choose quality patient care in routine as well as advanced cardiopulmonary procedures

Course Contents:

Structure of the thoracic wall, Suprapleural Membrane, Diaphragm, The Thoracic Cavity Basic Anatomy, Anterior Chest Wall Posterior Chest Wall, Lines of Orientation Mediastinum and its contents Relations of the contents of the Mediastinum, Pleurae, Anatomy of Larynx and trachea, Anatomy of lungs, The anatomy of Heart, Relations of heart to other structures within the Thorax, The general structure of arteries and veins, The embryonic period and fetal development of the cardiovascular and respiratory systems, Cardiovascular and respiratory changes at birth

Practical:

- Identification of different organs and their components
- Radiological Presentation & Pathological Findings on Radiographs
- Identification of cardiac valve areas on the Thoracic wall
- Identification of labeled structures, their features and relations with other structures
- Identification of given ribs with their features
- Identification of normal apex beat anatomically
- To identify major coronary arteries and their branches

Recommended Books:

- **Clinical Anatomy** by Snell, in 2000 by Churchill Livingstone
- **Gray's anatomy 2nd edition** by Williams and Warwick Dyson
- **Last's Anatomy 11th edition** by R.M. McMinn

Course Objectives

After successful completion of this course, students will be able to,

- Specify the abnormalities of cell growth and differentiation.
- Describe cellular responses to stress and noxious stimuli and inflammation.
- Discuss cell injury, cell death and mechanisms involved in wound healing.
- Explain the hemodynamic disorders and neoplasia.

Course Contents

Cell Injury & adaptation Cell injury, Cellular adaptation

Inflammation Acute Inflammation, Chronic Inflammation

Cell Repair & Wound Healing Regeneration & Repair, Healing Factors affecting Healing

Hemodynamic Disorders Define & classify the terms, Edema, Hemorrhage, Thrombosis, Embolism, Infarction & Hyperemia, Shock, compensatory mechanism of shock, possible consequences of thrombosis & difference between arterial & venous emboli

Neoplasia Dysplasia& Neoplasia Difference between benign & malignant neoplasm, etiological factors for Neoplasia, different modes of metastasis

Practicals

- Blood culture
- Urine & stool examination
- Gram staining
- Neoplasia: Characteristics of malignancy
- Estimation of Bleeding, clotting, prothrombin time

Recommended Books

- Robbins and Cotran Pathologic Basis of Disease, Professional Edition, 8th Edition

Course Objectives

After successful completion of this course, students will be able to,

- Describe common terms related to pharmacology and drug therapy.
- Identify a range of drugs used in medicine and discuss their mechanisms of action.
- Report the clinical applications, side effects and toxicities of drugs used in medicine.

Course Contents:

Introduction to Pharmacology, Pharmacokinetics, Pharmacodynamics ,Adverse effects of drugs, Classification of drugs, Drugs affecting the Autonomic Nervous System, NSAIDS, Opioids, Drugs Affecting Endocrine system (Corticosteroids, Thyroid and anti Thyroid Gastrointestinal Drugs (PPIs, Blockers and antacids) , Antihistamines, Anesthetics (General and Local Anesthetics)

Practicals:

- Routes of drug administration
- Introduction to drug dosage form
- Study of the action of drugs (Atropine) on the rabbit's eye

Recommended Books:

- Lippincott's pharmacology (text book) by Mycek 2nd edition published by Lippincott Raven
- Katzung textbook of pharmacology (Reference Book) by Bertram Katzung 8th Edition, Published by Appleton.

Course Objectives

After successful completion of this course, students will be able to,

- Communicate effectively both verbally and non-verbally
- Apply the requisite academic communication skills in their essay writing and other forms of academic writing
- Use various computer-mediated communication platforms in their academic and professional work
- Relate the interpersonal and organizational dynamics that affect effective communication in organizations.

Course Contents

Introduction to Communication, Meaning and definition of Communication, The process of communication, Models of communication

Effective Communications in Business, Importance and Benefits of effective communication, Components of Communication, Communication barriers, Non verbal communication

Principles of effective communication, Seven Cs.

Communication for academic purposes, Introduction to academic writing, Summarizing, paraphrasing and argumentation skills, Textual cohesion

Communication in Organizations, Formal communication networks in organizations, Informal communication networks, Computer- mediated communication (videoconferencing, internet, e-mail, Skype, groupware, etc)

Business Writing, Memos, Letters, Reports, Proposals, Circulars, etc

Public Speaking and Presentation skills, Effective public presentation skills, Audience analysis, Effective argumentation skills, Interview skills

Recommended books:

- Interpersonal Communication Paperback by Kory Floyd
- Reading into Writing 1: English for Academic Purposes: A Handbook-Workbook for College Freshman English (Mass Market Paperback) by Concepcion D. Dadufalza (Lecture Notes/Presentations)

4thSemester

- 1. Pathology-II**
- 2. MedicalMicrobiology-II**
- 3. Electrocardiography-I**
- 4. Cardiopulmonary
Physiology**
- 5. Hematology-II**
- 6. Pharmacology-II**
- 7. Behavioralsciences**

Course Objectives:

- To introduce students various pathologies of various systems
- To gain knowledge of pathological basis of various systemic diseases

Course Details:

Pathologies of following systems: Cardiovascular system, Respiratory system, Urinary system, Blood and Nervous system

Practical:

1. Helicobacter pylori test
2. Diagnosis methods of UTI
3. Determination of renal function tests
4. Determination of liver function tests
5. Determination of cardiac profile

Recommended Books:

- Robbins Basic Pathology Kumar Abbas Aster 9th Edition 2013
- Review of General Pathology Moh. Firdaus, 9th Edition

Short Text Book of Pathology Moh. Inam Danish 3rd Edition 2006

Course objectives:

- To introduce the students with basic concepts in virology and parasitology.
- To introduce the students with common viral and parasitic infections.
- To introduce the students with diagnosis of common viral and parasitic infections.

Course Contents:

Biosafety levels, control of hospital infection, biomedical waste management, introduction to virology, Viral morphology, structure, replication and classification, general properties of virus, pathogenesis and control of virus, common viral pathogen prevailing in Pakistan, introduction to parasitology, Parasite (protozoan and helminthes) morphology and classification, general principal of pathogenesis, immunology and diagnosis of parasitic infection, common parasitic pathogen prevailing in Pakistan.

Practical:

1. Cleaning of new and used glasswares for microbiological purposes.
2. Students should be familiar to use autoclave, hot air oven, water bath, steamer etc.
3. Macroscopic and microscopic examination of stool for adult worms, ova, cysts, larvae.
4. Visit to hospital for demonstration of biomedical waste management.
5. Demonstration of common serological tests used for the diagnosis of viral and parasitic infection.
6. Demonstration of malarial parasites in blood and bone marrow.
7. Demonstration of leishmania in blood film.
8. Concentration techniques for intestinal parasites in stool.

Recommended books:

- Sherris Medical Microbiology: An Introduction to Infectious Diseases. Ryan, K. J., Ray, C. G., 4th ed. McGraw-Hill, 2003.
- Clinical Microbiology Made Ridiculously Simple. Gladwin, M., & Trattler, B., 3rd ed. MedMaster, 2004.
- Medical Microbiology and Infection at a Glance. Gillespie, S., H., Bamford, K., B., 4th ed. Wiley-Blackwell, 2012.
- Medical Microbiology, Kayser, F., H., & Bienz, K., A., Thieme, 2005.
- Review of Medical Microbiology and Immunology. Levinson, W., 10th ed. McGraw Hill Professional, 2008.
- Jawetz, Melnick, & Adelberg's Medical Microbiology. Brooks, G., Carroll, K., C., Butel, J., & Morse, S., 26th ed. McGraw-Hill Medical, 2012.

• Course Objectives:

- To describe the basic concepts of EKG
- To recognize the basic electro-physiology using EKG
- To compute different basic technical ECG abnormalities
- To infer different types of arrhythmias
- To identify different heart pathologies on the basis of EKG

Course Contents:

Basic Concepts; Rate, Rhythm, intervals, Cardiac axis, Wave morphologies, Step-by-Step Method for Accurate, Electrocardiogram Interpretation, P Wave Abnormalities, Bundle Branch Block, ST Segment Abnormalities, Q Wave Abnormalities.

Practical:

- Identification of different EKG electrodes
- Placement of Electrodes on the body
- Demonstration of EKG procedure
- Finding heart rate, Rhythm, axis and intervals
- Different types of EKG waves and correlation with different heart chambers

Recommended Books:

- EKG by Dale Dubin 6th edition
- ECG made Easy by Jhon R 6th edition
- Rapid ECG Interpretation by Mr. M. Gabriel Khan 3rd edition
- An Introduction to ECG by Leo Schamroth 6th edition
- ECG Interpretation for the clinical exercise 3rd edition
- EKG book by Malcolm. S 4th edition
- Manual of ECG 4th edition

Course Objectives:

- To describe the physiology of Cardiovascular and Respiratory system
- To illustrate the normal physiological parameters related to systems
- To compute the effect of certain factors affecting normal physiology
- To explain advanced concepts and calculation related to the physiological functions
- To assess the normal physiological functions for the understanding of different pathologies

Course Contents:

Cellular Membrane structure & function, Physiologic anatomy of the Heart, Propagation of cardiac impulse, The cardiac cycle, Pressure changes during cardiac cycle. The stroke volume and stroke output, Cardiac output regulation of cardiac function. The special excitatory and conductive system of the heart and their control. Abnormalities of the cardiac rhythms, The heart sounds. Functional classification of blood vessels, Peripheral circulation: pressure and resistance, The Arterial Blood Pressure, Hypertension, The Arterial Pressure Pulse, The Physiology of the Veins, The Jugular Venous Pulse, The Physiology of the Capillaries, Lymph and Lymphatics, The Cutaneous Circulation, Coronary Circulation, Cerebral Circulation and Pulmonary Circulation, Gas Exchange & Diffusion. Perfusion and Ventilation/Perfusion. Acid-base imbalances: pathophysiology of acidosis and alkalosis. Heat Exchange, Filters and Reservoirs.

Practical:

- Measurement of Blood Pressure
- Demonstration on ECG
- Heart sounds
- Measurement of JVP
- Cardiac output measurements
- Measurement of pulses from various regions of the body
- Interpretation of Arterial blood gases
- Interpretation of different lung volumes and capacities from Lung function test
- Nebulization procedure

Recommended books:

- Physiology by Jypee 5th edition

- Cardiovascular Physiology by J.R. Levick 2nd edition
- Human Physiology By Guyton and Hall 12th edition
Illustrated Physiology B. R. Mackena 5th edition

Course Objectives:

- To introduce the students about the basic concepts in Hematology and acquire skill in practical work to produce a team of Medical Technologists steeped in knowledge of Pathology
- To equip Medical Technologists with latest advancements in the field of hematology.

Course Contents:

Iron metabolism, introduction to iron deficiency anemia, different stages and diagnosis, introduction to thalassemia, classification, pathophysiology and its diagnosis, introduction to Sideroblastic anemia, etiology and diagnosis, folate and vitamin B₁₂ metabolism, introduction to megaloblastic anemia, etiology and diagnosis, introduction to G6PD deficiency anemia, pathophysiology and diagnosis, introduction to sickle cell anemia, pathophysiology and diagnosis, introduction to hereditary spherocytosis, pathophysiology and diagnosis, introduction to hemolytic anemia, Immune hemolytic anemia, non-immune hemolytic anemia, aplastic anemia, etiology and diagnosis. ABO and RhD group system, Kell blood group system, Kidd blood group system, Duffy blood group system, donor selection criteria, phlebotomy of donor, blood products, preparation, storage and its importance, hemovigilance in blood bank, cross match, types of cross match, procedure and its importance, blood grouping and its importance, Coombs' test, types and importance, introduction to hemolytic disease of newborn, types, pathophysiology, diagnosis and management, hemolytic transfusion reactions and management.

Practicals:

1. ABO blood grouping (Forward and Reverse grouping)
2. Rh Blood grouping
3. Antibodies screening
4. Cross matching (Major and Minor)
5. Coombs tests (Direct and Indirect)
6. Separation of different blood components
7. Du Test

Recommended books:

- Essential of Hematology, A. V. Hoff Brand, 6th edition 2006
- Clinical Hematology, G. C. DeGrunchi, 5th edition 2002
- Practical Hematology, Dacie J. V. 10th edition 2012

Course Objectives:

- To provide quality patient care in routine as well as advanced procedures.
- To understand the mechanism of drug action at molecular as well as cellular level, both desirable and adverse.
- To understand the principles of pharmacokinetics i.e. drug absorption, distribution, metabolism and excretion and be able to apply these principles in therapeutic practice.

Course Contents:

Drugs acting on cardiovascular system; Drugs for heart failure, anti-hypertensive drugs, anti arrhythmic drugs, antianginal drugs, Anti Hyperlipidemic drugs, Blood drugs, Diuretics, Insulin and glucose lowering drugs, Chemotherapeutic drugs, Antibiotics, Drugs acting on Respiratory system, Anesthetics.

Practical:

1. Routes of drug administration
2. Dose-Response Curves
3. Effect of adrenaline on pulse rate
4. Effect of beta blocker on heart rate after exercise
5. Source of drug and identification of some raw materials that are source of drug
6. Weight conversions and measurements
7. Preparation Sulfur ointment
8. Preparation of pilocarpine drops
9. Prescription writing

Recommended Books:

- Lippincott's pharmacology (text book) by Mycek 2nd Edition published by Lippincott Raven 2000.
- Katzung textbook of pharmacology (Reference Book) by Bertram Katzung 8th Edition, Published by Appleton. Dec 2007.

Course Objectives:

- To introduce about various diagnostic interviews
- Formulating and clarifying diagnostic findings and treatment recommendations
- Documenting evaluation and treatment procedures, involving duties such as recording results of diagnostic interviews, lab studies, and/or treatment plans in a timely way according to the medical records protocols of the rotation site

Course Contents:

Introduction to Behavioral Sciences and its importance in health: Bio-Psycho-Social Model of Health Care and the Systems Approach, Normality vs Abnormality, Importance of Behavioral sciences in health, Desirable Attitudes in Health Professionals Understanding Behavior: Sensation and sense organs, Perception, Attention and concentration, Memory, Thinking, Communication, Individual Differences: Personality, Intelligence, Emotions, Motivation, Learning, Stress and Stressors, Life Events, Stress, Management, Interviewing/Psychosocial History Taking, Allied Health Ethics- Hippocratic oath, Culture and Allied Health practice, Psychological reactions, Breaking Bad News, Pain, Sleep, Consciousness.

Recommended Books:

- Behavioral Sciences by M.H Rana 2007
- Sociology in a Changing World by [William Kornblum 8th edition 2007](#)
- Changing Behavior: Immediately Transform Your Relationships with Easy-to-Learn, Proven Communication Skills by [Georgiana Donadio 2011](#)

5thSemester

- 1. Clinicalmedicine**
- 2. PerfusionTechnology-I**
- 3. Echocardiography**
- 4. Electrocardiography–II**
- 5. Ventricularassistantdevices**
- 6. Medicalphysics**

Course objectives:

- Students will be able to record clinical history, Physical examination and correlate the knowledge to make differential diagnosis of various diseases
- To justify patients, families and caregivers the diagnosis, prognosis and treatment plan for their condition, and educate them about beneficial lifestyle behaviors and preventive health measures.
- To judge routine procedures commonly required for the evaluation and care of patients

Course Contents:

Introduction of diseases; their clinical features, signs, symptoms and management of diseases. Investigations and their interpretation for various diseases of the following systems: Diseases of Cardiovascular System, Diseases of Respiratory System, Diseases of the Kidney & Urinary System, Diseases of Endocrine system

Practical:

- Patient History and clinical Examination (General)
- Systematic Examination
- Radiological and Physical Investigations
- First Aid
- Concept of Holistic Health
- Interpretation of investigation
- Diagnosing clinical problems

Recommended Books:

- Davidson's Principles and Practice of Medicine, 21st edition
- Kumar and Clark's Clinical Medicine (Kumar, Kumar and Clark's Clinical Medicine), **8th edition**
- Clinical Medicine by Parveen Kumar, Michalclark in by ELBS

Course objectives:

- To Introduce Perfusion of the heart
- To list the various Perfusion techniques
- To illustrate various protocols for various procedures
- To select an appropriate procedure for various pathologies
- To plan and prepare for Complications during Cardiac surgery
- To design set up for Cardiac Surgery
- To set up Circuit designs for perfusion

Course Content:

Introduction to heart perfusion, Equipment and monitoring, Priming solutions for cardiopulmonary bypass circuits, Anticoagulation, coagulopathies, Metabolic management during cardiopulmonary bypass, Myocardial protection and cardioplegia, Mechanical circulatory support, Organ damaged during cardiopulmonary bypass, Acute kidney injury, Extracorporeal membrane oxygenation, Intra-aortic balloon.

Practical:

- Identification of various parts of oxygenator
- Designing Circuit for various perfusions
- Steps and protocol of perfusion
- Application of various devices used in perfusion
- Identification of various cannulas

Recommended Books:

- Manual of Perfusion 1st edition
- Cardiovascular perfusion by Cambridge 4th edition
- On Bypass 2nd edition

Course objectives:

- To explain basic physical principles of ultrasound and instrumentation.
- To Correlate cardiac gross pathology with echocardiography images.
- To evaluate cardiac chamber size, left ventricular systolic and diastolic function and right ventricular systolic function.
- To Analyze and interpret echocardiographic derived hemodynamic data.
- To interpret trans esophageal images and distinguish attributes and limitations versus transthoracic echocardiography

Course Contents:

History of echocardiography, Development of various echocardiographic Technologies, Recording Echocardiograms, Cardiac Sonographers, Physics and Instrumentation, Physical Principles, Definition of Basic Terms, Principles of cardiac ultrasonography, Principles of ultrasound physics and instrumentation, The Doppler principles, The anatomical echocardiographic examinations (Basic Views), Examination and appearance of the normal heart, Quantification of the ventricular performance, Principles of the Doppler examination, Additional imaging formats and techniques, Contrast echocardiography, Artifacts

Practical:

Clinical application of echocardiography in:

- Acquired valvular heart disease
- Evaluation of prosthetic heart valves
- Congenital heart disease of the pericardium
- Cardiomyopathies
- Ischemic heart disease
- Diseases of the aorta
- Cardiac masses and tumors
- Pericarditis

Recommended Books:

- Feigunbaum's Echocardiography, 6th Edition
- Echo Made Easy, by Sam Kaddoura, 2nd Edition

Course objectives:

- To describe the basic concepts of EKG
- To recognize the basic electro-physiology using EKG
- To compute different basic technical ECG abnormalities
- To infer different types of arrhythmias
- To identify different heart pathologies on the basis of EKG
- To relate the EKG abnormalities with the heart and lung pathologies

Course Contents:

Review of electrocardiography-

I.Q Wave Abnormalities, Atrial and Ventricular Hypertrophy, T Wave Abnormalities, Electrical Axis and Fascicular Block, Miscellaneous Conditions, Arrhythmias, EKG of different Myocardial infarctions, EKG of Different congenital as well as acquired Heart pathologies; Aortic disease, valvular diseases, Pericardial disease, dextrocardia and EKG of different syndromes causing heart disease

Practical:

- Identification of different EKG electrodes
- Placement of Electrodes on the body
- Demonstration of EKG procedure
- Finding heart rate, Rhythm, axis and intervals
- Different types of EKG waves and correlation with different heart chambers
- Interpretation of different type of arrhythmias
- Interpretation of Myocardial infarction
- Interpretation of cardiac chamber hypertrophy and enlargements
- Interpretation of Cardiac myopathies
- Interpretation of valvular pathologies
- Interpretation of different aortic pathologies

Recommended Books:

- EKG by Dale Dubin 6th edition
- ECG made Easy by Jhon R 6th edition
- Rapid ECG Interpretation by Mr. M. Gabriel Khan 3rd edition

- AnIntroductiontoECGbyLeoSchamroth6thedition
- ECGInterpretationfortheclinicalexercise3rdedition
- EKGbookbyMalcolm.S4thedition
- ManualOfECG4thedition

Course objectives:

- To outline various Cardiac assistant devices
- To identify various Cardiac assistant devices
- To select various devices in a particular procedure
- To recognize various cardiac procedures
- To predict possible complications of various procedures
- To set up the machine and other necessary equipment needed
- To judge the procedure and finding out any problem
- To prepare the things for the smooth running of the procedure
- To plan a particular procedure with a Surgeon

Course Contents:

Indications for Ventricle Assist Devices, Echocardiographic Evaluation of Ventricular Assist Devices, Altered Expression of mRNA and miRNA during Mechanical Support of the Failing Human Heart, Ventricular Assist Device – How to Obtain Optimal Benefits?, Cardiac Support and Multi-organ Dysfunction Syndrome, Future Treatment of Acute Cardiac Collapse - A Role for Percutaneous Circulatory Assist Devices, Future Treatment of Acute Cardiac Collapse - A Role for Percutaneous Circulatory Assist Devices, Initial Experience of Lower Limb Thermal Therapy for Patients with an Extracorporeal Left Ventricular Assist Device Awaiting Heart Transplantation, Treatment of Ventricular Arrhythmias in Patients Undergoing LVAD Therapy, Community Based Management of Ventricular Assist Devices, Long-Term Management of Pulsatile Extracorporeal Left Ventricular Assist Device, Outcomes Following Heart Transplantation among Those Bridged with VAD

Practical:

- Identification of various Cardiac assistant devices
- Identification of procedures and devices and planning for the procedure
- Analyzing the procedure by knowing the disease
- Steps of various procedures
- Identification of various lesions
- Handling the complications

Recommended Books:

- Ventricular Assist Devices By: Dr. Jeffrey Shuhaiber

Course objectives:

- To list S.I units of physical quantities
- To describe the various conversions of S.I units into other units
- To interpret various equations used in medical physics
- To recognize various principles of fluid dynamics
- To sketch different graphs and their interpretation
- To relate various relations using equations

Course Contents:

Introduction to medical physics, Physical measurement and calibration, The SI units, The gas laws, Laminar flow, Turbulent flow, Bernoulli, Venturi and Coanda, Heat and temperature, Latent heat, Isotherms, Solubility and diffusion, Osmosis and colligative properties, The valves and their types with their principle, Resistors and resistance, Defibrillators, Resonance and damping, Pulse oximetry, Capnography, Absorption of carbon dioxide, Cardiac output measurement, The echo principle, The Doppler effect, Neuromuscular block monitoring, Lung volumes, Spirometry, Flow–volume loops, The alveolar gas equation, The shunt equation, Pulmonary vascular resistance, Ventilation/perfusion mismatch, Dead space, Fowler's method, The Bohr equation, Oxygen delivery and transport, The oxyhaemoglobin dissociation curve, Carriage of carbon dioxide, Cardiac action potentials, The cardiac cycle, Pressure and flow calculations, Central venous pressure, Pulmonary arterial wedge pressure, The Frank–Starling relationship, Venous return and capillary dynamics, Ventricular pressure–volume relationship, Systemic and pulmonary vascular resistance, The Valsalva manoeuvre.

Practical:

- Measurements of length and volume
- Measurement of temperature using various thermometer
- Calculations to find out various parameters like cardiac output, dead space, Pulmonary artery wedge pressure,
- Principle of Sphygmomanometer and measurement of blood pressure
- Identification of spirometer, its various parts and analysis of lung function test
- Analyzing the resistance of body using Poiseuille's equation
- To find the gradient across the valves using various equations

Recommended books:

- Physics, Pharmacology and Physiology for Anaesthetists by Matthew E. Cross . Cambridge latest edition
- Medical Physics
- Physics and body by John R 2nd edition

6TH SEMESTER

- 1. CriticalCare**
- 2. PharmacologyrelatedtoPerfusion**
- 3. Cardiacsurgery**
- 4. DiagnosticEquipmentsinCardiology**
- 5. ECMO**
- 6. PulmonaryDisease**

Course objectives:

- To outline critical cardiovascular situations
- To recognize critical cardiovascular care in various situations
- To categorize the patient situation
- To plan the right procedure in cardiovascular critical situations
- To assess the critically ill patients
- To select various pharmacological and mechanical procedures

Course Contents:

An introduction to critical care, Shock, Resuscitation in intensive care, Cardiovascular monitoring in critical care, Cardiovascular investigation of the critically ill, Hematological Aspects of cardiovascular critical care, Cardiovascular support: Pharmacological, Arrhythmias, Mechanical heart failure therapy, Care of the high risk patient undergoing surgery, Common complications of cardiovascular critical illness, Acute coronary syndromes and myocardial infarction, Cardiogenic shock, Aortic dissection, Emergency management of cardiac trauma, Hypertensive crises, Endocrine problems and cardiovascular critical care.

Practical:

- Assessment of shock and its types
- Assessment of arrhythmias
- Management of shock
- Management of arrhythmias
- Management of Cardiac arrest
- Management of acute Myocardial infarction
- Management of Hypertensive crisis
- Analysis of arterial blood gases
- Management of Cardiac trauma and aortic dissection

Recommended Books:

- Cardiovascular Critical Care by Mark J.D. Griffiths, Jeremy J. Cordingley and Susanna. 010 Blackwell Publishing Ltd.
- Critical care by Andrea G 4th edition
- Critical care Current diagnosis and treatment by Frederic S 3rd edition

Hours:3(2+1) Course objectives:

- To list the drugs used in perfusion
- To explain the pharmacokinetics, and pharmacodynamics of drugs
- To tell the dosage of various drugs
- To plan the usage of drugs in various procedures
- To handle the complications using drugs during cardiac procedures

Course Contents:**Pharmacokinetics and pharmacokinetics, Indications, side effects and dosage of:**

Cholinergic agonists and antagonists, Anesthetics, Blood acting drugs, immunosuppressant, Sympathomimetic agonist and antagonists, Analgesics, Blood substitutes, Cryoprecipitate, Antihypertensive, IV Solutions, Antiarrhythmic.

Practicals:

1. Planning specific drugs related to procedure
2. Drug dosage
3. Specific effects related to drugs
4. Management of various conditions using drugs

Recommended books:

- Lippincott Pharmacology 6th edition
- Catzung Pharmacology 10th edition

Course objectives:

- To describe various cardiac surgical procedures
- To identify the pathologies
- To prepare the required investigation for a specific surgery
- To prepare the patient for surgery
- To evaluate the condition of the patient
- To predict an appropriate procedure in case of an emergency

Course Contents:

Surgical approach to the heart and great vessels (An introduction), Preparation for cardiopulmonary bypass, Surgery of various heart valves; valve repair and replacement, Surgery for coronary disease, Surgery of cardiac tumors, Coarctation of the aorta, Atrial septal defect, Patent ductus arteriosus, Transposition of the great vessels, Coronary artery anomalies surgery.

Practicals:

- Clinical examination
- History taking
- Pre-Op requirements of a particular procedure
- Patient assessment
- Investigation required and their interpretation with their importance
- Post-Op care of the patients

Recommended Books:

- Cardiac Surgery by Siavosh Khonsari . Lippincott 4th edition
- Cardiac Surgery by Kerlin 4th edition
- Cardiac Surgery by C Narian 2nd edition
- Cardiothoracic Surgery by Micheal S 2nd edition

Course objectives:

- To name the various equipments used in cardiology
- To describe the indications of the tests
- To prepare the patient for a specific test
- To explain the test procedure and protocol
- To design an appropriate test relating a disease
- To predict the possible complications
- To interpret the results of a test

Course Contents:

Introduction, Principle, Indications, Contraindications, Complications and uses of diagnostic equipments in cardiology. Following devices will be included: ECG machine, ETT machine, Pulse oximetry, Cardiac monitors, Defibrillator, Echocardiograph machine, Ultrasound machine, Cardiac CT, Cardiac MRI, Cardiac X-Ray, Angiograph machine, Holter monitors, Equipments used in Electrophysiology Laboratory, Swan Ganz catheter, Temporary pacemaker.

Practical:

- To identify the shown equipments
- To label the parts of given equipment
- Basic knowledge of operation of an equipment
- To eradicate the basic technical fault in the equipment
- To interpret the report of the equipments
- To calibrate the equipments

Recommended Books:

Course objectives:

- To recognize the basic concept and principal of ECMO
- To Manage ECMO machine
- To identify various parts of ECMO
- To Plan ECMO for various conditions
- To explain the use of ECMO
- To interpret various ABG's values during ECMO

Course Contents:

The History and Development of Extracorporeal Support, Physiology of Extracorporeal Life Support
Cardiac Failure: Principles and Physiology, Acute Hypoxic Respiratory Failure in Children, Blood
Biomaterial Surface Interaction During ECLS, The Registry of the Extracorporeal Life Support
Organization, The Circuit, Vascular Access for Extracorporeal Support, Management of Blood Flow and
Gas Exchange during ECLS, Anticoagulation and Bleeding During ECLS, Anticoagulation and
Bleeding During ECLS, Renal Function and Renal Supportive Therapy during ECMO
Infections and ECMO, Infections and ECMO, Neonatal Respiratory ECLS, Congenital Diaphragmatic
Hernia and ECMO, ECMO for Pediatric Respiratory Failure, Pediatric Cardiac Extracorporeal Life
Support, ECMO in Patients With Functionally Univentricular Circulation
Adult Respiratory ECMO, Adult Cardiac Support, Extracorporeal Cardiopulmonary Resuscitation:
ECPR, Other Uses for ECLS, Ventricular Assist Devices in Children, Extracorporeal Support Assisted
Organ Donation, Sepsis and ECMO, Extracorporeal Life Support Pre and Post Lung Transplantation
Cardiac Catheterization Procedures for ECMO Patients, The Future of Extracorporeal Life Support,
Regionalization and Triage, Which centers should provide ECMO?, The benefits of regionalization
Volume-outcome benefits, Regionalized systems of care, Triage of patients for ECMO, ECMO
Administrative and Training Issues, and Sustaining Quality, Economics of ECLS, Regulatory and Legal
Aspects of ECLS, ECMO Ethics in the Twenty-first Century

Practicals:

- Basic demonstration of ECMO
- Identification of various parts of machine and their functions
- Normal parameters interpretation
- Basic technique to perform the ECMO
- Demonstration of different ECMO procedures
- Interpretation of ECMO performance

Recommended Books:

- ECMO Extracorporeal Cardiopulmonary Support in Critical Care 4th edition By: Gail M. Annich, MD
- Manual of Perfusion 1st edition
- Cardiovascular perfusion by Cambridge 4th edition

Course objectives:

- To write the investigations used in respiratory medicine
- To describe various diseases of respiratory tract
- To diagnose various respiratory tract diseases
- To plan treatment for various respiratory diseases

Course Contents:

Examination of the respiratory system, Investigation used to investigate respiratory diseases, Diseases of the upper respiratory tract, Diseases of the lower respiratory tract, Asthma, Pneumonia, Tuberculosis, Diseases of the Respiratory system, Congenital anomalies, Carcinoma, Infections, Adult respiratory distress syndrome, Chronic obstructive pulmonary disease, Pulmonary hypertension, Lung Transplantation, Lung reduction surgery

Practicals:

- History taking in pulmonary diseases
- Clinical Examination in pulmonary diseases
- Interpretation of investigations
- Diagnose of various respiratory diseases
- Management plan for various respiratory diseases

Recommended Books:

- Kumar and Clark's Clinical Medicine (Kumar, Kumar and Clark's Clinical Medicine), 8th edition
- Davidson's Principles and Practice of Medicine, 21st edition

7thSemester

- 1. Perfusiontechnology-II**
- 2. HeartDisease**
- 3. Researchmethodology**
- 4. FundamentalofInfectionControl**
- 5. Biostatistics**
- 6. Epidemiology**

Course objectives:

- To name the components of cardiopulmonary bypass circuit
- To describe various protocols for cardiac procedures
- To demonstrate the conduct of bypass
- To operate CPB machine and Intra-aortic balloon pump
- To assess the complications during CPB
- To analyze the injuries caused by CPB

Course Contents:

Review of Perfusion Technology-I. Limb perfusion, Liver transplant perfusion, Perfusion in special cases like perfusion in pregnant women, sickle cell disease, in tumors, blood diseases, perfusion in severe respiratory problems, perfusion in patients allergic to drugs, perfusion during CNS procedures, Perfusion during heart transplant, Hypothermic procedures, Ventricular assist devices and perfusion, Cardioplugia composition and delivery techniques, effect of various drugs on myocardium during cardiac surgery, effect of various ions on the myocardium present in cardioplegia, advances in perfusion, various circuit designs, ACT and its control, Priming, conduct of cardiopulmonary bypass, Ethics in perfusion

Practicals:

- Identification of various parts of Oxygenator
- Identification of various arterial and venous cannula
- Setup of cardiopulmonary bypass circuit
- Setup of intra-aortic balloon pump
- calculation for Body surface area, prime volume and blood volume
- Monitoring various parameters during cardiopulmonary bypass

Recommended Books:

- Cardiopulmonary Bypass by Sunit Ghosh, Florian Falter and David J. Cook . 1st edition University Press, Cambridge 2009
- Manual of cardiac perfusion 1st edition
- Cardiovascular perfusion by Cambridge 4th edition

Course objectives:

- To describe various risk factors in CVD
- To recognize various cardiovascular risk factors
- To estimate the progression of the disease
- To modify life style in the prevention of the disease progression
- To select an appropriate intervention to minimize risk factors
- To design a set of care

Course Contents:

Atrial septal defects, Ventricular septal defects, Persistent atrioventricular canal defects d. Patent ductus arteriosus, Coarctation of the aorta, Aortic stenosis, Hypoplastic left heart syndrome, Right ventricular outflow obstructions, Tetralogy of Fallot, Tricuspid atresia, Ebstein anomaly of the tricuspid valve, Transposition of the great arteries, Total and partial anomalous pulmonary venous return, Univentricular heart, Malposition of the heart, Anomalous left coronary artery arising from the pulmonary artery, Cardiac Transplantation
Atherosclerosis, Ischemic heart disease, Valvular heart disease, Cardiac hypertrophy, Hypertensive heart disease, Cor pulmonale and pulmonary hypertension, Myocarditis, Cardiomyopathies, Pericardial disease, Endocrines and the heart, Heart Tumors, Arrhythmias and conduction disorders, Diseases of the aorta: aneurysms and dissections, Cardiac Transplantation, Diseases of the Respiratory system
Congenital anomalies, Carcinoma, Infections, Adult respiratory distress syndrome, Chronic obstructive pulmonary disease, Pulmonary hypertension, Lung Transplantation, Lung reduction surgery

Practical:

- Assessment of the patient's risk factors
- Physical Examination
- Heart sounds and their interpretation
- Analysis of investigations used
- Interventions to reduce CVD
- Management of the patient's at risk
- Exercise treadmill stress testing

Recommended Books:

- Preventive Cardiology: Companion to Braunwald's Heart Disease by Roger Blumenthal and JoAnne Foody
- Braunwald's Heart Disease, 9th Edition
- Harrison's Cardiovascular Medicine 2nd Edition_2

Course Objectives

After successful completion of this course, students will be able to,

- Recognize the basic concepts of research and the research process.
- Develop understanding on various kinds of research, objectives of doing research, research designs and sampling.
- Conduct research work and formulating research synopsis and report.

Course contents

Introduction to research (in simple term and a scientific term), concept of research, why do need research, advantage and scope of research, identification of research needs and its qualities, Types of research; Qualitative, Quantitative and their sub types, Research process Introduction (Deciding, formulating research questions, planning, conduct of study, data collection, processing and analysis, Research writing and reporting), Literature review (What, why, where from, how and qualities of good literature and its use), Writing a research problem/question and selection of the title of study, Identification of various research variables, Hypothesis its types, formulation and testing of hypothesis, Research study designs used in qualitative and quantitative studies, Designing of data collection tools/questionnaires, Selection of appropriate sampling technique in various study designs, Concept of validity and reliability, Research proposal writing, Ethical principles of Research and their examples to apply those principles, Data collection and processing/displaying techniques, Writing of research report (Chapters in research report/thesis, Outline/Abstract of research, Referencing and Bibliography

Practicals

- Literature Search
- Survey conduct
- Citation and Referencing
- Proposal writing
- Data collection and displaying

Recommended Books

- Foundation of Clinical Research by Portney LG Walkais MP in 1993, Publisher by Appleton and lauge USA
- A guide to Research Methodology, Biostatistics and Medical writing by college of physicians and surgeons Pakistan by WHO collaboration center
- Health system research project by Corlien M Varkerisser, Indra Pathmanathan, Ann Brownlee in 1993 by International Development Research Center in New Dehli, Singapore

PMS-624**Fundamentals of Infection Control****Credit Hours 3(2+1)****Course Objectives:**

- To introduce the students with basic concepts in infection control.
- To introduce the students with infection control principles and practices.
- To introduce the students with importance of immunization and hand hygiene in infection control.
- To introduce the students with the role of clinical laboratory in infection control.

Course contents:

Introduction to infection control, principle of infection control, source and transmission of infection, infection in the hospital environment, immunization prophylaxes, exposure prophylaxes, sterilization, disinfection and antisepsis, practical disinfection, epidemiology of infectious disease, antimicrobial agents, antibiotic and their uses (prophylactic, empirical, and therapeutic), antibiotic resistance and policy, principles of laboratory diagnosis of infectious diseases, biomedical waste management, biosafety levels, hand hygiene, standard precautions and PPE.

Practical:

- Hand washing and hand rubbing technique.
- Preparation of different disinfection and antiseptic solutions.
- Biomedical waste management in hospitals.
- Cleaning and disinfection of working premises.
- How to handle spills and aseptic handling.
- Standard precautions and PPE.

Recommended Books:

- Fundamentals of Infection Prevention and Control: Theory and Practice. Weston, D., Wiley-Blackwell, 2013.
- Sherris Medical Microbiology: An Introduction to Infectious Diseases. Ryan, K. J., Ray, C. G., 4th ed. McGraw-Hill, 2003.
- District Laboratory Practice in Tropical Countries, Part 1 & Part 2. Cheesbrough, M., 2nd ed. Cambridge University Press, 2006.
- Medical Microbiology and Infection at a Glance. Gillespie, S., H., Bamford, K., B., 4th ed. Wiley-Blackwell, 2012.

Course objectives:

To introduce the student with the significance of bio-statistics, statistics means basic concept, describing and exploring data, normal distribution, sampling distribution and hypothesis testing, basic concept of probability and application of statistics and social research.

Course Contents:

Statistical data, condensation of Data, Presentation of Data by Graphs, Health Related Data, Presentation of quantitative data, The concept of sampling, types and methods of sample, sample distribution, error of sampling, standard error, Chi square, T-Test, Z-Test, Sample and population, Basic considerations in sampling, random sampling, stratified random sampling, cluster sampling, systematic sampling, determination of sample size, elimination of sampling bias, Concept, Mean, Median, Mode and their value in health, Percentiles, measure of dispersion, Coefficient of variation and skewness, normal distribution, range, standard deviation and relative deviation, Concepts of hypothesis testing, null and alternative hypothesis, two types of errors, acceptance and rejection Regions, Two sided and one sided tests, general steps in hypothesis testing, test about means, confidence interval for mean, Types of tests and scales, validity and reliability of an instrument scales, assessment, development of tests/scales, Preparing data analysis, types of measurement scales, descriptive statistics, inferential statistics, using computer for data analysis, Quantitative vs. qualitative research, application of scientific method, positivistic vs. naturalistic paradigm, Basic vs. applied research, evaluation research, research & development (R&D), action research, Steps/sequence, methods involved while preparing a research report

Recommended Books:

- A guide to research methodology, biostatistics and medical writing by college of physicians and surgeons Pakistan by WHO collaboration center
- Reading understanding multivariate statistics by Gimm LG Yard AD PR, publisher American Psychological association
- Ilyas Ansari's community medicine (Text Book) by Ilyas and Ansari 2003 published by Medical division Urdu Bazaar Karachi

Course objectives:

- To introduce basic concept of Epidemiology
- To introduce basic definitions used in Epidemiology
- To introduce various study designs

Course Contents:

Introduction to Epidemiology, Measures of Disease Occurrence; Incidence and Prevalence, Incidence, Rates and Dynamic Populations, Calculating Observation Time, Prevalence, Incidence, Duration, Mortality and Life Expectancy, Life Expectancy, Estimates of Associations, Age Standardization, Causes of Diseases, Study Design Options, Common Designs Used to Estimate Associations, Case-Control Study, Cohort Study, Experimental Study, The Cross-Sectional Study, Case-Reports, Sources of Error; Confounding and Biases

Recommended Books:

1. An Introduction to Epidemiology for Health Professionals

8thSemester

Research Project

Seminar

Subject of own interest

- **ECMO**
- **PerfusionTechnology**
- **Extra Cardiac perfusion**
- **CardiacAssist devices**
- **Medical Physics**

Bioethics

CourseObjectives:

- Students will learn some basic research methodology and gain knowledge about research.
- It will hopefully result in some of presentation or publication for the students and will provide a research oriented environment

CourseContents:

During last year each student should select a topic of research report with consultation of his/hersupervisor and shall prepare and submit research report to Khyber Medical University by the end of last year.

Practicals:

Students will prepare a comprehensive report on their selected research topic and will submit hard copy of following :

- *One Copy to Examination Department*
- *One Copy to the Library KMU*
- *One Copy to the Supervisor*

Objective of the seminar:

During last year each student should select a topic of research work with consultation of his/her supervisor and shall present his/her research work through a seminar.

Student will have to select one optional subject from the following subjects.

- **ECMO**
- **Perfusion Technology**
- **Extra Cardiac perfusion**
- **Cardiac Assist devices**
- **Medical Physics**
- **Pediatric Perfusion**

Course Objectives:

- Use the approach of ethical principle the safety and benefits of the patients.
- Analyze bioethical issues in practices.

Course Contents:

Introduction to bioethics, ethical principles, autonomy, informed consent, intentional non-disclosure, patient self-determination act, the health insurance portability and accountability act of 1996 (HIPAA) privacy and security rules, non-maleficence, slippery slope arguments, beneficence, paternalism, justice, social justice, the patient protection and affordable care act, professional patient relationship, unavoidable trust, human dignity, patient advocacy, moral suffering, ethical dilemmas.

Recommended Books:

Introduction to bioethics and ethical decision making by Karen L. Rich (chapter 2) 2015