Bahria University
Discovering Knowledge

BAHRIA UNIVERSITY HEALTH SCIENCES POSTGRADUATE INSTITUTE (BUHS-PGI), KARACHI

Prospectus

PhD – Health Sciences Program

2024

CONTENTS

INTRODUCTION OF BAHRIA UNIVERSITY HEALTH SCIENCES POSTGRADUATE INSTITUTE (BUHS-PGI)

The institute originally was established as the Postgraduate Programs (PGP) department in 2017 and has evolved within few years into Bahria University Health Sciences Postgraduate Institute (BUHS-PGI). It is serving to promote postgraduate culture at the Health Sciences Campus and is supporting postgraduates holistically through a single, highly accessible point of contact.

The Postgraduate Institute offers FCPS residency program with biannual induction in June and December, Degree program of MPhil - Basic Medical Sciences in five disciplines, MS in one discipline - Medical Laboratory Sciences (MLS) and PhD in Health Sciences program with six disciplines. The degree programs have annual induction in September.

Our faculty is committed and dedicated in training the postgraduate students to become excellent future academicians, researchers and clinicians. Our programs are time framed and outcome - based. We enable students to develop critical thinking to identify the local, regional and global health issues of the community and to bring forth their reliable, relevant and cost-effective solutions, aligned with the WHO Sustainable Developmental Goals (SDGs).

We provide infrastructure to the students that is based on modern technology, to maintain their curricular as well as extracurricular portfolios. Professionals passing out from our institute are capable of providing quality services in their relevant fields.

The environment at the campus is safe, clean, secured, conducive and green. It motivates the students to bring out the best. This is the fruit of untiring efforts and foolproof measures of our administration hierarchy. The BUHS-PGI team believes strongly and is moving forward with innovation in teaching, training and research to bring students at par with regional and international standards.

VISION STATEMENT OF BAHRIA UNIVERSITY

To become a knowledge and creativity driven international university that contributes towards development of society

MISSION STATEMENT BUHS-PGI

To attain highest standards in knowledge through creativity driven health professional skills of learning, teaching and transformative research involving national and international linkages for prevention, diagnosis, treatment of human illnesses and community care

AIMS OF PHD-HS PROGRAM

The aim of Doctor of Philosophy Program in Health Sciences (PhD-HS) is to train the scholars in a way that they shall have comprehensive understanding of the general principles of level 800 , in addition to specific expertise in their particular area of specialization after completion of the degree. The scholars will build-up upon their knowledge of master`s program enabling to think critically about advances and emerging trends in specific areas of their respective specialization subject. They will be able to formulate and design, as well as carry out and interpret insights into fields at molecular, genomics, proteomics and bioinformatics horizons. Their findings will be authenticated by publications to enhance the ranking of university. Scholars are expected to show capacity for continuing significant contributions in their respective specialized fields and to conduct independent research.

INTRODUCTION OF PHD-HS PROGRAM

The program is regular and full time with minimum duration of three years and maximum duration of six years. It has a total of fifty-four credit hour allocation and has been designed as per the guidelines of HEC. The program comprises of coursework of one-year duration with two regular semesters. Each semester will have nine credit hours of course load with a total of 18 credit hour in year one. All courses have been developed and will be assessed as per Bahria University guidelines aligned with HEC grading system policy.

The scholar will acquire an advanced level of understanding of the content through core and elective courses. The program has three core courses irrespective of the specialization. These are MED 801 (Laboratory Research Techniques), MED 802 (Biostatistics & Epidemiology) and MED 803 (Health Policy and Systems Research). The student will choose two out of three core courses. There are four elective courses of respective specialization to be selected by the candidate out of eight available courses with the exception of Public Health specialization where students will take up four elective courses out of nine total courses.

After completing the coursework with minimum CGPA 3.0/4.0, the scholar will have to pass the written comprehensive examination. He then has to defend the research proposal successfully to start the research work, lasting for two years that is four regular semesters with allocation of thirty-six credit hours. Thesis internal defense will be conducted on the pattern of final defense with open presentation of defense followed by closed viva examination by two external evaluators. Evidence of publication of at least one research article in W-category HEC approved journal or two research articles in X-category HEC approved journals prior to thesis defense examination. After successful internal defense, the thesis will be submitted for evaluation by two foreign experts of the relevant field from HERC approved list of foreign evaluators. Upon successful foreign evaluators report, the student will take the final thesis defense exam to be conducted by a panel of three examiners, one internal evaluator from the FRC approved list and two external evaluators from the HERC approved list. The defense will be open to all but viva voce will be conducted as closed session by the panel of examiners. Successful defense of thesis will make the candidate eligible for award of PhD degree.

MISSION STATEMENT PHD-HS PROGRAM

To produce humane, ethical and competent researchers specialized in basic and applied health sciences by achieving excellence in innovative research & national and international collaborations for improving the health of community

PROGRAM SIGNIFICANCE

A doctorate is the highest level of academic achievement. While completing a PhD, students develops extensive, original research project under the guidance of supervisor who have a substantial impact on their field of study. A professional doctorate requires students to provide extensive and unique contributions to a particular professional practice. These degrees are earned by completing coursework and creating an original thesis

SCHEME OF STUDY

Degree title	Doctor of Philosophy in Health Sciences (Specialization name)
Campus	Bahria University Health Sciences, Campus, Karachi
Specializations	Anatomy, Physiology, Biochemistry, Pathology-Microbiology & Pathology-Histopathology, Pharmacology, Public health
Course duration	Minimum duration 3 years and Maximum duration 6 years
Type of study	Regular Full time Program
Study system	Semesters system 16 weeks of teaching + 2 week examinations 2 Regular semesters for coursework (1 year) 4 semesters for research work
Total credit hours	Credit Hours of Course Work = 18 (Semester 1 & 2) Specialized Elective Courses = 04 = 12 CH Generic Courses = 02 = 6 CH PhD dissertation Credit Hours = 36 (Semester 3,4,5,6) Total credit hours = 54
Course load per semester	9 Credit Hours
Teaching institution	Bahria University Health Sciences Postgraduate Institute (BUHS-PGI) Bahria University Health Sciences Campus, Karachi (BUHSCK)
Degree awarding institution	Bahria University Islamabad

PROGRAM LEARNING OUTCOMES (PLOS):

In the fields of Anatomy, Physiology, Biochemistry, Pathology-Histopathology, Pathology-Microbiology, Pharmacology and Public health

1. **Cognitive Domain**:
   a. Contribute to scientific understanding by carrying out cutting edge research in the respective field by original publication, presentation and collaborations with academia and industry
   b. Comprehend theoretical and experimental knowledge and be able to critically reflect on its applied aspects
   c. Evaluate and analyse existing and novel ideas for systematic insight
2. **Psychomotor Domain**:
   a. Develop technical expertise and creative skills applicable to the domains
   b. Acquire expertise in database utilization of various search engines to design, analyze the research and make significant contribution of knowledge and its application
   c. Acquaint with communication skills to explain, critically review and present the original research at national and international forums
3. **Affective Domain:**
   a. Practice intellectual independence in research endeavors with dedication

b. Create and initiate innovative thought provoking ideas
c. Self-reflect with full responsibility and accountability for personal inputs and outcomes
d. Exercise confidence in planning, execution and management of original research project

PROGRAM EDUCATIONAL OUTCOMES (PEOs)

The program is committed to produce PhD scholar able to demonstrate:

1. attributes of the subject related specialty
2. credibility as committed and dedicated scientific researcher
3. open mindedness and intellectual curiosity to learn
4. effective educator qualities with professionalism
5. time and project management
6. skills of self- management and reflection
7. collaboration with academia and industry with leadership skills
8. approach of critical thinking for analysis and problem solving
9. commitment and dedication to quality team work
10. command on written & oral communication skills

PHD-HS PROGRAM EDUCATIONAL OUTCOME / MIT / ASSESSMENT GRID

S NO.	Program Educational Outcome/Competencies	MIT	Assessment
1	attributes of the subject related specialty	Small group strategies (tutorials, group discussions etc.)	Group dynamics Case-based discussions Role-playing exercises – Small group faculty evaluations
2	credibility as committed and dedicated scientific researcher	Journal club / Presentations	Debates & discussions in JC & presentations
3	open mindedness and intellectual curiosity to learn	Research projects /Assignments	Research proposal writing Data analysis Journal club presentations – Thesis/dissertation evaluation
4	Effective educator qualities with professionalism	Teaching internship / Small group	Teaching demonstrations Student feedback surveys
5	Time and project management	Workshops / Seminars / Research projects	Leadership & group dynamics
6	Skills of self-management and reflection	Guided self-reflection exercises Time management workshops Portfolio-based learning Case-based discussions	Reflective journal/portfolio Self-assessment reports Supervisor feedback Time management project
7	Collaboration with academia and industry with leadership skills	Guest lectures from industry experts Collaborative research projects Leadership training workshops Industry internships/academic collaborations	Evaluation of industry/research projects Peer and mentor feedback on leadership skills Presentation on industry collaboration experience

8	Approach of critical thinking for analysis and problem solving	Case-based learning Debates & group discussions Research methodology workshops Problem-based learning (PBL) sessions	Case study analysis Critical appraisal of research papers Problem-solving exercises in viva Research proposal evaluation
9	Commitment and dedication to quality teamwork	Group projects & interdisciplinary collaboration Team-based learning (TBL) Role-play scenarios in healthcare settings	Peer assessment of teamwork Group project reports Faculty observation of team interactions OSCE (Objective Structured Clinical Examination) for teamwork scenarios
10	Command of written & oral communication skills	Academic writing workshops Research presentations & journal clubs Public speaking and debate sessions Grant writing exercises	Evaluation of research papers Oral presentations & poster sessions Participation in journal club discussions Structured feedback on grant proposals

PhD-HS Curriculum Map with Teaching & Assessment Strategies

Program Learning Objective	Course Learning Objective	Teaching Strategy	Assessment Strategy	Semester
Develop expertise in Anatomical/Biochemical/ Physiological/Pathological/ Pharmacological / Public Health Sciences	Describe Anatomical/ Biochemical/Physiological/ Pathological/Pharmacological processes at molecular level Describe Public Health Science at community level	Lectures, lab practical's, tutorials	Written exams, practical lab evaluations Viva	1& 2
Enhance research capabilities	Design and conduct epidemiological studies and application of biostatistical tests	Case-based learning, data analysis	Assignments, presentations, mid & final term assessments	1
Promote critical analysis in health systems	Assess role of different health policy configurations	Seminars, group discussions	Case analysis, policy review presentations	1
Master advanced laboratory techniques	Demonstrate molecular biology techniques like PCR, ELISA	Hands-on laboratory sessions, demonstrations	Lab reports, practical demonstrations	1
Prepare for academic leadership roles	Apply principles of effective teaching	Internship, classroom teaching	Teaching internship evaluation, peer review	1 & 2
Inculcation for life long learner	Communicate scientific ideas effectively in various formats.	Oral presentation Communication skills, literature searching, scientific writing	Journal Club Oral presentation, peer review Critical appraisal	1 & 2

Program Roadmap aligned with HEC GEP Policy

UN SDGs No. 3 Good Health & Well Being

Semester-1

Sr. No	Pre- requisite Course Code	Course Code	Course Title	Credit Hours
1	Level 7 MED Courses	MED 801	Laboratory Research Techniques	3(2+1)
2		MED 802	Biostatistics and Epidemiology	3+0
3		XXXXXXX	Elective-I	3+0
4		MED 804	Journal Club -I	No CH
5		MED 806	Teaching Internship-I	No CH
Total Credit Hours				**9**

*** Student have to choose 2 courses out of three mentioned**

Semester-2

Sr. No.	Pre- requisite Course Code	Course Code	Course Title	Credit Hours
1	Semester- I	XXXXXXX	Elective-II	3+0
2		XXXXXXX	Elective-III	3+0
3		XXXXXXX	Elective-IV	3+0
4	MED 804	MED 805	Journal Club –II	No CH
5	MED 806	MED 807	Teaching Internship-II	No CH
Total Credit Hours				**9**

Semester-3

Sr. No	Pre-requisite Course Code	Course Code	Course Title	Credit Hours
1.	Comprehensive Exam Pass	THS 900	PhD Dissertation	9
Total Credit Hours				**9**

Semester-4

Sr. No	Pre-requisite Course Code	Course Code	Course Title	Credit Hours
1.	Comprehensive Exam Pass	THS 900	PhD Dissertation	9
Total Credit Hours				**9**

Semester-5

Sr. No	Pre-requisite Course Code	Course Code	Course Title	Credit Hours
1.	Comprehensive Exam Pass	THS 900	PhD Dissertation	9
Total Credit Hours				**9**

Semester-6

Sr. No	Pre-requisite Course Code	Course Code	Course Title	Credit Hours
1.	Comprehensive Exam Pass	THS 900	PhD Dissertation	9
Total Credit Hours				**9**

PhD-HS Program Core / Generic Courses

MED 801, 3(2 +1), Laboratory Research Techniques

The course will provide the detailed understanding of principles, opportunity to develop skills and application of essential laboratory research techniques such as cell culture technique, Microscopic Techniques, Molecular biology techniques, Spectroscopy and its types, extraction of biomolecules and sample storage, Blotting Techniques, Recombinant DNA technology and PCR, Proteomics and protein analysis, Gene expression, DNA sequencing applications and Genetic manipulation, Cytological techniques, Immunological techniques, Histopathology Techniques, Chromatography Techniques. It will also encompass the guidelines of safe laboratory working place and Office of the Gene Technology Regulator (OGTR)

MED 802, 3+0, Epidemiology & Biostatistics

This course is designed to advance the application of epidemiological and biostatistical knowledge of the students. Thus the course includes the challenges and issues related to the designs of the epidemiological studies. Similarly, it includes higher-level statistical applications such as survival analysis and longitudinal analysis.

MED 802, 3+0, Health Policy and Systems Research

Health systems and related health system approach to major health challenges globally as well as specific to Pakistan

MED 804 & 805 [Essential –No credit hour] JOURNAL CLUB: SEMESTER 1& 2

Critical review of the published paper(s) of choice and elaborating in detail the findings described on semester basis in the research journal club as presentation, critical thinking on the provided research literature, delivery of lecture, report writing

MED 806 & 807 [Essential –No credit hour] TEACHING INTERNSHIP: SEMESTER 1 & 2

Working and duties, academic and administerial tasks performed by the student in the respective department and institution as faculty member including taking up of interactive lectures of undergraduates & postgraduates (MPhil) students apart from, case based sessions, problem based learning sessions, demonstrations, mentoring of undergraduate students etc. Development of questions (BCQs & SEQs) & cases, participation in the assessment process of the undergraduates & postgraduates (MPhil) students

PhD-HS Program Anatomy

Human Anatomy is the branch of Basic Health Sciences that deals with morphology or structure of the body. It is divided into Gross Anatomy, Microscopic Anatomy and Embryology or developmental anatomy. Gross Anatomy is the study of external and internal structure of the body. Microscopic Anatomy is the study of cells and tissues and is done by using microscope, also known as histology. Development anatomy or Embryology deals with the growth and development of the human beings before birth. Clinical Anatomy is the term used for the study of all disciplines, such as gross, histology and embryology as they relate to the practice of medicine and other health sciences. The history of anatomy is characterized by a progressive understanding of the functions of the organs and structure of human body. Methods have improved dramatically advancing from the examination of animals by dissection of the cadaver to 20th century, where imaging techniques including X-Ray, ultrasound, CT scan and MRI scan are widely available.

The structure of PhD-HS program Biochemistry comprises of an extensive “Course Work" followed by the "Supervised Research Thesis." This program fulfills the requirement of Higher Education Commission (HEC). The coursework components are specifically designed to maximize learning and to develop a comprehensive skill base required to undertake thesis research. Assessment of course content in each semester will consist of a combination of continuous assessments and examinations. In line with academic standards` the students will be required to pass coursework to progress to the thesis research work

PhD-HS Program Anatomy Elective Subject Courses

ANA 830 , 3 (2+1), Human Histology

Cell biology (Advanced /Ultrastructure)

Microscopic/ Ultramicroscopic structure of cell including cell organelles , functions, molecules of cells acting as enzymes for cell growth and cell division and cell cycle, factors affecting the cell cycle and death of cells

Basic tissue (Advanced /Ultrastructure)

Types of basic tissues epithelial tissue, connective tissue, muscle tissue, and nervous tissue, their microscopic / ultramicroscopic structure and function

Organ systems (Advanced & clinically oriented) structure of organs comprising systems with special reference to

Immune system (Advanced / Ultrastructure)

The immune system includes vast network of many types of cells, organs, proteins, and tissues, role in body defense, mechanism involve in identification of self from non-self-tissue

Immune system disorders including abnormally low activity or over activity of the immune system, molecular or cellular basis of autoimmune diseases and immune deficiency diseases vulnerability of body to infections.

Nano-Histology

Nanomaterials can occur naturally, A nanoparticle is a small particle ranges between 1 to 100 nano-materials in size, can exhibit significantly different physical and chemical properties to their larger material counterparts. Most nanoparticles are made up of only a few hundred atoms.

Tissue techniques

Tissue processing for light microscopy (Paraffin embedding)

Tissue processing for electron microscopy

Frozen tissue techniques (Cryostats)

Tissue staining for light microscopy

Cytogenetics, molecular biology techniques Immunohistochemistry; Immunocytochemistry; Florescent immunostaining; Immunoblotting; Western blotting; Southern blotting

Florescent insituhybridization (FISH) and tissue culture

ANA 831 , 3(2+1), Human Embryology

Introduction to embryology with reference to comparative embryology

Fertilization; normal process and infertility & drug induced pregnancy/ In vitro-fertilization

Zygote formation, stages of development; embryonic & fetal periods

Development of Twins/ Identical twins

Stem cells (embryonic/ fetal / perinatal and adult) their use in regenerative medicine i.e procedure that manipulate the immature cells to specialized into specific type of cells such as heart muscle cells, blood cells or nerve cells. The specialized cells can then be implanted into a person

4th week of development /organogenesis with reference to Teratogens and Congenital Anomalies/ Birth Defect

- Morphological and/or functional anomaly
- Result of an abnormal prenatal development
- Presented at birth

Congenital vs Acquired / Chromosomal, Genetic & Environmental (Nutrition & Drugs) teratogenesis / teratogens / teratology
(Physical, chemical or biological)
Pregnancy including ectopic pregnancy & Rh incompatibility
Placenta: normal gross and microscopic (Light and Electron)structure of human placenta, types of mammalian placenta, placental abnormalities (Low-lying placentas and placenta previa; Abnormally invasive placentas; Clinical implications ; advanced Research aspects

ANA 832 , 3 (2+1), Neurosciences and Anatomy of Head & Neck Region

Advanced Cellular, Molecular Neurobiology including membrane structure and function, ion channel and neurotransmitter receptor structure and function, synaptic plasticity, sensory transduction.
Advanced developmental neurobiology including embryonic and post-embryonic development of vertebrate / primate nervous systems Neural Tube Formation; Neural Tube Defects;
Systems Neurobiology: Brain Vesicles developing into Brain; Brain stem; cerebellum and Spinal Cord; Expansion of the Cerebral Cortex ; neuronal pathways;
Cerebral Palsy and other developmental disorders
Molecular Mechanisms underlying Sensory-Motor Circuits and their contribution to disease pathogenesis.
Neuroanatomical basis of Brain and Behavior with special context to neuropsychiatric disease and disability, including mental disorders, behavior changes following human brain injury and disease, and mental sub normality
Cognitive Neuroscience: The neurological basis of cognition, including perception, attention, memory, language, motor control, executive control, and emotion.
Neurological basis of Learning and Memory: different types of memory; Localization of memory in different regions of the brain; how does memory work? Involvement of genes and proteins; how can a memory last for a lifetime?
Neuroscience of special senses spanning the entire neural pathway from Special sense organ to cortical processing of sensory signals
Neurobiology of Aging and Aging-Related Disorders: A complex process of all vertebrate organisms influenced by systemic, genetic, and environmental factors
Molecular Basis of Neurologic Disease
Blood supply with emphasis to stroke
Head & Neck
The skull (cranium), the skeletal structure of the head supporting the face and forming a protective cavity for the brain.
Features of articulated skull and Cranial fossae,
Le Fort Fractures, a group of midface fracture patterns classified into 3 types: Le Fort I, II, and III. Le Fort fractures represent 10%–20% of all facial fractures and can be caused by any significant blunt trauma to the face, most commonly from motor vehicle accidents.

Types of Intracranial Hemorrhage:

- Epidural hemorrhage (EDH) is an event characterized by bleeding into the epidural space between the dural layers of the meninges and the skull.
- Subdural hemorrhage (SDH) is bleeding into the space between the dural and arachnoid meningeal layers surrounding the brain.
- Subarachnoid hemorrhage (SAH) is a type of cerebrovascular accident (stroke) resulting from intracranial hemorrhage into the subarachnoid **meninges surrounding the brain.**
- **Oral cavity , and associated structures;**

Special sensory organs and the cranial nerves

The Orbit, eye ball and Extraocular Muscles, Optic nerve, Visual system

Oral cavity, tongue, muscles of mastication Temporomandibular joint; Muscles of facial expression, Parotid and other salivary glands; Vagus, facial, glossopharyngeal, hypoglossal nerves; Parasympathetic ganglia; Cervical ganglia. Dural venous sinuses; Remaining cranial nerves; **Vertebral column**.

Nose; Paranasal sinuses; **Ear**

Blood supply lymphatic drainage.

Cervical region:

Cervical vertebrae; Cervical fascia; Triangles of neck; muscles glands and other structures (pharynx, larynx, esophagus and trachea) related to neck

Neck pain: one of the most common complaints in the general population. many causes including degenerative disease, trauma, rheumatologic disease, and infections, Musculoskeletal conditions

Blood supply , lymphatic drainage

Miscellaneous

ANA 833 , 3 (2+1), Human Urinary and Genital System

Gross anatomy of the kidney, ureter, urinary bladder and urethra

Light & electron Microscopic anatomy of kidney, ureter, urinary bladder and urethra

Structure and function of juxtaglomerular complex/apparatus in the kidney

Developmental anatomy of kidney, ureter, urinary bladder and urethra, signaling pathways regulating the development and associated abnormalities

Functions of urinary system as:

Secretion of Hormonal renin angiotensin aldosterone system (RAAS)

Regulation of water, blood pressure and electrolytes (sodium, potassium, etc)

Elimination of wastes and toxins from the body

Production of hormones involved in red blood cell production

Acid-base balance in the blood

Metabolism of vitamin D

Molecular and genetic basis of kidney diseases as

Autosomal Dominant Polycystic Kidney Disease (ADPKD)

Autosomal Recessive Polycystic Kidney Disease (ARPKD)

Hereditary Interstitial Kidney Disease

Bartter Syndrome
Common pathological changes in the urinary tract, including glomerulonephritis, pyelonephritis, interstitial, tubular and cystic diseases, and prostate enlargement, and their clinical consequences.
Factors leading to male infertility, and the clinico-pathological features of cryptorchidism, renal calculi and neoplastic lesions of the urogenital tract.
Gross and microscopic anatomy of male reproductive system including Testis with their reproductive function, Leydig cells & function and steroidogenesis, Sertoli cell and their function, germ cell maturation, genetic and HPG axis function, the onset of puberty, Sperm transport-vas deferens, prostate, seminal vesicles etc.
Gross and microscopic anatomy of the female reproductive system including the ovaries, fallopian tubes, uterus, cervix, vagina and mammary glands with their functions, genetic and hormonal regulation and clinical correlation
Special emphasis on the process of folliculogenesis, hormonal regulation, HPG axis function, steroidogenesis, process of ovulation leading to menstruation, the onset of puberty and menopause.

ANA 834 , 3 (2+1), Human Alimentary Tract

Gross feature of anterior abdominal wall/ quadrants
Clinical significance Abdominal examination; differential diagnoses of acute abdomen; Referred pain; Surgical anatomy of incisions
Inguinal hernia; Umbilical hernia; Epigastric hernia; Rectus sheath hematoma
Anatomy of inguinal region, groin hernias. Hydroceles, clinical and surgical application Peritoneum, peritoneal reflexion, peritoneal recesses and fossae. Peritonitis types, Symptoms and Causes
Gross and microscopic features and development of gut: esophagus, stomach, small and large intestine, rectum, anal canal, and spleen, blood supply, lymphatic drainage and clinical significance
Gross and microscopic features and development of liver, gallbladder and pancreas blood supply, lymphatic drainage, portal circulation and porto-systemic anastomosis , liver disease and liver transplant
Correlate the formation & sites of porto-systemic anastomosis with portal hypertension
Role of Gut as a strong immune system,
Gut microbiota: Definition, importance and medical uses
Significant change in the GIT with Ageing
Clinical significance of gut hormones

ANA 835, 3 (2+1), Human Respiratory System

Gross anatomical and Light & electron microscopic structure of Nose, nasal cavity, paranasal sinuses with functional and clinical significance
Gross anatomical and Light & electron microscopic structure of Pharynx, larynx, trachea and bronchial tree, bronchopulmonary segments with functional and clinical significance
Thoracic wall , ribs, joints and Intercostal structures and diaphragm
Pleura pleural reflection and pleural cavity and lungs
Blood supply, Lymphatic drainage and innervation

Normal and abnormal development of trachea and lungs involvement of gene and signaling proteins in the process of development

Clinical problems encounter respiratory system as nasal bleed, Common cold, sinusitis, Allergies, Asthma, Bacterial and viral infections.

Molecular, genetics and genomics of respiratory diseases

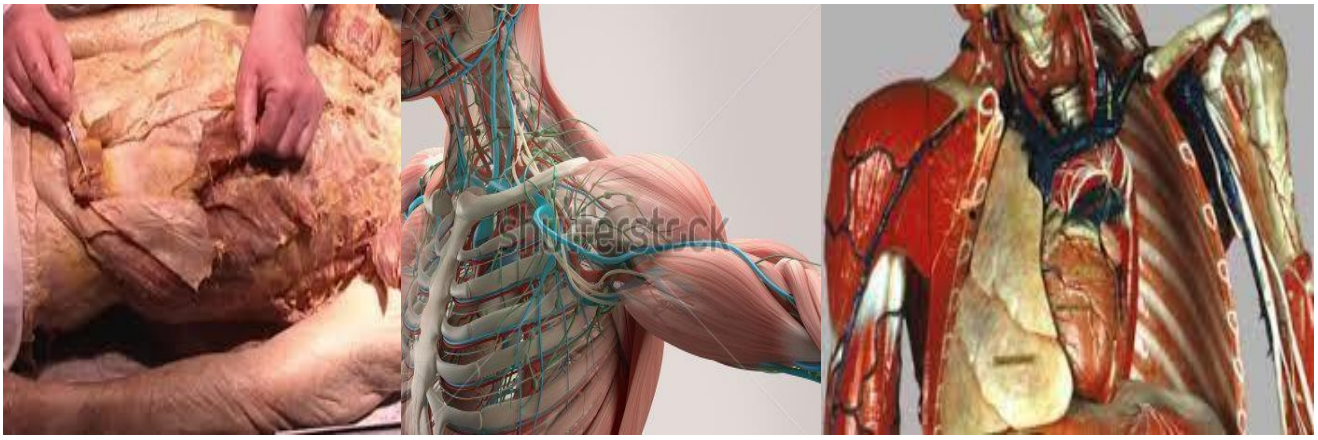
Role of Lung microbiome, and sleep and circadian biology in respiratory system in health and disease

ANA 836, 3 (2+1), Anatomy of Human Heart and Blood Vessels

Thoracic cage, mediastinum and its subdivisions, Pericardium. Anatomy, physiology and pathophysiology of the cardiovascular system. Main emphasis on the light and electron microscopic structure of heart, vessels and cardiac conducting system, embryological development of heart and vessels, genes and transcription factors regulating the process of development, mutational analysis leading to developmental anomalies of the heart and vascular system. Coronary circulations, hemodynamics of the heart and vascular system. Disease processes to challenge genetic modifications known to cause cardiovascular diseases. Role of predisposing factors in relation to ischemic heart disease and heart failure: atherosclerosis, diabetes, hypertension, metabolism, gender, acute myocardial ischemia. Tissue engineering to restore the structure and function of tissues damaged due to injury, aging or disease through the use of cells, biomaterials, and biologically active molecules

ANA 837, 3(2+1), Anatomy of Human Skeletal and Muscular System

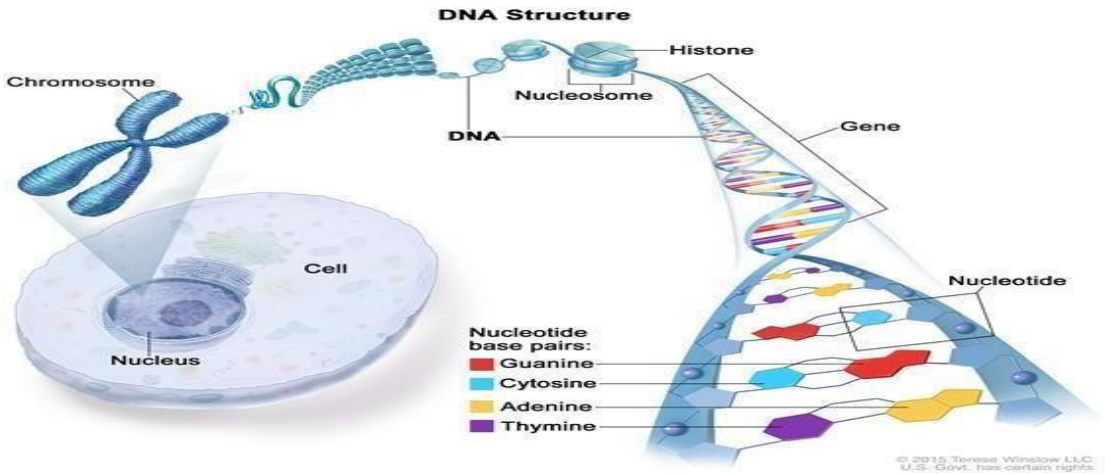
Gross and microscopic structure and functions of bones and cartilages, including cell biology of bone / cartilage cells; measurement techniques; adaption to the mechanical and metabolic environments; regulatory factors and mineral homeostasis; and growth and development, ossification and congenital anomalies factors (genetic and environmental) affecting the growth and development of bones and cartilage. Injuries and repairments. Gross and microscopic (light and electron) features of skeletal muscles, tendon, ligament and aponeurosis. Nerve and blood supply clinical correlation with myopathy (muscular dystrophies) and role of stem cells in muscular regeneration. Classification of muscles on the basis of arrangement of muscle fibers and on the basis of their functions. Injuries, regeneration, disease and aging, problem with movement, pain, stiffness , congenital anomalies



PhD-HS Program Physiology

Physiology is the study of normal function within living creatures. From ancient theories to molecular laboratory techniques, physiological research has shaped our understanding of the components of our body, how they communicate, and how they keep us alive. Department of physiology is an important segment of basic health sciences which occupies a very prominent place in modern age of biosciences and applied biological sciences. It is the core of all medical research for research oriented mind. The level of education is maintained efficiently by implementation of concepts, skills, advance knowledge and teaching method. One of the current challenges in physiology is integrating information from different body systems into a cohesive picture of the living human body. The concept of integrated function is the underlying principle in translational research, an approach described as 'bench to bedside'.

The structure of PhD-HS Program Physiology comprises of an extensive "Course Work" followed by the "Supervised Research Thesis". This program fulfills the requirement of Higher Education Commission (HEC). The coursework components are specifically designed to maximize learning and to develop a comprehensive skill base required to undertake thesis research. Assessment of course content in each semester will consist of a combination of continuous assessments and examinations. In line with academic standards` the students will be required to pass coursework to progress to the thesis research work.



PhD-HS Program Physiology Elective Subject Courses

PHY 861, 3+0, Cellular & Molecular Basis of Physiology

Explore the molecular mechanisms of cell physiology, gene expression and genome function including the role of chromatin and non- coding RNA, translation, cell cycle and division, and cell signaling. Protein trafficking, secretory pathways, electron transport, cell homeostasis and apoptosis.

PHY 862, 3+0, Hormonal Physiology

Understanding the underlying principles of endocrinology, the mechanisms involved in regulating hormone levels, including thyroid hormones (cretinism, myxedema ,graves' disease Hashimoto thyroiditis), role of endocrine system in integrating metabolic pathways, role of various factors like lipid profile, BMI and adipokines in development of metabolic syndrome ,regulation of gene expression and its association with metabolic and endocrine regulation in different tissues, infertility including causes and risk factors of male and female infertility, ovulation induction, reproductive technologies, assisted conception

PHY 863, 3(1+2), Laboratory techniques in Physiology

Cardiorespiratory adaptation to exercise and various modern laboratory procedures for diagnosis of important cardiorespiratory diseases, pathophysiology and diagnostic techniques for detection of hematological disorders including anemias, hemoglobinopathies and bleeding disorders, interpretation of EEG and EMG recordings during different types of activities.

PHY 864, 3+0, Physiology of Behaviour and Neurosciences

Internal, external environments and biological factors act upon the brain to produce perceptions, control body functions, and generate behavior. This will also include learning and memory, emotions, stress, aggression, and parental nurturing and neurological and neuropsychiatric disorders. Display insight into current research issues and an ability to critically evaluate primary literature in the field of neuroscience

PHY 865, 3+0, Exercise Physiology and Movement Disorders

Studies in acute physiological responses and chronic adaptations to a wide range of exercise conditions and their neuronal control.

PHY 866, 3+0, Principles of Hematology and Immune Mechanisms

Genesis of blood cells and their role in different blood diseases, different blood groups and incompatibility, bleeding disorders, various mediators, cytokines and signaling pathways involved in regulation and genetic control of immune responses and disease susceptibility

PHY 867, 3+0, Cardio-Vascular Physiology and Hemodynamics

Knowledge of advanced physiology of cardiovascular system and Hemodynamics with reference to control of blood pressure and blood flow. The course will also cover conduction defects, arrhythmias and congenital heart diseases. Explore how Cardiac output propels blood through the arteries and veins as a function of ventricular contraction.

PHY 868, 3+0, Pulmonary and Renal Physiology

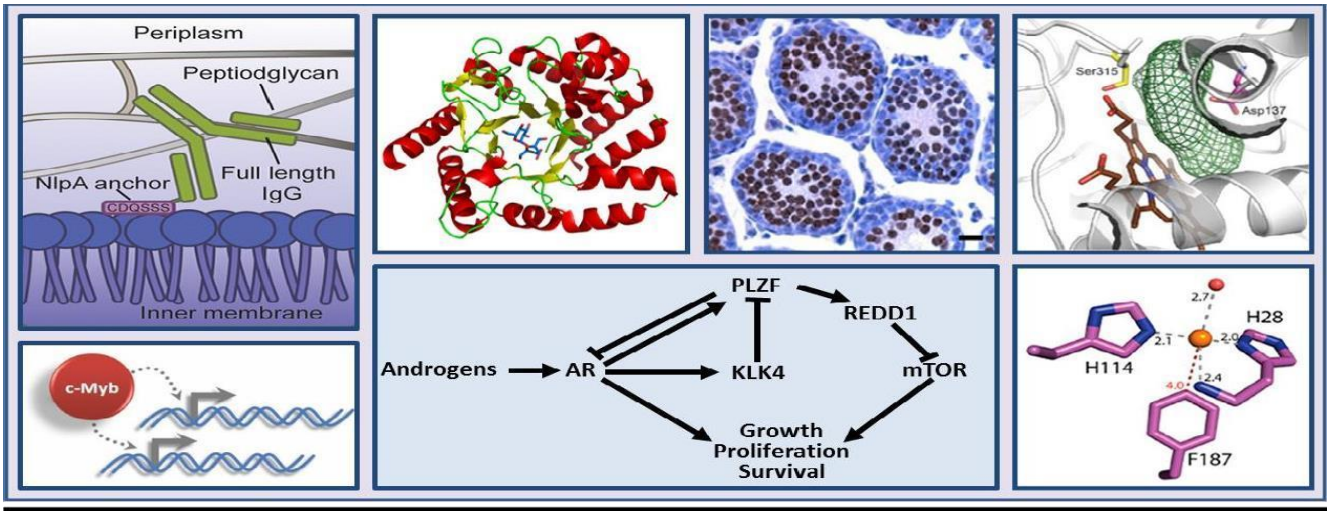
Normal physiology of renal and respiratory mechanisms in body homeostasis and its disturbance in different disease conditions such as acid base disturbances. Describe Dalton's law, Henrys law and general gas laws for diffusion of gases.

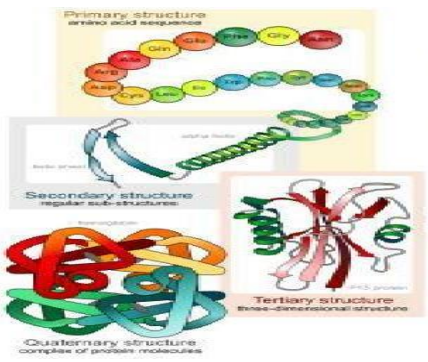
PhD-HS Program Biochemistry

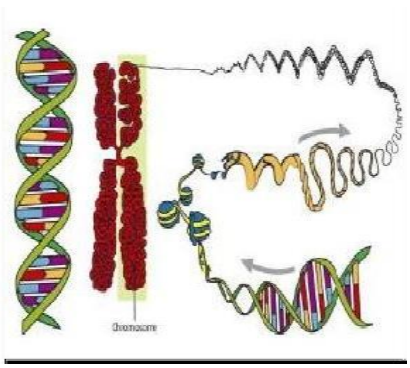
Biochemistry is the language of all biology sciences. The study of Biochemistry is essential to understand basic functions of the body. This study will give information regarding the functioning of cells at the molecular level. Modern day medical practice is highly dependent on the laboratory analysis of body fluids, especially the blood. The disease manifestations are reflected in the composition of blood and other tissues. Hence, the demarcation of abnormal from normal constituents of the body is another aim of the study of Biochemistry.

Advances in genomics like RNA interference for silencing of genes and creation of transgenic animals by gene targeting of embryonic stem cells are opening up new vistas in therapy of diseases like cancer and AIDS. It is hoped that in future, the physician will be able to treat the patient, by understanding his biochemical and molecular genetic basis, so that very efficient "designer medicine" could cure the diseases. Medical practice is now depending more on the science of Medical Biochemistry.

The structure of PhD-HS program Biochemistry comprises of an extensive “Course Work" followed by the "Supervised Research Thesis." This program fulfills the requirement of Higher Education Commission (HEC). The coursework components are specifically designed to maximize learning and to develop a comprehensive skill base required to undertake thesis research. Assessment of course content in each semester will consist of a combination of continuous assessments and examinations. In line with academic standards` the students will be required to pass coursework to progress to the thesis research work.







PhD-HS Program Biochemistry Elective Subject Courses

BIO 852, 3(2+1), Medical Biochemistry and Diagnostics

Procedure and interpretation of hypothalamic and pituitary function, Adrenocortical function tests with their interpretation, Assessment of gonadal functions, Interpretation of thyroid functions, Assessment of liver functions, Assessment of cardiac functions, Evaluation of renal functions, Pancreatic functions and gastrointestinal functions, Body fluid analysis, Circulating tumor markers ,Clinical chemistry and geriatric patient, Acid base disorders.

BIO 853, 3+0, Nutritional Biochemistry

Food nutrition and diet- BMI, BMR, waist circumference; Balanced diet, glycemic index and glycemic load in food; Diet and Nutrition in pregnancy; Vitamins; Water soluble Vitamins; Micronutrients; Macronutrients; review of classification of amino acids and proteins and their importance in nutrition; Association of digestion and absorption of protein and amino Acids with clinical disorders; Clinical importance, structural properties and function of different forms of carbohydrates; Review of digestion, absorption, and functions of lipids with clinical disorders along with the essential fatty acids and their biomedical importance; Sources, role, importance, and properties of cholesterol; Properties of lipids; Biochemical role of eicosanoids; Lipid per oxidation and its significance

BIO 854, 3+0, Metabolic Pathways

Digestion and absorption of carbohydrate, protein and lipids with their clinical significance; Carbohydrate metabolism (Glycolysis, TCA, Gluconeogenesis, and HMP shunt, uronic acid, fructose, galactose and sorbitol); Glycogen metabolism pathways; Respiratory chain and oxidation phosphorylation ,Uncouplers and inhibitors of oxidative phosphorylation; Fatty acids synthesis; Oxidation of fatty acid -steps, regulation and its clinical disorders; Metabolism of cholesterol and ketone bodies and its clinical disorders; Metabolism of lipoproteins and its clinical disorders; Metabolism and clinical disorders of Eicosanoids; Metabolism of phospholipids and its clinical significance; Synthesis and metabolic pathways of Urea; Individual metabolism and their inherited disorders of amino acids including phenyalanine, tyrosine, methionine, cysteine; Individual metabolism and their inherited disorders of amino acids including cystine, tryptophan, creatine, leucine, valine, isoleucine; Neurotransmitters metabolism and related disorders

BIO 855, 3+0, Applied Enzymology

Enzyme Nomenclature, Steady state enzyme kinetics, Differences between chemical equilibrium and steady state kinetics, Limitation of Michealis-Menten equation (MME), variation in MME with respect to the type of inhibitor, Multisubstrate systems, Enzyme reconstitution, Enzyme assays, Criteria for determining purity of enzymes, Measurement and magnitude of enzyme rate constant, The pH dependence of enzyme catalysis, Regulatory enzymes; regulation of enzyme activity and synthesis, Molecular models for allosterism, Multienzyme complexes, Transient kinetic methods, Detection of intermediate in reactions, Determination of Enzyme- Substrate, Dissociation Constants, Chemistry of enzyme catalysis, Stereochemistry of enzymatic reaction, Active site-directed and enzyme activated irreversible inhibitors, Cooperativity, allosteric interactions and regulation, Mechanisms of action of enzymes, Thermodynamics of enzyme-substrate interactions

BIO 856, 3+0, Molecular Genetics and Disorders

The history and impact of genetics in medicine, the cellular and molecular basis of inheritance, transcription, translation, gene expression regulation, Mutations, Human chromosomes and methods of analysis, Cell division, DNA technology and application Mapping and identifying genes for monogenic disorders, Developmental genetics, Patterns of inheritance, Mathematics and population genetics, Polygenic and mutifactorial inheritance, Hemoglobin and the hemoglobinopathies, Biochemical genetics, Pharmacogenetics, Immunogenetics, Cancer genetics, Genetic factors in common diseases, Congenital abnormalities and dysmorphic syndromes Genetic counseling, Chromosome disorders, Single- gene disorders, Screening for genetic disease, prenatal testing and reproductive genetics, Risk calculation, Ethical and legal issues in medical genetics

BIO 857, 3+0, Principles of Immunology

Introduction, Components of the immune system, Antigens and Pathogens, Innate Immunity and Inflammation, Different types of leukocytes, Recognition and Responses to foreign antigens, Pattern recognition receptors, Innate immune signaling, The complement system, Hybridoma technology, Lymphocyte Development and Diversity, Lymphocyte development, , Differences between B and T lymphocytes, The generation of lymphocyte receptor diversity, T Cell Activation by Antigens, Antigen presentation, T Cell-Dependent B Cell Responses, T Cell activation of B cells, Isotype switching and affinity maturation, Helper T cell functions, The role of helper T cells in disease, Cytotoxic T cell functions, Selection and expansion of cytotoxic T cells, Therapies that target cytotoxic T cell functions, Tumor Immunology, Detection and identification of Tumor Antigens, Immune Escape Mechanisms of Tumor Antigens, basis of Immunodiagnostic Techniques, Transplantation of Autologous, Bone Marrow/Hematopoietic Stem Cells, Clinical Aspects of Organ Transplantation

BIO 858, 3+0, Medical Biotechnology

Introduction to the medical biotechnology, Introduction to gene and genome, Human Genome project, Primer Designing, Single nucleotide polymorphism, Principles of cloning DNA in medical biotechnology, General principles and strategies for cloning, Gene cloning techniques for mammalian cells, Molecular biological techniques for rapid diagnosis of diseases, DNA sequencing, Medical biotechnological approach to study various types of diseases (Infectious and Genetic), Tuberculosis, Typhoid, Hepatitis C, Thalassemia, Chromosomal anomalies, Other mutations, Prenatal diagnosis of anemia, Molecular basis for inherited disease , Mapping a genetic disease, Medical Biotechnology Regulations, Ethics and Medical Biotechnoloy, Biosafety Regulation, Introduction to genetically manipulated organisms (GMOs)

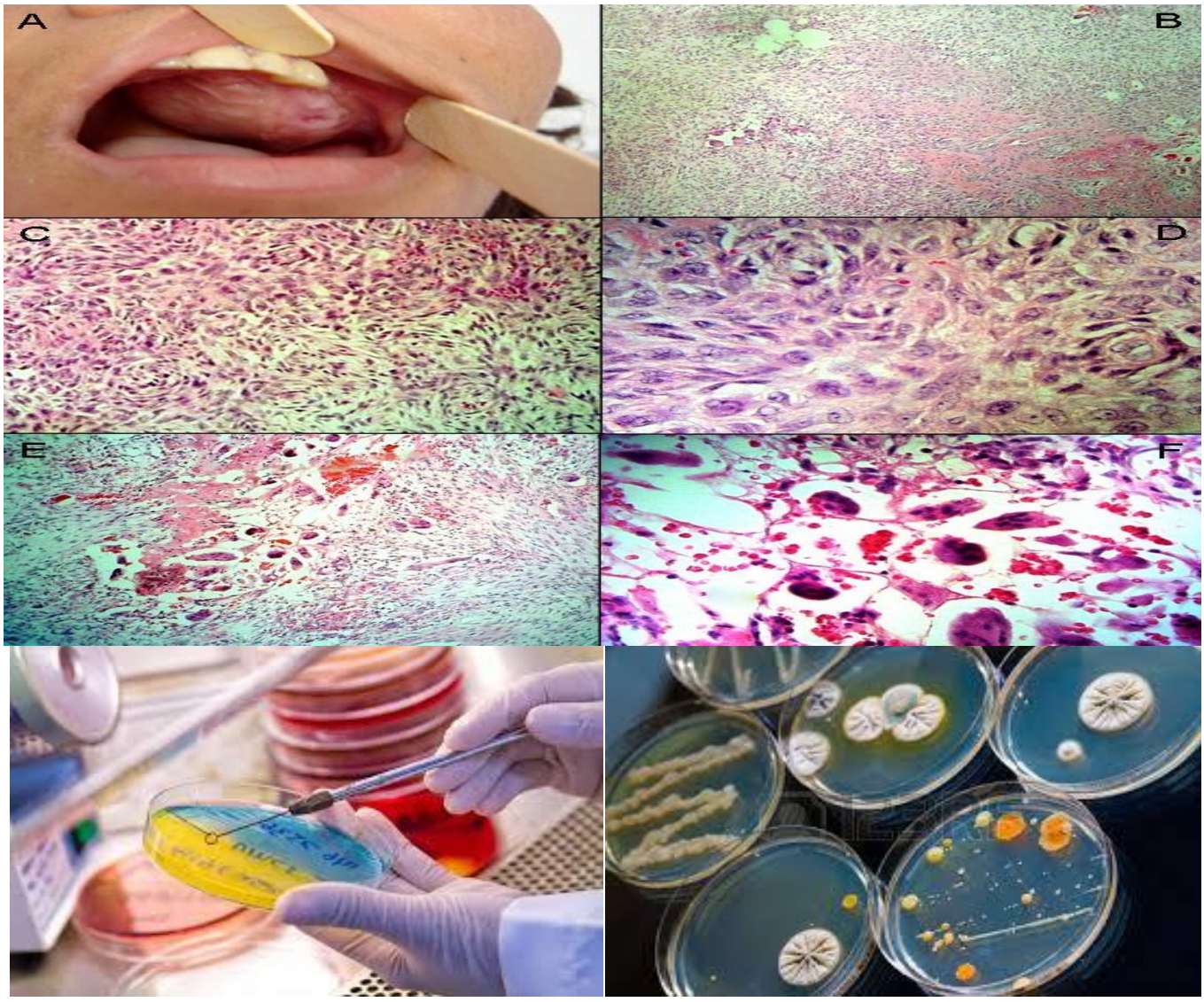
BIO 859, 3(2+1), Bioinformatics

Bioinformatics repositories, tools, browsers and servers. NCBI, Uniprot, Gene Card, PDB, SCOP, CATH, Expasy, EMBL sequence alignment tools.1D. 2D and 3D structure analyses, sequence alignments, homolog search, finding similarity and identity, Algorithms and approaches: PAM, BLOSUM, Dynamic programing etc. Applications: Drug discovery and validation, antibody development, molecular communication, Structure (3D) modeling and validation, Sequencing methods, Evolutionary relationship analysis, Retrieval and understanding of Biological Data Concepts, Methodology and analysis of Biological information, Application of bioinformatics in research, diagnostics and medicine, and evolution. Employing bioinformatics resources and available information to fill the knowledge gaps and find the solutions to biological problems

PhD-HS Program Pathology

Pathology is the study of disease, encompassing its causes, mechanisms, and effects on the body. It involves examining tissues, organs, bodily fluids, and even performing autopsies to understand the nature of illness and provide diagnostic information. Essentially, pathology acts as a bridge between basic science and clinical medicine, informing diagnosis, treatment, and prevention strategies.

The structure of PhD-HS program Pathology comprises of an extensive “Course Work" followed by the "Supervised Research Thesis." This program fulfills the requirement of Higher Education Commission (HEC). The coursework components are specifically designed to maximize learning and to develop a comprehensive skill base required to undertake thesis research. Assessment of course content in each semester will consist of a combination of continuous assessments and examinations. In line with academic standards` MPhil students will be required to pass coursework to progress to the thesis research work.



PhD-HS Program Pathology Elective Subject Courses
(Microbiology)

PAT 840, 3(1+2), Diagnostic Microbiology

Microbiological laboratory services with minimum resources. Collection, labeling, preservation, transportation and dispatching of microbiological aspects. Preparation and interpretation of culture media. Biochemical tests and serology procedures and interpretations of tests to make diagnosis of staphylococcus and streptococcus infections. Biochemical tests and serology procedures and interpretations of tests to make diagnosis of neisseria infections. Procedures and interpretations of tests to make diagnosis of spore- forming gram-positive rods (bacillus clostridium) and non–spore-forming gram- positive rods (corynebacterium diphtheria and listeria monocytogenes). Procedures and interpretations of tests to make diagnosis of pathogens both within & outside the enteric tract (escherichia and salmonella) and pathogens primarily within the enteric tract (shigella, vibrio, campylobacter and helicobacter). procedures and interpretations of biochemical and serological tests to make diagnosis of pathogens outside the enteric tract (klebsiella– enterobacter–serratia group, proteus–providencia–morganella group, pseudomonas bacteroides & prevotella). Procedures and interpretations of biochemical and serology tests to make diagnosis of bacteria related to respiratory tract (haemophilus, bordetella and legionella). Procedures and interpretations of tests to make diagnosis of zoonotic organisms (brucella, francisella yersinia, pasteurella and bartonella). procedures and interpretations of tests to make diagnosis of treponema (treponema pallidum and nonvenereal treponematoses) Borrelia (Borrelia burgdorferi, Borrelia recurrentis & Borrelia hermsii) Leptospira and Other SpirochetesInterpretations of tests of Mycobacterium tuberculosis, Atypical Mycobacteria and Mycobacterium leprae. Procedures and interpretations of tests to make diagnosis of Actinomycetes and Mycoplasma species. Interpretations of tests to make diagnosis of Rickettsiae and Chlamydiae infections

PAT 841, 3(1+2), Immunological basis of diseases

Chronological development and scope of immunology. Immunity and immune responses: Definitions and types (specific and non-specific). Humoral and cellular immunity. Details of Complement system. Cells and tissues of immune system. The antigens: structure (simple and complex molecules, proteins and polysaccharides) and immunogenicity. Tissue antigens: the Allo- and heterophile antigens. The ABO and Rh blood group systems, their chemical basis, inheritance & clinical significance. Immunoglobulin: structure and function; classes, subclasses, types and subtypes; immunoglobulin genetics. Immune response to an antigen. Introduction to antigen-antibody reactions: methods for detecting antigens and antibodies (agglutination, precipitation, complement fixation, EIA, etc.). Introduction to HLA & MHC and its role in immune response, disease and its significance in tissue transplantation. Immune-regulation and tolerance. Introduction to Cancer immunology. Introduction to immunopathology: hypersensitivity reactions, autoimmune diseases and immune-deficiencies. Immunization (methods of immunization, vaccines and adjuvants). Parameter of complete blood count, Differential leucocyte count, Erythrocyte sedimentation Rate and Reticulocyte count along with their relevant significance to different diseases. Blood grouping techniques. Different cross matching methods and indications (e.g., electronic, immediate-spin, anti-globulin). Policies/process in selection of a blood donor and blood donation procedure. Coagulation techniques with coagulopathies. Principles of apheresis technology, including centrifugation, filtration and immune-adsorption. Diagnosis of Haemoglobinopathies. Technique of bone marrow aspiration, its indication, contraindication, significance and complication. Purpose and techniques of compatibility testing and Auto-transfusion. Types of Blood transfusion reactions (hemolytic and non-

hemolytic), clinical manifestations, pathophysiology and complications. Immunization (methods of immunization, vaccines and adjuvants)

PAT 842, 3(1+2), Microscopy and Staining Techniques

Introduction to advanced microscopy, mechanisms involved in different microscopy techniques and he basic principles of advanced microscopy. Use of advanced microscopes including, microscope care, slide preparation and operating procedures of fluorescent microscopy, con-focal microscopy, flow cytometry and electron microscopy. Will also study the role of microscopy in basic medical research and diagnostics. The students will also learn standard operating procedures and data interpretation using specific software for these microscopes. Different Staining Techniques, their principles and significance.

PAT 843, 3(1+2), Medical Parasitology

Principles of medical parasitology including molecular mechanism involved in cellular physiology, growth, spread and disease causation. The molecular mechanism involved in maintenance of normal flora of body organs and parasitic pathogenesis and molecular mechanism of developing resistance. The course will also include the molecular methods in diagnosis of parasitic diseases, their pathogenesis in normal and immune-compromised host. The course will also include the development of anti-helminthic drugs and vaccines against different diseases. Parasitic interaction with their human host will be studied at molecular level including their genetic makeup and their genetic association with the development of resistance to the available therapies. The course will also include molecular mechanism involved in different systematic manifestations of parasitic infections and their association with the community and any outbreaks.

PAT 844, 3(1+2), Medical Mycology

Principles of medical mycology including molecular mechanism involved in cellular physiology, growth, spread and disease causation. The molecular mechanism involved in maintenance of normal flora of body organs and fungal pathogenesis and molecular mechanism of developing resistance. The course will also include the molecular methods in diagnosis of fungal diseases, their pathogenesis in normal and immunocompromised host. The course will also include the development of antifungal drugs and vaccines against different diseases. Fungal interaction with their human host will be studied at molecular level including their genetic makeup and their genetic association with the development of resistance to the available therapies. The course will also include molecular mechanism involved in different systematic manifestations of fungal infections and their association with the community and any outbreaks

PAT 845, 3(1+2), Clinical Virology

Principles of medical virology including molecular mechanism involved in viral life cycle and replication, spread and disease causation. The molecular mechanisms involved in viral pathogenesis and the development resistance. The course will also include the molecular methods in lab diagnosis of different viral diseases, development of antiviral agents and vaccines. The viral diseases spreading from animals to humans will also be studied at molecular level including viral genetic makeup and their genetic association with the development of resistance to the available antibiotics. The course will also include molecular mechanism involved in different systematic viral pathogens and their association with the community i.e. Hepatitis, HIV Aids and other sexually transmitted virus, Cancer causing viruses and other medically important viruses which may cause outbreaks. The course will also include antiviral therapy and antiviral drug development.

PAT 846, 3(1+2), Infection Control

Understand regarding prevention of laboratory associated infections. Classification of infective microorganisms. Techniques of working safely to prevent laboratory related infections. Classify and elaborate Biological safety cabinets. Identify safe laboratory premise and personal safety measures. Identify safe transport of specimens. Demonstrate the responsibility of a laboratory for safe decontamination, recycling, and disposal of laboratory waste. Elaborate methods used to decontaminate and disposal of infectious material in district laboratories. Cleaning and Sterilization of reusable items. Laboratory autoclave technique and its usage. Handling of Incubator, water bath, heat block to minimize infectious spread. Identify the methods, use and care of mixers. Identify the procedure, use and care of different general laboratory-wares. Identify potential hazardous biological materials and the risks associated with them. Select appropriate means to minimize risk and to protect against or prevent exposure. Recognize applicable legal requirements and prepare the necessary documents to obtain authorizations. Understand how to run a bio-risk management program.

PAT 847, 3(1+2), Serology

General Immunology including Innate versus acquired immunity and Antigen versus antibodies. Categorize serological tests; Precipitation tests and their types. Antigen, Properties of Antigen, Types of antigens, Antibodies, Structure of antibodies, Classes of antibodies, Antigen-antibody interaction. List factors which affect antigen-antibody reaction. Method of Agglutination Precipitation (Precipitin). Principles of Radioimmunoassay (RIA). Procedure of Enzyme-Linked Immunosorbent Assay (ELISA). Method of Immunofluorescence (Fluorescent Antibody). Principles of Complement Fixation. Principles of Neutralization Tests. Method of Immune Complexes. Principles of Hem-agglutination Tests. Technique of Antiglobulin (Coombs) Test. Method of Western Blot (Immunoblot). Principles of Fluorescence-Activated Cell Sorting (Flow Cytometry). Application of such tests to relevant cases of disease. Advantages and Disadvantages of different immunological techniques

(Histopathology)

PAT 848, 3+0, Research Oriented Pathology

Pathogenesis of diseases related to the urinary tract, male and female genital tract, breast, endocrine organs, cardiovascular system, central nervous system, skin, bones and joints, gastro-intestinal, hepatobiliary and respiratory systems with regards to the current advancements in research

PAT 849, 3(2+1), Biomarkers in Histopathology

Biomarkers and their discovery, validation, clinical application etc. Diagnostic, Prognostic, Predictive biomarkers, Interpretation and application of biomarkers

PAT 850, 3+0, Cancer Genetics

Cellular and molecular events involved in tumor formation, progression and metastasis, hereditary cancer syndromes and pedigree analysis, genetic counseling, specific examples of hereditary cancers, advances in cancer diagnosis and therapeutics with special emphasis on gene expression and gene therapy.

PAT 851, 3(2+1), Bioinformatics in Pathology

Bioinformatics repositories, tools, browsers and servers: NCBI, Uniprot, GeneCard, PDB, SCOP, CATH, Expasy, EMBL sequence alignment tools. 1D, 2D and 3D structure analyses, sequence alignments, homolog search, finding similarity and identity, Structure (3D) modeling and validation, Sequencing methods, Evolutionary relationship analysis. Retrieval and understanding of Biological Data. Application of bioinformatics in research, diagnostics, medicine, and evolution.

PAT 852, 3(3+0),Molecular Genetics

Cellular and molecular basis of inheritance transcription, translation, gene expression, regulation, mutations, human chromosomes cell division, monogenic disorders, developmental genetics, patterns of inheritance and population genetics, polygenic and mutifactorial inheritance, cancer genetics, genetic factors in common diseases, congenital abnormalities and dysmorphic syndromes, genetic counseling, chromosome disorders, screening for genetic disease, prenatal testing and reproductive genetics.

PAT 853, 3+0, Immunological Pathology

Cells and tissues of the immune system, Innate and acquired Immunity immune response, cell mediated and humoral immunity, antibodies and hybridomas, MHC and antigen presentation, Isotype switching and affinity maturation, tumor Immunology, Immune escape by tumors, Immunotherapeutic Strategies, Transplantation of Autologous, Bone Marrow/ Hematopoietic Stem Cells, Clinical Aspects of Organ Transplantation, gene therapy for immunological disorders.

PAT 854, 3(2+1), Biosafety

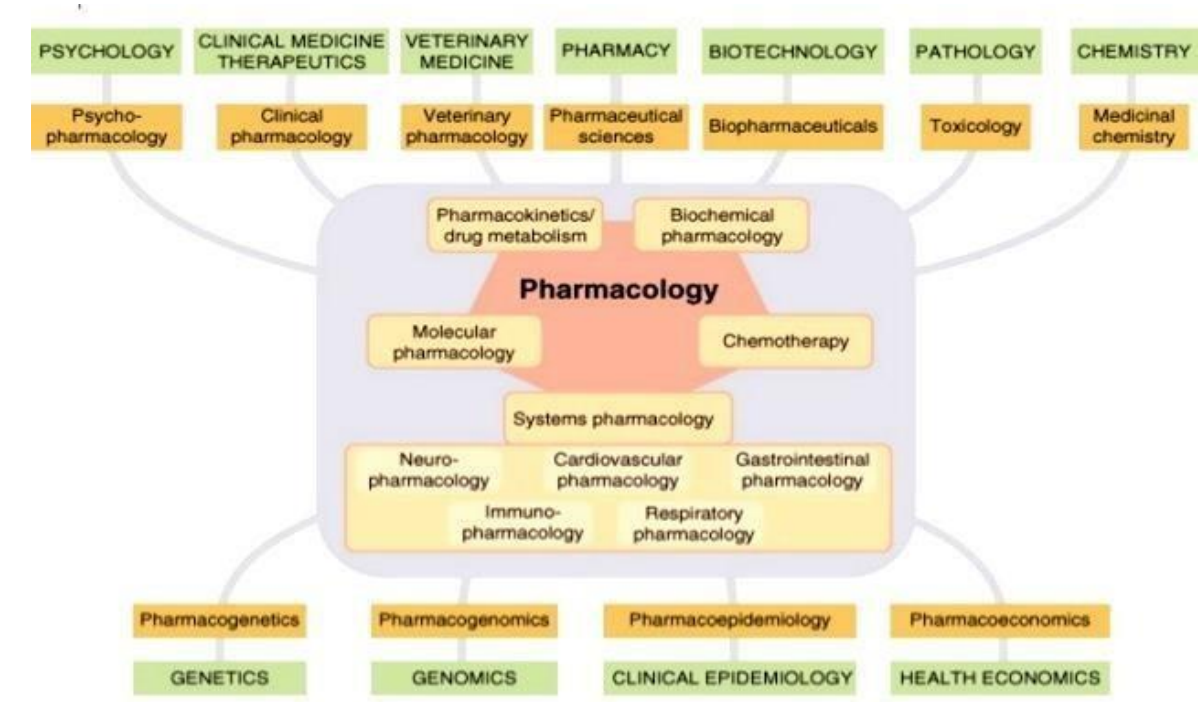
Biosafety and important terminologies, bio-risk management AMP model, Good laboratory work practices, Biosafety levels, Biosecurity, personal protection, decontamination and waste management, safe collection, handling and transport of specimens, genetically engineered samples, autoclaving biological safety cabinets, personal safety measures

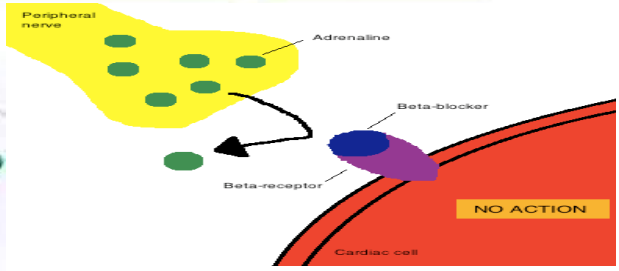
PAT 855, 3+0, Molecular Medicine

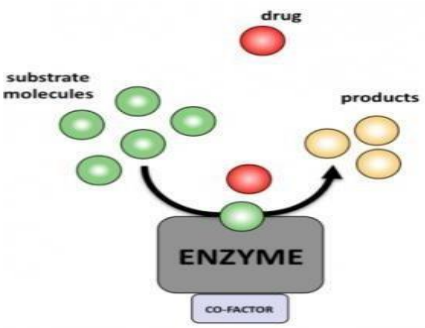
Introduction to molecular medicine, important terminologies in molecular medicine, principles and applications of pharmacogenomics, stem cell therapy: procedures and applications, methods and techniques of gene therapy and its applications, drug discovery and development, molecular medicine and treatment of cancer, cell reprogramming and its applications, molecular medicine and treatment of neurodegenerative disorders

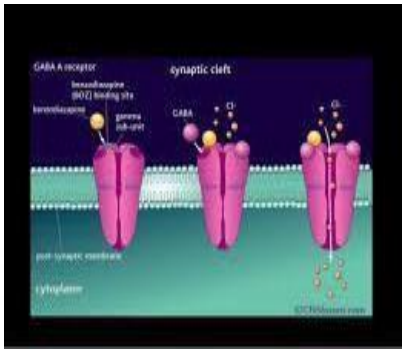
PhD-HS Program Pharmacology

The structure of MPhil program- Pharmacology comprises of an extensive “Course Work" followed by the "Supervised Research Thesis." This program fulfills the requirement of Higher Education Commission (HEC). The coursework components are specifically designed to maximize learning and to develop a comprehensive skill base required to undertake thesis research. Assessment of course content in each semester will consist of a combination of continuous assessments and examinations. In line with academic standards MPhil students will be required to pass coursework to progress to the thesis research work.









PhD-HS Program Pharmacology Elective Subject Courses

PHM 821, 3(2+1), Pharmacokinetics & Clinical Pharmacology Concepts

Molecular mechanisms of absorption, distribution, metabolism and elimination of drugs, mechanism of drug absorption, physiochemical, biological and pharmaceutical factors affecting drug absorption through GIT, Drug disposition**,** Protein and tissue binding, Bioavailability, bioequivalence, metabolism, Pharmacokinetic characterization of drugs, linear and nonlinear pharmacokinetics. Drug development, definition of Clinical trial, types of clinical trial, registration of a clinical trial, regulation of clinical trial, clinical trial unit setting, biasness and how to minimize the biasness, Current rules and regulations in Pakistan related to drug research, FDA rules to regulate clinical research, interpretation of results of a clinical trial and its extrapolation.

PHM 822, 3+0, Molecular Pharmacology

I. Genomic Regulation of Drug Actions
   A. Introduction to pharmacogenetics and personalized medicine
   B. Genetic basis of drug response and roles of single nucleotide polymorphisms, copy number variation, tandem repeat polymorphisms; gene insertion and deletion; gene duplications; alternative splicing & their effects on drug
   C. Drug metabolism affected by polymorphisms in Cytochrome P450 isoforms

II. Drugs Acting through Epigenetic Mechanisms
   A. Fundamentals of epigenetics
   B. Examples of drugs acting through epigenetic mechanisms

III. Signal Transduction and Modulation
   A. Types of secondary messengers
   B. Types of receptors & regulation of inter and intra cellular signalling

IV. Molecular Pharmacology of Enzymes
   A. Types of enzymes on the basis of their mechanism of action
   B. Effects of different drugs on enzyme function

V. Pharmacology of Transcription and Translation
   A. Different types of post-transcriptional and translational modifications.
   B. Induction and inhibition of gene expression
   C. Intervention at post-translational levels by modulating protein kinases and phosphatases

VI. Regenerative Medicine and Gene therapy
   A. Stems cells, their classification and features
   B. Stem cell-based drugs
   C. Cell therapy and regenerative medicine
   D. Gene therapy protocols and role in treatment of monogenic disorders

VII. Mitochondrial Medicine
   A. Principles of mitochondrial homeostasis
   B. Drugs targeting mitochondrial channels and metabolism

PHM 823, 3(1+2), Clinical Neuro and Psycho Pharmacology

Neuro-humoral transmission and CNS, sedatives and hypnotics, anesthetic agents, drugs of abuse, alcohol, drugs used in treatment of epilepsy, Parkinson's disease, psychiatric diseases, depression, schizophrenia, treatment in comatose, diagnostic tools

PHM 824, 3(1+2), Clinically Oriented Cardiovascular and Renal Pharmacology

Cholinergic and adrenergic receptor agonists and antagonists, their role in treating diseases, antihypertensive drugs, cardiac glycosides, treatment of cardiac failure, anti-anginal drugs, anti-arrhythmic drugs, lipid lowering drugs, diuretics, treatment of acute and chronic kidney disease, drug treatment of benign prostatic hypertrophy, toxicities caused by drugs, ECG, ETT, angiography, echocardiography, enzyme levels

PHM 825, 3+0, Pharmacotherapy of microbes, malignancies & cutaneous diseases

General principles of pharmacotherapy, penicillin, cephalosporin, carbapenam, monobactam, vancomycin, clindamycin, macrolides, sulphonamides, trimethoprim, co-trimoxazole, , tetracycline, chloramphenicol, aminoglycosides, quinolones, anti- tuberculosis, antileprosy, antimalarial, antifungal, anti-amoebic , anti -viral,anthelmintic, antiprotozoal, anticancer and dermatological drugs

PHM 826, 3+0, Gastroenterology and Hormonal Pharmacology

Drug treatment of peptic ulcer, GERD emesis, inflammatory bowel disease, cholestasis, pancreatitis, hepatic failure, type 1 & 2 Diabetes mellitus, thyroid diseases, obesity, diarrhea, constipation, infertility, Iatrogenic effects of drugs on somatotropic, pituitary, hypothalamic and adrenal cortex hormones, advances in composition of contraceptives and administration of Hormone-replacement therapy

PHM 827, 3+0, Pulmonary Pharmacology and peptides

Pharmacological knowledge and application of histamine, bradykinin, 5- hydroxy-tryptamine, ergot alkaloids and their antagonists, eicosanoids, prostaglandins, drugs used in the treatment of bronchial asthma, COPD, expectorants, mucolytics, antitussives, vasoactive peptides, neuroactive peptides

PHM 828, 3+0, Haemopeiotic and Musculoskeletal Pharmacology

Oral and parenteral anticoagulants, coagulants, thrombolytics, anti-platelet drugs, hematinics, analgesics, drug treatment of rheumatoid arthritis, osteoarthritis , gout, immunosuppressants, immuno-modulators, glucocorticoids, skeletal muscle relaxants, drugs affecting bone mineral metabolism

PhD-HS Program Public Health

Public health is the science and art of preventing disease, prolonging life, and promoting health through organized efforts and informed choices of society, organizations, public and private, communities and individuals. It focuses on improving the health of populations by addressing factors that influence health, rather than focusing on individual patient care. Public Health Involves activities of Surveillance, Disease prevention and control, Health promotion, Health protection, Health systems strengthening, Policy development, advocacy etc.

PhD-HS Program Public Health Elective Subject Courses

PBH 802, 3+0, Strategic Planning in Health Sector of Developing Countries

The course content included topics pertinent to strategic planning, the planning cycle, situation analysis to health project and evaluation

PBH 803, 3+0, Ethics and Public Health: Theory & Practice

Importance of ethics and its role in public health, ethics in conducting research, addressing of ethical issues while conducting research

PBH 804, 3+0, Disease Control (Communicable & non-Communicable) approaches: Historical evolution & advancement

Communicable and non-communicable disease and surveillance. Using surveillance data and using QALYS and DALYS.

PBH 805, 3+0, Monitoring and Evaluation of Health Programs

Monitoring and evaluation of health programs and their importance. Use of monitoring and evaluation tools. Data source and resource allocation

PBH 806, 3+0, Qualitative Research Methods in Public Health

Qualitative methods and types. Skills of qualitative research, sampling, use analysis, and drawing results. Different types of qualitative research methods

PBH 807, 3+0, Community Development & stakeholders' engagement

Different types of stakeholders and their engagement for community development, Issues, challenges and their decision-making

PBH 808, 3+0, Public Health Leadership and Systems Thinking

The key contents including introduction to public health leadership and its importance. Context and forms of leadership, Issue and challenges and system thinking

PBH 809 , 3+0, Advanced Techniques of Research Data Analysis

This course is designed as an elective for PhD students to equip them with the skills required for research data analysis including basic and advanced research data. The students will review the most commonly used basic statistical tests and learn how to carry out those tests using SPSS and/or Epi-Info. They will then focus on analyzing the data from cross-sectional studies, case-control studies, cohort studies, and randomized controlled trials. The students will learn advanced data analysis methods, including regression models and survival analysis. The students will also master the art of selecting the right method (s) of data analysis, interpreting their results, and presenting the research results in tables and graphs.

PBH 810, 3+0, Applied Demography and Family Planning (Population Dynamics)

This course is designed as an elective for PhD students to equip them with the knowledge and skills for addressing the population and health issues of the developing countries, with special focus on Pakistan. The course will introduce demography, population dynamics, and family planning in Pakistani settings. The course will introduce the commonly used demographic methods and indicators necessary for policymaking and planning. It will also provide a full understanding of contraceptive technology and family planning programming, again in the context of Pakistan. The course will be highly interactive. Students must also complete a research project using secondary data from available resources

MUTIDISCIPLINARY RESEARCH LABORATORY (MDRL)

Prof. Dr. Mehreen Lateef
BSc (H), MSc, MPhil, PhD
Principal (BUCAHS)
HOD, Multidisciplinary Lab
BUHSCK

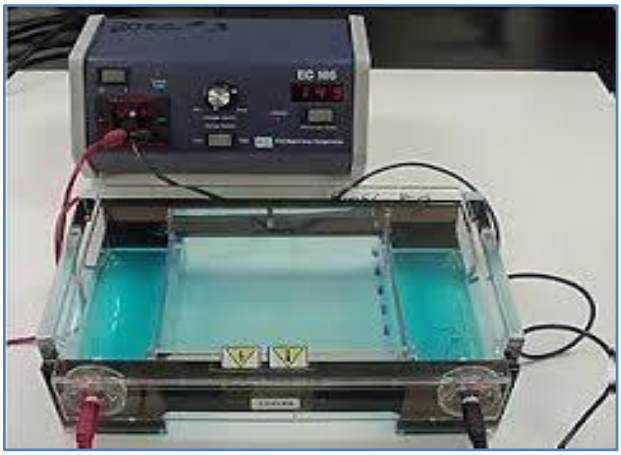
Bahria University Health Sciences Campus, Karachi (BUHSCK) has developed a well-equipped advanced Multidisciplinary laboratory to achieve excellence in health sciences fields by delivering health services through adaptation of advanced techniques. The development of strong research skills and the provision of medical care are inextricably linked. The Multidisciplinary Research Laboratory (MDRL) provides a platform where several academic disciplines or professional specialists combine to conduct or perform innovative research. MDRL is located on second floor of Bahria University Medical College with advanced research instruments. The main objective of MDRL is to strengthen research environment in medical college for faculty, students and researchers (undergraduates and postgraduates) by providing scientific instrumentation and technical expertise under one umbrella. With the help of MDRL, clinicians, medical doctors and scientists will be enabled to explore diagnostic and various treating ways in basic and clinical research and in this way overall health care system can be improved. The name of Bahria University Health Sciences Campus will become more pronounced and so do the ranking of our prestigious institute via research work on advance understanding of biological processes at molecular level from genomics to proteomics.

With respect to the facilities offered, MDRL is divided into different units including Molecular Biology lab, Analytical Centre, Pharmacology and histopathology lab sections. There is cold storage room, PCR machines, UV visible spectrophotometer, ELISA reader, florescence spectrophotometer, cold centrifuge machine, sensitive electronic balances, autoclave machine, deionizer, centrifuge machines, gel electrophoresis. On the other hand Pharmacology and Histopathology labs have also developed with specific equipment for postgraduate advanced research.

Thus MDRL is a highly innovative project at BUHSCK that have research equipment related to basics and clinical, medical and dental health sciences under one roof to facilitate good quality research.

MOLECULAR BIOLOGY LAB

Biosafety Cabinet



Gel Electrophoresis Unit

Autoclave machine

PCR machine

Cold Centrifuge machine

Hot plate Magnetic Stirrer

ELISA reader with built in florescence

UV visible Spectrophotometer

ELISA Washer

Centrifuge Machine

pH meter

Electronic balance

SAMPLE STORAGE ROOM

-80° C Freezer

MEDIA PREPARATION ROOM & WASHING AREA

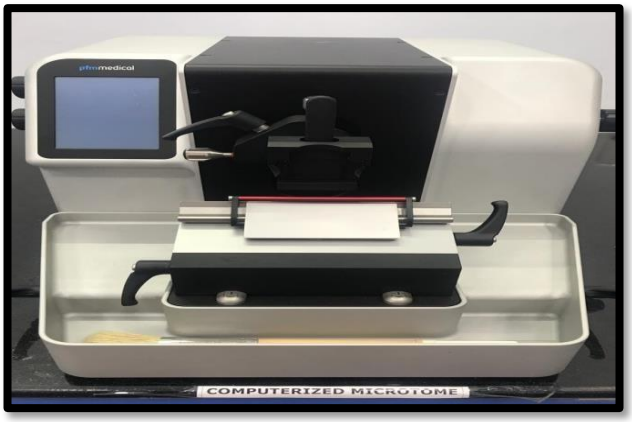
HISTOPATHOLOGY LAB UNIT

Tissue Processor

Cryotome

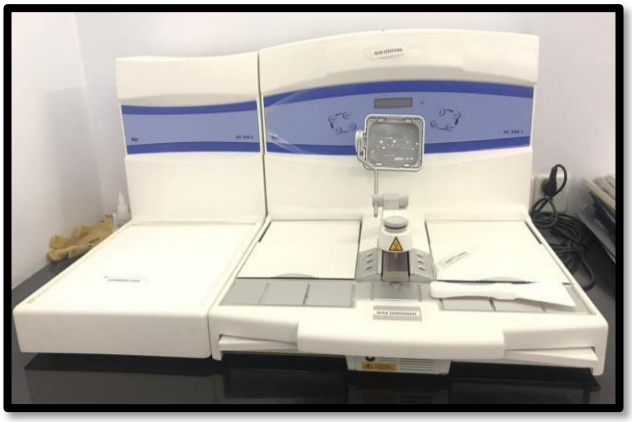
Hot Air Oven

Tissue Stainer



Computerized Microtome

Water bath



Tissue Embedding System

PHARMACOLOGY LAB UNIT

Hematology Analyzer

HPLC

Microscope

Coagulation analyzer

Chemistry Analyzer

Model Apparatus

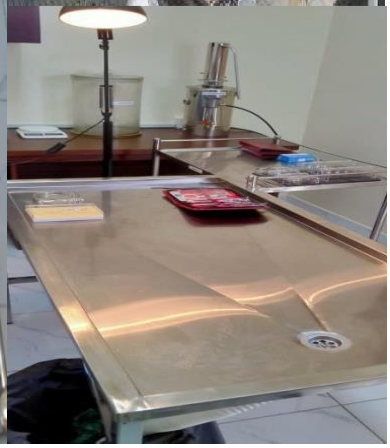
Rotary Evaporator

ANIMAL HOUSE

Animal House at BUHSCK is a training and research facility with a capacity to keep 500 animals. It has five purpose build rooms, including that of breeding, experimental and dissection room. It is equipped with Auto clave, Water bath, Hot air oven, dissection table, surgical instruments, and chemicals, which can play an important role in the undergraduate teaching and training as well as for novel research projects of the faculty and the postgraduate researchers. The animal facility will provide backup support to all units of MDRL through provision of laboratory animals such as rabbits, mice, rats, guinea pigs etc. as sample.



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