COURSE OF STUDIES

for

Doctor of Philosophy

in

<Forensic Medicine>

UNIVERSITY OF HEALTH SCIENCES, LAHORE PAKISTAN

Program Rationale:

PhD program in Forensic Medicine is grounded in the critical necessity to cultivate an elite cohort of forensic medical experts. Our focus is on advancing the field through cutting-edge research, innovative methodologies, and the rigorous application of scientific principles in the realm of medicolegal investigations. The program is meticulously tailored to address the growing demand for specialized proficiency in forensic pathology, medical investigations of death, postmortem examinations, and the nuanced interplay between medicine and the legal system. Emphasizing a multidimensional approach, the curriculum integrates both theoretical knowledge and hands-on practical skills. Aligned with the mission of the University of Health Sciences and in adherence to the accreditation standards set by the Higher Education Commission of Pakistan (HEC), our program aspires to produce professionals who excel in academic prowess and research acumen. We aim to contribute significantly to the progression of forensic medicine, ensuring that our graduates play a pivotal role in reinforcing justice within the criminal legal framework.

Mission Statement:

The mission of our PhD program in Forensic Medicine is to cultivate adept forensic medical professionals poised to advance the field through rigorous research, innovative practices, and the application of medical principles in medicolegal investigations, ultimately contributing to the pursuit of justice. The program is dedicated to honing students' expertise in areas such as postmortem examinations, forensic pathology, medical investigations of death, and the intersection of medicine with the legal system. By integrating theoretical coursework, hands-on practical training, and research projects, the program aims to provide a comprehensive understanding of the interdisciplinary nature of forensic medicine and its critical relevance to the criminal justice system. Our goal is to produce graduates who excel in both academic knowledge and research proficiency, making significant contributions to the progression of forensic medicine and reinforcing justice within the legal framework. The proposed objectives are consistent with the mission of University of Health Sciences and accreditation standards of the Higher Education Commission of Pakistan (HEC).

Program Educational Objectives:

The objectives of PhD Program in Forensic Medicine are:

- Foster advanced research skills for groundbreaking contributions to forensic medicine, encouraging intellectual inquiry and originality.
- Develop expertise in postmortem examinations, forensic pathology, medical investigations of death, toxicology, and the intersection of medicine with the legal system.
- Cultivate interdisciplinary collaboration, integrating knowledge from diverse medical realms to enhance investigative approaches.
- Instill strong ethical foundations and legal awareness to navigate complex issues responsibly within the medicolegal framework.
- Provide hands-on training for graduates to adeptly apply medical principles in real-world forensic scenarios.
- Nurture leadership qualities to initiate and lead forensic research projects, contributing to industry innovation.
- Emphasize adherence to the highest professional standards, ensuring integrity, objectivity, and impartiality in forensic medical practice.
- Promote a commitment to continuous professional development, keeping graduates updated on emerging medical technologies and legal advancements.

Program Learning Outcomes:

Students should be able to:

- Graduates will demonstrate advanced research skills through impactful and independent research in forensic medicine, contributing to the field's knowledge base.
- Exhibit a high level of proficiency in analyzing and interpreting complex forensic medical data, utilizing state-of-the-art techniques and technologies in medicolegal investigations.

- Integrate knowledge from diverse medical disciplines, addressing multifaceted challenges in medicolegal investigations through a comprehensive, interdisciplinary approach.
- Apply ethical principles and legal considerations effectively, navigating complex ethical dilemmas in forensic medical practice with integrity and professionalism.
- Apply theoretical knowledge and medical principles to practical scenarios, demonstrating competence in postmortem examinations, forensic pathology, and medical investigations of death.
- Adhere to the highest standards of professional ethics, maintaining objectivity, impartiality, and transparency in all aspects of forensic medical practice.
- Engage in lifelong learning, staying current with evolving medical technologies, methodologies, and legal frameworks in forensic medicine, ensuring sustained professional growth and relevance.

SCHEME OF STUDIES (3-Year)

PhD Forensic Medicine

Semester #	Course code	Course title	Credit hours		
			Theory	Practical	Total
1	ARM-801	Research Methodology	2	0	02
	ABS-802	Advance Biostatistics	2	0	02
	FS-801	Fundamentals of Forensic Sciences	2	1	03
	FS-802	Forensic Medicine & Toxicology	2	1	03
2	ALT-803	Advanced Laboratory Techniques	2	0	02
	FM-801	Artificial Intelligence (AI) in Forensic Investigations	2	1	03
	FM-802	Forensic Genetics	2	1	03
3	Research (thesis)		30		30
(Total: 48)					

Course Title: Fundamentals of Forensic Sciences

Contact Hours:	Credit Hours:
Theory = 30	Theory = 02
Practical = 15	Practical = 01
Total = 45	Total = 03

Course Objective:

To provide students with a fundamental understanding of the principles, methodologies, and applications of forensic sciences, encompassing various disciplines such as crime scene investigation, forensic laboratory analysis, forensic biology, forensic chemistry, and forensic evidence interpretation.

Learning Outcome:

The course aims to provide students with a foundational understanding of forensic sciences, covering principles, methodologies, and applications in disciplines such as crime scene investigation, forensic laboratory analysis, biology, chemistry, and evidence interpretation. Graduates will develop analytical skills, integrate insights across forensic disciplines, cultivate critical thinking, and foster ethical competence in evidence handling.

Course Outline:

Introduction to Forensic Science, Brief history, Crime Scene Investigation, The Nature of Evidence, Branches of Forensic Science , Forensic Biology, Forensic Chemistry, Forensic Toxicology, Forensic Pathology, Crime Scene Investigation, Odontology, Entomology, Fingerprints, Questioned Document Analysis, DNA Analysis, Forensic Hair Examinations , Illicit Drugs, Forensic Toxicology, Development of a Forensic Science

Laboratory, Impressions analysis, Fingerprints analysis, Firearm and tool marks, Blood Pattern Analysis, Drugs, Forensic Toxicology, Trace Evidence – Hairs and Fibers analysis, Trace Evidence – Paint, Glass, and Soil analysis. Crime Scene Equipment, Photography, Crime Scene Sketching, Measurements & Note taking, Footwear/Tire Track Evidence at the Crime Scene, Friction ridges, Impression evidence, Blood splatter patterns, Drug Evidence at the Crime Scene, Digital Evidence at the Crime Scene.

Practical:

Evidence Collection, ALS Examinations/Photography, Fingerprints, Impressions, Bloodstain Pattern Analysis. Bloodstain Pattern Analysis.

Recommended Books:

1. Houk, M & Siegel, J (2015). Fundamentals of Forensic Science (3rd Edition/e). New York Elsevier (Latest Edition).
2. Richard Saferstein (2015). Criminalistics: An Introduction to Forensic Science (11th/e). New York Pearson (Latest Edition).
3. Durnal, Evan W. "Crime scene investigation" Forensic Science International 199.1-3 (2010): 1-5.
4. Faggiano, Vincent, et al. Techniques of crime scene investigation. crc Press, 2003.
5. The Forensic Casebook: The Science of Crime Scene Investigation Book by Ngaire Genge
6. Forensic Science: Crime Scene Analysis Paperback – May 30, 2014 by Mr David Elio Malocco
7. Silent Witnesses: The Often Gruesome but Always Fascinating History of Forensic Science by Nigel McCrery

Course Title: Forensic Medicine & Toxicology

Contact Hours:	Credit Hours:
Theory = 30	Theory = 02
Practical = 15	Practical = 01
Total = 45	Total = 03

Course Objective:

The objectives of this course will help students in learning basic types of injuries, cause of injury and their role in death scene investigations.

Learning Outcome:

Throughout the course, students will develop a comprehensive understanding of various types of injuries, including blunt force, sharp force, and thermal injuries. This knowledge will enable them to analyze and determine the cause of injuries, drawing on principles from anatomy, physiology, and forensic science. Moreover, students will grasp the pivotal role of injuries in death scene investigations, learning to connect the nature and pattern of injuries to potential causes of death.

Course Outline:

Introduction to Forensic Medicine; Injuries: Types and classification of injuries, anti-mortem and post-mortem injuries, aging of injuries, artificial injuries.; Forensic Toxicology: Introduction, Role of the toxicologist, significance of toxicological findings, poisons, definition, classification based on their origin, physiological action and chemical nature, poisons and poisoning.; Introduction to Autopsy. Death: Introduction to death, Causes of death, determination of time since death, medico legal aspects of death investigation,

types of deaths, Personal Identification; Abortion; General study and Isolation techniques of toxins, drugs, Volatile poisons, vegetable poisons. Principles and procedures of medicolegal death investigation. Postmortem examination techniques, including external and internal examination. Interpretation and documentation of autopsy findings. Forensic Research Methodologies: Medicolegal death investigation research, Innovations in postmortem techniques, Advancements in forensic toxicology.

Practical:

Sample Preparation and Presumptive Tests, Sample Extraction and Thin Layer Chromatography, Immunoassays, Spectrophotometry.

Recommended Books:

1. Casarett & Doull's Toxicology: The Basic Science of Poisons by Curtis D. Klaassen. Publisher: McGraw-Hill Professional; 7th edition (2007).
2. Principles of Forensic Toxicology, 3rd Edition Author: Barry Levine Publisher: AACC Press; 3rd edition (January 4, 2010) ISBN: 1594250960
3. Clarke’s Analytical Forensic Toxicology; Sue Jickells and Adam Negrusz, 2nd ed.; Pharmaceutical Press; 2013; ISBN 978-0-85369-705-3
4. Textbook of Forensic Medicine and Toxicology Textbook by Nagesh Kumar Rao
5. Textbook of Forensic Medicine and Toxicology: Principles and Practice Textbook by Krishan Vi.

Course Title: Artificial Intelligence (AI) in Forensic Investigations

Contact Hours:	Credit Hours:
Theory = 30	Theory = 02
Practical = 15	Practical = 01
Total = 45	Total = 03

Course Objective:

This course aims to provide students with a comprehensive understanding of the potential integration of technology in the fields of forensic medicine and forensic sciences. Participants will explore various technological advancements and their applications in medico-legal autopsy, forensic toxicology, crime scene investigation, and disaster victim identification (DVI). The course will cover topics such as enhancing autopsy procedures through technological tools, leveraging technology for in-depth forensic analysis, and streamlining disaster victim identification processes using cutting-edge methods.

Learning Outcome:

Upon completion of this course, students will emerge equipped with a broad understanding of the potential applications of technology in forensic medicine and forensic sciences. Exploring various technological advancements, participants will gain specific knowledge of how technology can enhance medico-legal autopsy procedures, forensic toxicology analyses, crime scene investigations, and disaster victim identification (DVI) processes.

Course Outline:

An exploration of the historical evolution of technology within the context of forensic medicine and forensic sciences, specific applications of technology in medico-legal autopsy procedures, forensic toxicology, crime scene investigation, and disaster victim identification (DVI), utilization of technology in disaster victim identification (DVI), ethical considerations and legal frameworks pertinent to technological applications in forensic contexts, fundamentals of technology for autopsy procedures, application of technology in analyzing forensic evidence and toxic substances, exploration of current research and emerging trends, interdisciplinary nature of technology in forensic sciences, use of technology for evidence examination, cause of death determination, and the integration of advanced imaging technologies.

Practical:

Introduction to popular technological tools and platforms. Digital autopsy simulation software or virtual platforms to simulate technology-enhanced autopsy procedures (open source). Application of technology for data analysis. Application of technology to analyze forensic evidence and interpret findings at crime scenes.

Recommended Books:

1. Topol, E. (2019). Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again.
2. Müller, V. C., & Haynes, N. (Eds.). (2018). Ethics of Artificial Intelligence and Robotics: A Handbook of Current and Future Developments.
3. Hayes, A. W., & Kruger, C. A. (2014). "Toxicology: Principles and Applications.

Course Title: Forensic Molecular Diagnostics

Contact Hours:	Credit Hours:
Theory = 30	Theory = 02
Practical = 15	Practical = 1
Total = 45	Total = 02

Course Objective:

Students will develop a thorough understanding of the principles and applications of molecular diagnostics in forensic investigations. This involves acquiring proficiency in advanced techniques for analyzing DNA and other molecular markers, with a focus on their relevance to criminal cases. The course aims to instill expertise in the interpretation of complex molecular data, enabling students to draw meaningful conclusions in forensic contexts.

Learning Outcome:

Upon completion of the forensic molecular diagnostics course, students will emerge with a high level of proficiency in the application of advanced techniques and methodologies within the field. This expertise will empower them to conduct intricate analyses of complex DNA profiles, demonstrating a nuanced understanding of genetic data interpretation. Graduates will showcase the ability to assess the significance and probative value of DNA evidence within the context of criminal investigations, contributing to the refinement of investigative processes. Additionally, students will acquire practical skills in utilizing cutting-edge genetic technologies, enhancing their capacity to address the evolving challenges presented in forensic genetics.

Course Outline:

Introduction to Forensic Genetics, DNA structure and the genome, DNA extraction, DNA quantification, Polymerase chain reaction, The analysis of short tandem repeats, Assessment of STR profiles, Databases of DNA profiles, Statistical interpretation of STR profiles, Evaluation and presentation of DNA evidence, The Basics of Population Genetics, Hardy-Weinberg equilibrium, Allele frequency, Power of discrimination, inclusion and exclusion, matching probability, Examination of assault cases, Documentation and interpretation of sexual assault cases, Role of DNA in sexual assault cases, Child abuse, Advanced research applications for exploring innovative techniques in forensic genetics and examination.

Practical:

Practical examination of assault cases, interpretation of findings, utilization of DNA in assault cases, child abuse examination, hands-on application of acquired peculiarities in identification, diagnosis of poisoning (acute and chronic in living and deceased), drug dependence assessment (WHO criteria), advanced practical research applications exploring innovative techniques in forensic molecular diagnostics.

Recommended Books:

1. Human Genetics: concepts and applications by Ricki Lewis
2. Concepts of genetics (11th edition) by William S. Klug, Pearso
3. Investigating Sexual Assault Cases (Jones & Bartlett Learning Guides to Law Enforcement Investigation): Arthur S. Chancellor.

4. Practical Investigation of Sex Crimes: A Strategic and Operational Approach (Practical Aspects of Criminal and Forensic Investigations) 1st Edition by Thomas P. Carney.
5. Sex Crimes Investigation: Catching and Prosecuting the Perpetrators by Robert L. Snow.
6. Criminal Psychology: Forensic Examination Protocols 1st Edition by Brent E. Turvey.