Department of Forensic Sciences

Proposed Syllabi for all Courses

Prepared by

Abdelmuhsen Abusneina, PhD

March 9, 2023

Faculty of Biomedical Sciences
University of Benghazi

كلية العلوم الطبية الحيوية
جامعة بنغازي

التاريـــــــخ: 11_/ مارس/2023
الرقم الأشاري: 2.و.ك_ 97 /2023

السادة الأفاضل /السيدات الفضليات:

- ☐ د.توفيق عبدالله التواتي -رئيس قسم التشخيص الجزيـــــئي
- ☐ د.زينب عبدالله الحـــرش -رئيس قسم التقنية الخلـــويـــــة
- ☐ د.طارق عاشور المســماري -رئيس قسم علوم الطب الشرعـــي
- ☐ د.ناصر عثمان البرغـــثي -رئيس قسم علوم المختبرات الطبـية
- ☐ أ.سالمة عمر الزائـــــدي -رئيس قسم إدارة المختـــــبرات
- ☐ أ.علي محمد كشيـــــش -منسق المرحلة الأولـــــــــى

تحية طيبة وبعد،

أحيل اليكم توصيف **27** مقرر لكل قسم (التخصصية ومتطلبات الكلية) للسنوات الدراسية الثانية والثالثة والرابعة. هذا التوصيف هو عبارة عن مسودة أولى، والذي قمت بإعداده حسب ما توفر لي من الوقت، ليتم الاسترشاد به وان يتم مراجعته والعمل على تحسينه، إذا تطلب الأمر، من قبل مختصين بالقسم، مع مراعاة المفهوم العام لكل تخصص، ولكي نصل به جميعا الى المستوى المطلوب.

ارجوا أن تتقبلوا مني هذا الجهد المتواضع، وأتمنى أن يكون هذا المنتوج لبنة أولى لتحسين القدرات العلمية لكل الأقسام العلمية بالكلية. وكما أتمنى ان تلتمسوا لي العذر في حال حصول نقص أو تقصير.

ستجدون مرفقا بهذه الرسالة: 3 مجلدات (مجلد لكل سنة دراسية لكل قسم)

كل توصيف مقرر يحتوي على:

Course Syllabus	محتويات التوصيف
• Course Description and Aims	• نبذة عن المقرر وأهدافه
• Intended Learning Outcomes:	• النتائج المتوقعة للتعلم:
○ Knowledge and Understanding:	○ المعرفة والفهم
○ Intellectual Skills:	○ المهارات الفكرية
○ Professional and Practical Skills:	○ المهارات المهنية والعملية
○ General Transferable Skills:	○ المهارات العامة القابلة للنقل
• Course Topics	• محتويات المقرر (النظرية)
• Practical Classes	• محتويات الدروس العملية
• Course References:	• المراجع

ملاحظة: هذا يشكل معظم ما يتطلبه نموذج الجودة لمقرر ما.

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كذلك، ستجدون مرفقا الآتي:

- الرؤية والرسالة والأهداف لكل قسم علمي (باللغتين العربية والإنجليزية).
- مقترح لبرنامج التدريب الميداني في تخصص كل قسم بعدد 10 ساعات أسبوعية لمدة 24 أسبوع.
- عدد من النماذج الخاصة بالمقررات والتدريب الميداني وذلك لتنظيم الدراسة وهي:

English Title	المسمى باللغة العربية
• **Undergraduate Thesis Forms:**	**نماذج خاصة بالأطروحة (مشروع التخرج)**
○ Undergraduate thesis proposal registration form	نموذج تسجيل مقترح إطروحة بكالوريوس
○ Student Progress Form	نموذج تقرير مستوى تقدم الطالب في إنجاز الإطروحة
○ Thesis Evaluation Form	نموذج تقييم الأطروحة
○ Thesis Defense Evaluation Form	نموذج تقييم العرض الخاص بالأطروحة
• **Student Seminar Evaluation Form**	**نموذج تقييم أداء الطالب في الندوة العلمية**
• **Student Performance Evaluation Form for Workplace Experience**	**نموذج تقييم أداء الطالب في التدريب الميداني**
• **Student Evaluation Forms:**	**نماذج خاصة بالطالب:**
○ Evaluation Form for Undergraduate Course	نموذج تقييم لتجربة الطالب بالمقرر
○ Evaluation Form for Workplace Experience	نموذج تقييم لتجربة الطالب بالتدريب الميداني
• **letterhead format**	**نموذج ورقة معنونة للقسم**

رجاء، لا تترددوا في الاتصال بي في حال لديكم أي استفسارات

أتمنى لكم كل التوفيق

والسلام عليكم ورحمة الله وبركاته

د. عبدالمحسن محمد بوسنينة

وكيل الكلية للشؤون العلمية

نسخة لكل من:

السيد/د. وكيل الجامعة للشؤون العلمية- للتفضل بالاطلاع.

السيدة/د. عميد الكلية- للتفضل بالاطلاع.

السيد/د. مدير إدارة الجودة وتقييم الأداء بالجامعة-للتفضل بالاطلاع.

السيدة/د. مدير قسم الجودة وتقييم الأداء بالكلية-للتفضل بالاطلاع.

السيد/أ. مسجل الكلية-للتفضل بالاطلاع.

السيد/أ. منسقي الجودة وتقييم الأداء بالأقسام العلمية-للتفضل بالاطلاع.

الملف الصـــــــــــادر.

الملف الدوري العـــــــــأم.

بوسنينة

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Table of content:

الرؤية والرسالة والأهداف لقسم علوم الطب الشرعي

الرؤية:

يهدف برنامج علوم الطب الشرعي إلى تأهيل وتدريب الطلاب على دراسة الأدلة الجنائية بمختلف أنواعها، وفي مجالات التحقيق والكشف الجنائي، وذلك من خلال توفير تعليم عالي الجودة والمتطور، وبرامج بحثية وتطبيقية مميزة، وتعاون مع المؤسسات المحلية والدولية المعنية بالأدلة الجنائية..

الرسالة:

توفير برنامج أكاديمي عالي الجودة في مجال علوم الطب الشرعي لإعداد خريجين مؤهلين ومتخصصين في التشخيص الطبي والتحقيق الشرعي في القضايا الجنائية والقضايا الصحية، وتوفير الدعم الأكاديمي والموارد اللازمة للبحث العلمي المتقدم والخدمة العامة.

الأهداف :

1. **توفير تعليم عالي الجودة في مجال علوم الطب الشرعي والتحقيقات الجنائية، بما يتوافق مع المعايير الدولية المتبعة في هذا المجال .**
2. **توفير برامج تدريب عملي للطلاب لتحسين مهاراتهم العملية والفنية في مجال علوم الطب الشرعي.**
3. **تأهيل الطلاب في مجالات الأدلة الجنائية ، وتطوير قدراتهم العلمية والعملية في هذا المجال .توفير برامج بحثية وتطبيقية مميزة تساعد في تطوير المعرفة والممارسة في مجال الأدلة الجنائية .**
4. **تشجيع الابتكار والتميز في مجال علوم الطب الشرعي ، ودعم الأبحاث الرائدة في هذا المجال.**
5. **تعزيز التواصل والتعاون مع الجهات الحكومية والخاصة لتحسين جودة الخدمات المتعلقة بعلوم الطب الشرعي.**
6. **تنمية الوعي العام بأهمية علوم الطب الشرعي والمساهمة في الحفاظ على حقوق الأفراد وتوفير العدالة في المجتمع.**

Vision, Mission, and Objectives of the Department of Forensic Sciences

Vision:

The Forensic Sciences program aims to qualify and train students and researchers to study various types of criminal evidence, in the fields of investigation and forensic detection. This is achieved through providing high-quality and advanced education, distinguished research and applied programs, and cooperation with local and international institutions concerned with criminal evidence.

Mission:

To provide a high-quality academic program in the field of Forensic Sciences, to prepare qualified and specialized graduates in forensic investigation in criminal cases, and to provide academic support and necessary resources for advanced scientific research and public service.

Objectives:

- To provide high-quality education in Forensic Sciences and criminal investigations, in accordance with international standards in this field.
- To provide practical training programs for students to improve their practical and technical skills in Forensic Sciences.
- To qualify students in the fields of criminal evidence, and to develop their scientific and practical capabilities in this field. To provide distinguished research and applied programs that contribute to the development of knowledge and practice in the field of criminal evidence.
- To encourage innovation and excellence in the field of Forensic Sciences and to support pioneering research in this field.
- To enhance communication and cooperation with governmental and private entities to improve the quality of services related to Forensic Sciences.
- To raise public awareness of the importance of Forensic Sciences and to contribute to the protection of individuals' rights and the provision of justice in society.

University of Benghazi

Faculty of Biomedical Sciences
Department of Forensic Sciences

Course Requirements for Forensic Sciences (FRSC) BSc Degree

1st YEAR							
No	Course title		Course Code	Cr. hrs.	Teaching hrs		Remarks
	English	Arabic			Th	lab	
1	Anatomy and Physiology	علم التشريح ووظائف الأعضاء	ANAT-101	4	3	2	
2	Applied Mathematics	الرياضيات التطبيقية	BMSC-101	2	2	-	
3	Computer Skills	مهارات الحاسوب	BMSC-102	2	1	2	
4	Cytology and Histology	علم الخلية الأنسجة	CYTO 103	4	3	2	
5	Fundamentals of Biochemistry	إساسيات الكيمياء الحيوية	MLSC-101	4	3	2	
6	General Forensic Sciences	علوم الطب الشرعي العام	FRSC-101	4	3	2	
7	General Microbiology	علم الأحياء الدقيقة العام	MLSC-102	4	3	2	
8	Hematology and Immunology	علم الدم والمناعة	MLSC-103	4	3	2	
9	Scientific Skills and Communication	المهارات العلمية والتواصل	BMSC-103	3	2	2	
CREDIT HOURS				**31**			
2nd YEAR							
No	Course title		Course Code	Cr. hrs.	Teaching hrs		Remarks
	English	Arabic			Th	lab	
1	Cell and Molecular Biology	علم الأحياء الخلوي والجزيئي	MOLD-203	3	2	2	
2	Crime Scene Investigations	علم تحقيقات مسرح الجريمة	FRSC-201	3	2	2	
3	Criminalistics	علم الجريمة	FRSC-202	4	3	2	
4	Forensic Biology	علم الأحياء الطب الشرعي	FRSC-203	4	3	2	
5	Forensic Chemistry	كيمياء الطب الشرعي	FRSC-204	4	3	2	
6	Integrative Physiology	علم وظائف الأعضاء التكاملي	BMSC-201	4	3	2	
7	Lab Management and Medical Informatics	إدارة المختبرات والمعلومانية الطبية	LBMT-202	2	2	-	
8	Molecular Biology Techniques	تقنيات علم والأحياء الجزيئي	MOLD-204	2	1	2	
9	Principles of Human Genetics	مبادئ علم الوراثة البشري	MOLD-205	4	3	2	
CREDIT HOURS				**30**			
3RD YEAR							
No	Course title		Course Code	Cr. hrs.	Teaching hrs		Remarks
	English	Arabic			Th	lab	
1	Bioinformatics and Genomics	المعلومانية الحيوية وعلم الجينوم	MOLD-301	4	3	2	
2	Crime Scene Investigations Lab	تحقيقات مسرح الجريمة العملي	FRSC - 301	2	-	2	
3	Environmental Forensics	علم الطب الشرعي البيئي	FRSC - 302	4	3	2	
4	Examination and Analysis of Biological Evidence	فحص وتحليل الأدلة الحيوية	FRSC - 303	4	3	2	
5	Forensic Anthropology	انثروبولوجيا الطب الشرعي	FRSC - 304	4	3	2	
6	Forensic Genetics	علم الطب الشرعي الوراثي	FRSC - 305	4	3	2	
7	Forensic Toxicology and Drug Analysis	علم السموم الشرعي وتحليل المخدرات	FRSC - 306	4	3	2	
8	Instrumental Analysis	التحليل الالي	FRSC - 307	2	1	2	
9	Research Methodology and Data Analysis	طرق البحث وتحليل البيانات	BMSC -301	4	3	2	
CREDIT HOURS				**32**			
4TH YEAR							
No	Course title		Course Code	Cr. hrs.	Teaching hrs		Remarks
	English	Arabic			Th	lab	
1	Biomedical Ethics and Scientific Integrity	إخلاقيات الطب الحيوي والنزاهة العلمية	BMSC-401	2	2	-	
9	Forensic Investigation of Mass Fatalities	تحقيقات الطب الشرعي للوفيات الجماعية	FRSC - 401	2	2	-	
2	Forensic Medicine	الطب الشرعي	FRSC - 402	3	2	2	
3	Infection Control and Safety	مكافحة العدوى والسلامة	BMSC-402	2	2	-	
4	Libyan Law and Trial Process	القانون الجنائي الليبي واجراءات المحاكمة	FRSC - 403	2	2	-	
5	Presentation and Quality of Evidence	عرض وجودة الأدلة	FRSC - 404	3	2	2	
6	Seminar In Forensic Sciences	ندوة علمية في علوم الطب الشرعي	FRSC - 408	1	1	-	
7	Thesis	مشروع التخرج	FRSC - 409	4	4	-	
8	Workplace Experience	التدريب الميداني	FRSC - 410	10	-	10	
CREDIT HOURS				**29**			
TOTAL CREDIT HOURS				122			

Department of Forensic Sciences

Proposed Syllabi for all Courses in the Second Year

Prepared by

Abdelmuhsen Abusneina, PhD

March 9, 2023

Syllabus of Second Year Courses

1	Course title: Cell and Molecular Biology	Course Code: MOLD-203

Overall Description and Aims:

The course aims to provide students with a fundamental understanding of the molecular and cellular processes that underpin human health and disease. The course covers a range of topics, from the basic structure and function of cells to advanced concepts such as gene expression and signaling pathways. It also includes practical sessions designed to provide students with hands-on experience in laboratory techniques commonly used in molecular and cellular biology.

Intended Learning Outcomes: After completing this course, students should be able to demonstrate:

Knowledge and Understanding:

1. An understanding of the basic structure and function of cells and the molecular components that underpin cellular processes.
2. Knowledge of molecular genetics, including DNA replication, transcription, translation, and gene regulation.
3. An understanding of the importance of protein structure and function in cellular processes, including enzymatic catalysis and molecular signaling.
4. An understanding of the major signaling pathways involved in cellular communication and their role in normal and disease states.

Intellectual Skills:

1. The ability to critically evaluate scientific literature and experimental data.
2. The ability to design and execute experimental protocols in molecular and cellular biology.
3. The ability to analyze and interpret data obtained from experiments.
4. The ability to develop hypotheses and design experiments to test them.

Professional and Practical Skills:

1. The ability to use laboratory equipment and perform basic techniques in molecular and cellular biology.

2. The ability to work effectively as part of a team in a laboratory setting.
3. The ability to analyze and interpret data obtained from experiments and present findings in written and oral formats.
4. The ability to conduct research in a responsible and ethical manner.

General Transferable Skills:

1. Effective communication skills.
2. Time-management and organizational skills.
3. Problem-solving and analytical skills.
4. The ability to work independently and take initiative.

Course Topics:

Introduction to Cell and Molecular Biology:

1. Historical perspectives and discoveries in cell and molecular biology
2. Basic principles and concepts of cell and molecular biology
3. Organization of living organisms, from cells to tissues to organs
4. Comparison of prokaryotic and eukaryotic cells
5. Applications of cell and molecular biology in biomedical research

Cell Structure and Function:

1. Membrane structure and function
2. Cytoskeleton and cell motility
3. Nucleus and nucleolus
4. Mitochondria and energy production
5. Endoplasmic reticulum and Golgi apparatus
6. Lysosomes and peroxisomes
7. Ribosomes
8. Centrosome
9. Microvilli
10. Flagella and cillia

Biomolecules:

1. Amino acids and protein structure
2. Carbohydrates and glycosylation
3. Lipids and membrane composition
4. Nucleotides and nucleic acid structure

5. Vitamins and coenzymes

Enzymes and Metabolism:

1. Enzyme kinetics and mechanism
2. Glycolysis and the Krebs cycle
3. Electron transport chain and oxidative phosphorylation
4. Biosynthesis of macromolecules
5. Regulation of metabolism

DNA Replication and Repair:

1. DNA replication machinery
2. DNA damage and repair mechanisms
3. Telomeres and telomerase
4. Mutations and genetic diseases
5. Epigenetic modifications and gene regulation

Transcription and RNA Processing:

1. Transcription initiation and elongation
2. RNA splicing and alternative splicing
3. RNA editing and modification
4. Post-transcriptional regulation of gene expression
5. Non-coding RNAs and their functions

Translation and Protein Folding:

1. Ribosome structure and function
2. Translation initiation, elongation, and termination
3. Protein folding and chaperones
4. Protein targeting and trafficking
5. Protein degradation and turnover

Genetic Variation and Mutation:

1. Mechanisms of genetic variation
2. Types of mutations and their effects
3. Genetic screening and diagnosis
4. Inheritance patterns and genetic counseling
5. Evolutionary implications of genetic variation and mutation

Recombinant DNA Technology:

1. Restriction enzymes and DNA cloning
2. Polymerase chain reaction (PCR)
3. DNA sequencing and genotyping
4. CRISPR-Cas gene editing
5. Applications of recombinant DNA technology in research and medicine

Genetic Engineering:

1. Genetic modification of organisms
2. Transgenic animals and plants
3. Gene therapy and its challenges
4. Synthetic biology and bioengineering
5. Ethics and regulation of genetic engineering

Genomics and Proteomics:

1. Genome sequencing and annotation
2. Transcriptomics and gene expression profiling
3. Proteomics and protein identification
4. Metabolomics and metabolic profiling
5. Systems biology and network analysis

Gene Expression and Regulation:

1. Transcriptional regulation of gene expression
2. Chromatin structure and remodeling
3. Regulatory proteins and cis-acting elements
4. Epigenetic modifications and gene regulation
5. Post-transcriptional regulation of gene expression

Cellular signaling and its regulation:

1. Extracellular signals and receptors
2. Signal transduction pathways
3. Second messengers and signaling cascades
4. Feedback mechanisms and signal amplification
5. Crosstalk between signaling pathways

Signal Transduction Pathways:

1. Receptor tyrosine kinases and intracellular signaling
2. G protein-coupled receptors and G proteins
3. Protein kinase signaling cascades
4. Calcium signaling and its regulation
5. Signaling pathways involved in development and disease

• Genomics and Proteomics:

1. Techniques in genomics and proteomics
2. Gene expression profiling
3. Genome sequencing and annotation
4. Structural and functional genomics
5. Comparative genomics and evolutionary genomics

• Gene Expression and Regulation:

1. Transcriptional regulation in prokaryotes
2. Transcriptional regulation in eukaryotes
3. Post-transcriptional regulation
4. Epigenetic regulation
5. Genetic and environmental factors affecting gene expression

• Cellular Signaling and its Regulation:

1. Signal transduction pathways
2. G protein-coupled receptors (GPCRs)
3. Receptor tyrosine kinases (RTKs)
4. Intracellular signaling molecules
5. Cross-talk between signaling pathways

• Signal Transduction Pathways:

1. Second messengers and their regulation
2. Protein kinases and phosphatases
3. Calcium signaling
4. MAPK signaling pathway
5. Wnt and Hedgehog signaling pathways

• Intracellular Vesicular Transport:

1. Endocytosis and exocytosis

2. Vesicular trafficking
3. Endoplasmic reticulum and Golgi apparatus
4. Lysosomes and peroxisomes
5. Autophagy and mitophagy

• Cell Cycle and Division:

1. Cell cycle checkpoints
2. Cyclins and cyclin-dependent kinases
3. Mitosis and cytokinesis
4. Meiosis and genetic recombination
5. Regulation of cell cycle progression

• Apoptosis and Cell Death:

1. Mechanisms of apoptosis
2. Regulation of apoptosis
3. Caspases and their regulation
4. Necrosis and other forms of cell death
5. Implications of cell death in disease and development

• Cancer Biology:

1. Tumor suppressor genes
2. Oncogenes and their activation
3. DNA damage and repair in cancer
4. Metastasis and angiogenesis
5. Cancer treatment and targeted therapy

• Stem Cells and Regeneration:

1. Types of stem cells
2. Self-renewal and differentiation
3. Stem cell niche and microenvironment
4. Regeneration and tissue repair
5. Stem cells in disease and therapy

Practical Classes:

1. Microscopy Techniques
2. Cell Culture

3. Protein Purification
4. DNA Extraction and Purification
5. PCR and Gel Electrophoresis
6. Western Blotting
7. Enzyme Assays
8. Cell Fractionation and Membrane Transport
9. Immunofluorescence and Confocal Microscopy
10. CRISPR/Cas9 Gene Editing
11. RNA Interference (RNAi)
12. Fluorescence-Activated Cell Sorting (FACS)
13. Bioinformatics and Genomic Data Analysis
14. Proteomics and Mass Spectrometry
15. Cell-Based Assays for Drug Screening
16. Tissue Engineering and 3D Cell Culture
17. Microbial Culturing and Identification
18. Antibiotic Sensitivity Testing
19. Clinical Laboratory Techniques

References:

1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2015). Molecular biology of the cell (6th ed.). Garland Science.
2. Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., & Darnell, J. (2016). Molecular cell biology (8th ed.). W. H. Freeman and Company.

2	Course title: Crime Scene Investigations	Course Code: FRSC-201

Overall Description and Aims:

The course is designed to provide students with an understanding of the principles and techniques used in the investigation of crime scenes. The course aims to provide students with the skills and knowledge required to analyze and evaluate the evidence gathered from crime scenes in order to reach accurate conclusions. Through a combination of lectures, practical exercises, and case studies, students will learn how to collect and preserve evidence, analyze bloodstains, fibers, fingerprints, and DNA, and interpret findings.

Intended Learning Outcomes: At the end of the course, students will be able to:

Knowledge and Understanding:

1. Understand the principles and techniques used in crime scene investigation
2. Identify the different types of evidence found at crime scenes
3. Describe the different methods used to collect and preserve evidence
4. Discuss the role of forensic science in the investigation of crimes
5. Understand the legal and ethical issues associated with crime scene investigations.

Intellectual Skills:

- Analyze and interpret the evidence gathered from crime scenes
- Evaluate the reliability and validity of forensic evidence
- Identify potential sources of error in crime scene investigations
- Synthesize information from multiple sources to reach conclusions about a crime

Professional and Practical Skills:

- Conduct crime scene investigations in a professional and ethical manner
- Apply scientific and technical knowledge to the collection and analysis of evidence
- Use laboratory equipment and techniques to analyze evidence
- Communicate findings clearly and concisely to other professionals and the public

General Transferable Skills:

14. Work effectively in a team

15. Manage time and prioritize tasks effectively
16. Think critically and creatively to solve problems
17. Develop effective communication skills
18. Develop self-awareness and self-management skills

Course Topics:

1. Introduction to Crime Scene Investigations: Objective: To introduce students to the basic principles and techniques of crime scene investigations.
2. Legal and Ethical Issues in Crime Scene Investigations: Objective: To discuss the legal and ethical issues associated with crime scene investigations.
3. Collection and Preservation of Evidence: Objective: To introduce students to the methods used to collect and preserve evidence.
4. Bloodstain Pattern Analysis: Objective: To teach students how to analyze bloodstains to reconstruct a crime scene.
5. Fingerprint Analysis: Objective: To teach students how to identify and analyze fingerprints.
6. DNA Analysis: Objective: To teach students how to analyze DNA evidence.
7. Fibers and Textile Analysis: Objective: To teach students how to analyze fibers and textiles found at crime scenes.
8. Trace Evidence Analysis: Objective: To teach students how to analyze trace evidence, including hair and fibers.
9. Ballistics and Firearms Analysis: Objective: To teach students how to analyze ballistics and firearms evidence.
10. Toolmarks and Impression Analysis: Objective: To teach students how to analyze toolmarks and impressions found at crime scenes.
11. Arson and Explosion Investigation: Objective: To teach students how to investigate arson and explosions.
12. Digital Forensics: Objective: To teach students how to investigate crimes using digital forensics.
13. Document Examination: Objective: To teach students how to analyze documents as evidence.
14. Toxicology and Drug Analysis: Objective: To teach students how to analyze drugs and toxins found at crime scenes.
15. Anthropology and Odontology: Objective: To teach students how to use anthropology and odontology in crime scene investigations.
16. Forensic Psychology: Objective: To teach students how to use forensic psychology in crime scene investigations.

17. Criminalistics and Forensic Science: Objective: To discuss the history and development of criminalistics and forensic science.
18. Crime Scene Reconstruction: Objective: To teach students how to reconstruct a crime scene.
19. Forensic Entomology: Objective: To teach students how to use insects in forensic investigations.
20. Firearm and Toolmark Identification: Objective: To teach students how to identify firearms and toolmarks.
21. Crime Scene Photography: Objective: To teach students how to take photographs and videos of crime scenes.
22. Courtroom Testimony and Presentation of Evidence: Objective: To teach students how to present evidence in court and how to provide expert testimony.
23. Case Studies in Crime Scene Investigations: Objective: To analyze and discuss real-world examples of crime scene investigations.
24. Professional Standards and Ethics: Objective: To discuss the professional standards and ethics in crime scene investigations.
25. Research in Forensic Science: Objective: To introduce students to research methods and techniques used in forensic science.
26. Quality Assurance and Quality Control: Objective: To teach students about quality assurance and quality control in forensic investigations.
27. Crime Scene Management: Objective: To teach students how to manage a crime scene and coordinate the efforts of the investigative team.
28. Forensic Science and the Criminal Justice System: Objective: To discuss the role of forensic science in the criminal justice system.
29. Emerging Technologies in Forensic Science: Objective: To introduce students to emerging technologies and techniques in forensic science.

Practical Classes:

1. Crime Scene Simulation: Students will participate in a simulated crime scene, where they will have to collect and analyze evidence as if they were real crime scene investigators.
2. Fingerprint Analysis: Students will learn how to collect, compare, and analyze fingerprints using various techniques, including dusting and lifting.
3. Bloodstain Pattern Analysis: Students will learn how to identify and analyze different types of bloodstain patterns, which can provide valuable information about a crime.
4. Ballistics: Students will learn how to analyze bullet trajectories and determine the type of firearm used in a crime.

5. DNA Analysis: Students will learn how to collect, analyze, and interpret DNA evidence, including sample preparation, extraction, and amplification.
6. Forensic Entomology: Students will learn how to use insects found at a crime scene to estimate the time of death and other important information.
7. Digital Forensics: Students will learn how to analyze digital evidence, such as computer files, emails, and social media activity, to gather information about a crime.
8. Crime Scene Photography: Students will learn how to take and analyze crime scene photographs, which can be used as evidence in court.
9. Forensic Anthropology: Students will learn how to analyze skeletal remains to determine the identity of a victim, the cause of death, and other important information.
10. Fire Scene Investigation: Students will learn how to analyze fire scenes to determine the cause and origin of a fire, and to identify any evidence that may have been destroyed.

References:

1. Saferstein, R. (2019). Criminalistics: An Introduction to Forensic Science (12th Ed.). Pearson Education Limited.
2. Fisher, B. A. J., & Fisher, D. R. (2018). Techniques of Crime Scene Investigation (9th Ed.). CRC Press.
3. Lee, H. C., & Harris, S. (2020). Crime Scene Investigation (3rd ed.). Routledge.

3	Course title: Criminalistics	Course Code: FRSC-202

Overall Description and Aims:

The course aims to provide students with a comprehensive understanding of the principles, methods, and techniques used in forensic science. Through a combination of theoretical and practical training, students will develop the knowledge and skills required to apply scientific evidence to criminal investigations and legal proceedings. The course is designed to provide students with a broad-based education in the field of criminalistics, including topics such as forensic pathology, toxicology, ballistics, and DNA analysis.

Intended Learning Outcomes:

Knowledge and Understanding:

- Understand the principles and methods of criminalistics
- Understand the role of forensic science in criminal investigations and legal proceedings
- Understand the limitations and potential sources of error in forensic analysis
- Understand the ethical and legal issues related to forensic science

Intellectual Skills:

- Analyze and interpret complex scientific data
- Evaluate the validity and reliability of forensic evidence
- Apply scientific principles and methods to solve problems in criminal investigations
- Synthesize information from multiple sources to develop comprehensive forensic reports

Professional and Practical Skills:

- Conduct forensic analyses using appropriate techniques and equipment
- Communicate effectively with other forensic scientists, law enforcement officers, and legal professionals
- Provide expert testimony based on scientific evidence
- Use ethical and professional standards to guide forensic practice

General Transferable Skills:

- Work effectively in teams
- Manage time and resources efficiently
- Apply critical thinking and problem-solving skills to diverse situations
- Communicate complex information to diverse audiences

Course Topics and Objectives:

1. Introduction to Criminalistics

- Understand the history and development of forensic science
- Understand the role of criminalistics in the criminal justice system

2. Crime Scene Investigation

- Understand the principles and methods of crime scene investigation
- Be able to document and collect evidence from crime scenes

4. Serology and DNA Analysis

- Understand the principles of serology and DNA analysis
- Be able to collect and analyze DNA evidence

5. Firearms and Ballistics

- Understand the principles of firearms and ballistics
- Be able to analyze and compare bullet and cartridge case evidence

6. Fingerprint Analysis

- Understand the principles of fingerprint analysis
- Be able to analyze and compare fingerprint evidence

7. Document Examination

- Understand the principles of document examination
- Be able to analyze and compare handwriting and other document evidence

8. Forensic Anthropology

- Understand the principles of forensic anthropology
- Be able to identify human remains and provide evidence in criminal cases

9. Forensic Entomology

- Understand the principles of forensic entomology
- Be able to use insect evidence to determine time of death and other factors in criminal cases

10. Forensic Botany

- Understand the principles of forensic botany
- Be able to use plant evidence to provide evidence in criminal cases

11. Forensic Geology

- Understand the principles of forensic geology
- Be able to use geological evidence to provide evidence in criminal cases

12. Trace Evidence Analysis

- Understand the principles of trace evidence analysis
- Be able to collect and analyze trace evidence such as hair, fibers, and soil

13. Arson and Explosives Investigation

- Understand the principles of arson and explosives investigation
- Be able to analyze fire and explosion scenes to determine the cause and origin of the event

14. Bloodstain Pattern Analysis

- Understand the principles of bloodstain pattern analysis
- Be able to analyze and interpret bloodstain evidence to provide evidence in criminal cases

15. Digital Forensics

- Understand the principles of digital forensics
- Be able to collect and analyze digital evidence from computers and other electronic devices

16. Forensic Toxicology

- Understand the principles of forensic toxicology

- Be able to analyze and interpret toxicological evidence in criminal cases

17. Forensic Odontology

- Understand the principles of forensic odontology
- Be able to use dental evidence to provide evidence in criminal cases

18. Forensic DNA Databases

- Understand the principles of forensic DNA databases
- Be able to use DNA databases to solve criminal cases

19. Crime Scene Reconstruction

- Understand the principles of crime scene reconstruction
- Be able to use evidence to reconstruct events leading up to a crime

20. Criminal Profiling

- Understand the principles of criminal profiling
- Be able to develop profiles of suspects based on forensic evidence

Practical Classes:

1. DNA extraction and analysis
2. Toxicological analysis
3. Firearms identification and analysis
4. Digital forensics analysis
5. Crime scene investigation techniques
6. Trace evidence analysis
7. Bloodstain pattern analysis
8. Forensic anthropology analysis
9. Forensic entomology

References:

1. Saferstein, R. (2011). Criminalistics: An Introduction to Forensic Science. Pearson Education.
2. Fisher, B. A. J., & Fisher, D. R. (2018). Techniques of Crime Scene Investigation. CRC Press.

4	Course title: Forensic Biology	Course Code: FRSC-203

Overall Description and Aims:

The course is designed to provide students with a comprehensive understanding of the principles, theories, and techniques of forensic biology as it applies to criminal investigations. The course covers the fundamental concepts of forensic biology, including DNA analysis, forensic anthropology, and forensic entomology. Students will learn how to analyze biological evidence and how to interpret the results in a court of law. The course also aims to develop students' critical thinking and problem-solving skills, as well as their ability to work effectively in a team.

Intended Learning Outcomes:

The course is designed to achieve the following learning outcomes:

Knowledge and Understanding:

1. Understand the principles and theories of forensic biology
2. Understand the role of forensic biology in criminal investigations
3. Understand the techniques used in forensic biology, including DNA analysis, forensic anthropology, and forensic entomology
4. Understand the ethical and legal issues surrounding forensic biology

Intellectual Skills:

1. Analyze biological evidence and interpret the results in a court of law
2. Critically evaluate scientific literature related to forensic biology
3. Formulate hypotheses and design experiments to test them

Professional and Practical Skills:

1. Demonstrate proficiency in laboratory techniques used in forensic biology
2. Work effectively in a team to analyze and interpret biological evidence
3. Communicate scientific findings clearly and accurately in written and oral formats

General Transferable Skills:

1. Develop critical thinking and problem-solving skills
2. Develop effective communication skills

3. Develop team working skills

Course Topics and Objectives:

1. Introduction to forensic biology: Understand the history, principles, and applications of forensic biology.
2. Forensic anthropology: Understand the methods and techniques used in forensic anthropology, including the analysis of skeletal remains.
3. Forensic entomology: Understand the role of insects in forensic investigations and the methods used to analyze insect evidence.
4. Forensic Zooarchaeology: Understand the principles and techniques of forensic zooarchaeology, including the analysis of animal remains in criminal investigations.
5.
6. Forensic botany: Understand the role of plants in forensic investigations and the methods used to analyze plant evidence.
7. DNA analysis: Understand the principles and techniques of DNA analysis, including PCR, DNA sequencing, and STR analysis.
8. DNA profiling: Understand the principles and methods of DNA profiling and its applications in forensic investigations.
9. DNA databases: Understand the role and limitations of DNA databases in forensic investigations.
10. Forensic toxicology: Understand the methods used to analyze toxic substances in biological samples and their applications in forensic investigations.
11. Forensic serology: Understand the principles and techniques of forensic serology, including bloodstain pattern analysis.
12. Forensic odontology: Understand the methods and techniques used in forensic odontology, including the analysis of dental records and bite marks.
13. Crime scene investigation: Understand the methods and techniques used in crime scene investigation, including evidence collection and preservation.
14. Chain of custody: Understand the importance of chain of custody in forensic investigations and the methods used to maintain it.
15. Evidence analysis: Understand the methods used to analyze biological evidence, including DNA, bloodstains, and hairs.
16. Forensic microscopy: Understand the principles and techniques of forensic microscopy, including the analysis of fibers and other microscopic evidence.
17. Forensic imaging: Understand the principles and techniques of forensic imaging, including the analysis of photographs and video evidence.
18. Trace evidence analysis: Understand the methods used to analyze trace evidence, including soil, glass, and paint.

19. Firearms and toolmark analysis: Understand the methods used to analyze firearms and toolmarks, including ballistics and toolmark analysis.

20. Case studies in forensic biology: Analyze real-life case studies and apply the principles and techniques of forensic biology to solve forensic cases.
21. Forensic biology and the criminal justice system: Understand the role of forensic biology in the criminal justice system and the interaction between forensic science and the legal system.

Laboratory class:

1. DNA Extraction and Quantification
2. DNA Amplification (PCR)
3. DNA Analysis (Gel Electrophoresis)
4. Analysis of Bloodstains
5. Analysis of Semen Stains
6. Analysis of Saliva Stains
7. Identification of Body Fluids
8. Identification of Human Remains through Dental Records
9. Analysis of Drugs in Biological Samples
10. Analysis of hairs and fibers

References:

1. Saferstein, R. (2019). Forensic Science: From the Crime Scene to the Crime Lab. Pearson.
2. Butler, J. M. (2020). Advanced Topics in Forensic DNA Typing: Interpretation. Academic Press.

5	Course title: Forensic Chemistry	Course Code: FRSC-204

Overall Description and Aims:

The course focuses on the application of chemistry principles to the analysis of physical evidence in criminal investigations. The course provides students with an understanding of the various analytical techniques used in forensic chemistry, such as chromatography, spectroscopy, and mass spectrometry. Students will also learn about the principles of toxicology, forensic drug analysis, and the legal and ethical issues surrounding forensic chemistry.

The aim of this course is to provide students with a solid foundation in the principles of forensic chemistry and analytical techniques, as well as the skills needed to apply this knowledge in real-world settings. Students will learn to critically evaluate forensic evidence and communicate their findings effectively.

Intended Learning Outcomes: By the end of the course, students will have developed the following knowledge and skills:

Knowledge and Understanding:

- Understanding of the principles and applications of forensic chemistry
- Knowledge of the different analytical techniques used in forensic chemistry
- Understanding of toxicology and forensic drug analysis
- Knowledge of the legal and ethical issues surrounding forensic chemistry

Intellectual Skills:

- Ability to critically evaluate forensic evidence
- Ability to analyze data and draw conclusions
- Ability to interpret complex scientific information

Professional and Practical Skills:

- Ability to use analytical equipment and techniques effectively
- Ability to communicate scientific findings effectively
- Knowledge of quality control and quality assurance in analytical chemistry

General Transferable Skills:

- Time management and organizational skills

- Teamwork and collaboration
- Written and oral communication skills

Course Topics:

1. Introduction to Forensic Chemistry - Understand the scope and applications of forensic chemistry
2. Evidence Collection and Preservation - Understand the principles and techniques used in the collection and preservation of physical evidence
3. Forensic Chromatography - Understand the principles and techniques used in the analysis of chromatographic evidence in forensic investigations
4. Forensic Spectroscopy - Understand the principles and techniques used in the analysis of spectroscopic evidence in forensic investigations
5. Forensic Mass Spectrometry - Understand the principles and techniques used in the analysis of mass spectrometry evidence in forensic investigations
6. Forensic Analysis of Explosives - Understand the principles and techniques used in the analysis of explosive evidence in forensic investigations
7. Forensic Analysis of Fire Debris - Understand the principles and techniques used in the analysis of fire debris evidence in forensic investigations
8. Forensic Analysis of Paint and Glass - Understand the principles and techniques used in the analysis of paint and glass evidence in forensic investigations
9. Forensic Analysis of Fibers - Understand the principles and techniques used in the analysis of fiber evidence in forensic investigations
10. Forensic Analysis of Soil - Understand the principles and techniques used in the analysis of soil evidence in forensic investigations
11. Forensic Analysis of Drugs and Poisons I - Understand the principles and techniques used in the analysis of drugs and poisons in forensic investigations
12. Forensic Analysis of Trace Evidence - Understand the principles and techniques used in the analysis of trace evidence in forensic investigations

Practical Classes: The course will include practical classes in which students will gain hands-on experience in the laboratory and in the field. The practical classes will cover a range of topics, including evidence collection, chromatography, spectroscopy, and DNA analysis. The objectives for each practical class will vary depending on the content of the class. For example, the objectives for a practical class on "Chromatographic Analysis of a Controlled Substance" might include:

- Understand the principles of chromatography and its applications in forensic investigations
- Operate a gas chromatograph and a liquid chromatograph

- Prepare samples for analysis using different types of chromatography
- Analyze and interpret chromatographic data to identify a controlled substance
- Understand the limitations and sources of error in chromatographic analysis

References:

1. Saferstein, R. (2018). Forensic science: From the crime scene to the crime lab. Pearson.
2. Houck, M. M., & Siegel, J. A. (2019). Fundamentals of forensic science. Academic Press.

6	Course title: Integrative Physiology	Course Code: BMSC-201

Overall Aims of the Course:

The overall aim of this course is to provide students with a comprehensive understanding of the fundamental principles of physiology and the role of different physiological systems in maintaining health and responding to environmental challenges. By the end of the course, students should have the ability to critically analyze the function of different physiological systems and their interactions, and apply this knowledge to the study of human health and disease.

Intended Learning Outcomes of the Course: Upon completion of this course, students should be able to:

1. Demonstrate an understanding of the fundamental principles of physiology and homeostasis
2. Analyze the organization and function of different physiological systems in the body
3. Evaluate the mechanisms that control cellular communication and signaling pathways
4. Understand the role of different physiological systems in maintaining homeostasis and responding to environmental challenges
5. Describe the function of the reproductive system and its hormonal regulation
6. Demonstrate the ability to design and conduct laboratory experiments in physiology
7. Analyze and interpret experimental data and draw appropriate conclusions

Intellectual Skills:

1. Critical analysis and evaluation of physiological concepts and mechanisms
2. Synthesis of complex physiological systems and their interactions
3. Application of physiological principles to human health and disease
4. Evaluation of experimental design and interpretation of results

Professional and Practical Skills:

1. Effective communication of physiological concepts and mechanisms
2. Collaboration and teamwork in the laboratory setting

General Transferable Skills:

- Critical thinking and problem-solving
- Independent learning and study
- Time management and organization

Course topics

1: Introduction to Physiology and Homeostasis

- Overview of physiology and its importance
- Homeostasis and its role in maintaining physiological equilibrium

2: Cellular Communication and Signaling Pathways

- Overview of cellular communication
- Signaling pathways and their importance in physiology

3: Membrane Transport and Energy Metabolism

- Structure and function of cell membranes
- ATP production and energy metabolism

4: Nervous System and Sensory Physiology

- Anatomy and function of the nervous system
- Sensory physiology and perception

5: Cardiovascular System and Blood Pressure Regulation

- Anatomy and function of the cardiovascular system
- Regulation of blood pressure

6: Respiratory System and Gas Exchange

- Anatomy and function of the respiratory system
- Gas exchange and regulation of breathing

7: Renal System and Water Balance

- Anatomy and function of the renal system
- Regulation of water balance and electrolytes

8: Digestive System and Nutrient Absorption

- Anatomy and function of the digestive system
- Nutrient absorption and regulation of digestion

9: Endocrine System and Hormonal Regulation

- Anatomy and function of the endocrine system
- Hormonal regulation and feedback mechanisms

10: Environmental Physiology and Adaptations to Stressors

- Overview of environmental physiology
- Adaptations to different types of stressors

11: Homeostatic Imbalances and Disease States

- Overview of homeostatic imbalances and their consequences
- Common disease states and their effects on physiological systems

12: Genetic Basis of Physiology

- Overview of genetics and its role in physiology
- Genetic disorders and their impact on physiological systems

13: Exercise Physiology and Metabolic Adaptations

- Overview of exercise physiology
- Metabolic adaptations to exercise and physical activity

14: Aging and Physiological Changes

- Overview of aging and its effects on physiological systems
- Age-related diseases and their impact on health

15: Reproductive System and Hormonal Regulation

- Anatomy and function of the male and female reproductive systems
- Hormonal regulation of reproduction

16: Immunology and Inflammation

- Overview of the immune system
- Inflammation and its role in immune response

17: Pharmacology and Drug Effects on Physiology

- Overview of pharmacology and drug mechanisms
- Common drug effects on physiological systems

18: Body Composition and Energy Balance

- Overview of body composition and energy balance
- Energy expenditure and weight management

19: Circadian Rhythms and Biological Clocks

- Overview of circadian rhythms and biological clocks
- Implications for health and disease

20: Neural Control of Cardiovascular and Respiratory Systems

- Anatomy and function of neural control of cardiovascular and respiratory systems
- Regulation of blood pressure and breathing rate

21: Environmental Factors and Physiology

- Effects of environmental factors such as temperature, altitude, and pollution on physiological systems
- Adaptations to environmental stressors

22: Hormonal Control of Digestive System

- Anatomy and function of hormonal control of digestive system
- Regulation of digestion and nutrient absorption

23: Mechanisms of Pain and Pain Management

- Overview of pain mechanisms
- Common pain management strategies and their effects on physiology

24: Brain and Behavior

- Anatomy and function of the brain and its impact on behavior
- Effects of emotions and stress on physiological systems

25: Autonomic Nervous System and Stress Response

- Anatomy and function of the autonomic nervous system
- Stress response and its effects on physiological systems

26: Reproductive Health and Fertility

- Overview of reproductive health
- Common issues affecting fertility and their impact on physiological systems

27: Physiology of Sleep and Sleep Disorders

- Anatomy and function of sleep
- Common sleep disorders and their effects on health

Practical class:

1: Introduction to Lab Techniques in Physiology
- Introduction to lab safety protocols
- Overview of lab equipment and materials
- Basic lab skills (pipetting, measuring, weighing, etc.)
- Data analysis and interpretation

2: Physiology of Muscle Contraction
- Isolation and preparation of muscle tissue (e.g., frog gastrocnemius)
- Stimulation of muscle contraction using electrical stimulation
- Measurement of muscle force and contraction velocity
- Analysis of muscle fatigue

3: Cardiovascular Physiology
- Measurement of blood pressure using sphygmomanometer
- ECG measurement and analysis
- Calculation of cardiac output and stroke volume
- Effects of exercise on cardiovascular function

4: Respiratory Physiology
- Measurement of lung volumes and capacities using spirometer
- Analysis of respiratory flow rates
- Calculation of respiratory rate and minute ventilation

- Effects of different respiratory stimuli on ventilation

5: Endocrine System Physiology
- Measurement of blood glucose levels using glucometer
- Analysis of hormone levels (e.g., cortisol, insulin) using ELISA
- Calculation of metabolic rate and energy expenditure
- Effects of hormones on metabolic processes

6: Digestive System Physiology
- Measurement of gastric acid secretion using pH meter
- Analysis of nutrient absorption using spectrophotometer
- Calculation of energy intake and expenditure
- Effects of diet on digestive processes

7: Renal Physiology
- Measurement of urine volume and composition
- Calculation of glomerular filtration rate (GFR)
- Analysis of renal function using biochemical markers (e.g., creatinine)
- Effects of dehydration on renal function

8: Neural Control of Physiology
- Measurement of nerve conduction velocity using nerve stimulator
- Analysis of reflex responses (e.g., knee-jerk reflex)
- Calculation of nerve impulse propagation speed
- Effects of nerve damage on physiological function

9: Sensory Physiology
- Measurement of sensory thresholds using psychophysical methods
- Analysis of sensory adaptation
- Calculation of sensory acuity
- Effects of sensory deprivation on physiological function

10: Immunology and Inflammation
- Measurement of white blood cell count using hemocytometer
- Analysis of inflammatory markers (e.g., CRP) using ELISA
- Calculation of immune cell function (e.g., phagocytosis)
- Effects of immune dysfunction on physiological function

11: Environmental Physiology

- Measurement of core body temperature using thermometer
- Analysis of response to different environmental stressors (e.g., heat, cold)
- Calculation of physiological adaptations to environmental stress
- Effects of environmental stress on physiological function

12: Aging and Physiology

- Measurement of physiological parameters associated with aging (e.g., muscle strength, bone density)
- Analysis of age-related changes in physiological function
- Calculation of age-related changes in metabolic rate and energy expenditure
- Effects of age-related diseases on physiological function

13: Reproductive Physiology

- Measurement of hormone levels associated with reproductive function (e.g., FSH, LH)
- Analysis of reproductive cycles using ultrasonography
- Calculation of semen analysis parameters (e.g., sperm count, motility)
- Effects of reproductive dysfunction on physiological function

14: Pain Physiology

- Measurement of pain thresholds using psychophysical methods
- Analysis of pain modulation mechanisms
- Calculation of pain intensity and duration
- Effects of pain on physiological function

15.Measurement of Blood Pressure and Heart Rate:

- Demonstrate proper technique for taking blood pressure and heart rate measurements using a sphygmomanometer and stethoscope.
- Interpret blood pressure and heart rate readings accurately and understand the implications for cardiovascular physiology.
- Identify factors that can affect blood pressure and heart rate measurements, such as exercise, stress, and medications.
- Compare and contrast different methods for measuring blood pressure and heart rate, such as automated blood pressure monitors and heart rate monitors.

16.Measurement of Lung Function:

- Demonstrate proper technique for measuring lung function using a spirometer.
- Interpret lung function measurements accurately and understand the implications for respiratory physiology.
- Identify factors that can affect lung function measurements, such as age, smoking, and lung disease.
- Compare and contrast different methods for measuring lung function, such as peak expiratory flow rate (PEFR) and forced vital capacity (FVC).

17.Analysis of Electrocardiogram (ECG) Waveforms:

- Identify and interpret the different components of an ECG waveform, such as the P wave, QRS complex, and T wave.
- Recognize normal and abnormal ECG waveforms and understand the implications for cardiac physiology.
- Understand the physiological mechanisms that generate the ECG waveform and how they relate to cardiac function.
- Compare and contrast different methods for analyzing ECG waveforms, such as Holter monitoring and exercise stress testing.

18.Analysis of Muscle Function:

- Demonstrate proper technique for analyzing muscle function using techniques such as EMG and force plate analysis.
- Interpret muscle function measurements accurately and understand the implications for musculoskeletal physiology.
- Identify factors that can affect muscle function measurements, such as age, exercise, and injury.
- Compare and contrast different methods for analyzing muscle function, such as isokinetic testing and muscle biopsies.

19.Analysis of Brain Function:

- Demonstrate proper technique for analyzing brain function using techniques such as EEG and fMRI.
- Interpret brain function measurements accurately and understand the implications for neural physiology.
- Identify factors that can affect brain function measurements, such as age, sex, and disease.
- Compare and contrast different methods for analyzing brain function, such as magnetoencephalography (MEG) and transcranial magnetic stimulation (TMS).

20.Measurement of Body Composition:

- Demonstrate proper technique for measuring body composition using techniques such as BIA and DXA.
- Interpret body composition measurements accurately and understand the implications for metabolic physiology.
- Identify factors that can affect body composition measurements, such as age, sex, and exercise.
- Compare and contrast different methods for measuring body composition, such as skinfold measurements and air displacement plethysmography.

21.Analysis of Circadian Rhythms:

- Demonstrate proper technique for analyzing circadian rhythms using techniques such as melatonin assays and act

22.Thermoregulation Experiments:

- Describe the physiological mechanisms that regulate thermoregulation.
- Demonstrate the proper technique for measuring core body temperature, skin temperature, and sweat rate in response to different environmental conditions.
- Analyze the results of thermoregulation experiments and interpret the implications for maintaining homeostasis.
- Discuss the importance of thermoregulation in human physiology and health.

23.Reproductive Physiology Experiments:

- Explain the physiological mechanisms that regulate reproductive function in both males and females.
- Demonstrate the proper technique for measuring menstrual cycle parameters, sperm motility, and fertility markers.
- Analyze the results of reproductive physiology experiments and interpret the implications for fertility and reproduction.
- Discuss the importance of reproductive physiology in human health and reproduction.

24.Immune System Experiments:

- Describe the different components and functions of the immune system.

- Demonstrate the proper technique for measuring white blood cell counts, antibody levels, and cytokine production.
- Analyze the results of immune system experiments and interpret the implications for fighting infection and disease.
- Discuss the importance of the immune system in maintaining overall health and preventing illness.

References:

1. Silverthorn, Dee Unglaub. Human Physiology: An Integrated Approach. 7th ed., Pearson Education Limited, 2015.
2. Hall, John E. Guyton and Hall Textbook of Medical Physiology. 14th ed., Elsevier, 2021.

7	Course title: Lab Management and Medical Informatics	Course Code: LBMT-202

Overall Description and Aims:

The Course is designed to equip students with the necessary skills and knowledge to effectively manage and maintain medical laboratories, as well as to apply medical informatics to enhance patient care. This course covers a range of topics including laboratory operations, quality assurance, regulatory compliance, data management, and medical informatics. By using a combination of lectures, case studies, and hands-on exercises, students will gain a comprehensive understanding of laboratory management, regulatory compliance, data management, and medical informatics. Ultimately, the course aims to prepare students to manage modern medical laboratories and apply medical informatics to improve patient care.

Intended Learning Outcomes of the Course:

Upon completion of the course, students should be able to demonstrate the following:

Knowledge and Understanding:

- Understand the fundamental principles of laboratory operations and management.
- Understand the regulatory requirements governing laboratory operations and compliance.
- Understand the principles of quality assurance and quality control in laboratory operations.
- Understand the importance of data management and medical informatics in modern healthcare.

Intellectual Skills:

1. Analyze and evaluate laboratory operations to identify areas for improvement.
2. Evaluate and apply laboratory regulations and compliance requirements to ensure laboratory operations meet the necessary standards.
3. Develop and implement quality control measures to ensure accurate and reliable laboratory results.
4. Analyze and interpret medical data to provide valuable insights for patient care.

Professional and Practical Skills:

- Develop laboratory policies and procedures to ensure effective and efficient laboratory operations.
- Develop and implement data management and medical informatics strategies to improve patient care.
- Effectively communicate laboratory findings and medical information to healthcare professionals and patients.
- Implement strategies to ensure laboratory safety and compliance.

General Transferable Skills:

- Develop problem-solving skills and critical thinking skills.
- Develop communication skills for effective communication with healthcare professionals and patients.
- Develop skills for managing and leading laboratory staff.

Course topics:

1: Introduction to Laboratory Operations and Management
- Laboratory organization and structure
- Types of laboratories and their functions
- The role of laboratory personnel
- Laboratory documentation and record keeping

2: Laboratory Regulations and Compliance
- 2.1 Overview of laboratory regulations and guidelines
- 2.2 The role of regulatory bodies
- 2.3 Compliance strategies and best practices
- 2.4 Documentation and reporting requirements

3: Quality Assurance and Quality Control in Laboratory Operations
    - The principles of quality assurance and quality control
    - Quality management systems in the laboratory
    - Validation and verification of laboratory methods
    - Quality metrics and performance indicators

4: Laboratory Information Management Systems
    - Introduction to laboratory information management systems (LIMS)
    - Features and capabilities of LIMS

- Implementation and integration of LIMS in laboratory operations
- Data security and confidentiality in LIMS

5: Medical Informatics

- Introduction to medical informatics
- Electronic health records (EHR) and their use in healthcare
- Clinical decision support systems (CDSS)
- Telemedicine and telehealth applications

6: Laboratory Equipment Management and Maintenance

- Equipment selection and procurement
- Calibration and maintenance of laboratory equipment
- Troubleshooting equipment problems
- Replacement and retirement of laboratory equipment

7: Laboratory Safety and Compliance

- Introduction to laboratory safety
- Hazards and risks in the laboratory
- Safety equipment and procedures
- Emergency response and incident management

8: Laboratory Accreditation and Certification

- Overview of laboratory accreditation and certification programs
- The benefits of accreditation and certification
- The accreditation and certification process
- Maintaining accreditation and certification

9: Laboratory Budgeting and Finance

- Budget development and management
- Cost analysis and resource allocation
- Revenue generation and funding opportunities
- Financial reporting and accountability

10: Laboratory Auditing and Inspection

- Types of laboratory audits and inspections
- Audit and inspection planning and preparation
- Audit and inspection execution and follow-up
- Corrective action and continuous improvement

11: Laboratory Project Management

- The principles of project management
- Project planning and scheduling
- Resource allocation and budgeting for projects
- Project monitoring and evaluation

12: Laboratory Ethics and Professionalism

- The role of ethics in laboratory operations
- Ethical issues in laboratory research and development
- Professional conduct and responsibility
- Confidentiality and data security

13: Data Analysis and Reporting

- Data collection and management
- Statistical analysis and interpretation of data
- Data visualization and reporting
- Data sharing and publication ethics

14: Medical Informatics Applications in Healthcare

- Clinical decision support systems (CDSS) in healthcare
- Health information exchange (HIE) systems
- Patient engagement and empowerment through health informatics
- Health data analytics and population health management

15: Leadership and Team Management in the Laboratory

- Leadership styles and approaches
- Team building and communication skills
- Conflict resolution and problem-solving
- Performance management and evaluation

16: Laboratory Waste Management

- Define laboratory waste management and its importance in laboratory operations.
- Discuss the regulations and guidelines for laboratory waste management.
- Evaluate the effectiveness of laboratory waste management strategies.
- Develop and implement a laboratory waste management plan.

17: Laboratory Personnel Management

- Define laboratory personnel management and its importance in laboratory operations.
- Discuss the challenges and best practices for laboratory personnel management.
- Evaluate the effectiveness of laboratory personnel management strategies.
- Develop and implement a laboratory personnel management plan.

18: Laboratory Inventory Control

- Define laboratory inventory control and its importance in laboratory operations.
- Discuss the methods and best practices for laboratory inventory control.
- Evaluate the effectiveness of laboratory inventory control strategies.
- Develop and implement a laboratory inventory control plan.

19: Laboratory Informatics and Analytics

- Define laboratory informatics and analytics and their importance in laboratory operations.
- Discuss the use of informatics and analytics for laboratory data management and analysis.
- Evaluate the effectiveness of laboratory informatics and analytics tools.
- Develop and implement laboratory informatics and analytics solutions.

20: Laboratory Automation and Robotics

- Define laboratory automation and robotics and their importance in laboratory operations.
- Discuss the benefits and challenges of laboratory automation and robotics.
- Evaluate the effectiveness of laboratory automation and robotics systems.
- Develop and implement laboratory automation and robotics solutions.

Practical Classes:

1: Laboratory Safety and Compliance Training: Students will be able to identify potential laboratory hazards and develop safety protocols to minimize the risk of accidents.

2: Quality Control Procedures: Students will be able to perform and interpret quality control tests to ensure accuracy and precision in laboratory results.

3: Laboratory Equipment Maintenance: Students will be able to perform routine maintenance tasks and troubleshoot common issues with laboratory equipment.

4: Laboratory Data Analysis: Students will be able to analyze and interpret laboratory data using statistical methods.

5: Laboratory Information System Integration: Students will be able to implement laboratory information system integration to improve efficiency and data accuracy in laboratory operations.

6: Laboratory Waste Management: Students will be able to identify and properly dispose of different types of laboratory waste.

7: Personnel Management: Students will be able to apply best practices in laboratory personnel management, including hiring, training, and performance evaluations.

8: Inventory Control: Students will be able to develop and implement an effective laboratory inventory control system.

9: Informatics and Analytics: Students will be able to use laboratory informatics and analytics tools to manage and analyze laboratory data.

10: Automation and Robotics: Students will be able to operate and troubleshoot laboratory automation and robotics systems.

References:

1. Valenstein PN. Laboratory management principles and processes. 3rd ed. Washington: American Society for Clinical Pathology Press; 2017.
2. O'Connor J. Laboratory waste management: a guidebook. London: Royal Society of Chemistry; 2018.
3. Jha AK, DesRoches CM, Campbell EG, Donelan K, Rao SR, Ferris TG, et al. Use of electronic health records in U.S. hospitals. N Engl J Med. 2009;360(16):1628-38.

8	Course title: Molecular Biology Techniques	Course Code: MOLD-204

Overall Description and Aims:

The course provides students with theoretical and practical knowledge of molecular biology techniques used in research and clinical settings. The course covers essential molecular biology techniques, including DNA extraction, PCR, cloning, gene expression analysis, and DNA sequencing. The course aims to develop students' practical skills in molecular biology and prepare them for research and clinical careers.

Intended Learning Outcomes of Course:

Knowledge and Understanding:

1. Understand the fundamental concepts and principles of molecular biology.
2. Understand the theoretical basis of essential molecular biology techniques.
3. Understand the role of molecular biology techniques in research and clinical settings.

Intellectual Skills:

1. Analyze scientific literature related to molecular biology techniques.
2. Design experiments and optimize protocols for molecular biology techniques.
3. Interpret data generated from molecular biology experiments.

Professional and Practical Skills:

1. Demonstrate practical skills in molecular biology techniques.
2. Perform experiments and record data accurately and precisely.
3. Work collaboratively in a laboratory setting.

General Transferable Skills:

1. Communicate scientific ideas and results effectively.
2. Solve problems and think critically.
3. Manage time effectively.

Course Topics:

1. Introduction to molecular biology techniques
    - Define molecular biology and its significance in research and clinical settings.

- Understand the historical context of molecular biology.
- Describe the central dogma of molecular biology.

2. DNA Extraction
   - Understand the basic principles of DNA extraction.
   - Describe different DNA extraction methods.
   - Optimize DNA extraction protocols.
3. Polymerase Chain Reaction (PCR)
   - Understand the basic principles of PCR.
   - Describe the different types of PCR.
   - Optimize PCR protocols.
4. Gel Electrophoresis
   - Understand the basic principles of gel electrophoresis.
   - Describe different types of gel electrophoresis.
   - Analyze gel electrophoresis results.
5. Cloning
   - Understand the basic principles of cloning.
   - Describe different types of cloning.
   - Optimize cloning protocols.
6. Gene Expression Analysis
   - Understand the basic principles of gene expression analysis.
   - Describe different methods of gene expression analysis.
   - Analyze gene expression data.
7. Western Blotting
   - Understand the basic principles of Western blotting.
   - Describe the different steps involved in Western blotting.
   - Analyze Western blotting results.
8. Enzyme-Linked Immunosorbent Assay (ELISA)
   - Understand the basic principles of ELISA.
   - Describe the different types of ELISA.
   - Optimize ELISA protocols.
9. DNA Sequencing
   - Understand the basic principles of DNA sequencing.
   - Describe different types of DNA sequencing.
   - Analyze DNA sequencing data.
10. Restriction Enzyme Digestion
    - Understand the basic principles of restriction enzyme digestion.
    - Describe different types of restriction enzymes.
    - Optimize restriction enzyme digestion protocols.
11. Site-Directed Mutagenesis

- Understand the basic principles of site-directed mutagenesis.
- Describe different types of site-directed mutagenesis.
- Optimize site-directed mutagenesis protocols.

12. RNA Extraction and Analysis
    - Understand the basic principles of RNA extraction and analysis.
    - Describe different RNA extraction and analysis methods.
    - Optimize RNA extraction and analysis protocols.
13. Real-Time PCR
    - Understand the basic principles of real-time PCR.
    - Describe different types of real-time PCR.
    - Optimize real-time PCR protocols.
14. Microarray Analysis
    - Understand the basic principles of microarray analysis.
    - Describe different types of microarray analysis.

15: Epigenetic Modifications:

- The role of epigenetic modifications in gene expression
- Different modifications affect chromatin structure and function.

16: Recombinant Protein Production:

- Principles and techniques of recombinant protein production
- The use of expression vectors and host cells

17: Genome Editing Objective:

- the principles and applications of genome editing technologies
- CRISPR-Cas9.

18: RNA Interference (RNAi):

- Principles and applications of RNAi technology
- The use of siRNA and shRNA

19: Stem Cell Culture and Differentiation:

- Principles and techniques of stem cell culture and differentiation

Practical Classes:

1. Introduction to basic laboratory techniques:

- To introduce students to the basic laboratory techniques and safety protocols used in molecular biology experiments.

2. Gel electrophoresis:

- Perform and analyze gel electrophoresis experiments, including DNA and protein gel electrophoresis.

3. Restriction enzyme digestion and ligation:

- Perform and analyze restriction enzyme digestion and ligation experiments, including plasmid preparation and purification.

4. Polymerase chain reaction (PCR):

- Perform and analyze PCR experiments, including primer design, optimization of reaction conditions,

5: DNA Sequencing:

- Understand the principles and applications of DNA sequencing
- Learn the different DNA sequencing methods and their advantages and disadvantages
- Be able to perform basic DNA sequencing experiments

6: Polymerase Chain Reaction (PCR) Objectives:

- Understand the principles and applications of PCR
- Learn the different types of PCR and their advantages and disadvantages
- Be able to perform basic PCR experiments

7: Gene Expression Analysis Objectives:

- Understand the principles and applications of gene expression analysis
- Learn the different methods for measuring gene expression and their advantages and disadvantages
- Be able to perform basic gene expression experiments

8: Protein Purification Objectives:

- Understand the principles and applications of protein purification
- Learn the different protein purification techniques and their advantages and disadvantages
- Be able to perform basic protein purification experiments

9 Enzyme Kinetics Objectives:

- Understand the principles and applications of enzyme kinetics
- Learn the different methods for measuring enzyme activity and their advantages and disadvantages
- Be able to perform basic enzyme kinetics experiments

10: Western Blotting Objectives:

- Understand the principles and applications of western blotting
- Learn the different western blotting techniques and their advantages and disadvantages
- Be able to perform basic western blotting experiments

11: Immunoprecipitation Objectives:

- Understand the principles and applications of immunoprecipitation
- Learn the different immunoprecipitation techniques and their advantages and disadvantages
- Be able to perform basic immunoprecipitation experiments

12: Flow Cytometry Objectives:

- Understand the principles and applications of flow cytometry
- Learn the different flow cytometry techniques and their advantages and disadvantages
- Be able to perform basic flow cytometry experiments

13: Microscopy Objectives:

- Understand the principles and applications of microscopy
- Learn the different types of microscopy and their advantages and disadvantages
- Be able to perform basic microscopy experiments

14: Bioinformatics Objectives:

- Understand the principles and applications of bioinformatics
- Learn the different bioinformatics tools and their advantages and disadvantages
- Be able to perform basic bioinformatics analyses

For each of the 19 practical classes, the objectives will be to demonstrate proficiency in the specific technique being taught and to apply that technique to a relevant biological problem.

Assessment methods for the course will include written exams, laboratory reports, and class participation.

References:

1. Molecular Biology Techniques: A Classroom Laboratory Manual, 4th Edition, by Susan Carson, Heather Miller, and D. Scott Witherow (2018).
2. Molecular Biology: Principles and Practice, 3rd Edition, by Michael M. Cox, Jennifer Doudna, and Michael O'Donnell (2021).

9	Course title: Principles of Human Genetics	Course Code: MOLD-205

Overall Description and Aims:

The Principles of Human Genetics undergraduate course in Biomedical Sciences aims to provide students with a comprehensive understanding of the fundamental principles of human genetics and their applications in various fields of medicine and healthcare. The course will cover the basic concepts of genetics, including inheritance patterns, molecular genetics, gene expression, and genomics, and how these principles apply to human health and disease. The course will also cover ethical, legal, and social issues related to human genetics and genomics.

Intended Learning Outcomes:

Upon completing the course, students will be able to:

- Demonstrate a solid understanding of the fundamental principles of human genetics
- Analyze and interpret genetic data using molecular genetic techniques
- Apply genetic principles to the diagnosis and treatment of human diseases
- Understand the ethical, legal, and social issues related to human genetics and genomics
- Develop critical thinking, problem-solving, and analytical skills
- Develop professional and practical skills necessary for a career in the biomedical sciences
- Develop general transferable skills such as communication, teamwork, and time management.

Knowledge and Understanding:

- Basic principles of genetics
- Molecular genetics and gene expression
- Genomics and personalized medicine
- Genetic diseases and their inheritance patterns
- Genetic testing and counseling
- Ethical, legal, and social issues related to human genetics and genomics

Intellectual Skills:

- Analyzing genetic data using molecular genetic techniques
- Applying genetic principles to the diagnosis and treatment of human diseases

- Critically evaluating research studies in human genetics
- Synthesizing and interpreting complex genetic information
- Developing hypotheses and designing experiments in genetics research

Professional and Practical Skills:

- Genetic counseling and communication skills
- Designing and implementing genetic tests
- Interpreting and reporting genetic test results
- Performing molecular genetic techniques
- Analyzing and interpreting genetic data using bioinformatics tools

General Transferable Skills:

- Communication skills
- Teamwork and collaboration
- Time management and organization
- Critical thinking and problem-solving
- Adaptability and flexibility

Course topics:

1. Introduction to Human Genetics

- Basic genetics terminology
- Historical development of human genetics
- Human genome and genetic variation

2. History of Human Genetics

- Early theories of inheritance
- Discovery of DNA and its role in genetics
- Landmark discoveries in human genetics

3. Structure and Function of DNA

- Chemical structure of DNA
- DNA replication and repair
- DNA transcription and translation

4. Chromosome Structure and Function

- Chromosome organization and morphology
- Chromosome segregation and meiosis
- Chromosome abnormalities and human disease

5. Mendelian Genetics

- Mendel's laws of inheritance
- Punnett squares and probability calculations
- Inheritance patterns and genetic variation

6. Pedigree Analysis

- Pedigree construction and interpretation
- Autosomal dominant and recessive inheritance
- X-linked inheritance and sex-linked traits

7. Single Gene Disorders

- Cystic fibrosis and other recessive disorders
- Huntington's disease and other dominant disorders
- Sickle cell anemia and other codominant disorders

8. Chromosomal Disorders

- Down syndrome and other trisomies
- Turner syndrome and other monosomies
- Structural chromosomal abnormalities and human disease

9. Carrier Testing

- Carrier frequency and population screening
- Genetic counseling and informed consent
- Ethics and social implications of carrier testing

11. Molecular Genetics

- DNA sequencing and genotyping
- Polymerase chain reaction (PCR) and its applications
- DNA microarrays and their uses

12. Gene Expression

- Transcription and translation
- Post-transcriptional and post-translational modifications
- Regulation of gene expression

13. Gene Regulation

- Transcriptional regulation and transcription factors
- Epigenetic regulation and chromatin modifications
- Non-coding RNA and gene regulation

14. Epigenetics

- DNA methylation and demethylation
- Histone modifications and chromatin remodeling
- Epigenetic inheritance and disease

15. Genomics

- Genome sequencing and annotation
- Comparative genomics and evolutionary genomics
- Functional genomics and systems biology

16. Human Genome Project

- Goals and objectives of the Human Genome Project
- Impact of the Human Genome Project on science and medicine
- Ethical and social implications of genome research

17. Genetic Discrimination

- Definition and examples of genetic discrimination
- Legal and ethical issues surrounding genetic discrimination
- Prevention and regulation of genetic discrimination

18. Personalized Medicine

- Definition and principles of personalized medicine
- Examples of personalized medicine in practice
- Challenges and opportunities of personalized medicine

19. Precision Medicine

- Definition and principles of precision medicine
- Role of genomics in precision medicine
- Applications of precision medicine in disease prevention and treatment

20. Pharmacogenetics

- Definition and principles of pharmacogenetics
- Examples of pharmacogenetics in practice
- Role of pharmacogenetics in drug development and precision medicine

21. Genetic Diversity

- Definition and measurement of genetic diversity
- Importance of genetic diversity in human populations
- Factors influencing genetic diversity

22. Gene-Environment Interactions

- Definition and examples of gene-environment interactions
- Mechanisms of gene-environment interactions
- Implications of gene-environment interactions for human health and disease.

Practical classes:

1. Chromosome Structure and Function

- Preparation of chromosome spreads from cells
- Staining of chromosomes for visualization
- Identification and labeling of specific chromosome structures (e.g. centromeres, telomeres)
- Analysis of chromosome number and structure abnormalities

2. Mendelian Genetics

- Cross-breeding experiments using model organisms (e.g. fruit flies, pea plants)

- Analysis of progeny to determine the mode of inheritance (e.g. dominant, recessive)
- Calculation of expected and observed ratios using Punnett squares
- Identification of phenotype and genotype frequencies

3. Pedigree Analysis

- Analysis of family pedigrees to determine patterns of inheritance
- Identification of carriers and affected individuals
- Calculation of risk for offspring to inherit a genetic disorder
- Interpretation of complex pedigrees with multiple generations and affected individuals

4. Single Gene Disorders

- Extraction and analysis of DNA from patient samples
- Identification of disease-causing mutations using PCR and sequencing techniques
- Comparison of mutant and wild-type DNA sequences
- Analysis of the effect of mutations on protein function

5. Chromosomal Disorders

- Analysis of karyotypes from patient samples
- Identification of chromosomal abnormalities (e.g. deletions, translocations)
- Calculation of the risk for offspring to inherit a chromosomal disorder
- Interpretation of complex karyotypes with multiple abnormalities

6. Genetic Testing

- Analysis of patient samples for genetic mutations associated with specific diseases
- Comparison of patient DNA with reference sequences
- Interpretation of test results and communication of findings to patients and their families
- Discussion of the benefits and limitations of genetic testing

7. Carrier Testing

- Analysis of DNA from individuals to determine carrier status for specific genetic disorders

- Calculation of the risk for offspring to inherit a genetic disorder from carrier parents
- Discussion of the implications of carrier status for family planning

8. Molecular Genetics

- Extraction and analysis of DNA and RNA from patient samples
- PCR amplification of specific DNA sequences
- Analysis of gene expression using microarray or RNA sequencing techniques
- Interpretation of gene expression data to understand the molecular basis of disease

9. Gene Expression

- Analysis of gene expression in model organisms
- Quantification of mRNA levels using qPCR or RNA sequencing
- Analysis of gene expression patterns during development or in response to environmental stimuli
- Interpretation of gene expression data to understand the function of specific genes

10. Gene Regulation

- Analysis of regulatory elements in DNA sequences
- Cloning of regulatory sequences into reporter plasmids
- Analysis of gene expression in response to different regulatory sequences
- Interpretation of data to understand the mechanisms of gene regulation

11. Epigenetics

- Analysis of epigenetic modifications (e.g. DNA methylation, histone modifications) in patient samples
- Comparison of epigenetic patterns between normal and diseased tissues
- Analysis of the effect of environmental factors on epigenetic modifications
- Interpretation of data to understand the role of epigenetics in disease development

12. Genetic Discrimination

- Discussion of case studies of genetic discrimination in healthcare and employment settings

- Analysis of legal and ethical implications of genetic discrimination
- Development of strategies to prevent genetic discrimination

13. Pharmacogenetics

- Analysis of genetic variants associated with drug metabolism and response
- Discussion of case studies of pharmacogenetic testing in clinical practice
- Interpretation of test results and communication of findings to patients and healthcare providers
- Development of personalized medicine strategies based on pharmacogenetic data

14. Genetic Diversity

- Analysis of genetic variation within and between populations
- Calculation of genetic diversity metrics (e.g. heterozygosity, Fst)
- Discussion of the implications of genetic diversity for disease susceptibility, drug response, and personalized medicine
- Interpretation of data to understand the evolutionary history and migration patterns of human populations

15. Gene-Environment Interactions

- Analysis of gene-environment interactions in model organisms
- Examination of the effect of environmental factors (e.g. diet, toxins) on gene expression and phenotype
- Calculation of the risk for disease development based on genetic and environmental factors
- Interpretation of data to understand the complex interplay between genetic and environmental factors in disease development

References:

1. Klug, W. S., Cummings, M. R., Spencer, C. A., Palladino, M. A. (2021). Essentials of Genetics. Pearson Education, Inc.
2. Lewin, B. (2018). Genes IX. Jones & Bartlett Learning.

Department of Forensic Sciences

Proposed Syllabi for all Courses in the Third Year

Prepared by

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Syllabus for Third Year Courses

1	Course title: Bioinformatics and Genomics	Course Code: MOLD-301

Overall Description and Aims:

The overall aim of the course is to provide students with a deep understanding of the principles and practices of bioinformatics, genomics, and computational biology. This course will provide students with a solid foundation in the underlying concepts of molecular biology, genetics, and computer science, enabling them to apply this knowledge in the analysis of complex biological data. Students will also gain practical experience in the use of software tools and databases, and will develop professional and transferable skills in data analysis, interpretation, and communication.

Intended Learning Outcomes:

Knowledge and Understanding:

1. Develop a deep understanding of the molecular basis of life and the relationship between genomics, proteomics, and transcriptomics.
2. Understand the basic principles and methods of sequence alignment, gene prediction, and sequence analysis.
3. Learn to use computational techniques to analyze and interpret large datasets.
4. Learn to identify and use databases, software tools, and other resources for the analysis of biological data.

Intellectual Skills:

1. Develop critical thinking skills for the analysis of complex biological data.
2. Apply computational and statistical methods to interpret biological data.
3. Analyze complex genetic and genomic data and draw meaningful conclusions.
4. Develop the ability to identify and address biological questions using bioinformatics and genomics approaches.

Professional and Practical Skills:

1. Develop skills in the use of bioinformatics tools and databases.
2. Develop skills in the analysis and interpretation of biological data.
3. Develop skills in the communication of scientific findings.
4. Develop skills in team-based research and collaboration.

General Transferable Skills:

1. Develop skills in problem-solving, critical thinking, and data analysis.
2. Develop skills in scientific writing and communication.
3. Develop skills in team-based research and collaboration.
4. Develop skills in project management and time management.

Course Topics:

1: Introduction to Bioinformatics and Genomics.

Objective: Understand the history, scope, and applications of bioinformatics and genomics.

2: Molecular Biology and Genetics: Develop a deep understanding of the molecular basis of life, genetics, and genomics.

3: Sequence Alignment: Understand the basic principles and methods of sequence alignment.

4: Sequence Analysis: Develop skills in the analysis and interpretation of sequence data.

5: Gene Prediction: Understand the basic principles and methods of gene prediction.

6: Genome Assembly: Understand the basic principles and methods of genome assembly.

7: Comparative Genomics: Understand the basic principles and methods of comparative genomics.

8: Transcriptomics: Develop skills in the analysis and interpretation of transcriptomics data.

9: Proteomics: Develop skills in the analysis and interpretation of proteomics data.

10: Metabolomics: Develop skills in the analysis and interpretation of metabolomics data.

11: Structural Bioinformatics: Understand the basic principles and methods of structural bioinformatics.

12: Systems Biology: Understand the basic principles and methods of systems biology.

13: Genomic Variation: Understand the basic principles and methods of genomic variation analysis.

14: Epigenomics: Develop skills in the analysis and interpretation of epigenomic data.

15: Functional Genomics: Develop skills in the analysis and interpretation of functional genomic data.

16: Next-Generation Sequencing: Understand the basic principles and methods of next-generation sequencing.

17: High-Performance Computing: Develop skills in the use of high-performance computing for biological data analysis.

18: Machine Learning: Understand the basic principles and methods of machine learning and its applications in bioinformatics and genomics.

19: Network Analysis: Understand the basic principles and methods of network analysis and its applications in bioinformatics and genomics.

20: Pathway Analysis: Develop skills in the analysis and interpretation of biological pathways.

21: Data Visualization: Develop skills in the visualization and presentation of biological data.

22: Bioinformatics Databases.: Develop skills in the use of bioinformatics databases for the analysis of biological data.

23: Personalized Genomics: Understand the basic principles and methods of personalized genomics.

24: Current Topics in Bioinformatics and Genomics.: Understand current topics in bioinformatics and genomics research and their applications.

Tutorials:

1. Introduction to Bioinformatics and Genomics: This tutorial provides an overview of the field of bioinformatics and genomics, including the types of data analyzed, tools used, and applications in research.
2. Sequence Alignment: This tutorial covers the basics of sequence alignment, including types of alignment, algorithms, and tools commonly used.
3. Sequence Analysis: This tutorial covers the analysis of DNA and RNA sequences, including sequence annotation, motif discovery, and phylogenetic analysis.
4. Genome Assembly: This tutorial covers the process of genome assembly, including methods for assembling short reads into longer sequences.
5. Gene Prediction: This tutorial covers the process of gene prediction, including tools and algorithms used for identifying genes in genomic sequences.
6. Transcriptomics: This tutorial covers the analysis of transcriptomic data, including differential expression analysis, pathway analysis, and functional enrichment analysis.
7. Epigenomics: This tutorial covers the analysis of epigenomic data, including DNA methylation and histone modification data, and their role in gene regulation.
8. Structural Bioinformatics: This tutorial covers the analysis of protein structures, including methods for predicting protein structure, and analysis of protein-ligand interactions.
9. Comparative Genomics: This tutorial covers the comparison of genomes across different species, including methods for identifying conserved regions and evolutionary relationships.
10. Metagenomics: This tutorial covers the analysis of metagenomic data, including taxonomic and functional profiling of microbial communities.
11. Next-Generation Sequencing Technologies: This tutorial covers the principles of next-generation sequencing technologies, including Illumina, PacBio, and Oxford Nanopore sequencing.
12. Quality Control and Data Preprocessing: This tutorial covers the quality control and preprocessing of next-generation sequencing data, including trimming, filtering, and error correction.
13. Genome Annotation: This tutorial covers the annotation of genomic sequences, including the identification of genes, regulatory elements, and functional domains.
14. Variant Analysis: This tutorial covers the analysis of genetic variation, including single nucleotide polymorphisms (SNPs), insertions, and deletions.
15. Pathway Analysis: This tutorial covers the analysis of biological pathways, including identification of enriched pathways and analysis of pathway interactions.

16. Network Analysis: This tutorial covers the analysis of biological networks, including protein-protein interaction networks and gene co-expression networks.
17. Integrative Analysis: This tutorial covers the integration of multiple types of data, including genomics, transcriptomics, and epigenomics, to gain a comprehensive understanding of biological processes.

References:

1. Pevsner, J. (2015). Bioinformatics and functional genomics (3rd ed.). John Wiley & Sons.
2. Lesk, A. M. (2017). Introduction to bioinformatics (4th ed.). Oxford University Press.

2	Course title: Crime Scene Investigations Lab	Course Code: FRSC - 301

Overall Description and Aims:

The Crime Scene Investigations Lab undergraduate course is designed to introduce students to the principles and practices of crime scene investigations. The course aims to provide students with a comprehensive understanding of the scientific and forensic techniques used to analyze evidence, as well as the legal and ethical considerations of conducting investigations. The course will combine lectures, practical classes, and case studies to give students a hands-on learning experience.

Intended Learning Outcomes: By the end of the course, students should be able to demonstrate:

Knowledge and Understanding:

1. The principles of forensic science and its application to crime scene investigations
2. The various types of evidence and their collection, preservation, and analysis methods
3. The legal and ethical considerations of conducting investigations
4. The role of different forensic specialists in crime scene investigations
5. The importance of following standard operating procedures in evidence collection and documentation

Intellectual Skills:

1. Analyze and interpret complex data
2. Critically evaluate evidence and apply scientific reasoning to solve problems
3. Apply scientific principles to criminal investigations
4. Synthesize information from different sources to form a cohesive conclusion

Professional and Practical Skills:

1. Develop skills in evidence collection, preservation, and documentation
2. Use appropriate laboratory equipment and techniques to analyze evidence
3. Communicate findings and conclusions effectively to different audiences
4. Work collaboratively in a team to solve problems

General Transferable Skills:

1. Time management and organization

2. Attention to detail
3. Independent thinking and problem solving
4. Communication and presentation skills

Course Topics:

1. Crime Scene Investigation: Apply crime scene investigation techniques, including the use of forensic tools and techniques, to collect and document evidence at a mock crime scene.

2. Evidence Collection and Preservation: Demonstrate the correct techniques for collecting and preserving different types of evidence, such as fingerprints, DNA, blood spatter, and toolmarks.

3. Fingerprint Analysis: Analyze fingerprints using fingerprint analysis techniques and interpret the results to identify individuals.

4. DNA Analysis: Use DNA analysis techniques to identify individuals and analyze complex DNA mixtures.

5. Blood Spatter Analysis: Analyze blood spatter patterns and use them to determine the nature and direction of an attack or other crime.

6. Toolmark Analysis: Analyze toolmark impressions and use them to identify tools used in a crime.

7. Shoeprint and Tire Track Analysis: Analyze shoeprints and tire tracks and use them to identify individuals or vehicles involved in a crime.

8. Firearm and Toolmark Identification: Analyze firearms and toolmarks and use them to identify the type of weapon used in a crime.

9. Digital Forensics: Collect and analyze digital evidence from different devices and media, such as computers, smartphones, and social media.

10. Serology: Analyze serological evidence, such as blood, semen, and saliva, and use it to identify individuals involved in a crime.

11. Toxicology: Analyze toxicological evidence, such as blood, urine, and hair samples, and use it to identify the presence of drugs, alcohol, or other toxic substances.

12. Forensic Entomology: Analyze insect evidence, such as larvae and adult insects, and use it to estimate the time of death or other important information.

13. Crime Scene Reconstruction: Use different pieces of evidence to reconstruct the events leading up to a crime and determine the sequence of events.

16. Quality Control and Quality Assurance

References:

1. Saferstein, R. (2015). Criminalistics: An Introduction to Forensic Science. Pearson Education Limited.
2. James, S. H., & Nordby, J. J. (2017). Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press.

3	Course title: Environmental Forensics	Course Code: FRSC - 302

Overall Description and Aims:

Environmental forensics is a critical interdisciplinary field that applies scientific methods and analytical techniques to identify and understand the sources, fate, and effects of environmental contamination. This undergraduate course in environmental forensics is designed to provide students with an understanding of the principles and applications of this field in the context of biomedical sciences. The course aims to enable students to critically evaluate the environmental impact of human activities on health and the ecosystem, and to apply environmental forensic tools to solve environmental problems.

Intended Learning Outcomes:

By the end of the course, students should have achieved the following learning outcomes:

Knowledge and Understanding:

1. Understand the principles and applications of environmental forensics
2. Identify the types and sources of environmental contamination
3. Understand the fate and transport of contaminants in the environment
4. Understand the environmental impact on human health and the ecosystem

Intellectual Skills: 5. Critically evaluate the quality of environmental data

6. Analyze and interpret environmental data
7. Apply scientific reasoning to solve environmental problems
8. Develop and implement environmental monitoring and remediation plans

Professional and Practical Skills: 9. Collect and analyze environmental samples

10. Operate and maintain environmental analytical instruments
11. Conduct environmental risk assessments
12. Communicate environmental data and results to stakeholders

General Transferable Skills: 13. Work independently and in a team

14. Manage time effectively
15. Adapt to changing circumstances and environments
16. Apply ethical principles to environmental problem-solving

Course Topics:

1. Introduction to environmental forensics: Define the field and its applications.
2. Environmental contamination: Identify the types and sources of environmental contamination.
3. Environmental sampling: Learn how to collect environmental samples and maintain quality control.
4. Environmental analytical techniques: Understand the principles and applications of environmental analytical techniques.
5. Fate and transport of contaminants: Learn how contaminants move in the environment.
6. Contaminant toxicity: Understand how contaminants affect human health and the environment.
7. Environmental risk assessment: Learn how to assess the risk of environmental contamination.
8. Soil forensics: Identify and analyze soil contamination.
9. Water forensics: Identify and analyze water contamination.
10. Air forensics: Identify and analyze air contamination.
11. Solid waste forensics: Identify and analyze solid waste contamination.
12. Molecular techniques in environmental forensics: Learn the application of molecular biology in environmental forensics.
13. GIS and spatial analysis: Learn how to apply GIS and spatial analysis techniques in environmental forensics.
14. Petroleum forensics: Learn the application of forensic techniques in petroleum contamination.
15. Environmental forensics in urban environments: Identify and analyze contamination in urban environments.
16. Forensic ecology: Understand the role of environmental forensics in ecological investigations.
17. Environmental forensics case studies: Review case studies of environmental forensic investigations.

Practical Classes and Objectives:

1. Environmental Sampling: To learn how to collect and maintain environmental samples.
2. Environmental Analysis Techniques: To operate and maintain environmental analytical instruments.
3. Soil Contamination: To identify and analyze soil contamination.
4. Water Contamination: To identify and analyze water contamination.

5. Air Contamination: To identify and analyze air contamination.
6. Solid Waste Contamination: To identify and analyze solid waste contamination.
7. Molecular Biology Techniques: To learn and apply molecular biology techniques in environmental forensics.
8. GIS and Spatial Analysis: To learn how to apply GIS and spatial analysis techniques in environmental forensics.
9. Petroleum Contamination: To learn and apply forensic techniques in petroleum contamination.
10. Urban Contamination: To identify and analyze contamination in urban environments.
11. Ecological Investigations: To understand the role of environmental forensics in ecological investigations.
12. Case Studies: To review case studies of environmental forensic investigations.
13. Environmental Risk Assessment: To learn how to conduct environmental risk assessments.
14. Environmental Monitoring: To design and implement environmental monitoring plans.
15. Group Project: To apply environmental
16. Field Trip: To observe and analyze environmental contamination in the field.

References:

1. O'Connor TP, Wildanger JC. Environmental forensics: principles and applications. CRC Press; 2018.
2. Morrison RD, Murphy BL, Littlefield NA. Environmental forensics. Elsevier; 2017.

4	Course title: Examination and Analysis of Biological Evidence	Course Code: FRSC - 303

Overall Description and Aims:

The Examination and Analysis of Biological Evidence course is designed to provide students with a comprehensive understanding of the principles and techniques used in examining and analyzing biological evidence. The course aims to equip students with the knowledge and skills necessary to perform scientific investigations on biological evidence and to critically evaluate scientific evidence.

Intended Learning Outcomes:

Knowledge and Understanding:

- Understand the principles of forensic biology and its role in criminal investigations.
- Understand the various types of biological evidence that can be found at a crime scene.
- Understand the various methods used in analyzing biological evidence, including DNA analysis, serology, and bloodstain pattern analysis.

Intellectual Skills:

- Develop critical thinking skills in analyzing scientific evidence and drawing conclusions.
- Develop skills in experimental design and data analysis.
- Develop skills in scientific writing and communication.

Professional and Practical Skills:

- Develop skills in laboratory techniques used in the analysis of biological evidence.
- Develop skills in evidence collection, preservation, and analysis.
- Develop an understanding of the ethical and legal considerations in the use of biological evidence in criminal investigations.

General Transferable Skills:

- Develop problem-solving skills.
- Develop independent learning skills.
- Develop effective communication skills.

Course Topics and Objectives:

1. Introduction to Forensic Biology

- Understand the role of forensic biology in criminal investigations.

2. Types of Biological Evidence

- Understand the different types of biological evidence that can be found at a crime scene.

3. Collection and Preservation of Biological Evidence

- Develop skills in the proper collection and preservation of biological evidence.

4. DNA Analysis

- Understand the principles and techniques used in DNA analysis.

5. Serology

- Understand the principles and techniques used in serology.

6. Bloodstain Pattern Analysis

- Understand the principles and techniques used in bloodstain pattern analysis.

7. Microscopy

- Understand the principles and techniques used in microscopy.

8. Forensic Entomology

- Understand the principles and techniques used in forensic entomology.

9. Forensic Anthropology

- Understand the principles and techniques used in forensic anthropology.

10. Forensic Odontology

- Understand the principles and techniques used in forensic odontology.

11. Forensic Botany

- Understand the principles and techniques used in forensic botany.

12. Forensic Mycology

- Understand the principles and techniques used in forensic mycology.

13. Forensic Toxicology

- Understand the principles and techniques used in forensic toxicology.

18. Case Studies in Forensic Biology

- Apply the principles and techniques learned in the course to real-world case studies.

Practical Classes:

1. Collection and Preservation of Biological Evidence

- Develop skills in the proper collection and preservation of biological evidence.

2. DNA Extraction and Quantification

- Develop skills in DNA extraction and quantification.

3. DNA Amplification and Analysis

- Develop skills in DNA amplification and analysis.

4. Serological Testing

- Develop skills in serological testing.

5. Bloodstain Pattern Analysis

- Develop skills in bloodstain pattern analysis.

6. Microscopy

- Develop skills in microscopy.

7. Forensic Entomology

- Develop skills in forensic entomology.

8. Forensic Anthropology

- Develop skills in forensic anthropology.

9. Forensic Odontology

- Develop skills in forensic odontology.

10. Forensic Botany

- Develop skills in forensic botany.

11. Forensic Mycology

- Develop skills in forensic mycology.

17. Case Study Analysis

- Apply the principles and techniques learned in the course to real-world case studies.

References:

1. Butler, J. M. (2015). Fundamentals of forensic DNA typing. Academic Press.
2. Saferstein, R. (2018). Forensic science: From the crime scene to the crime lab. Pearson Education

5	Course title: Forensic Anthropology	Course Code: FRSC - 304

Overall Description and Aims:

Forensic anthropology is the study of human remains within a medico-legal context. This course in provides an introduction to the field of forensic anthropology. The course aims to develop a comprehensive understanding of the concepts, principles, and methods used in forensic anthropology, including the identification of human skeletal remains, interpretation of trauma and pathology, estimation of age and sex, and determination of ancestry. The course is designed to provide students with the knowledge and skills necessary to analyze and interpret forensic anthropological data and to apply this knowledge in a variety of forensic contexts.

Intended Learning Outcomes of Course:

Knowledge and Understanding:

- Understand the principles and methods of forensic anthropology
- Understand the anatomy and morphology of the human skeleton
- Understand the techniques used to estimate age, sex, and ancestry from skeletal remains
- Understand the interpretation of trauma and pathology on human remains

Intellectual Skills:

- Analyze and interpret forensic anthropological data
- Critically evaluate forensic anthropological methods and research
- Apply forensic anthropological knowledge to medico-legal contexts

Professional and Practical Skills:

- Demonstrate proficiency in the identification and analysis of human skeletal remains
- Apply forensic anthropological techniques to estimate age, sex, and ancestry from skeletal remains
- Interpret and report on the presence of trauma and pathology on human remains

General Transferable Skills:

- Develop critical thinking and problem-solving skills

- Develop research and analytical skills
- Develop communication and presentation skills

Course Topics and Objectives:

1. Introduction to Forensic Anthropology: Explain the principles and methods used in forensic anthropology
2. Human Osteology: Describe the anatomy and morphology of the human skeleton
3. Bone Growth and Development: Explain the processes of bone growth and development and their implications for age estimation
4. Dental Anthropology: Explain the principles and methods used in dental anthropology
5. Estimating Age from Skeletal Remains: Apply methods for estimating age from skeletal remains
6. Estimating Sex from Skeletal Remains: Apply methods for estimating sex from skeletal remains
7. Estimating Ancestry from Skeletal Remains: Apply methods for estimating ancestry from skeletal remains
8. Stature Estimation from Skeletal Remains: Apply methods for estimating stature from skeletal remains
9. Trauma Analysis: Interpret and report on the presence of trauma on skeletal remains
10. Pathology Analysis: Interpret and report on the presence of pathology on skeletal remains
11. Time Since Death: Explain the methods used to estimate time since death
12. Taphonomy: Describe the processes of decomposition and taphonomy and their implications for the analysis of skeletal remains
13. Mass Disasters: Describe the challenges and methods used in mass disaster victim identification
14. Forensic Facial Reconstruction: Explain the principles and methods used in forensic facial reconstruction
15. Forensic Archaeology: Describe the methods used in forensic archaeology and their implications for the analysis of skeletal remains
16. Human Rights and Forensic Anthropology: Describe the role of forensic anthropology in human rights investigations

Practical Classes and Objectives:

1. Introduction to Skeletal Anatomy: Identify and describe the major bones of the human skeleton
2. Osteometric Measurements: Measure and record osteometric data from skeletal elements
3. Age Estimation Techniques: Apply methods for estimating age
4. Sex Estimation Techniques: Apply methods for estimating sex from skeletal remains
5. Ancestry Estimation Techniques: Apply methods for estimating ancestry from skeletal remains
6. Stature Estimation Techniques: Apply methods for estimating stature from skeletal remains
7. Trauma Analysis: Interpret and report on the presence of trauma on skeletal remains
8. Pathology Analysis: Interpret and report on the presence of pathology on skeletal remains
9. Time Since Death: Apply methods for estimating time since death
10. Taphonomy Analysis: Analyze and interpret the effects of taphonomy on skeletal remains
11. Mass Disaster Victim Identification: Apply methods for the identification of mass disaster victims
12. Facial Reconstruction: Apply methods for the facial reconstruction of skeletal remains
13. Forensic Archaeology Techniques: Apply methods for the recovery and analysis of buried skeletal remains
14. Human Rights Investigations: Apply forensic anthropology techniques to human rights investigations
15. Case Studies: Analyze and interpret case studies in forensic anthropology

References:

1. Dirkmaat, D. C. (2018). A Companion to Forensic Anthropology. John Wiley & Sons.
2. Steadman, D. W. (2015). Hard Evidence: Case Studies in Forensic Anthropology. Prentice Hall.

6	Course title: Forensic Genetics	Course Code: FRSC - 305

Overall Description and Aims:

Forensic Genetics is a crucial and rapidly developing field that involves the use of genetic information and technologies in legal and criminal investigations. This course aims to provide students with a comprehensive understanding of the principles, methods, and applications of Forensic Genetics. The course will cover a wide range of topics, including basic genetics, DNA analysis techniques, forensic DNA databases, forensic statistics, and ethical and legal issues related to the use of genetic evidence in the criminal justice system. The course also aims to develop students' practical skills in DNA analysis and interpretation, as well as their professional and transferable skills in communication, critical thinking, and problem-solving.

Intended Learning Outcomes:

Knowledge and Understanding:

1. Demonstrate a comprehensive understanding of the principles of genetics and DNA analysis techniques.
2. Explain the relevance and applications of Forensic Genetics in the criminal justice system.
3. Analyze the statistical and ethical issues associated with forensic DNA databases and genetic evidence.

Intellectual Skills:

- Critically evaluate scientific evidence and apply scientific principles to forensic investigations.
- Analyze and interpret complex genetic data to support forensic investigations.
- Apply critical thinking and problem-solving skills to complex forensic genetic scenarios.

Professional and Practical Skills:

- Use laboratory techniques and equipment for DNA analysis and interpretation.
- Work effectively in a team and communicate scientific findings and conclusions effectively.
- Develop professional and ethical conduct when handling sensitive forensic evidence.

General Transferable Skills:

- Apply scientific and analytical skills to real-world problems and scenarios.
- Communicate effectively in written and oral forms to a range of audiences.
- Develop independent learning skills and the ability to work effectively under pressure.

Course Topics:

1. Introduction to Forensic Genetics: Define Forensic Genetics and explain its applications and limitations.
2. Basic Genetics: Understand the fundamental principles of genetics and inheritance.
3. DNA Analysis Techniques: Understand the principles and applications of various DNA analysis techniques.
4. DNA Extraction and Quantification: Perform DNA extraction and quantification from different types of samples.
5. DNA Profiling: Understand the principles and applications of DNA profiling techniques such as STR analysis.
6. Forensic DNA Databases: Understand the principles and applications of forensic DNA databases.
7. Interpretation of DNA Evidence: Understand the principles and methods of interpreting DNA evidence in forensic investigations.
8. Forensic Statistics: Understand the principles and applications of statistical analysis in forensic genetics.
9. DNA Evidence Admissibility: Understand the legal and ethical issues related to the admissibility of DNA evidence in court.
10. Forensic Genetics in Criminal Investigations: Understand the role and applications of Forensic Genetics in criminal investigations.
11. Forensic Genetics in Missing Persons and Disaster Victim Identification: Understand the principles and applications of Forensic Genetics in missing persons and disaster victim identification.
12. Forensic Genetics in Wildlife Forensics: Understand the principles and applications of Forensic Genetics in wildlife forensics.
13. Forensic Genetics in Historical and Archaeological Investigations: Understand the principles and applications of Forensic Genetics in historical and archaeological investigations.
14. Forensic Genetics in Medical Investigations: Understand the principles and applications of Forensic Genetics in medical investigations.

15. Mitochondrial DNA Analysis: Understand the principles and applications of mitochondrial DNA analysis in forensic investigations.
16. Y-Chromosome Analysis: Understand the principles and applications of Y-chromosome analysis in forensic investigations.
17. Genetic Genealogy: Understand the principles and applications of genetic genealogy in forensic investigations.
18. Emerging Technologies in Forensic Genetics: Understand the principles and applications of emerging technologies in forensic genetics.
19. Ethics and Legal Issues in Forensic Genetics: Understand the ethical and legal issues related to the use of genetic evidence in the criminal justice system.

Practical Classes:

1. DNA Extraction: Perform DNA extraction from different types of samples.
2. DNA Quantification: Perform DNA quantification using various methods.
3. PCR Amplification: Perform PCR amplification of DNA using different primers and protocols.
4. Gel Electrophoresis: Perform agarose gel electrophoresis to visualize PCR products.
5. DNA Sequencing: Perform DNA sequencing using Sanger sequencing and analyze sequencing data.
6. STR Analysis: Perform STR analysis using capillary electrophoresis and interpret STR profiles.
7. Mitochondrial DNA Analysis: Perform mitochondrial DNA analysis using PCR and sequencing.
8. Y-Chromosome Analysis: Perform Y-chromosome analysis using PCR and interpretation of Y-STR profiles.
9. Forensic DNA Databases: Use forensic DNA databases to search for and interpret DNA profiles.
10. DNA Evidence Interpretation: Interpret complex DNA evidence in a mock forensic investigation scenario.

References:

1. Butler, J. M. (2015). Forensic DNA typing: biology, technology, and genetics of STR markers. Academic Press.
2. Goodwin, W., Linacre, A., & Hadi, S. (2019). An introduction to forensic genetics. John Wiley & Sons.

7	Course title: Forensic Toxicology and Drug Analysis	Course Code: FRSC - 306

Overall Description and Aims:

Forensic toxicology and drug analysis is a vital part of the biomedical sciences that focuses on the detection and identification of drugs and poisons in biological samples. This undergraduate course is designed to provide students with a comprehensive understanding of the principles and practices of forensic toxicology and drug analysis. The course will cover a broad range of topics, including the pharmacokinetics and pharmacodynamics of drugs, analytical techniques used in forensic toxicology, drug screening and confirmation testing, interpretation of toxicological data, and the role of forensic toxicology in criminal investigations. The course aims to equip students with the knowledge and skills required to conduct forensic toxicology and drug analysis in a professional and ethical manner.

Intended Learning Outcomes of the Course: By the end of the course, students should have achieved the following learning outcomes:

Knowledge and Understanding:

- Understand the principles and concepts of forensic toxicology and drug analysis.
- Describe the pharmacokinetics and pharmacodynamics of drugs.
- Explain the principles and practices of analytical techniques used in forensic toxicology.
- Analyze and interpret toxicological data.
- Understand the role of forensic toxicology in criminal investigations.

Intellectual Skills:

- Critically evaluate analytical methods and data.
- Synthesize and interpret complex information related to forensic toxicology and drug analysis.
- Apply knowledge of forensic toxicology and drug analysis to solve problems.

Professional and Practical Skills:

- Perform basic laboratory techniques used in forensic toxicology and drug analysis.
- Understand the importance of quality assurance and control in forensic toxicology and drug analysis.

- Demonstrate professional and ethical conduct in conducting forensic toxicology and drug analysis.

General Transferable Skills:

- Communicate scientific information effectively.
- Work effectively in a team.
- Manage time and prioritize tasks.

Course Topics and Objectives:

1. Introduction to Forensic Toxicology Objective: Understand the principles and concepts of forensic toxicology.
2. Pharmacokinetics and Pharmacodynamics of Drugs Objective: Describe the absorption, distribution, metabolism, and excretion of drugs and their effects on the body.
3. Analytical Techniques Used in Forensic Toxicology Objective: Understand the principles and practices of analytical techniques used in forensic toxicology.
4. Gas Chromatography Objective: Describe the principles and applications of gas chromatography in forensic toxicology.
5. High-Performance Liquid Chromatography Objective: Describe the principles and applications of high-performance liquid chromatography in forensic toxicology.
6. Mass Spectrometry Objective: Understand the principles and applications of mass spectrometry in forensic toxicology.
7. Immunoassay Techniques Objective: Understand the principles and applications of immunoassay techniques in forensic toxicology.
8. Drug Screening Objective: Understand the principles and practices of drug screening in forensic toxicology.
9. Confirmation Testing Objective: Understand the principles and practices of confirmation testing in forensic toxicology.
10. Interpretation of Toxicological Data Objective: Analyze and interpret toxicological data.
11. Toxicology of Alcohol Objective: Understand the pharmacokinetics and pharmacodynamics of alcohol and its effects on the body.
12. Toxicology of Drugs of Abuse Objective: Understand the pharmacokinetics and pharmacodynamics of drugs of abuse and their effects on the body.
13. Forensic Toxicology in Traffic Accidents Objective: Understand the role of forensic toxicology in traffic accidents.

14. Forensic Toxicology in Criminal Investigations Objective: Understand the role of forensic toxicology in criminal investigations.
15. Forensic Toxicology in Postmortem Examinations Objective: Understand the role of forensic toxicology in postmortem examinations.
16. Forensic Toxicology and Workplace Drug Testing Objective: Understand the principles and practices of forensic toxicology in workplace drug testing.
17. Forensic Toxicology and Doping Control Objective: Understand the role of forensic toxicology in doping control.
18. Forensic Toxicology and Environmental Contamination Objective: Understand the role of forensic toxicology in environmental contamination.
19. Quality Assurance and Control in Forensic Toxicology Objective: Understand the importance of quality assurance and control in forensic toxicology.

Practical Classes and Objectives:

1. Introduction to Laboratory Safety and Basic Laboratory Techniques Objective: Understand the importance of laboratory safety and perform basic laboratory techniques used in forensic toxicology.
2. Preparation of Standards and Calibration Curves Objective: Understand the principles of calibration and perform the preparation of standards and calibration curves for analytical methods.
3. Extraction Techniques in Forensic Toxicology Objective: Understand the principles and practices of extraction techniques used in forensic toxicology and perform sample extraction.
4. Gas Chromatography Analysis Objective: Perform gas chromatography analysis of drugs and poisons in biological samples.
5. High-Performance Liquid Chromatography Analysis Objective: Perform high-performance liquid chromatography analysis of drugs and poisons in biological samples.
6. Mass Spectrometry Analysis Objective: Perform mass spectrometry analysis of drugs and poisons in biological samples.
7. Immunoassay Techniques in Forensic Toxicology Objective: Perform immunoassay techniques in forensic toxicology for screening of drugs in biological samples.
8. Confirmation Testing Techniques in Forensic Toxicology Objective: Perform confirmation testing techniques in forensic toxicology for identification and quantification of drugs in biological samples.

9. Interpretation of Toxicological Data Objective: Analyze and interpret toxicological data to determine the presence and concentration of drugs and poisons in biological samples.
10. Analysis of Alcohol in Biological Samples Objective: Perform analysis of alcohol in biological samples using gas chromatography and other techniques.
11. Analysis of Drugs of Abuse in Biological Samples Objective: Perform analysis of drugs of abuse in biological samples using gas chromatography, high-performance liquid chromatography, and other techniques.
12. Forensic Toxicology in Traffic Accidents Objective: Understand the role of forensic toxicology in traffic accidents and perform analysis of drugs and poisons in samples collected from traffic accident victims.
13. Forensic Toxicology in Criminal Investigations Objective: Understand the role of forensic toxicology in criminal investigations and perform analysis of drugs and poisons in samples collected from crime scenes and suspects.
14. Forensic Toxicology in Postmortem Examinations Objective: Understand the role of forensic toxicology in postmortem examinations and perform analysis of drugs and poisons in samples collected from deceased individuals.
15. Forensic Toxicology and Workplace Drug Testing Objective: Understand the principles and practices of forensic toxicology in workplace drug testing and perform analysis of drugs in biological samples collected from employees.
16. Forensic Toxicology and Doping Control Objective: Understand the role of forensic toxicology in doping control and perform analysis of drugs in biological samples collected from athletes.
17. Forensic Toxicology and Environmental Contamination Objective: Understand the role of forensic toxicology in environmental contamination and perform analysis of drugs and poisons in environmental samples.
18. Quality Assurance and Control in Forensic Toxicology Objective: Understand the importance of quality assurance and control in forensic toxicology and perform quality control procedures for analytical methods.
19. Report Writing and Presentation Objective: Communicate scientific information effectively by writing a scientific report and presenting findings to peers.

References:

1. Moffatt, A. C., & Osselton, M. D. (2013). Clarke's analysis of drugs and poisons. Pharmaceutical Press.
2. Jones, A. W. (2016). Forensic toxicology. Royal Society of Chemistry.

8	Course title: Instrumental Analysis	Course Code: FRSC - 307

Overall Description and Aims:

This course focuses on the use of analytical instruments and techniques in forensic investigations. This course aims to provide students with a comprehensive understanding of the analytical tools used in forensic investigations and their applications in different fields of forensic science. The course covers various analytical techniques such as chromatography, mass spectrometry, spectroscopy, and microscopy. The course also covers the legal and ethical aspects of forensic science and the role of forensic scientists in the criminal justice system.

Intended Learning Outcomes: Upon completion of this course, students should be able to demonstrate the following learning outcomes:

Knowledge and Understanding:

- Understand the principles of forensic instrumental analysis.
- Explain the applications of different analytical techniques in forensic investigations.
- Understand the legal and ethical aspects of forensic science.
- Explain the role of forensic scientists in the criminal justice system.

Intellectual Skills:

- Analyze and interpret data obtained from forensic analytical instruments.
- Evaluate the validity and reliability of forensic analytical results.
- Apply critical thinking to solve problems related to forensic instrumental analysis.
- Synthesize and communicate complex scientific information related to forensic investigations.

Professional and Practical Skills:

- Demonstrate practical skills in operating different analytical instruments.
- Apply the appropriate sample preparation techniques for different forensic samples.
- Follow laboratory safety protocols and procedures.
- Maintain accurate and detailed laboratory records.

General Transferable Skills:

- Work effectively in a team.
- Manage time efficiently.
- Demonstrate good communication skills.
- Apply scientific principles to real-life situations.

Course Topics:

1. Introduction to Forensic Instrumental Analysis

- Understand the importance of analytical instruments in forensic science
- Explain the role of forensic scientists in the criminal justice system

2. Chromatography Techniques

- Understand the principles of chromatography
- Explain the applications of gas and liquid chromatography in forensic science

3. Mass Spectrometry Techniques

- Understand the principles of mass spectrometry
- Explain the applications of mass spectrometry in forensic science

4. Spectroscopy Techniques

- Understand the principles of spectroscopy
- Explain the applications of infrared, ultraviolet-visible, and nuclear magnetic resonance spectroscopy in forensic science

5. Microscopy Techniques

- Understand the principles of microscopy
- Explain the applications of different microscopy techniques in forensic science

6. Legal and Ethical Aspects of Forensic Science

- Understand the legal and ethical considerations in forensic science
- Explain the importance of following ethical guidelines in forensic science

7. Forensic Sample Collection and Preservation

- Understand the importance of proper sample collection and preservation in forensic science

- Apply appropriate sample collection and preservation techniques for different types of forensic samples

8. Qualitative Analysis of Forensic Samples

- Understand the principles of qualitative analysis
- Apply different qualitative analysis techniques for forensic samples

9. Quantitative Analysis of Forensic Samples

- Understand the principles of quantitative analysis
- Apply different quantitative analysis techniques for forensic samples

10. Forensic Toxicology

- Understand the principles of forensic toxicology
- Explain the role of toxicology in forensic investigations

11. Forensic Anthropology

- Understand the principles of forensic anthropology
- Explain the role of anthropology in forensic investigations

12. Forensic Entomology

- Understand the principles of forensic entomology
- Explain the role of entomology in forensic investigations

13. Forensic Botany

- Understand the principles of forensic botany
- Explain the role of botany in forensic investigations

14. Forensic Serology

- Understand the principles of forensic serology
- Explain the role of serology in forensic investigations

15. Forensic DNA Analysis

- Understand the principles of forensic DNA analysis

Practical Classes and Objectives:

1. Introduction to Chromatography

- Understanding the principles of gas and liquid chromatography
- Developing practical skills in operating gas and liquid chromatography instruments

2. Chromatographic Separation Techniques

- Understanding the principles of chromatographic separation techniques
- Developing practical skills in performing chromatographic separations

3. Introduction to Mass Spectrometry

- Understanding the principles of mass spectrometry
- Developing practical skills in operating mass spectrometry instruments

4. Mass Spectrometric Identification Techniques

- Understanding the principles of mass spectrometric identification techniques
- Developing practical skills in performing mass spectrometric identification techniques

5. Introduction to Spectroscopy

- Understanding the principles of spectroscopy
- Developing practical skills in operating infrared and ultraviolet-visible spectroscopy instruments

6. Spectroscopy Techniques

- Understanding the principles of spectroscopic techniques
- Developing practical skills in performing infrared and ultraviolet-visible spectroscopic techniques

7. Introduction to Microscopy

- Understanding the principles of microscopy
- Developing practical skills in operating light and electron microscopy instruments

8. Microscopic Identification Techniques

- Understanding the principles of microscopic identification techniques
- Developing practical skills in performing microscopic identification techniques

9. Sample Preparation Techniques for Chromatography and Mass Spectrometry

- Understanding the principles of sample preparation techniques for chromatography and mass spectrometry
- Developing practical skills in performing sample preparation techniques for different types of forensic samples

10. Sample Preparation Techniques for Spectroscopy and Microscopy

- Understanding the principles of sample preparation techniques for spectroscopy and microscopy
- Developing practical skills in performing sample preparation techniques for different types of forensic samples

11. Analysis of Controlled Substances

- Understanding the principles of analyzing controlled substances
- Developing practical skills in identifying and analyzing controlled substances using chromatography and mass spectrometry techniques

12. Analysis of Forensic Toxicology Samples

- Understanding the principles of analyzing forensic toxicology samples
- Developing practical skills in identifying and analyzing drugs and other toxic compounds using chromatography and mass spectrometry techniques

13. Analysis of Forensic Biology Samples

- Understanding the principles of analyzing forensic biology samples
- Developing practical skills in identifying and analyzing biological evidence using spectroscopy and microscopy techniques

14. Analysis of Forensic Trace Evidence

- Understanding the principles of analyzing forensic trace evidence
- Developing practical skills in identifying and analyzing trace evidence using spectroscopy and microscopy techniques

15. Forensic Digital Analysis Techniques

- Understanding the principles of forensic digital analysis techniques
- Developing practical skills in acquiring, analyzing, and interpreting digital evidence

17. Interpretation of Analytical Results in Forensic Science

- Understanding the principles of interpreting analytical results in forensic science
- Developing practical skills in applying appropriate interpretation techniques to forensic analytical results

18. Writing Forensic Case Reports

- Understanding the principles of writing forensic case reports
- Developing practical skills in writing clear and concise forensic case reports

19. Laboratory Management and Accreditation

- Understanding the principles of laboratory management in forensic science
- Developing practical skills in implementing laboratory management and accreditation procedures in forensic science

Equipment used in Forensic analysis

Scanning Electron Microscope (SEM) with Energy Dispersive X- Ray Analyzer (EDX)
Gas Chromatograph coupled with Mass Spectrometer (GCMS)
Gas Chromatograph coupled with Mass Spectrometer and mass Spectrograph (GCMS-MS)
Raman spectrometer
Universal Testing Machine (UTM)
High Pressure Liquid Chromatograph (HPLC) with Diode Array Detector
High Performance Thin layer Chromatograph (HPTLC)
Gene Cycler/ PCR & Gel Documentation System
DNA Sequencer / STR Analyzer
Forensic Comparison Microscope
Forensic Computer Work Station with Software
Video Spectral Comparator (VSC 5000, VSC 6000)
Docucenter 3000, Docuexpert
X-Ray Fluorescence Spectrometer (XRF)

Digital Densitometer & Digital Flash Point System
Liquid Chromatography interfaced with Mass Spectrometry (LCMS)
Video Forensic Workstation
Computerized Speech Laboratory

References:

1. Saferstein, R. (2018). Forensic science: From the crime scene to the crime lab. Pearson Education.
2. Lee, H. C., & Harris, M. L. (Eds.). (2018). Handbook of forensic drug analysis. Academic Press.
3.
4. Government Of Assam, Home & Political/Directorate of Forensic science https://forensic.assam.gov.in/portlets/instruments-used- last accesed March6, 2023

9	Course title: Research Methodology and Data Analysis	Course Code: BMSC -301

Overall Description and Aims:

The course intends to provide students with an extensive comprehension of research methodologies and data analysis techniques applicable to various disciplines. Its goal is to equip students with the skills required to develop research proposals, conduct research, gather data, perform data analysis, and interpret results. Additionally, the course emphasizes improving students' critical thinking and problem-solving abilities. Specifically, the course aims to impart knowledge about research methodologies and data analysis techniques applicable to medical research, thereby enabling students to develop research proposals, conduct research, collect data, analyze data, and interpret results in the medical field.

Knowledge and Understanding:

- Understand the basic principles of research methodology in biomedical fields, including study design, sampling, data collection, and analysis
- Develop knowledge and understanding of the concepts and theories related to research methodology and data analysis in biomedical sciences
- Demonstrate intellectual skills in analyzing and evaluating research literature, formulating research questions and hypotheses, and selecting appropriate research methodologies
- Develop professional and practical skills in designing and conducting research projects, collecting and analyzing data, and presenting research findings
- Understand the principles of scientific writing and research communication in biomedical fields

Intellectual Skills:

- Develop critical thinking and problem-solving skills through analyzing and interpreting research data
- Develop the ability to formulate research questions, hypotheses, and objectives
- Develop the ability to design and implement research studies in biomedical fields
- Develop the ability to evaluate the strengths and limitations of different research methodologies in biomedical fields

Professional and Practical Skills:

- Develop the skills to effectively communicate research findings to a range of audiences
- Develop the skills to write scientific research proposals and manuscripts in biomedical fields
- Develop the skills to analyze and interpret research data using statistical software and other tools
- Develop the skills to manage and organize research data in biomedical fields

General Transferable Skills:

- Develop general transferable skills in critical thinking, problem-solving, communication, and teamwork
- Develop teamwork and collaboration skills through group projects and presentations
- Develop time management and organizational skills through planning and executing research projects
- Develop problem-solving and analytical skills that can be applied to a range of fields

Course Topics:

1. Introduction to Research
    - Understanding the concept of research
2. Research Methodology: An Introduction
    - Objectives of research
    - Types of research
    - Approaches to research
    - Significance of research
3. Reviewing the Literature
    - The functions of literature review in research
    - Conducting a literature search
    - Reviewing selected literature
    - Developing theoretical and conceptual frameworks

4. Writing Protocol

   - Precautions for writing research proposal
   - Identifying problems and limitations of the study
   - Setting a proposed time-frame for the project
   - Addressing ethical issues
   - Preventing plagiarism
   - Referencing and writing a bibliography

5. Formulating a Research Problem and Research Question

   - Identifying sources of research problems
   - Selecting a research problem
   - Steps in formulating a research problem
   - Developing research objectives

6. Ethics in Research
7. Introduction to Epidemiology

   - Understanding the concept of epidemiology

8. Measurement Tools in Epidemiology

   - Validity and reliability of measurement tools in epidemiology
   - Common types of measurement tools used in epidemiological studies (e.g., surveys, questionnaires, biomarkers)
   - Issues related to measurement error and bias in epidemiological studies

9. Descriptive Studies

   - Types of descriptive studies (e.g., cross-sectional, ecological)
   - Uses and limitations of descriptive studies in epidemiological research
   - Methods for analyzing and presenting descriptive data in epidemiological studies

10. Case-Control Studies

    - Basic principles and design of case-control studies
    - Sampling strategies for case-control studies
    - Strengths and weaknesses of case-control studies in epidemiological research

11. Cohort Studies

- Basic principles and design of cohort studies
- Types of cohorts (e.g., prospective, retrospective)
- Advantages and disadvantages of cohort studies in epidemiological research

12. Questionnaire Design

- Importance of questionnaire design in epidemiological research
- Common types of questions used in questionnaires
- Strategies for assessing the validity and reliability of questionnaires

13. Medical Reading and Writing

- Reading and interpreting medical literature
- Strategies for effective medical writing
- Ethical considerations in medical writing and publication

14. Structure of a Medical Research Paper

- Elements of a research paper (e.g., introduction, methods, results, discussion)
- Writing styles and formatting for medical research papers
- Tips for effective scientific writing and publication

15. Screening

- Principles of screening in epidemiology
- Types of screening tests and their characteristics (e.g., sensitivity, specificity)
- Evaluation of screening programs in epidemiology

16. Association and Causation

- Concepts of association and causation in epidemiology
- Criteria for establishing causality in epidemiological research
- Confounding and effect modification in epidemiological studies

17. Basic Concepts and Definitions in Statistics

- Types of variables in statistics (e.g., categorical, continuous)
- Measures of central tendency and variability

- Probability distributions and hypothesis testing in epidemiology

8. Selecting a Method of Data Collection

- Differences in methods of data collection in quantitative and qualitative research
- Collecting data using primary sources
- Observation
- Interviews

19. Descriptive Statistics

- Measures of central tendency
- Measures of variability
- Frequency distributions

20. Inferential Statistics and Significant Test

- Hypothesis testing
- Type I and Type II errors
- Confidence intervals

21. The Use of Excel and SPSS

- Data entry and cleaning
- Data manipulation and transformation
- Data visualization and presentation

22. Research Proposal Projects

- Identifying research gaps
- Formulating research questions and hypotheses
- Structuring a research proposal
- Designing a research methodology

Tutorial Classes:

1. Introduction to Research Methodology and Data Analysis course

- Objectives of the course
- Course requirements and expectations
- Overview of the course topics

2. Literature Search and Review

- Strategies for conducting a literature search
- Critical appraisal of research articles
- Synthesizing information from different sources

3. Writing a Research Proposal

- Components of a research proposal
- Tips for writing an effective proposal
- Ethical considerations in research proposal writing

4. Formulating a Research Question

- Importance of a research question
- Characteristics of a good research question
- Developing research objectives from research questions

5. Research Ethics

- Overview of ethical principles in research
- Ethical issues in biomedical research
- Ensuring ethical conduct in research

6. Descriptive Statistics

- Types of descriptive statistics
- Measures of central tendency
- Measures of variability

7. Inferential Statistics and Significance Testing

- Types of inferential statistics
- Hypothesis testing and p-values
- Understanding statistical significance

8. Epidemiology Concepts and Measurements

- Overview of epidemiology
- Types of epidemiological studies
- Epidemiological measures of disease frequency

9. Questionnaire Design

- Importance of questionnaire design in research
- Principles of questionnaire design
- Common pitfalls to avoid in questionnaire design

10. Research Proposal Presentations

- Tips for effective research proposal presentations
- Peer-review of research proposals
- Feedback and discussion of research proposals

Tutorial Class:

1. Students will be introduced to the course and its objectives, as well as expectations for the course.
2. Students will learn how to conduct a literature search, critically appraise research articles, and synthesize information from different sources.
3. Students will understand the components of a research proposal, how to write an effective proposal, and ethical considerations in research proposal writing.
4. Students will learn how to formulate a research question, characteristics of a good research question, and how to develop research objectives from research questions.
5. Students will understand the ethical principles in research, ethical issues in biomedical research, and how to ensure ethical conduct in research.
6. Students will learn the different types of descriptive statistics, measures of central tendency, and measures of variability.
7. Students will understand the types of inferential statistics, hypothesis testing and p-values, and the concept of statistical significance.
8. Students will learn about epidemiology, types of epidemiological studies, and epidemiological measures of disease frequency.
9. Students will understand the importance of questionnaire design in research, principles of questionnaire design, and common pitfalls to avoid.
10. Students will learn how to present a research proposal effectively, peer-review other students' research proposals, and receive feedback on their own research proposals.

References:

1. Dawson, C. (2009). Introduction to research methods: A practical guide for anyone undertaking a research project. How To Books Ltd.
2. Gliner, J. A., Morgan, G. A., & Leech, N. L. (2011). Research methods in applied settings: An integrated approach to design and analysis. Routledge.
3. Kumar, R. (2014). Research Methodology: A Step-by-Step Guide for Beginners. Sage Publications.

Department of Forensic Sciences

Proposed Syllabi for all Courses in the Fourth Year

Prepared by

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Syllabus of Fourth Year Courses

1	Course title: Biomedical Ethics and Scientific Integrity	Course Code: BMSC-401

Overall Description and Aims:

The undergraduate course in Biomedical Ethics and Scientific Integrity is designed to provide students with a comprehensive understanding of the ethical issues that arise in biomedical research and practice, as well as the importance of scientific integrity in the field. The course will explore a range of ethical frameworks and principles, and apply them to real-world scenarios in order to develop critical thinking skills and promote ethical decision-making.

Aims of the Course:

1. To introduce students to the fundamental principles of biomedical ethics and scientific integrity, and the importance of these principles in the biomedical sciences.
2. To develop students' critical thinking skills, and their ability to analyze complex ethical issues that arise in biomedical research and practice.
3. To promote ethical decision-making skills in students, and to provide them with the tools necessary to navigate ethical dilemmas that may arise in their future careers in the biomedical sciences.

Intended Learning Outcomes:

By the end of this course, students should be able to:

Knowledge and Understanding:

- Demonstrate a broad knowledge of the fundamental principles of biomedical ethics and scientific integrity.
- Describe the ethical frameworks and principles that are commonly used in biomedical research and practice.
- Analyze and evaluate ethical issues that arise in biomedical research and practice, using a range of ethical frameworks and principles.

Intellectual Skills:

1. Critically analyze and evaluate complex ethical issues that arise in biomedical research and practice.
2. Develop and present well-reasoned arguments to support ethical decision-making.

Professional and Practical Skills:

- Apply ethical frameworks and principles to real-world scenarios in the biomedical sciences.
- Demonstrate effective communication skills in discussing ethical issues with colleagues and other stakeholders in the field.

Course topics:

1: Introduction to Biomedical Ethics and Scientific Integrity

- Overview of the course goals, expectations, and assignments
- Introduction to ethical principles and theories in biomedical research and clinical practice
- Importance of maintaining scientific integrity in research

2: Autonomy and Informed Consent

- Explanation of the principle of autonomy and its role in healthcare decision-making
- Overview of informed consent and its requirements for ensuring patient understanding and choice

3: Beneficence and Non-Maleficence

- Discussion of the ethical principles of doing good (beneficence) and avoiding harm (non-maleficence)
- Case studies and scenarios exploring the ethical balancing of these principles in clinical practice and research

4: Justice and Fairness

- Introduction to the principle of justice and its application in healthcare and biomedical research
- Exploration of the concept of distributive justice and its implications for healthcare resource allocation

5: Confidentiality and Privacy

- Overview of the legal and ethical requirements for protecting patient information
- Discussion of the consequences of breaching confidentiality and privacy in healthcare and biomedical research

6: End-of-Life Issues

- Explanation of the ethical issues surrounding end-of-life care, including euthanasia and palliative care
- Discussion of advance directives and their role in promoting patient autonomy in end-of-life decision-making

8: Animal Research Ethics

- Exploration of the ethical issues involved in using animals in biomedical research
- Introduction to the principles of animal research ethics, including the 3Rs (replace, reduce, refine) and the role of animal care and use committees (ACUCs)

9: Ethics of Genetic Testing and Gene Editing

- Discussion of the ethical issues involved in genetic testing and gene editing, including the potential benefits and risks of these technologies
- Exploration of the ethical considerations involved in using gene editing technology

10: Clinical Trials

- Overview of the ethical issues involved in conducting clinical trials, including the principles of informed consent and the use of placebos
- Exploration of the selection of study participants and other ethical considerations in clinical trial design

11: Organ Donation and Transplantation

- Introduction to the ethical issues involved in organ donation and transplantation

- Discussion of the allocation of organs, the ethics of living organ donation, and the use of genetic testing in donor selection

12: Public Health Ethics

- Introduction to the ethical issues involved in public health practice and policy, such as vaccination programs and health emergency responses
- Discussion of the ethical principles of autonomy, beneficence, non-maleficence, and justice in public health decision-making

13: Reproductive Ethics

- Exploration of the ethical issues involved in reproductive health and technology, such as contraception, abortion, and in vitro fertilization (IVF)
- Discussion of the ethical considerations involved in the use of reproductive technologies, including the selection of embryos and the use of donor gametes

14: Disability Ethics

- Introduction to the ethical issues involved in the diagnosis, treatment, and care of people with disabilities
- Discussion of the ethical principles of respect for persons, beneficence, and justice in disability ethics

15: End-of-Life Ethics and Decision-Making

- Exploration of the ethical issues involved in end-of-life decision-making, including the withdrawal of life-sustaining treatment and the use of palliative care
- Discussion of the ethical considerations involved in advance care planning and end-of-life decision-making

16: Technology and Privacy Ethics

- Exploration of the ethical issues involved in the use of technology in healthcare, including electronic health records and telemedicine
- Discussion of the ethical considerations involved in the use of personal data and privacy protection in the context of technology in healthcare

17: Ethics of Innovation and Entrepreneurship in Biomedicine

- Exploration of the ethical issues involved in innovation and entrepreneurship in biomedicine, including intellectual property, conflicts of interest, and the potential impact on patient care
- Discussion of the ethical considerations involved in the translation of research and development into clinical practice and commercial applications.

18: Introduction to Scientific Integrity

- Definition and importance of scientific integrity
- Historical cases of scientific misconduct and their impact on scientific research

19: Research Design and Data Collection

- Ethical considerations in research design, such as informed consent, study design, and data collection methods
- Data management, data sharing, and data ownership

20: Data Analysis and Interpretation

- Ethical considerations in data analysis and interpretation, such as statistical significance, data manipulation, and data fabrication
- Responsible reporting of research findings

21: Authorship and Publication

- Ethical considerations in authorship, such as authorship criteria, conflicts of interest, and ghostwriting
- Ethical considerations in publication, such as peer review, editorial policies, and plagiarism

22: Collaboration and Mentoring

- Ethical considerations in scientific collaboration, such as authorship credit, data sharing, and communication
- Ethical considerations in mentoring, such as supervision, training, and responsible conduct of research

23: Conflicts of Interest and Professional Responsibility

- Types of conflicts of interest and their impact on scientific integrity

- Ethical responsibilities of researchers, such as reporting of conflicts of interest and ethical violations

24: Scientific Integrity and Research Misconduct

- Explanation of the principles of scientific integrity and the consequences of research misconduct
- Definition and types of research misconduct
- Ethical considerations in whistleblowing, such as reporting mechanisms, protection of whistleblowers, and ethical considerations in the reporting process
- Discussion of the different forms of research misconduct and their impact on the individual researcher and the scientific community

25: Scientific Integrity and Society

- The role of scientific integrity in society, such as trust in science, funding of research, and public perception of scientific research
- Scientific integrity in the context of emerging fields and technologies

26: Research Ethics

- Overview of the principles of research ethics, including respect for persons, beneficence, and justice
- Discussion of the role of institutional review boards (IRBs) in protecting research participants

27: International Perspectives on Scientific Integrity

- Comparison of scientific integrity standards across countries and cultures
- Ethical considerations in international collaborations and research projects

References:

1. Beauchamp, T.L. and Childress, J.F., Principles of Biomedical Ethics, 8th ed. New York: Oxford University Press, 2019.
2. National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. On Being a Scientist: A Guide to Responsible Conduct in Research, 3rd ed. Washington, DC: The National Academies Press, 2009.

2	Course title: Forensic Investigation of Mass Fatalities	Course Code: FRSC - 401

Overall Description and Aims:

The course is designed to provide students with a comprehensive understanding of the process and techniques involved in the forensic investigation of mass fatalities. The course aims to impart knowledge and skills necessary for students to investigate mass fatalities, identify the causes of death, and provide evidence for legal and humanitarian purposes. The course will equip students with the ability to apply scientific techniques in a forensic investigation setting and handle large-scale disasters professionally.

Intended Learning Outcomes:

Upon completion of the course, students will be able to:

- Demonstrate knowledge and understanding of the forensic investigation process, its role in mass fatalities and legal proceedings, and the techniques and methods used to investigate and analyze mass fatalities.
- Develop intellectual skills in critical thinking, problem-solving, and analytical reasoning to assess and evaluate the evidence collected from a mass fatality.
- Develop professional and practical skills in team-work, leadership, and communication to effectively manage a mass fatality situation.
- Develop transferable skills such as information gathering, report writing, and effective communication in oral and written formats.

Knowledge and Understanding:

- Understand the history of mass fatalities, disasters, and their forensic investigation.
- Understand the roles and responsibilities of forensic investigators and other stakeholders in a mass fatality investigation.
- Understand the legal aspects of forensic investigation, including the admissibility of evidence, expert testimony, and court procedures.
- Understand the basic anatomy and physiology of the human body, including the causes of death and pathological changes.
- Understand the techniques used in forensic anthropology, odontology, entomology, and toxicology to identify victims and determine causes of death.
- Understand the basic principles of disaster management and coordination.

Intellectual Skills:

- Develop critical thinking skills to analyze and evaluate evidence.
- Develop problem-solving skills to identify and address issues related to mass fatality investigations.
- Develop analytical reasoning skills to assess the reliability and accuracy of evidence collected from the scene.

Professional and Practical Skills:

- Develop teamwork and leadership skills to effectively manage a mass fatality situation.
- Develop communication skills to liaise with other professionals, stakeholders, and the media.
- Develop organizational skills to manage the logistics and resources required for a mass fatality investigation.

General Transferable Skills:

- Develop information gathering and research skills to obtain reliable and relevant data for a mass fatality investigation.
- Develop report writing skills to document the findings of a mass fatality investigation.
- Develop effective oral and written communication skills to convey complex ideas and findings to different audiences.

Course Topics:

1. Introduction to Forensic Investigation of Mass Fatalities
2. History of Mass Fatalities and Disaster Management
3. Legal Aspects of Mass Fatality Investigations
4. Roles and Responsibilities of Forensic Investigators
5. Human Anatomy and Physiology
6. Causes of Death
7. Postmortem Changes
8. Death Scene Investigation
9. Forensic Anthropology
10. Forensic Odontology
11. Forensic Entomology
12. Forensic Toxicology
13. DNA Analysis and Identification
14. Disaster Management and Coordination

15. Victim Identification
16. Evidence Collection and Preservation
17. Evidence Analysis and Interpretation
18. Reporting and Presentation of Findings
19. Case Studies in Mass Fatality Investigations

Objectives for each topic:

1. Explain the importance of forensic investigation in mass fatalities, its purpose and scope.
2. Analyze the history of mass fatalities and disaster management to identify the impact on forensic investigation techniques.
3. Evaluate the legal aspects of forensic investigation in mass fatalities, including the admissibility of evidence, expert testimony, and court procedures.
4. Describe the roles and responsibilities of forensic investigators, including those of other stakeholders, in a mass fatality investigation.
5. Explain the basic anatomy and physiology of the human body, including the causes of death and pathological changes. 6. Analyze the various causes of death, their pathological changes and how to identify them.

7. Evaluate the postmortem changes that occur after death and their effect on forensic investigation.
8. Assess the importance of death scene investigation, including the identification of the scene, collection of evidence and preservation of evidence.
9. Analyze the techniques used in forensic anthropology, including the identification of human remains, estimating time since death and determining the cause of death.
10. Evaluate the techniques used in forensic odontology, including the identification of human remains, estimating time since death and determining the cause of death.
11. Analyze the techniques used in forensic entomology, including the identification of insect species, estimating time since death and determining the cause of death.
12. Evaluate the techniques used in forensic toxicology, including the identification and quantification of toxic substances in the body and their effect on the cause of death.
13. Analyze the DNA analysis techniques used in the identification of victims and the importance of DNA in forensic investigation.

14. Evaluate the basic principles of disaster management and coordination, including the identification of different phases of disaster management and their importance in forensic investigation.
15. Assess the importance of victim identification in mass fatality investigations, including the techniques used and the ethical considerations involved.
16. Evaluate the evidence collection and preservation techniques used in mass fatality investigations, including the importance of chain of custody and the proper collection and preservation of evidence.
17. Analyze the techniques used in evidence analysis and interpretation, including the use of statistical analysis to support findings.
18. Develop skills in report writing and the presentation of findings, including the use of appropriate terminology and the structure of a forensic investigation report.
19. Analyze case studies in mass fatality investigations to understand the application of forensic investigation techniques in real-life situations.

Practical Classes and Objectives for each:

1. Death Scene Investigation - Students will learn how to identify the scene, collect and preserve evidence and document the scene.
2. Postmortem Changes - Students will learn how to recognize and interpret postmortem changes to determine the time since death.
3. Forensic Anthropology - Students will learn how to identify human remains, estimate the time since death and determine the cause of death.
4. Forensic Odontology - Students will learn how to identify human remains, estimate the time since death and determine the cause of death.
5. Forensic Entomology - Students will learn how to identify insect species, estimate the time since death and determine the cause of death.
6. Forensic Toxicology - Students will learn how to identify and quantify toxic substances in the body and their effect on the cause of death.
7. DNA Analysis and Identification - Students will learn how to collect and analyze DNA samples for identification.
8. Disaster Management and Coordination - Students will learn how to manage a mass fatality situation, including the coordination of resources and stakeholders.
9. Victim Identification - Students will learn the techniques used in victim identification, including DNA and dental analysis.
10. Evidence Collection and Preservation - Students will learn how to collect and preserve evidence, including the importance of chain of custody and the proper collection and preservation of evidence.

11. Evidence Analysis and Interpretation - Students will learn how to analyze and interpret evidence, including the use of statistical analysis to support findings.
12. Reporting and Presentation of Findings - Students will learn how to write and present a forensic investigation report, including the use of appropriate terminology and structure.
13. Case Study Analysis - Students will analyze case studies in mass fatality investigations to understand the application of forensic investigation techniques in real-life situations.
14. Teamwork and Communication - Students will work in teams to manage a simulated mass fatality situation, including communication and coordination with other stakeholders.

References:

1. Saferstein, R. (2018). Forensic Science: From the Crime Scene to the Crime Lab. Pearson Education Limited.
2. Busuttil, A., & Busuttil, J. (2017). Forensic Medicine: Clinical and Pathological Aspects. CRC Press.

3	Course title: Forensic Medicine	Course Code: FRSC - 402

Overall Description and Aims:

Forensic Medicine is a branch of medicine that applies medical knowledge and skills to legal matters. The undergraduate course in Forensic Medicine in biomedical sciences is designed to provide students with a comprehensive understanding of the application of medical knowledge and skills in legal contexts. This course aims to enable students to gain a solid foundation in forensic medicine, including the identification of the cause, manner, and time of death, as well as the interpretation of medical evidence in legal proceedings. The course also aims to develop students' intellectual, practical, and professional skills, enabling them to critically evaluate evidence, communicate effectively, and work in multidisciplinary teams.

Intended Learning Outcomes of the Course:

Upon completion of the course, students should be able to demonstrate:

Knowledge and Understanding:

- A comprehensive understanding of the principles and practice of forensic medicine.
- An understanding of the legal and ethical framework governing the practice of forensic medicine.
- Knowledge of the key concepts in pathology, toxicology, and genetics relevant to forensic medicine.

Intellectual Skills:

- The ability to critically evaluate medical evidence and draw conclusions.
- The ability to apply medical knowledge to legal contexts.
- The ability to communicate effectively, both orally and in writing.

Professional and Practical Skills:

- The ability to work effectively in multidisciplinary teams.
- An understanding of the roles and responsibilities of forensic medical practitioners.
- An ability to manage and document forensic medical examinations and procedures.

General Transferable Skills:

- The ability to manage time effectively and work independently.
- An ability to work to deadlines and manage competing priorities.
- An ability to identify and solve problems.
- An ability to think creatively and apply knowledge in novel contexts.

Course topics:

Introduction:

- Historical development of forensic medicine
- Scope and applications of forensic medicine

Medicolegal Autopsy:

- Differences between medicolegal and clinical autopsies
- Role of the forensic pathologist in medicolegal autopsies

Death and Its Cause:

- Types of death (natural, accidental, suicidal, homicidal)
- The role of forensic medicine in determining cause of death

Postmortem Changes:

- Stages of postmortem changes (autolysis, putrefaction, etc.)
- Factors affecting the rate of postmortem changes

Mechanical Injuries:

- Types of mechanical injuries (blunt force, sharp force, etc.)
- Forensic examination and interpretation of mechanical injuries

Regional Injuries:

- Injuries to specific regions of the body (head, neck, chest, etc.)
- Forensic examination and interpretation of regional injuries

Medicolegal Aspects of Wounds:

- Types of wounds (incised, puncture, etc.)
- Determining the manner of injury (self-inflicted, inflicted by another, etc.)

Thermal Deaths:

- Types of thermal deaths (burns, scalds, etc.)
- Forensic examination and interpretation of thermal injuries

Starvation:

- Forensic examination and interpretation of cases involving malnutrition and starvation
- Determining the cause and manner of death in cases of starvation

Mechanical Asphyxia:

- Types of mechanical asphyxia (hanging, strangulation, etc.)
- Forensic examination and interpretation of mechanical asphyxia cases

Anaesthetic and Operative Deaths:

- Forensic examination and interpretation of deaths related to anesthesia or surgical procedures
- Determining the cause and manner of death in anaesthetic and operative deaths

Impotence and Sterility:

- Forensic examination and interpretation of cases involving impotence and sterility
- Determining the cause and manner of impotence and sterility

Virginity, Pregnancy and Delivery:

- Forensic examination and interpretation of cases involving virginity, pregnancy, and delivery
- Determining the cause and manner of injuries related to pregnancy and delivery

Abortion:

- Forensic examination and interpretation of cases involving abortion

- Determining the cause and manner of death in cases of illegal abortions

Sexual Offences:

- Forensic examination and interpretation of cases involving sexual offences
- Collecting and preserving evidence in cases of sexual offences

Infant Deaths:

- Forensic examination and interpretation of cases involving infant deaths
- Determining the cause and manner of death in cases of sudden infant death syndrome (SIDS)

Blood Stains:

- Collection and analysis of blood stains as forensic evidence
- Determining the type and origin of blood stains

Artefacts:

- Forensic examination and interpretation of artefacts (objects found at a crime scene)
- Collecting and preserving artefacts as evidence

Agricultural Poisons:

- Types of agricultural poisons and their effects
- Forensic examination and interpretation of cases involving agricultural poisons

Corrosive Poisons:

- Types of corrosive poisons and their effects
- Forensic examination and interpretation of cases involving corrosive poisons

Metallic Poisons:

- Types of metallic poisons and their effects
- Forensic examination and interpretation of cases involving metallic poisons

Inorganic Irritant Poisons:

- Types of inorganic irritant poisons and their effects

- Forensic examination and interpretation of cases involving inorganic irritant poisons

Organic Irritant Poisons:

- Types of organic irritant poisons and their effects
- Forensic examination and interpretation of cases involving organic irritant poisons

CNS Depressants:

- Types of CNS depressants and their effects
- Forensic examination and interpretation of cases involving CNS depressants

Psychotropic Drugs:

- Types of psychotropic drugs and their effects
- Forensic examination and interpretation of cases involving psychotropic drugs

Deliriant Poisons:

- Types of deliriant poisons and their effects
- Forensic examination and interpretation of cases involving deliriant poisons

Drug Dependence and Abuse:

- Forensic examination and interpretation of cases involving drug dependence and abuse
- The role of forensic medicine in drug addiction treatment and prevention

Spinal Poisons:

- Types of spinal poisons and their effects
- Forensic examination and interpretation of cases involving spinal poisons

Cardiac Poisons:

- Types of cardiac poisons and their effects
- Forensic examination and interpretation of cases involving cardiac poisons

Asphyxiants:

- Types of asphyxiants and their effects
- Forensic examination and interpretation of cases involving asphyxiants

Food Poisoning:

- Types of food poisoning and their effects
- Forensic examination and interpretation of cases involving food poisoning

1. Payne-James, J., Busuttil, A., & Smock, W. (Eds.). (2011). Forensic Medicine: Clinical and Pathological Aspects. Greenwich Medical Media.
2. Reddy, K.S. Narayan and Murty, O.P. (2017). The Essentials of Forensic Medicine and Toxicology. Jaypee Brothers Medical.

4	Course title: Infection Control and Safety	Course Code: BMSC-402

Overall Description and Aims:

The course is designed to provide students with an understanding of the principles of infection control and safety in healthcare settings. The course aims to equip students with the knowledge and skills necessary to prevent and control infections, protect themselves and patients from hazards, and promote safe and healthy work environments. The course will cover a range of topics, including infection control practices, occupational health and safety, emergency preparedness, and risk assessment.

Intended Learning Outcomes:

Knowledge and Understanding:

- Demonstrate a comprehensive understanding of the principles of infection control and safety.
- Identify the different types of infections and their modes of transmission.
- Explain the role of healthcare professionals in preventing and controlling infections.
- Describe the principles of occupational health and safety in healthcare settings.
- Understand the principles of emergency preparedness in healthcare settings.

Intellectual Skills:

- Evaluate the effectiveness of infection control practices in healthcare settings.
- Analyze and assess the risks associated with healthcare practices.
- Develop strategies to prevent and control infections in healthcare settings.
- Develop emergency preparedness plans for healthcare settings.
- Interpret and analyze infection control policies and procedures.

Professional and Practical Skills:

- Apply infection control practices in healthcare settings.
- Use appropriate personal protective equipment in healthcare settings.
- Conduct risk assessments in healthcare settings.
- Develop and implement infection control policies and procedures.
- Communicate effectively with colleagues and patients about infection control practices.

General Transferable Skills:

- Develop critical thinking skills.
- Work effectively in teams.
- Develop problem-solving skills.
- Improve time management skills.
- Develop effective communication skills.

Course Topics and Objectives:

1. Introduction to Infection Control and Safety

- Define the principles of infection control and safety in healthcare settings.
- Identify the different types of infections and their modes of transmission.
- Explain the role of healthcare professionals in preventing and controlling infections.

2. Infection Control Practices

- Describe the principles of infection control practices in healthcare settings.
- Identify the different types of infection control practices.
- Evaluate the effectiveness of infection control practices in healthcare settings.

3. Personal Protective Equipment (PPE)

- Define the principles of personal protective equipment in healthcare settings.
- Identify the different types of PPE.
- Use appropriate PPE in healthcare settings.

4. Hand Hygiene

- Define the principles of hand hygiene in healthcare settings.
- Identify the different types of hand hygiene.
- Apply appropriate hand hygiene techniques in healthcare settings.

5. Environmental Cleaning and Disinfection

- Define the principles of environmental cleaning and disinfection in healthcare settings.
- Identify the different types of environmental cleaning and disinfection.

- Apply appropriate environmental cleaning and disinfection techniques in healthcare settings.

6. Sterilization and Disinfection of Medical Devices

- Define the principles of sterilization and disinfection of medical devices.
- Identify the different types of sterilization and disinfection techniques.
- Apply appropriate sterilization and disinfection techniques in healthcare settings.

7. Infection Prevention and Control in Special Situations

- Define the principles of infection prevention and control in special situations.
- Identify the different types of special situations.
- Apply appropriate infection prevention and control measures in special situations.

8. Occupational Health and Safety

- Describe the principles of occupational health and safety in healthcare settings.
- Identify the different types of occupational hazards in healthcare settings.
- Develop strategies to prevent and control occupational hazards in healthcare settings.

9. Emergency Preparedness

- Define the principles of emergency preparedness in healthcare settings.
- Identify the different types of emergencies in healthcare settings.
- Develop emergency preparedness plans for healthcare settings.

10. Risk Assessment

- Define the principles of risk assessment in healthcare settings.
- Identify the different types of risks in healthcare settings.
- Conduct risk assessments in healthcare settings.

11. Healthcare-Associated Infections (HAIs)

- Define healthcare-associated infections (HAIs).
- Identify the different types of HAIs.
- Develop strategies to prevent and control HAIs in healthcare settings.

12. Outbreak Management

- Define outbreak management in healthcare settings.
- Identify the different types of outbreaks.
- Develop outbreak management plans for healthcare settings.

13. Communicable Diseases

- Define communicable diseases.
- Identify the different types of communicable diseases.
- Develop strategies to prevent and control communicable diseases in healthcare settings.

14. Immunization and Vaccination

- Define the principles of immunization and vaccination.
- Identify the different types of vaccines.
- Develop immunization and vaccination plans for healthcare settings.

15. Infectious Waste Management

- Define the principles of infectious waste management.
- Identify the different types of infectious waste.
- Develop infectious waste management plans for healthcare settings.

16. Emerging Infectious Diseases

- Define emerging infectious diseases.
- Identify the different types of emerging infectious diseases.
- Develop strategies to prevent and control emerging infectious diseases in healthcare settings.

17. Infection Control Policies and Procedures

- Define infection control policies and procedures.
- Identify the different types of infection control policies and procedures.
- Develop and implement infection control policies and procedures in healthcare settings.

18. Infection Control Auditing and Surveillance

- Define infection control auditing and surveillance.

- Identify the different types of infection control audits and surveillance.
- Develop infection control auditing and surveillance plans for healthcare settings.

21. Management of Infectious Diseases

- Define the principles of management of infectious diseases.
- Identify the different types of infectious diseases.
- Develop management plans for infectious diseases in healthcare settings.

22. Infection Control in the Community

- Define the principles of infection control in the community.
- Identify the different types of community infection control.
- Develop strategies to prevent and control community infections.

23. Infection Control in Outpatient Settings

- Define the principles of infection control in outpatient settings.
- Identify the different types of outpatient infection control.
- Develop infection control plans for outpatient settings.

24. Infection Control in Long-Term Care Facilities

- Define the principles of infection control in long-term care facilities.
- Identify the different types of infection control in long-term care facilities.
- Develop infection control plans for long-term care facilities.

25. Infection Control in the Laboratory

- Define the principles of infection control in the laboratory.
- Identify the different types of infection control in the laboratory.
- Develop infection control plans for laboratory settings.

27. Infection Control Program Evaluation

- Define infection control program evaluation.
- Identify the different types of infection control program evaluation.
- Develop infection control program evaluation plans.

28. Infection Control in a Pandemic

- Define the principles of infection control in a pandemic.
- Identify the different types of pandemics.
- Develop infection control plans for pandemics.

References:

1. Weber, D. J., & Rutala, W. A. (2013). Understanding and preventing transmission of healthcare-associated infections. Infection Control & Hospital Epidemiology, 34(8), 781-786.
2. Zelman, M., & Milne-Zelman, C. (2017). Infection Control and Safety (1st ed.). Jones & Bartlett Learning
3. Centers for Disease Control and Prevention (CDC). (2009). Guidelines for infection control in healthcare personnel, 1998. Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC). MMWR. Recommendations and reports: Morbidity and mortality weekly report. Recommendations and reports, 48(RR-6), 1-37.

5	Course title: Libyan Law and Trial Process	Course Code: FRSC - 403

Overall Description and Aims:

The Libyan Law and Trial Process course for undergraduate biomedical sciences students aims to provide an understanding of the legal system in Libya and its application to the field of Forensic sciences. The course will cover the basics of the Libyan legal system, the trial process, and ethical considerations in Forensic Sciences. It will also focus on practical skills such as legal writing and document preparation.

Intended Learning Outcomes: By the end of the course, students will be able to:

- Demonstrate an understanding of the Libyan legal system and its application to biomedical sciences
- Analyze and evaluate legal issues related to Forensic Sciences
- Develop critical thinking and problem-solving skills in the context of legal issues
- Demonstrate proficiency in legal writing and document preparation
- Apply ethical principles to Forensic Sciences.

Knowledge and Understanding:

- Libyan legal system and trial process
- Legal issues related to Forensic Sciences
- Medical malpractice law
- Liability in Forensic Sciences
- Intellectual property law

Intellectual Skills:

- Analytical thinking and reasoning
- Critical thinking and problem-solving
- Synthesis and evaluation of legal arguments
- Effective communication and legal writing

Professional and Practical Skills:

- Legal document preparation
- Trial advocacy skills
- Legal research skills
- Ethical considerations in Forensic Sciences
- Teamwork and collaboration

General Transferable Skills:

- Time management and organization
- Interpersonal skills
- Information literacy
- Ethical decision making

Course Topics and Objectives:

1. Introduction to Libyan legal system: Understand the structure and functions of the Libyan legal system.
2. Basic legal concepts: Understand key legal concepts including liability, negligence, and duty of care.
3. Medical malpractice: Understand the legal principles and case law relating to medical malpractice.
4. Ethics in Forensic Sciences: Develop an understanding of ethical principles and their application to Forensic Sciences.
5. Liability in Forensic Sciences: Understand the principles of liability and negligence in Forensic Sciences.
6. Intellectual property law: Understand the principles of intellectual property law as they relate to Forensic Sciences.
7. Introduction to the trial process: Understand the basic steps in the trial process.
8. Evidence: Understand the types of evidence and their admissibility in court.
9. Trial advocacy skills: Develop skills in trial advocacy, including opening and closing statements, direct and cross-examination, and argumentation.
10. Expert witnesses: Understand the role and qualifications of expert witnesses.
11. Sentencing and appeals: Understand the principles of sentencing and the appellate process.
12. Legal writing: Develop skills in legal writing, including drafting pleadings and legal briefs.
13. Legal research: Develop skills in legal research, including using legal databases and case law.
14. Judicial opinions: Understand the structure and content of judicial opinions.
15. Contract law: Understand the principles of contract law and their application to Forensic Sciences.

References:

1. United Nations Development Programme. (2012). Strengthening the Rule of Law in Libya: A Country Assessment Report. Retrieved from

https://www.undp.org/content/dam/libya/docs/Strengthening%20the%20Rule%20of%20Law%20in%20Libya%20-%20A%20Country%20Assessment%20Report.pdf. March 5, 2023

2. World Health Organization. (2016). Ethical Considerations for Forensic Sciences in Libya. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/204502/WHO-EM/EDB/2016.1_eng.pdf?sequence=1&isAllowed=y accessed: March 5, 2023

6	Course title: Presentation and Quality of Evidence	Course Code: FRSC - 404

Overall Description and Aims:

The undergraduate course in Presentation and Quality of Evidence aims to equip students with the knowledge and skills necessary to effectively present forensic evidence in a court of law. The course focuses on the principles of communication and the use of evidence to support legal arguments. The course aims to prepare students for careers in forensic science, law enforcement, and related fields.

Intended Learning Outcomes: Upon completing the course, students will have developed knowledge and understanding of the following:

- The principles of effective communication and its importance in forensic science
- The different types of evidence and their reliability in legal cases
- The legal framework for the presentation of forensic evidence in court
- The principles of evidence collection, preservation, and analysis
- The role of expert witnesses in the presentation of forensic evidence
- The ethical and professional responsibilities of forensic practitioners

following intellectual skills:

- Critical thinking and analysis in evaluating forensic evidence
- Problem-solving skills in identifying and interpreting evidence
- Research skills in investigating forensic cases

professional and practical skills:

- Effective communication skills for presenting forensic evidence in legal cases
- Attention to detail in collecting and analyzing evidence
- Interpersonal skills for working with colleagues and legal professionals

General transferable skills:

- Time management.
- Teamwork/
- Ethical decision-making.

Course Topics:

1. Communication in Forensic Science

- Oral Communication
- Written Communication

2. Types of Evidence

- Physical Evidence
- Testimonial Evidence

3. Reliability of Evidence

- Validity
- Reliability

4. Legal Framework for Presentation of Evidence

- Admissibility of Evidence
- Rules of Evidence

5. Evidence Collection

- Collection of Physical Evidence
- Collection of Testimonial Evidence

6. Evidence Preservation

- Preservation of Physical Evidence
- Preservation of Testimonial Evidence

7. Evidence Analysis

- Physical Analysis
- Testimonial Analysis

8. Role of Expert Witnesses

- Qualifications of Expert Witnesses
- Presentation of Expert Testimony

9. Ethical and Professional Responsibilities

- Ethical Considerations
- Professional Standards

10. Presenting Evidence in Court

- Direct Examination
- Cross-Examination

Practical Classes:

1. Oral Presentation Skills
2. Written Communication Skills
3. Evidence Collection Techniques
4. Evidence Preservation Techniques
5. Physical Evidence Analysis Techniques
6. Testimonial Evidence Analysis Techniques
7. Expert Witness Qualification and Preparation
8. Direct Examination Techniques
9. Cross-Examination Techniques
10. Mock Trial

References:

1. Jackson, A. (2011). Expert Evidence. Oxford University Press.
2. O'Hara, P. (2012). Forensic Science Evidence: Can the Law Keep Up With Science? Emerald Group Publishing.

7	Course title: Seminar In Forensic Sciences	Course Code: FRSC - 408

Overall Description and Aims:

The seminar focuses on the principles and practices of forensic science. The aim of the seminar is to provide students with an opportunity to develop their knowledge and understanding of forensic science, as well as to develop their intellectual, professional, and practical skills. Through this seminar, students will learn about the role of forensic science in the criminal justice system, the techniques and procedures used in forensic investigations, and the ethical and legal considerations involved in forensic work. The seminar will be delivered through a combination of lectures, workshops, and practical sessions. Students will be expected to actively participate in class discussions, prepare and present research papers, and engage in group work. Overall, organizing and conducting a seminar by students is a great way to learn about new topics, share knowledge and ideas, and improve public speaking and presentation skills.

Intended Learning Outcomes:

At the end of the seminar, students will be able to:

Knowledge and Understanding:

- Describe the role of forensic science in the criminal justice system
- Understand the basic principles of forensic investigations
- Identify the different types of evidence that can be used in forensic investigations
- Understand the ethical and legal considerations involved in forensic work

Intellectual Skills:

- Analyze and interpret forensic evidence
- Evaluate the reliability and validity of forensic evidence
- Apply critical thinking to forensic investigations

Professional and Practical Skills:

- Demonstrate the ability to collect and analyze forensic evidence
- Follow established protocols and procedures for forensic investigations
- Communicate forensic findings effectively to different audiences

General Transferable Skills:

- Develop effective research and presentation skills
- Collaborate effectively with others
- Demonstrate problem-solving skills

Suggested topics:

1. Advances in forensic DNA analysis
2. Crime scene investigation techniques and protocols
3. Forensic pathology: principles and practice
4. Forensic toxicology and drug analysis
5. Digital forensics and cybercrime investigations
6. Forensic psychology: application in criminal investigations
7. Forensic anthropology and identification of human remains
8. Bloodstain pattern analysis in crime scene investigations
9. Ballistics and firearms identification
10. Forensic accounting and financial fraud investigations
11. Forensic odontology and bite mark analysis
12. Forensic entomology and the estimation of time since death
13. Arson and explosion investigations
14. Forensic linguistics and authorship analysis
15. Forensic anthropology and identification of mass graves
16. Forensic botany and the analysis of plant evidence in criminal investigations
17. The use of DNA databases in forensic investigations
18. Forensic facial reconstruction and identification
19. The role of the forensic scientist in the criminal justice system
20. The ethics of forensic science and expert testimony in court.

Typical steps for organizing and conducting a seminar by students:

1. Topic Selection: Choose a topic that is relevant and interesting to the audience. It is important to select a topic that is within the scope of the course or program of study.
2. Identify the Speakers: Identify one or more speakers who are knowledgeable and experienced in the chosen topic. Speakers can be fellow students, faculty members, or industry professionals.

3. Set a Date and Venue: Choose a date and a venue that is suitable for the seminar. The venue should be able to accommodate the number of participants and should have the necessary audio-visual equipment.
4. Promote the Seminar: Advertise the seminar through various channels such as social media, email, and flyers to attract attendees.
5. Seminar Preparation: The speakers should prepare their presentations or discussions ahead of time, making sure to cover all the important points of the topic. It is also important to practice the presentation to ensure a smooth delivery.
6. Conducting the Seminar: The seminar can be conducted in several formats, such as a lecture, a panel discussion, or a workshop. The speakers should present their topics and allow time for questions and discussions from the audience.
7. Evaluation: After the seminar, students are evaluated based on the quality of their research, the clarity and effectiveness of their presentation, their ability to engage with the

8	Course title: Thesis	Course Code: FRSC - 409

Overall Description:

The thesis is a research project that aims to investigate a specific topic in the field of forensic science. The student will carry out a thorough investigation using scientific methods and techniques to collect, analyze, and interpret data relevant to their research question. The thesis will be a written report that outlines the findings of the study and presents conclusions and recommendations based on the results.

Aims:

The main aim of the thesis is to provide students with an opportunity to develop and demonstrate their research skills and critical thinking abilities in the field of forensic science. The thesis will enable students to apply the knowledge and skills they have acquired throughout their course of study to a real-world research problem. It will also help students to develop skills in scientific writing, data analysis, and interpretation, which are essential for success in their future careers.

Intended Learning Outcomes:

Upon completion of the Forensic Sciences undergraduate course in Biomedical Sciences, students should be able to:

Knowledge and Understanding:

- Demonstrate a thorough understanding of the fundamental principles and theories of forensic science.
- Understand the role of forensic science in the criminal justice system and its importance in legal proceedings.
- Identify and evaluate different forensic techniques and their applications in forensic investigations.

Intellectual Skills:

- Apply scientific principles and methods to investigate forensic problems.
- Analyze and interpret complex data sets to draw valid conclusions.
- Critically evaluate scientific research and literature related to forensic science.

Professional and Practical Skills:

- Apply forensic techniques and procedures in a laboratory setting.
- Develop and implement experimental protocols to investigate forensic problems.
- Communicate scientific results effectively through written reports and presentations.

General Transferable Skills:

- Demonstrate effective time management skills and the ability to work independently.
- Develop team-working skills and the ability to collaborate effectively with others.
- Develop problem-solving and analytical thinking skills applicable to a range of scientific disciplines.

Suggested topics:

1. The reliability and validity of forensic evidence in criminal investigations
2. Investigating the accuracy of forensic DNA profiling methods
3. The effectiveness of gunshot residue analysis in forensic investigations
4. The use of forensic entomology in determining time of death in homicide cases
5. The role of forensic anthropology in identifying human remains
6. Investigating the accuracy of forensic toxicology in drug-related deaths
7. The effectiveness of forensic odontology in identifying bite marks and dental evidence
8. Investigating the use of facial recognition technology in forensic investigations
9. Investigating the effectiveness of forensic geology in soil and sediment analysis
10. The application of isotopic analysis in forensic investigations

How thesis is performed in forensic sciences:

The thesis is a self-directed research project, and the specific topic will be determined by the student in consultation with a supervisor. Performing a thesis in forensic sciences involves working closely with an advisor or supervisor throughout the entire research process. Here are the typical steps for performing a thesis in forensic sciences:

1. Topic Selection: Work with your supervisor to select a research topic that is relevant to the field of forensic sciences and that is of interest to you.
2. Literature Review: Conduct a thorough literature review with guidance from your supervisor to gain an understanding of the current state of knowledge on the topic. This will help you identify gaps in the literature that your research can address.
3. Research Design: Work with your supervisor to develop a research design that will address the research question or hypothesis. Your supervisor can help you select appropriate research methods, such as DNA analysis or toxicology, and determine the sample size and data analysis techniques.
4. Data Collection: Collect data with guidance from your supervisor using the research methods identified in the research design. Your supervisor can provide guidance on collecting biological samples, such as blood or tissue samples, or conducting experiments in the laboratory.
5. Data Analysis: Analyze the data with guidance from your supervisor using appropriate statistical methods. Your supervisor can help you determine whether your research hypothesis has been supported or not.
6. Results and Discussion: Work with your supervisor to present your findings in a clear and concise manner, and discuss the implications of your research in the context of the current state of knowledge.
7. Conclusion and Recommendations: Summarize your findings with guidance from your supervisor and provide recommendations for future research in the field of forensic sciences.
8. Thesis Defense: Work with your supervisor to prepare for your thesis defense in front of a thesis committee, which will typically include faculty members and experts in the field of forensic sciences.

9	Course title: Workplace Experience	Course Code: FRSC - 410

Overall Aims of Course:

The overall aim of this course is to provide students with a comprehensive understanding of the forensic sciences and their role in the criminal justice system. Students will learn about the scientific methods used to investigate crimes and analyze evidence, and gain practical experience in laboratory techniques and procedures.

Intended Learning Outcomes of Course: By the end of the course, students should be able to:

- Understand the role of forensic sciences in the criminal justice system
- Apply scientific methods and techniques to the analysis of evidence
- Interpret forensic evidence and present findings in a clear and concise manner
- Evaluate the reliability and validity of forensic evidence
- Understand the ethical and legal issues related to forensic sciences

Intellectual Skills:

- Critical thinking and analysis
- Problem-solving and decision-making
- Scientific reasoning and inquiry
- Attention to detail and accuracy
- Interpretation and evaluation of data

Professional and Practical Skills:

- Laboratory techniques and procedures
- Evidence collection and preservation
- Data analysis and interpretation
- Report writing and presentation skills
- Legal and ethical considerations in forensic sciences

General Transferable Skills:

- Communication skills (written and oral)
- Time management and organization
- Teamwork and collaboration
- Information literacy and research skills

- Independent learning and self-motivation

Suggested Training Schedule (10 hours per week for 24 weeks):

Week 1-2: Introduction to Forensic Sciences (2 hours)

- History of forensic sciences
- Types of forensic evidence
- Role of forensic scientists in criminal investigations
- Ethical and legal considerations in forensic sciences

Week 3-4: Crime Scene Investigation I (2 hours)

- Principles of crime scene investigation
- Evidence collection and preservation
- Chain of custody and documentation
- Crime scene reconstruction

Week 5-6: Crime Scene Investigation II (2 hours)

- Forensic photography
- Fingerprints and other impression evidence
- Bloodstain pattern analysis
- DNA evidence collection and analysis

Week 7-8: Forensic Toxicology (2 hours)

- Introduction to toxicology
- Drugs of abuse and their effects
- Alcohol and its effects on the body
- Poisoning and overdose

Week 9-10: Trace Evidence Analysis (2 hours)

- Introduction to trace evidence
- Hair and fiber analysis
- Glass and paint analysis
- Soil and mineral analysis

Week 11-12: Firearms and Toolmark Analysis (2 hours)

- Firearms identification and ballistics
- Toolmark identification
- GSR analysis
- Distance determination

Week 13-14: Forensic Anthropology (2 hours)

- Introduction to forensic anthropology
- Skeletal analysis and identification
- Age and sex determination
- Trauma and injury analysis

Week 15-16: Forensic Entomology (2 hours)

- Introduction to forensic entomology
- Insects as evidence in criminal investigations
- Life cycles of insects and their application in forensic sciences
- Case studies in forensic entomology

Week 17-18: Digital Forensics (2 hours)

- Introduction to digital forensics
- Computer and mobile device forensics
- Network forensics
- Ethical and legal considerations in digital forensics

Week 19-20: Forensic Psychology (2 hours)

- Introduction to forensic psychology
- Eyewitness testimony and identification
- Psychological profiling
- Competency and criminal responsibility evaluations

Week 21-22: Forensic Document Examination (2 hours)

- Introduction to forensic document examination
- Handwriting analysis and identification
- Document authentication and forgery detection
- Paper and ink analysis

Week 23-24: Professional Competencies in Forensic Sciences (2 hours)

- Ethics and professionalism in forensic sciences
- Courtroom testimony and expert witness qualifications
- Quality control and assurance in forensic sciences
- Career paths and opportunities in forensic sciences

Method of assessment

The following are some methods of assessment that could be used for the Workplace Experience:

1. Practical assessments: Students can be assessed on their ability to perform laboratory procedures, identify cells and tissues, and interpret laboratory results.
2. Written assignments: Assignments such as essays, case studies, or laboratory reports can be used to assess students' understanding of the course content and their ability to apply it in practice.
3. Presentations: Students can be asked to deliver presentations on a particular topic related to the course. This will help to assess their research and communication skills.
4. Examinations: A formal examination can be conducted at the end of the course to assess the students' knowledge and understanding of the course content.
5. Laboratory journal: Students can be asked to keep a journal of their laboratory work, including their observations, analysis, and conclusions. This will help to assess their practical skills, as well as their ability to record and analyze data.
6. Peer review: Students can be asked to review each other's work, such as laboratory reports or presentations. This will help to develop their critical thinking and analysis skills.
7. Feedback and reflection: Throughout the course, students can be encouraged to reflect on their learning and provide feedback on the course content and teaching methods. This will help to assess the effectiveness of the course and identify areas for improvement.

FORMS

University of Benghazi

Faculty of Biomedical Sciences
Department of Forensic Sciences

Student Seminar Evaluation Form

Academic year: 20___/20___

Evaluator's Name:			Credentials:	❒ MSc	❒ PhD
Evaluator's phone #:	09	Email:			
Student's Name		Student ID:			
Seminar Title:					
Location:		Date:	D	M	Y

Instructions: Please rate the student's performance in each category below:

Presentation Skills (25%)

- Did the presenter maintain eye contact with the audience? ____/5
- Was the presenter's voice clear and audible? ____/5
- Did the presenter use appropriate language and terminology? ____/5
- Did the presenter engage the audience effectively? ____/5

Overall score: [ ]

Content (25%)

- Did the presenter demonstrate a clear understanding of the topic? ____/5
- Was the information presented accurate and up-to-date? ____/5
- Did the presenter provide sufficient depth of understanding? ____/5
- Did the presenter effectively apply relevant concepts? ____/5

Overall score: [ ]

Critical Thinking (15%)

- Did the presenter demonstrate critical thinking skills in analyzing the information? ___/5
- Did the presenter make connections to related topics? ____/5
- Did the presenter offer unique insights or perspectives? ____/5

Overall score: [ ]

Organization and Clarity (15%)

- Was the presentation well-organized and logically sequenced? ____/5
- Were the explanations clear and easy to understand? ____/5
- Did the presenter effectively use visual aids? ____/5

Overall score: [ ]

Time Management (10%)

- Did the presenter complete the presentation within the allotted time frame? __/7.5
- Did the presenter effectively pace the presentation? ____/7.5

Overall score: [ ]

Student Seminar Evaluation Form

Question and Answer Session (10%)
Did the presenter effectively respond to questions from the audience? ____/7.5
Did the presenter demonstrate depth and accuracy in their answers? ____/7.5
Overall Evaluation:
How effective was the presentation overall? [ ] Very effective [ ] Somewhat effective [ ] Not effective
What were the strengths of the presentation?
What were the areas that need improvement?

Overall Score: (Out of 100) _____
Comments: (optional):

Evaluator's Signature:		**Date:**	D	M	Y

Department Head Signature:		**Date:**	D	M	Y

University of Benghazi
Faculty of Biomedical Sciences
Department of Forensic Sciences

خاص بالقسم:
موافقة ❒
رفض ❒

نموذج مقترح مشروع تخرج _____20/_____20

فردي ❒	جماعي ❒		

بيانات الطالب

ر.م	الاسم	الرقم الدراسي	رقم الهاتف	التوقيع
1				
2				
3				
4				
5				

بيانات المشرف

الاسم	الجهة التي يعمل بها	رقم الهاتف	المؤهل العلمي	
			❒ ماجستير	❒ دكتوراة

البريد الالكتروني:	
عنوان المشروع:	
.....	
.....	
كلمات مفتاحية:	

ملاحظة:

- **كل طالب مسجل بالسنة الدراسية الرابعة مطالب بتقديم أطروحة لبحث مكتوبة بطريقة علمية وأكاديمية بالإضافة الى تقديم عرض تقديمي خاص بالبحث لغرض مناقشة المشروع وتقييمه.**
- **يجب على كل طالب تعبئة هذا النموذج متضمنا توقيعه والمشرف الخاص به ومن ثم يسلم الى منسق المشاريع بالقسم.**
- **يجب ان يكون المشرف متحصلا على درجة علمية (ماجستير او دكتوراه).**
- **في حالة المشاريع الفردية (عنوان البحث خاص بطالب واحد فقط) يجب على الطالب ان ينجز كتابة كامل الاطروحة. اما في حالة العمل كفريق فكل طالب ملزم ان يشارك بشكل متساوي في انجاز الاطروحة.**
- **يجب على كل مشرف تعبئة نموذج التقرير الشهري لأداء تقييم كل طالب ونسبة ما تم إنجازه بمشروع التخرج وإرساله الى القسم المختص (سيتم تزويد المشرف بعنوان البريد الالكتروني لاحقا).**

الصفة	التوقيع	التاريخ		
		ي	ش	س
المشرف				
منسق المشاريع بالقسم				
اعتماد رئيس القسم				

University of Benghazi
Faculty of Biomedical Sciences
Department of Forensic Sciences

Undergraduate Thesis Student Progress Form

Academic year: 20____/20____

Meeting number ( )

Thesis Supervisor:		Credentials:	❒ MSc	❒ PhD
Student Name		Student ID:		
Thesis Title:				

Progress Overview:

Please provide a brief summary of the progress you have made since the last progress meeting

Tasks Completed:

1	Data Collection	❒ Yes	❒ No ▸	
2	Statistical Analysis	❒ Yes	❒ No ▸	
3	Writing: Abstract	❒ Yes	❒ No ▸	
4	Writing: Introduction	❒ Yes	❒ No ▸	
5	Writing: Literature Review	❒ Yes	❒ No ▸	
6	Writing: Methodology	❒ Yes	❒ No ▸	
7	Writing: Results	❒ Yes	❒ No ▸	
8	Writing: Discussion	❒ Yes	❒ No ▸	
9	Writing: Conclusion	❒ Yes	❒ No ▸	
10	Editing and Revision	❒ Yes	❒ No ▸	

Tasks in Progress: List any tasks that you are currently working on**.**

Challenges: List any challenges or obstacles that you have encountered since the last progress meeting, eg: Difficulty obtaining data from some sources or Issues with statistical software

University of Benghazi
Faculty of Biomedical Sciences
Department of Forensic Sciences

Undergraduate Thesis Student Progress Form

Upcoming Deadlines: List any upcoming deadlines that you need to meet.
Deadline for submission of first draft: _____/_____/20___
Deadline for submission of final draft: _____/_____/20___

Thesis Supervisor Comments:
Student Comments:

Thesis Supervisor Signature:		**Date:**	D	M	Y

Student Signature:		**Date:**	D	M	Y

Department Head Signature:		**Date:**	D	M	Y

University of Benghazi

Faculty of Biomedical Sciences
Department of Forensic Sciences

Thesis Defense Evaluation Form

Academic year: 20___/20___

Evaluator's Name:			Credentials:	❒ MSc	❒ PhD
Evaluator's phone #:	09	Email:			
Student's Name		Student ID:			
Thesis Title:					
Location:		Date:	D	M	Y

Instructions: Please rate the student's performance in each category below:

❒ Poor (0-59%)	❒ Fair (60-69%)	❒ Good (70-89%)	❒ Excellent (90-100%)

Presentation (10%)

- Did the student maintain eye contact with the audience? ____/2.5
- Was the student's voice clear and audible? ____/2.5
- Did the student use appropriate language and terminology? ____/2.5
- Did the student engage the audience effectively? ____/2.5

Overall score: [ ]

Content (40%)

- Did the student provide a clear and concise statement of the research problem or question? ____/8
- Were the research methods appropriate and well-described? ____/8
- Did the student provide a thorough and accurate literature review? ____/8
- Were the results presented clearly and accurately? ____/8
- Were the conclusions supported by the data? ____/8

Overall score: [ ]

Critical Thinking and Analysis (30%)

- Did the student demonstrate a critical analysis of the research problem? ____/7.5
- Did the student show an understanding of the broader context of the research? ____/7.5
- Did the student present a unique contribution to the field of study? ____/7.5
  ❒ Yes ❒ No
- Did the student provide a well-supported argument? ____/7.5
- Did the student demonstrate a critical analysis of the research problem? ____/7.5

Overall score: [ ]

University of Benghazi
Faculty of Biomedical Sciences
Department of Forensic Sciences

Thesis Defense Evaluation Form

Defense and Response (20%)
Did the student respond effectively to questions from the audience? ____/5
Did the student demonstrate a clear understanding of the research problem, methods, results, and conclusions? ____/5
Did the student show a willingness to engage in critical dialogue? ____/5
Overall score: [ ]
Overall Evaluation: [10%]
How effective was the thesis defense overall? ____/5 [ ] Very effective [ ] Somewhat effective [ ] Not effective
What were the strengths of the defense? ____/2.5
What were the areas that need improvement? ____/2.5
Overall score: [ ]

Overall Score: (Out of 100) _____
Comments: (optional):

Evaluator's Signature:		**Date:**	D	M	Y

Department Head Signature:		**Date:**	D	M	Y

University of Benghazi
Faculty of Biomedical Sciences
Department of Forensic Sciences

Thesis Evaluation Form

Academic year: 20____/20____

Evaluator's Name:			Credentials:	❒ MSc	❒ PhD
Evaluator's phone #:	09	Email:			
Student's Name		Student ID:			
Thesis Title:					

Instructions: Please rate the student's performance in each category below:			
❒ Poor (0-59%)	❒ Fair (60-69%)	❒ Good (70-89%)	❒ Excellent (90-100%)

Thesis Content (40%)
Does the thesis provide a clear and concise statement of the research problem or question? ___ /10
Are the research methods appropriate and well-described? ___ /10
Does the thesis provide a thorough and accurate literature review? ___ /10
Are the results presented clearly and accurately? ___ /10
Are the conclusions supported by the data? ___ /10
Overall score: [ ]
Critical Thinking and Analysis (30%)
Does the thesis demonstrate a critical analysis of the research problem? ___/7.5
Does the thesis show an understanding of the broader context of the research? ___/7.5
Does the thesis present a unique contribution to the field of study? ___/7.5
Does the thesis provide a well-supported argument? ___/7.5
Overall score: [ ]

Writing Style and Clarity (20%)
Is the writing clear and well-organized? ___/5
Does the thesis follow appropriate grammar and syntax rules? ___/5
Is the language appropriate for the academic audience? ___/5
Does the thesis use appropriate formatting and citation style? ___/5
Overall score: [ ]

Thesis Evaluation Form

Overall Evaluation: [10%]
How effective is the thesis in communicating the research problem, methods, results, and conclusions? ___/5 [ ] Very effective [ ] Somewhat effective [ ] Not effective
What were the strengths of the thesis? ___/2.5
What were the areas that need improvement? ___/2.5
Overall score: [ ]

Overall Score: (Out of 100) _____
Comments: (optional):

Evaluator's Signature:		**Date:**	D	M	Y

Department Head Signature:		**Date:**	D	M	Y

University of Benghazi
Faculty of Biomedical Sciences
Department of Forensic Sciences

Student Performance Evaluation Form for Workplace Experience

Academic year: 20____/20____

Training Location:		Date:	D	M	Y
Instructor Name:		Credentials:	❒ BSc	❒ MSc	❒ PhD
Instructor phone #:	09	Email:			
Student Name		Student ID:			

Instructions: Please rate the student's performance in each category below by selecting the appropriate response.

❒ Poor (0-59%)	❒ Fair (60-69%)	❒ Good (70-89%)	❒ Excellent (90-100%)

Category 1: Attendance and Participation (20%)	
	Attended classes regularly and on time: [ ]
	Actively participated in discussions and group activities: [ ]
	Engaged in self-directed learning and demonstrated a desire to learn: [ ]
	Overall score: [ ]
Category 2: Knowledge and Understanding (30%)	
	Demonstrated understanding of concepts and theories presented in class: [ ]
	Applied knowledge to complete assignments and exams: [ ]
	Showed evidence of critical thinking and problem-solving skills: [ ]
	Overall score: [ ]
Category 3: Technical Skills (30%)	
	Demonstrated competency in technical skills: [ ]
	Properly used laboratory equipment and followed safety protocols: [ ]
	Completed laboratory work with accuracy and precision: [ ]
Category 4: Professionalism (20%)	
	Demonstrated professional behavior and attitude towards classmates and instructor: [ ]
	Communicated effectively and respectfully with classmates and instructor: [ ]
	Showed initiative in completing assignments and participating in group work: [ ]
	Overall score: [ ]
Overall performance in the program: [ ]	
Additional Comments:	

Instructor Signature:		**Date:**	D	M	Y
Department Head Signature:		**Date:**	D	M	Y

University of Benghazi

Faculty of Biomedical Sciences
Department of Forensic Sciences

Evaluation Form for Undergraduate Course

Academic year: 20____/20____

Dear Student,

Please take a few minutes to complete the following evaluation form. Your feedback is important to us as we strive to continuously improve the quality of our courses.

Course Title:	**Course Code:**

1	**How would you rate the overall quality of the course?**				
	❒ Poor	❒ Fair	❒ Good	❒ Very Good	❒Excellent
2	**How well did the course meet your expectations?**				
	❒ Not at all	❒ Somewhat	❒ Neutral	❒ Very well	❒ Extremely well
3	**Which topics in the course did you find most interesting?**				
4	**Which topics in the course did you find least interesting?**				
5	**Were the course materials (syllabus, textbook, readings, etc.) clear and easy to understand?**				
	❒ Strongly Disagree	❒ Disagree	❒ Neutral	❒ Agree	❒ Strongly Agree
6	**Was the pace of the course appropriate?**				
	❒ Too slow	❒ Somewhat slow	❒ Appropriate	❒Somewhat fast	❒ Too fast
7	**Was the course well-structured and organized?**				
	❒ Poorly structured & organized	❒ Somewhat poorly structured & organized	❒ Neutral	❒ Well-structured & organized	❒ Extremely well-structured & organized
8	**Did you feel that the instructor was knowledgeable and engaging?**				
	❒ Strongly Disagree	❒ Disagree	❒ Neutral	❒ Agree	❒ Strongly Agree
9	**Were the assignments and exams helpful in reinforcing your knowledge and skills?**				
	❒ Not at all helpful	❒Somewhat helpful	❒ Neutral	❒ Very helpful	❒ Extremely helpful
10	**How would you rate the feedback and support provided by the instructor?**				
	❒ Poor	❒ Fair	❒ Good	❒ Very Good	❒Excellent
11	**What suggestions do you have for improving the course in the future?**				
	Thank you for your participation and feedback.				

University of Benghazi

Faculty of Biomedical Sciences
Department of Forensic Sciences

Evaluation Form for Workplace Experience

Academic year: 20____/20____

Dear Student,

Please take a few minutes to complete the following evaluation form. Your feedback is important to us as we strive to continuously improve the quality of our training programs.

Course Title:	**Course Code:**

1	**How would you rate the overall quality of the** training **program ?**				
	❒ Poor	❒ Fair	❒ Good	❒ Very Good	❒Excellent
2	**How well did the program meet your expectations?**				
	❒ Not at all	❒ Somewhat	❒ Neutral	❒ Very well	❒ Extremely well
3	**Which topics in the program did you find most interesting?**				
4	**Which topics in the program did you find least interesting?**				
5	**Were the course materials (handouts, presentation, practical, etc.) clear and easy to understand?**				
	❒ Strongly Disagree	❒ Disagree	❒ Neutral	❒ Agree	❒ Strongly Agree
6	**Was the pace of the program appropriate?**				
	❒ Too slow	❒ Somewhat slow	❒ Appropriate	❒Somewhat fast	❒ Too fast
7	**Was the program well-structured and organized?**				
	❒ Poorly structured & organized	❒ Somewhat poorly structured & organized	❒ Neutral	❒ Well-structured & organized	❒ Extremely well-structured & organized
8	**Did you feel that the instructor was knowledgeable and engaging?**				
	❒ Strongly Disagree	❒ Disagree	❒ Neutral	❒ Agree	❒ Strongly Agree
9	**Were the practical assignments helpful in reinforcing your knowledge and skills?**				
	❒ Not at all helpful	❒Somewhat helpful	❒ Neutral	❒ Very helpful	❒ Extremely helpful
10	**How would you rate the facilities and equipment provided for the program?**				
	❒ Poor	❒ Fair	❒ Good	❒ Very Good	❒Excellent
11	**What suggestions do you have for improving the program in the future?**				
	Thank you for your participation and feedback.				

Print title her

Academic year: 20____/20____