Department of Medical Laboratory 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.

www.bmtuob.edu.ly
info.bioMedScis@uob.edu.ly
+218.61.223.0200
بنغازي.ليبيا

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

www.bmt.uob.edu.ly
info.bioMedScis@uob.edu.ly
+218.61.223.0200
بنغازي.ليبيا

Table of content:

الرؤية والرسالة والأهداف لقسم علوم المختبرات الطبية

الرؤية:

ن يكون برنامج علوم المختبرات الطبية بكلية العلوم الطبية الحيوية رائدًا على المستوى المحلي والعالمي في إعداد خريجين مؤهلين بشكل ممتاز ومجهزين بالمعرفة والمهارات اللازمة لتلبية احتياجات سوق العمل في مجال المختبرات الطبية والمساهمة في التطوير والابتكار في هذا المجال.

الرسالة:

يهدف برنامج علوم المختبرات الطبية إلى توفير تعليم عالي الجودة وتدريب عملي متخصص في مجال المختبرات الطبية. يتم تدريس الطلاب في مجموعة متنوعة من الموضوعات، بما في ذلك الكيمياء الحيوية والميكروبيولوجيا والتحليلات الطبية وغيرها، كما يتم توفير فرص للتعلم العملي في المختبرات المجهزة بالكامل.

الأهداف:

1. **تزويد الطلاب بالمعرفة والمهارات اللازمة للعمل كمختصين في مجال المختبرات الطبية.**
2. **توفير فرص للتعلم العملي والتدريب العملي في المختبرات المجهزة بالكامل.**
3. **تطوير قدرات الطلاب في البحث والتطوير في مجال المختبرات الطبية.**
4. **توفير المساعدة والدعم اللازمين للطلاب للحصول على شهادات اعتماد معترف بها في مجال المختبرات الطبية.**
5. **تشجيع التعاون والتفاعل مع المجتمع المحلي والمؤسسات الصحية المختلفة للمساهمة في التطوير والابتكار في مجال المختبرات الطبية.**

Vision, Mission, and Objectives of the Department of Medical Laboratory Sciences

Vision:

The Medical Laboratory Sciences program at the Faculty of Biomedical Sciences aims to be a leader locally and globally in preparing excellent graduates equipped with the knowledge and skills necessary to meet the needs of the job market in the field of medical laboratories, and to contribute to the development and innovation in this field.

Mission:

The Medical Laboratory Sciences program aims to provide high-quality education and specialized practical training in the field of medical laboratories. Students are taught a variety of subjects, including biochemistry, microbiology, medical analyses, and others, and opportunities for practical learning are provided in fully equipped laboratories.

Objectives:

- To provide students with the knowledge and skills necessary to work as specialists in the field of medical laboratories.
- To provide opportunities for practical learning and training in fully equipped laboratories.
- To develop students' capabilities in research and development in the field of medical laboratories.
- To provide the necessary assistance and support for students to obtain recognized accreditation certificates in the field of medical laboratories.
- To encourage collaboration and interaction with the local community and various health institutions to contribute to the development and innovation in the field of medical laboratories.

University of Benghazi

Faculty of Biomedical Sciences
Dept. of Medical Laboratory Sciences

Course Requirements for Medical Laboratory Sciences (MLSC) 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 والأنسجة	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	Clinical Biochemistry	الكيمياء الحيوية السريرية	MLSC-201	4	3	2	
3	Clinical Hematology	أمراض الدم السريرية	MLSC-202	4	3	2	
4	Clinical Immunology and Serology	علم المناعة السريرية والأمصال	MLSC-203	4	3	2	
5	Clinical Microbiology and Infectious Diseases	علم الأحياء الدقيقة السريرية والأمراض المعدية	MLSC-204	4	3	2	
6	Integrative Physiology	علم وظائف الأعضاء التكاملي	BMSC- 201	4	3	2	
7	Laboratory Management and Medical Informatics	إدارة المختبرات والمعلوماتية الطبية	LBMT -202	2	2	-	
8	Medical Parasitology	علم الطفيليات الطبية	MLSC-207	3	2	2	
9	Principles of Human Genetics	مبادئ علم الوراثة البشري	MOLD-205	4	3	2	
CREDIT HOURS				**32**			
3RD YEAR							
No	Course title		Course Code	Cr. hrs.	Teaching hrs		Remarks
	English	Arabic			Th	lab	
1	Bioinformatics and Genomics	المعلوماتية الحيوية وعلم الجينوم	MOLD-301	4	3	2	
2	Biotechniques	التقنيات الحيوية	MOLD-302	3	2	2	
3	Blood Banking and Transfusion Sciences	علوم مصرف ونقل الدم	MLSC-301	4	3	2	
4	Body Fluid Analysis	تحليل سوائل الجسم	MLSC-302	3	2	2	
5	Histopathology	علم النسيج المرضي	CYTO-304	3	2	2	
6	Medical Toxicology	علم السموم الطبية	MLSC-304	4	3	2	
7	Pathophysiology	علم وظائف الأعضاء المرضي	MLSC-305	4	3	2	
8	Research Methodology and Data Analysis	طرق البحث وتحليل البيانات	BMSC -301	4	3	2	
9	Specimen Procurement and Documentation	العينات والتوثيق	MLSC-307	2	1	2	
CREDIT HOURS				**31**			
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	-	
2	Infection Control and Safety	مكافحة العدوى والسلامة	BMSC-402	2	2	-	
3	Medical Laboratory Instrumentations	الأجهزة المختبرية الطبية	MLSC-401	2	1	2	
4	Medical Terminology	علم المصطلحات الطبية	MLSC-402	2	2	-	
5	Molecular Diagnostic Techniques	تقنيات التشخيص الجزيئي	MOLD-404	2	1	2	
6	Seminar in Medical Laboratory Sciences	ندوة علمية في علوم طب المختبرات	MLSC-408	1	1	-	
7	Thesis	مشروع التخرج	MLSC-409	4	4	-	
8	Tumor Biology	علم بيولوجيا الاورام	MLSC-403	3	2	2	
9	Workplace Experience	التدريب الميداني	MLSC -410	10	-	10	
CREDIT HOURS				**28**			
TOTAL CREDIT HOURS				122			

Department of Medical Laboratory 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 is a core module that 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: Clinical Biochemistry	Course Code: MLSC-201

Overall Description and Aims:

The course aims to provide students with a comprehensive understanding of the biochemical principles underlying human disease and to develop their knowledge and skills in clinical laboratory science, including the ability to interpret laboratory data. This course covers a wide range of topics including basic analytical techniques, metabolism and disease, endocrine and reproductive systems, renal and liver function, and therapeutic drug monitoring. It also provides fundamental knowledge of the structure and function of biomolecules and their role in human physiology, health, and disease. Through a combination of lectures, practical classes, and case-based learning, students will acquire a solid foundation in the principles and practices of clinical chemistry, which are essential for a career in clinical laboratory science, medicine, or related fields.

Intended Learning Outcomes:

At the end of the course, students should have acquired:

Knowledge and Understanding:

- A comprehensive understanding of the biochemical basis of human disease
- A detailed understanding of the principles of clinical laboratory science
- A knowledge of the most important biochemical analyses used in clinical biochemistry

Intellectual Skills:

- The ability to critically evaluate and interpret biochemical data
- The ability to integrate and apply knowledge from different areas of biochemistry and biomedical sciences

Professional and Practical Skills:

- The ability to perform laboratory tests in clinical biochemistry
- The ability to use standard operating procedures and quality control measures in the clinical laboratory.
- Demonstrate knowledge of the metabolic pathways and biochemical processes involved in the diagnosis and management of diseases

- Understand the roles of various organs and organ systems in the regulation of biochemical homeostasis
- The ability to interpret laboratory data in the context of patient care

General Transferable Skills:

- The ability to work effectively in a team
- The ability to communicate complex scientific concepts effectively
- The ability to apply analytical and problem-solving skills in a range of settings
- Manage time effectively and prioritize tasks
-

Course Topics:

1. Introduction to Clinical Biochemistry

- Introduction to the course
- The role of clinical biochemistry in healthcare
- History and development of clinical biochemistry
- Basic analytical techniques in clinical chemistry

2. Biomolecules and their Properties

- Structure and function of proteins
- Structure and function of lipids
- Structure and function of carbohydrates

3. Metabolism

- Overview of metabolic pathways
- Glycolysis and gluconeogenesis
- TCA cycle and electron transport chain

4. Enzymes and Their Kinetics

- Enzyme classification and nomenclature
- Enzyme kinetics and Michaelis-Menten equation
- Factors affecting enzyme activity

2. Carbohydrate Metabolism and Diabetes

- Biochemistry of carbohydrates and their metabolism

- Pathophysiology of diabetes mellitus
- Laboratory tests for diabetes diagnosis and management

3. Lipid Metabolism and Cardiovascular Disease

- Biochemistry of lipids and their metabolism
- Pathophysiology of atherosclerosis and cardiovascular disease
- Laboratory tests for lipid disorders and cardiovascular risk assessment

4. Protein Metabolism and Renal Function

- Biochemistry of proteins and their metabolism
- Pathophysiology of renal disease
- Laboratory tests for renal function assessment and proteinuria

5. Liver Function and Hepatobiliary Diseases

- Biochemistry of liver function and metabolism
- Pathophysiology of hepatobiliary diseases
- Laboratory tests for liver function assessment and hepatobiliary disorders

6. Endocrine and Reproductive Systems

- Biochemistry of hormones and their regulation
- Pathophysiology of endocrine and reproductive disorders
- Laboratory tests for endocrine and reproductive function assessment

5. Hormones and Signaling

- Overview of hormone signaling
- Hormone biosynthesis and regulation
- Mechanisms of hormone action

6. Biochemical Techniques

- Chromatography
- Spectrophotometry
- Electrophoresis

7. Diagnostic Techniques in Clinical Biochemistry

- Analytical methods in clinical biochemistry

- Immunoassays
- Molecular diagnostics

8. Acid-Base Balance and Electrolytes

- Physiology of acid-base balance and electrolyte regulation
- Pathophysiology of acid-base and electrolyte disorders
- Laboratory tests for acid-base and electrolyte assessment

14. Hematology and Coagulation Disorders

- Overview of hematological disorders and their diagnosis
- Biochemistry of coagulation and hemostasis
- Laboratory tests for hematology and coagulation assessment

15. Clinical Enzymology and Analytical Techniques

- Biochemistry of enzymes and their regulation
- Principles of analytical techniques in clinical chemistry
- Laboratory tests for enzyme activity and measurement

16. Trace Elements and Minerals

- Biochemistry of trace elements and minerals
- Pathophysiology of trace element and mineral disorders
- Laboratory tests for trace element and mineral assessment

14. Iron Metabolism

- Overview of iron metabolism
- Iron deficiency anemia
- Hemochromatosis

15. Inborn Errors of Metabolism

- Overview of inborn errors of metabolism
- Diagnosis and management of inborn errors of metabolism
- Newborn screening

Practical Classes and Objectives:

1. Introduction to Clinical Chemistry Assays

- To perform basic clinical chemistry assays (e.g. glucose, creatinine, urea) using standard laboratory procedures and equipment
- To understand the principles of quality control and assurance in clinical chemistry testing

2. Serum Lipid Assays

- To perform lipid assays (e.g. cholesterol, triglycerides) using standard laboratory procedures and equipment
- To interpret lipid assay results in the context of cardiovascular risk assessment

3. Urine Analysis and Renal Function Tests

- To perform urine analysis (e.g. dipstick, microscopy) using standard laboratory procedures and equipment
- To perform renal function tests (e.g. creatinine clearance, albuminuria) using standard laboratory procedures and equipment

4. Liver Function Tests

- To perform liver function tests (e.g. AST, ALT, ALP, bilirubin) using standard laboratory procedures and equipment
- To interpret liver function test results in the context of hepatobiliary disease diagnosis and management

5. Glucose Tolerance Test

- To perform a glucose tolerance test using standard laboratory procedures and equipment
- To interpret glucose tolerance test results in the context of diabetes diagnosis and management

6. Hormone Assays

- To perform hormone assays (e.g. TSH, LH, FSH) using standard laboratory procedures and equipment
- To interpret hormone assay results in the context of endocrine disorders

7. Therapeutic Drug Monitoring Assays

- To perform therapeutic drug monitoring assays (e.g. digoxin, theophylline) using standard laboratory procedures and equipment
- To interpret therapeutic drug monitoring assay results in the context of medication dosage adjustment and toxicity monitoring

8. Blood Gas Analysis

- To perform blood gas analysis (e.g. pH, pCO2, pO2) using standard laboratory procedures and equipment
- To interpret blood gas analysis results in the context of acid-base disorders and respiratory dysfunction

9. Coagulation Assays

- To perform coagulation assays (e.g. PT, APTT) using standard laboratory procedures and equipment
- To interpret coagulation assay results in the context of hemostatic disorders

10. Immunological Assays

- To perform immunological assays (e.g. ELISA, Western blot) using standard laboratory procedures and equipment
- To interpret immunological assay results in the context of autoimmune and infectious diseases

11. Enzyme Assays

- To perform enzyme assays (e.g. amylase, lipase) using standard laboratory procedures and equipment
- To interpret enzyme assay results in the context of pancreatic and other organ dysfunction

References:

1. Tietz NW, Pruden EL, Siggaard-Andersen O. Clinical Guide to Laboratory Tests. 4th ed. Philadelphia, PA: W.B. Saunders Company; 2006.
2. Marshall WJ, Bangert SK. Clinical Chemistry: Principles and Practice. 2nd ed. London, UK: CRC Press; 2016.

3	Course title: Clinical Hematology	Course Code: MLSC-202

Overall Description:

The course covers the basic principles and concepts related to the study of blood and blood-forming tissues, as well as the pathophysiology and clinical manifestations of various hematological disorders. The course includes both theoretical and practical components, such as laboratory demonstrations and case studies, to provide students with a comprehensive understanding of the subject matter.

The primary aims of this course are to:

- Develop a sound knowledge and understanding of the structure and function of blood and blood-forming tissues
- Provide a comprehensive understanding of the pathophysiology and clinical manifestations of various hematological disorders
- Develop intellectual, professional, practical, and transferable skills necessary for a career in biomedical sciences

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

- Demonstrate a sound knowledge and understanding of the principles and concepts related to clinical hematology
- Evaluate and interpret laboratory data and clinical information to identify hematological disorders
- Demonstrate the ability to perform laboratory tests and procedures related to clinical hematology
- Apply critical thinking and problem-solving skills to clinical scenarios related to hematological disorders
- Demonstrate effective communication and teamwork skills in the context of clinical hematology

Knowledge and Understanding: Students will gain knowledge and understanding in the following areas:

- Anatomy and physiology of blood and blood-forming tissues
- Hematopoiesis and hematological disorders
- Hemostasis and thrombosis
- Laboratory methods and procedures related to clinical hematology

- Principles and practices of transfusion medicine

Intellectual Skills: Students will develop the following intellectual skills:

- Critical analysis of scientific literature related to hematological disorders
- Interpretation of laboratory data related to hematological disorders
- Formulation of hypotheses and development of research questions related to hematological disorders
- Evaluation of laboratory techniques used in the diagnosis and management of hematological disorders

Professional and Practical Skills:

- Conducting laboratory tests related to hematological disorders
- Interpreting laboratory results related to hematological disorders
- Communicating laboratory results to clinicians and other healthcare professionals
- Identifying and resolving technical problems related to laboratory tests

General Transferable Skills: Students will develop the following general transferable skills:

- Time management and organizational skills
- Written and oral communication skills
- Teamwork and collaboration skills

Course Topics:

1. Introduction to Clinical Hematology:

- Define the scope and importance of clinical hematology
- Understand the basic principles and concepts of clinical hematology
- Identify the different components of blood and their functions

2. Anatomy and Physiology of Blood and Blood-Forming Tissues:

- Describe the anatomy and physiology of blood and blood-forming tissues
- Understand the process of hematopoiesis and differentiation of blood cells
- Discuss the function of erythropoietin and thrombopoietin in hematopoiesis

3. Hematopoiesis:

- Define hematopoiesis and its regulation
- Identify the different stages of hematopoiesis
- Understand the role of cytokines and growth factors in hematopoiesis

4. Erythropoiesis and Red Blood Cell Disorders:

- Describe the process of erythropoiesis
- Understand the structure and function of red blood cells
- Identify the different types of anemias and their etiology

5. Hemoglobinopathies:

- Understand the structure and function of hemoglobin
- Identify the different types of hemoglobinopathies and their clinical manifestations
- Discuss the laboratory diagnosis and management of hemoglobinopathies

6. Megaloblastic Anemias:

- Define megaloblastic anemias and their etiology
- Identify the different types of megaloblastic anemias
- Understand the laboratory diagnosis and management of megaloblastic anemias

7. Hemolytic Anemias:

- Define hemolytic anemias and their etiology
- Identify the different types of hemolytic anemias
- Discuss the laboratory diagnosis and management of hemolytic anemias

8. Aplastic Anemia and Bone Marrow Failure Syndromes:

- Understand the pathophysiology and etiology of aplastic anemia
- Identify the different types of bone marrow failure syndromes
- Discuss the laboratory diagnosis and management of aplastic anemia and bone marrow failure syndromes

9. Polycythemia Vera and Myeloproliferative Neoplasms:

- Define polycythemia vera and myeloproliferative neoplasms

- Understand the etiology and pathophysiology of polycythemia vera and myeloproliferative neoplasms
- Discuss the laboratory diagnosis and management of polycythemia vera and myeloproliferative neoplasms

10. Leukocyte Biology and Disorders:

- Understand the biology and function of leukocytes
- Identify the different types of leukocyte disorders
- Discuss the laboratory diagnosis and management of leukocyte disorders

11. Lymphocyte Biology and Disorders:

- Understand the biology and function of lymphocytes
- Identify the different types of lymphocyte disorders
- Discuss the laboratory diagnosis and management of lymphocyte disorders

12. Monocyte and Macrophage Biology and Disorders:

- Understand the biology and function of monocytes and macrophages
- Identify the different types of monocyte and macrophage disorders
- Discuss the laboratory diagnosis and management of monocyte and macrophage disorders

13. Platelet Biology and Disorders:

- Understand the biology and function of platelets
- Identify the different types of platelet disorders
- Discuss the laboratory diagnosis and management of platelet disorders

14. Hemostasis and Thrombosis:

- Define hemostasis and thrombosis

- Understand the different components and mechanisms involved in hemostasis and thrombosis
- Identify the different types of bleeding disorders and thrombotic disorders
- Discuss the laboratory diagnosis and management of bleeding and thrombotic disorders

15. Coagulation Disorders:

- Understand the coagulation cascade and its regulation
- Identify the different types of coagulation disorders
- Discuss the laboratory diagnosis and management of coagulation disorders

16. Hemophilia and Other Bleeding Disorders:

- Define hemophilia and other bleeding disorders
- Understand the etiology and pathophysiology of hemophilia and other bleeding disorders
- Discuss the laboratory diagnosis and management of hemophilia and other bleeding disorders

17. Thrombophilia and Hypercoagulable States:

- Define thrombophilia and hypercoagulable states
- Understand the etiology and pathophysiology of thrombophilia and hypercoagulable states
- Discuss the laboratory diagnosis and management of thrombophilia and hypercoagulable states

18. Anticoagulation and Antiplatelet Therapy:

- Understand the different types of anticoagulant and antiplatelet agents and their mechanisms of action
- Identify the indications, contraindications, and adverse effects of anticoagulant and antiplatelet therapy
- Discuss the laboratory monitoring and management of patients on anticoagulant and antiplatelet therapy

19. Hematological Manifestations of Systemic Diseases:

- Identify the hematological manifestations of systemic diseases, such as infections, autoimmune diseases, and malignancies
- Understand the pathophysiology and etiology of hematological manifestations of systemic diseases
- Discuss the laboratory diagnosis and management of hematological manifestations of systemic diseases

20. Hematological Manifestations of Inherited Diseases:

- Identify the hematological manifestations of inherited diseases, such as hemoglobinopathies, coagulation disorders, and bone marrow failure syndromes
- Understand the pathophysiology and etiology of hematological manifestations of inherited diseases
- Discuss the laboratory diagnosis and management of hematological manifestations of inherited diseases

21. Hematological Manifestations of Environmental and Occupational Exposures:

- Identify the hematological manifestations of environmental and occupational exposures, such as radiation, chemicals, and drugs
- Understand the pathophysiology and etiology of hematological manifestations of environmental and occupational exposures
- Discuss the laboratory diagnosis and management of hematological manifestations of environmental and occupational exposures

22. Hematological Changes in Pregnancy and Neonatal Period:

- Identify the hematological changes that occur during pregnancy and neonatal period
- Understand the pathophysiology and etiology of hematological changes in pregnancy and neonatal period
- Discuss the laboratory diagnosis and management of hematological changes in pregnancy and neonatal period

23. Hematological Changes in Autoimmune Diseases:

- Identify the hematological changes that occur in autoimmune diseases, such as lupus, rheumatoid arthritis, and vasculitis
- Understand the pathophysiology and etiology of hematological changes in autoimmune diseases
- Discuss the laboratory diagnosis and management of hematological changes in autoimmune diseases

24. Hematological Changes in Hematological Malignancies:

- Identify the hematological changes that occur in hematological malignancies, such as leukemia, lymphoma, and multiple myeloma
- Understand the pathophysiology and etiology of hematological changes in hematological malignancies

- Discuss the laboratory diagnosis and management of hematological changes in hematological malignancies

25. Principles and Practices of Transfusion Medicine:

- Understand the principles and practices of transfusion medicine
- Identify the indications and contraindications for blood transfusion
- Discuss the laboratory testing and management of blood products

26. Hematopoietic Stem Cell Transplantation:

- Understand the principles and practices of hematopoietic stem cell transplantation
- Identify the indications and contraindications for hematopoietic stem cell transplantation
- Discuss the laboratory testing and management of hematopoietic stem cell transplantation

27. Emerging Technologies in Hematology:

- Identify the emerging technologies in hematology, such as genomics, proteomics, and immunotherapy
- Understand the principles and applications of emerging technologies in hematology
- Discuss the potential impact of emerging technologies on the diagnosis and management of hematological disorders

Laboratory Classes:

1. Blood cell morphology and identification: This lab class involves examining blood smears and identifying the different types of blood cells (red blood cells, white blood cells, and platelets) based on their morphology.
2. Hemoglobin electrophoresis: In this lab class, students learn how to separate different types of hemoglobin using electrophoresis and interpret the results to diagnose hemoglobinopathies.
3. Complete blood count and differential: Students learn how to perform a complete blood count (CBC) and differential count using an automated hematology analyzer, and interpret the results to diagnose blood disorders.

4. Reticulocyte count: This lab class involves performing a reticulocyte count to evaluate bone marrow function and diagnose anemia.
5. Blood smear preparation and staining: Students learn how to prepare and stain blood smears for microscopic examination.
6. Iron studies: Students learn how to perform iron studies (serum iron, total iron-binding capacity, and ferritin) to diagnose iron deficiency anemia.
7. Coagulation tests: This lab class involves performing various coagulation tests (PT, APTT, fibrinogen, and D-dimer) to diagnose bleeding and thrombotic disorders.
8. Blood transfusion: Students learn about the different blood products, blood groups, and blood transfusion reactions, and practice blood transfusion techniques.
9. Hematology analyzer operation and troubleshooting: In this lab class, students learn how to operate and troubleshoot common issues with hematology analyzers.
10. Immunophenotyping of leukocytes and lymphocytes: Students learn how to perform flow cytometry to identify and quantify different types of leukocytes and lymphocytes, and diagnose hematological disorders.
11. Hematology case studies and problem-solving exercises: Students analyze and solve case studies related to hematological disorders and develop problem-solving skills.

References:

1. Hoffman, R., Benz, E. J., Shattil, S. J., Furie, B., Cohen, H. J., Silberstein, L. E., & McGlave, P. (2018). Hematology: Basic Principles and Practice (7th ed.). Elsevier.
2. Rodak, B. F., Carr, J. H., & Doig, K. (2021). Clinical hematology atlas (6th ed.). Elsevier.
3. Harmening, D. M. (2017). Clinical hematology and fundamentals of hemostasis (6th ed.). F.A. Davis Company.

4	Course title: Clinical Immunology and Serology	Course Code: MLSC-203

Overall Description and Aims:

This course is designed to provide students with a comprehensive understanding of the immune system and the techniques used to diagnose and treat immunological disorders. It will cover the principles and mechanisms of the immune system, the clinical applications of serology, and the laboratory techniques used in immunological testing. The course aims to enable students to understand the role of immunology and serology in the diagnosis and treatment of various diseases and disorders.

Intended Learning Outcomes of the Course:

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

Knowledge and Understanding:

- Demonstrate an understanding of the immune system, including its components, functions, and interactions with other systems in the body.
- Describe the mechanisms of immunological response to infectious agents, including the roles of B cells, T cells, and cytokines.
- Explain the principles of serological testing and its clinical applications in the diagnosis and management of infectious and autoimmune diseases.
- Understand the laboratory techniques used in immunological testing, including ELISA, Western blot, and flow cytometry.

Intellectual Skills:

- Analyze and interpret immunological data, including test results and clinical presentations, to diagnose and manage immunological disorders.
- Evaluate the limitations and advantages of different serological and immunological tests in clinical practice.
- Critically appraise the literature on immunology and serology to inform clinical decision-making.

Professional and Practical Skills:

- Perform a range of laboratory techniques used in immunological testing, including ELISA, Western blot, and flow cytometry.
- Apply serological testing to diagnose and manage infectious and autoimmune diseases.

- Communicate effectively with patients, colleagues, and other healthcare professionals about immunological disorders and their management.

General Transferable Skills:

- Work effectively in a team to manage complex cases and interpret immunological data.
- Develop self-directed learning skills to keep up-to-date with developments in the field.
- Demonstrate effective time management and organizational skills in managing laboratory work and clinical cases.

Course Topics :

1. Introduction to Immunology and Serology
    - Overview of the immune system
    - Innate and adaptive immunity
    - Immune cells and their functions
2. Immunological Principles and Concepts
    - Antigens and antibodies
    - Immunoglobulin structure and function
    - Antibody-antigen interactions
3. Hypersensitivity Reactions
    - Types of hypersensitivity reactions
    - Mechanisms of hypersensitivity
    - Type I hypersensitivity and IgE-mediated reactions
    - Type IV hypersensitivity and cell-mediated immunity
4. Immunodeficiency Disorders
    - Types of immunodeficiency disorders
    - Mechanisms of immunodeficiency
    - Primary and secondary immunodeficiencies
    - Acquired immunodeficiency syndrome (AIDS)
5. Autoimmune Disorders
    - Mechanisms of autoimmunity
    - Rheumatoid arthritis
    - Systemic lupus erythematosus
    - Laboratory tests used in diagnosis
6. Immunohematology

- Blood group antigens and antibodies
- Blood transfusion compatibility testing
- Antibody identification and resolution of blood group discrepancies
- Hemolytic disease of the newborn

7. Immunological Techniques
   - Immunofluorescence microscopy
   - ELISA and Western blotting
   - Enzyme-linked immunospot (ELISPOT) assay
   - Flow cytometry
8. Serological Techniques
   - Serological tests for viral infections
   - Serological tests for bacterial infections
   - Serological tests for autoimmune disorders
   - Serological tests for syphilis
   - Serological tests for Lyme disease
9. Immunogenetics
   - Human leukocyte antigens (HLA)
   - HLA typing and transplantation
   - HLA-associated diseases
   - Killer cell immunoglobulin-like receptors (KIR)
   -
10. Vaccines and Immunization
    - Types of vaccines and their modes of action
    - Vaccine development and testing
    - Herd immunity and vaccination coverage
    - Adjuvants and their role in vaccines
    - Immunization schedules and guidelines
11. Cancer Immunology
    - Mechanisms of tumor immunity
    - Tumor immunotherapy
    - Cancer biomarkers and diagnostics
    - Tumor-associated antigens (TAA)
12. Immunomodulation and Immunosuppression
    - Mechanisms of immunomodulation
    - Immune checkpoint inhibitors
    - Immunomodulatory drugs and their clinical applications
    - Immunosuppressive drugs and their clinical applications

13. Infectious Diseases and Immunity

- Innate and adaptive immune responses to infectious agents
- Immune evasion strategies used by infectious agents
- Immunological diagnostics for infectious diseases

14. Allergy and Asthma
    - Pathophysiology of allergy and asthma
    - Diagnosis and management of allergy and asthma
    - Immunological treatments for allergy and asthma
15. Transplantation Immunology
    - Mechanisms of graft rejection
    - T cell-mediated rejection and antibody-mediated rejection
    - HLA matching
    - Immunosuppression in transplantation
    - Immune monitoring in transplantation
16. Immunology of Pregnancy
    - Fetal-maternal immunological interactions
    - Immunological changes during pregnancy
17. Clinical Laboratory Management
    - Quality assurance and quality control in clinical laboratories
    - Test result interpretation and reporting
    - Accreditation and regulatory compliance
    - Laboratory safety and risk management
18. Immunological Disorders of the Skin
    - Mechanisms of skin immunity
    - Immunological disorders of the skin
    - Psoriasis and its pathogenesis
    - Contact dermatitis and its immunological mechanisms
    - Immunological diagnostics and treatment of skin disorders
19. Immune-mediated Diseases of the Nervous System
    - Mechanisms of neuroinflammation and neurodegeneration
    - Autoimmune disorders of the nervous system
    - Multiple sclerosis and its immunological basis
    - Guillain-Barre syndrome and its pathogenesis
    - Immunological diagnostics and treatment of neurological disorders
20. Immunology and Emerging Technologies
    - Emerging technologies in immunology and serology
    - Applications of new technologies in clinical practice
    - Future directions in immunology and serology research

Practical classes:

1. Blood group determination using ABO and Rh typing sera
2. ELISA for detection of viral antigens or antibodies
3. Immunofluorescence microscopy for the detection of intracellular antigens
4. Cell culture and stimulation of immune cells
5. Flow cytometry for the analysis of cell surface markers and intracellular cytokines
6. Western blotting for the detection of specific proteins
7. Immunoprecipitation for the isolation of protein complexes
8. Immunohistochemistry for the detection of tissue antigens
9. Luminex assay for the detection of multiple cytokines in a single sample
10. Phagocytosis assay to measure the phagocytic activity of immune cells
11. Transwell migration assay to study cell chemotaxis and migration
12. Immunohematology case studies to resolve blood group discrepancies
13. Antibody titer determination using serial dilutions
14. Serological tests for infectious diseases

References:

1. Janeway's Immunobiology, 9th Edition by Kenneth Murphy, Casey Weaver
2. Turgeon, M. L. (2019). Clinical immunology and serology: a laboratory perspective. Elsevier Health Sciences.

5	Course title: Clinical Microbiology and Infectious Diseases	Course Code: MLSC-204

Overall description and Aims:

The course aims to provide students with a comprehensive understanding of the principles and practices of clinical microbiology and infectious diseases. The course covers the fundamentals of microbiology, including bacterial, viral, fungal, and parasitic pathogens, and their interactions with human hosts. It also addresses the epidemiology, pathogenesis, diagnosis, treatment, and prevention of infectious diseases.

Intended Learning Outcomes:

Knowledge and Understanding:

- Describe the basic principles of microbiology and infectious diseases.
- Identify the different types of bacterial, viral, fungal, and parasitic pathogens.
- Explain the epidemiology, pathogenesis, diagnosis, treatment, and prevention of infectious diseases.
- Discuss the principles of antibiotic resistance and the mechanisms by which bacteria become resistant.

Intellectual Skills:

- Analyze scientific data and interpret research findings.
- Evaluate the impact of infectious diseases on human health.
- Critically evaluate the effectiveness of current treatments and prevention strategies.
- Design and carry out experiments to investigate microbial pathogens.

Professional and Practical Skills:

- Perform microbiological techniques, including culturing, staining, and microscopy.
- Interpret laboratory test results and identify microbial pathogens.
- Use appropriate laboratory safety procedures.
- Develop effective communication skills with patients and healthcare professionals.

General Transferable Skills:

- Work effectively as part of a team.
- Think critically and problem-solve independently.
- Communicate effectively through oral and written presentations.

Course Topics:

1. Introduction to Microbiology and Infectious Diseases

- History and Scope of Microbiology
- Overview of Infectious Diseases
- Microbial Taxonomy and Classification

2. Bacterial Pathogens

- Gram-Positive Bacteria
- Gram-Negative Bacteria
- Bacterial Virulence Factors

3. Viral Pathogens

- DNA Viruses
- RNA Viruses
- Viral Replication and Pathogenesis

4. Fungal Pathogens

- Yeasts and Molds
- Fungal Pathogenesis
- Antifungal Treatment

5. Parasitic Pathogens

- Protozoan Pathogens
- Helminth Pathogens
- Parasitic Pathogenesis and Treatment

6. Host-Microbe Interactions

- Innate and Adaptive Immunity
- Microbial Evasion of Immune Responses
- Host Susceptibility to Infection

7. Epidemiology and Pathogenesis of Infectious Diseases

- Modes of Transmission
- Outbreak Investigation
- Pathogenesis of Infectious Diseases

8. Clinical Manifestations and Diagnosis of Infectious Diseases

- Symptoms and Signs of Infection
- Diagnostic Tests for Microbial Pathogens
- Interpretation of Laboratory Results

9. Antimicrobial Agents and Resistance

- Antibiotics, Antivirals, Antifungals
- Mechanisms of Antibiotic Resistance
- Strategies to Combat Antibiotic Resistance

10. Tuberculosis and Other Respiratory Infections

- Pathogenesis, diagnosis, and treatment of tuberculosis
- Other respiratory infections of medical importance

11. Vector-Borne and Zoonotic Infections

- Transmission and pathogenesis of vector-borne and zoonotic infections
- Emerging infectious diseases and their impact on global health

12. Prevention and Control of Infectious Diseases

- Vaccines and Immunization
- Infection Control Measures
- Public Health Strategies

11. Emerging and Re-Emerging Infectious Diseases

- Emerging Viral Infections
- Re-Emergence of Bacterial Infections

12. Microbial Ecology and Environmental Microbiology

- Microbial Diversity and Ecosystems

- Microbes in the Human Environment
- Microbes and Climate Change

13. Clinical Microbiology Laboratory Techniques

- Microscopy and Staining
- Culturing and Isolation Techniques

- Serological Tests and Molecular Diagnostics
- Interpretation of Results

14. Clinical Microbiology Laboratory Management

- Quality Control and Assurance
- Laboratory Safety and Biosecurity
- Equipment Maintenance and Calibration
- Data Management and Reporting

Practical Classes:

1. Introduction to Microscopy and Staining Techniques
2. Isolation and Identification of Bacterial Pathogens
3. Antimicrobial Susceptibility Testing
4. Viral Culturing and Serological Testing
5. Fungal Identification and Antifungal Susceptibility Testing
6. Parasitology Techniques and Identification
7. Molecular Diagnostics and PCR
8. Microbial Ecology and Environmental Sampling
9. Immunology Techniques and Serological Testing
10. Epidemiology and Outbreak Investigation
11. Infection Control and Biosecurity Measures
12. Clinical Case Studies and Interpretation of Results
13. Quality Control and Assurance in Microbiology Laboratories
14. Laboratory Safety Procedures and Emergency Response
15. Data Management and Reporting in Clinical Microbiology Laboratories

References:

1. Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2021). Medical microbiology. Elsevier Health Sciences.
2. Mandell, G. L., Bennett, J. E., & Dolin, R. (2015). Mandell, Douglas, and Bennett's principles and practice of infectious diseases. Elsevier Health Sciences.

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: Laboratory 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:

1. Understand the fundamental principles of laboratory operations and management.
2. Understand the regulatory requirements governing laboratory operations and compliance.
3. Understand the principles of quality assurance and quality control in laboratory operations.
4. 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:

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

General Transferable Skills:

1. Develop problem-solving skills and critical thinking skills.
2. Develop communication skills for effective communication with healthcare professionals and patients.
3. 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: Medical Parasitology	Course Code: MLSC-207

Overall Description and Aims :

The Medical Parasitology course is an integral part of the undergraduate curriculum in biomedical sciences that studies the biology, epidemiology, pathogenesis, diagnosis, treatment, and control of parasitic diseases affecting humans. The course aims to provide students with a comprehensive understanding of the various parasites that infect humans and the methods of diagnosing and treating parasitic diseases. The course also focuses on the global burden of parasitic diseases and their impact on public health. Through this course, students will acquire an in-depth knowledge of parasitic organisms, their life cycles, and the mechanisms by which they cause diseases in humans.

Intended Learning Outcomes of the Course:

Upon completing the Medical Parasitology course, students will have achieved the following learning outcomes:

Knowledge and Understanding:

- A thorough understanding of the biology and diversity of parasitic organisms, including their life cycles and modes of transmission.
- The ability to describe the epidemiology and global distribution of medically important parasitic infections.
- A comprehensive knowledge of the pathogenesis, clinical manifestations, and diagnostic methods used to identify parasitic infections.
- An understanding of the principles of parasitic control and prevention strategies.

Intellectual Skills:

- The ability to critically evaluate and interpret scientific literature related to parasitic infections.
- The capacity to analyze and synthesize complex information related to parasitic organisms and their impact on human health.
- The ability to apply the principles of parasitology to real-world scenarios and make evidence-based decisions.

Professional and Practical Skills:

- The ability to perform laboratory techniques commonly used to diagnose and study parasitic infections.
- The capacity to identify and classify parasitic organisms using microscopic and molecular techniques.
- The ability to communicate scientific concepts related to parasitology to a diverse audience.

General Transferable Skills:

- Enhance time management and organizational skills by meeting deadlines for assignments.
- Develop critical thinking and problem-solving skills through case-based discussions.
- Develop oral and written communication skills through presentations and scientific reports.

Course Topics:

1. Introduction to Medical Parasitology
    - Definition of terms
    - Features of parasites
    - Source of infection
    - Mode of transmission
    - Direct mode of transmission
    - Indirect mode of transmission
    - Routes of transmission
    - Host-parasite inter-relationship
    - Effect of parasites on the host
    - Host susceptibility factors
    - Escape mechanisms of parasites from the immune system
    - General life cycle of parasites
        - Direct life cycle
        - Indirect life cycle
    - Overview of Protozoan Parasites
    - Overview of Helminth Parasites
    - Overview of Arthropod Parasites
2. General laboratory diagnosis of parasites
    - Types of specimens (urine, blood, stool, sputum, skin)
    - Collection and preparation of specimens used for parasitological examination

- Preservation of parasites
- General techniques used for parasitological examination
  - Microscopic (saline, iodine, concentration, staining, etc.)
  - Chemical (Occult blood, Bile pigments)
  - Culture, Immunologic, Blotting, PCR
  - Xenodiagnosis
  - Reporting results

3. Helminths
   - Introduction to helminths
   - Classification of helminths
   - General features of Nemathelminthes
   - General features of Platyhelminthes

4. Nemathelminthes
   - Burden and impact on human life
   - General features
   - Intestinal Nematodes
   - Ascaris lumbricoides
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention & control
   - Hookworm (Ancylostoma duodenale and Necator americanus)
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention & control
   - *Strongyloides stercoralis*
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention & control
   - Enterobius vermicularis
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention & control
   - *Trichuris trichiura*
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention & control
   - Blood and Tissue nematodes
   - General characteristics

- *Wuchereria bancrofti*
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention & control
- Podoconiosis
  - Causative agent
  - Epidemiology
  - Differential diagnosis with Lymphatic filariasis
- *Brugia malayi/timori*
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention
- *Dracunculus medinensis*
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention& control
- Larva Migrans
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention& control
- Platyhelminthes
  - General characteristics of Platyhelminthes
- Tape worms (Cestodes)
  - General characteristics
  - Taenia Species (Taenia saginata and solium)
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention& control
- Hymenolepis nana
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention& control
- *Hymenolepis diminuta*
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis

- Treatment, Prevention& control

- *Echinococcus granulosus*
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention& control
- *Diphyllobothrim latum*
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention& control

5. The flukes (trematodes)
   - General characteristics
   - Blood flukes
     - General characteristics
   - *Schistosoma mansoni*
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention& control
   - *Schistosoma japonicum*
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention& control
   - *Schistosoma haematobium*
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention& control
   - *Schistosoma intercalatum* and *Schistosoma mekongi*
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention& control
   - *Cercarial dermatitis*
   - Liver flukes
     - Epidemiology, Morphology, Transmission and life cycle
     - Clinical features, Laboratory diagnosis
     - Treatment, Prevention& control

   - Intestinal flukes
     - Epidemiology, Morphology, Transmission and life cycle

- Clinical features, Laboratory diagnosis
- Treatment, Prevention & control

- Lung flukes
  - Epidemiology, Morphology, Transmission and life cycle
  - Clinical features, Laboratory diagnosis
  - Treatment, Prevention & control

6.Quality assurance in parasitology

Laboratory classes

- Microscopy techniques for the diagnosis of parasitic infections.
- Lab visit and Demonstration of different lab equipment and reagent preparation
- Preparation of different reagents for parasitological techniques
- Demonstration of collection, preparation, and preservation of different parasitological specimens
- Macroscopic examination of stool
- Wet mount preparation (Saline and Iodine)
- Demonstration of different concentration techniques
- Parasite culture, Immunological, and other available parasitological techniques demonstration
- Direct Wet mount (Saline, eosin, Iodine) & Examination and identification of intestinal parasites
- Occult blood test
- Water emergence sem concentration techniques for S. Stercolaris larva
- Concentration Techniques (Sedimentation) & Examination and identification of intestinal parasites
- Examination of preserved specimens and slides and identification of different parasites diagnostic stages

References:

1. Garcia, L.S. (2016). Diagnostic medical parasitology. American Society for Microbiology Press.
2. Chiodini, P.L., Moody, A.H., & Manser, D.W. (2013). Atlas of medical helminthology and protozoology. Churchill Livingstone.

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 Medical Laboratory Sciences

Proposed Syllabi for all Courses in the Third Year

Prepared by

Abdelmuhsen Abusneina, PhD

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Syllabus of 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: Biotechniques	Course Code: MOLD-302

Overall Description and Aims:

This course is designed to provide students with knowledge and practical experience in biotechniques. Students will learn about the principles, techniques, and applications of biotechnology in clinical settings. The course aims to enable students to understand the role of biotechnology in clinical diagnosis, treatment, and research.

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

1. Explain the principles and techniques of biotechnology in clinical settings.
2. Analyze and interpret data generated from biotechnological assays.
3. Apply biotechnical techniques in clinical laboratory investigations.
4. Critically evaluate the use of biotechnology in clinical diagnosis, treatment, and research.
5. Communicate scientific information related to biotechniques in clinical settings effectively.

Knowledge and Understanding: Students will gain knowledge and understanding of:

1. The principles and techniques of biotechnology.
2. The application of biotechnology in clinical settings.
3. The role of biotechnology in clinical diagnosis, treatment, and research.
4. The ethical, legal, and social issues associated with biotechnology in clinical settings.

Intellectual Skills: Students will develop intellectual skills in:

1. Analyzing and interpreting data generated from biotechnological assays.
2. Critically evaluating the use of biotechnology in clinical diagnosis, treatment, and research.
3. Applying biotechnical techniques in clinical laboratory investigations.

Professional and Practical Skills: Students will develop professional and practical skills in:

1. Using biotechnical equipment and instruments.

2. Conducting biotechnical assays and experiments.
3. Recording and analyzing biotechnical data.
4. Communicating scientific information related to biotechniques in clinical settings effectively.

General Transferable Skills: Students will develop general transferable skills in:

1. Problem-solving and decision-making.
2. Communication and teamwork.
3. Time management and organization.

Course Topics and Objectives:

1: Introduction to Biotechnology

- Explain the principles and techniques of biotechnology
- Describe the applications of biotechnology in clinical settings

2: DNA Extraction and Quantification

- Explain the principles and techniques of DNA extraction and quantification
- Conduct DNA extraction and quantification experiments

3: PCR (Polymerase Chain Reaction)

- Explain the principles and techniques of PCR
- Conduct PCR experiments

4: Gel Electrophoresis

- Explain the principles and techniques of gel electrophoresis
- Conduct gel electrophoresis experiments

5: DNA Sequencing

- Explain the principles and techniques of DNA sequencing
- Conduct DNA sequencing experiments

6: Microarrays

- Explain the principles and techniques of microarrays
- Conduct microarray experiments

7: Proteomics

- Explain the principles and techniques of proteomics
- Conduct proteomics experiments

8: Antibody Production and Purification

- Explain the principles and techniques of antibody production and purification
- Conduct antibody production and purification experiments

9: ELISA (Enzyme-Linked Immunosorbent Assay)

- Explain the principles and techniques of ELISA
- Conduct ELISA experiments

10: Western Blotting

- Explain the principles and techniques of Western blotting
- Conduct Western blotting experiments

11: Flow Cytometry

- Explain the principles and techniques of flow cytometry
- Conduct flow cytometry experiments

12: Biosensors

- Explain the principles and techniques of biosensors
- Conduct biosensor experiments

13: Microfluidics

- Explain the principles and techniques of microfluidics
- Conduct microfluidics experiments

14: Gene Editing with CRISPR-Cas

- Explain the principles and techniques of gene editing with CRISPR-Cas
- Conduct gene editing experiments using CRISPR-Cas

15: Next-Generation Sequencing

- Explain the principles and techniques of next-generation sequencing

- Conduct next-generation sequencing experiments

16: Nanotechnology in Biotechnology

- Explain the principles and techniques of nanotechnology in biotechnology
- Conduct nanotechnology experiments in biotechnology

17: Bioinformatics in Biotechnology

- Explain the principles and techniques of bioinformatics in biotechnology
- Conduct bioinformatics experiments in biotechnology

18: Immunotherapy

- Explain the principles and techniques of immunotherapy
- Conduct immunotherapy experiments

19: Stem Cell Technology

- Explain the principles and techniques of stem cell technology
- Conduct stem cell experiments

20: Tissue Engineering

- Explain the principles and techniques of tissue engineering
- Conduct tissue engineering experiments

21: Biobanks

- Explain the principles and techniques of biobanks
- Evaluate the use of biobanks in clinical diagnosis, treatment, and research

22: Biotechnology and Personalized Medicine

- Explain the principles and techniques of biotechnology in personalized medicine
- Critically evaluate the use of biotechnology in personalized medicine

23: Current Trends and Future of Biotechnology in Clinical Settings

- Evaluate the current trends and future of biotechnology in clinical settings
- Communicate scientific information related to biotechniques in clinical settings effectively

Practical Classes and Objectives:

1. DNA Extraction and Quantification - Conduct DNA extraction and quantification experiments
2. PCR (Polymerase Chain Reaction) - Conduct PCR experiments
3. Gel Electrophoresis - Conduct gel electrophoresis experiments
4. DNA Sequencing - Conduct DNA sequencing experiments
5. Microarrays - Conduct microarray experiments
6. Proteomics - Conduct proteomics experiments
7. Antibody Production and Purification - Conduct antibody production and purification experiments
8. ELISA (Enzyme-Linked Immunosorbent Assay) - Conduct ELISA experiments
9. Western Blotting - Conduct Western blotting experiments
10. Flow Cytometry - Conduct flow cytometry experiments
11. Biosensors - Conduct biosensor experiments
12. Microfluidics - Conduct microfluidics experiments
13. Gene Editing with CRISPR-Cas - Conduct gene editing experiments using CRISPR-Cas
14. Next-Generation Sequencing - Conduct next-generation sequencing experiments
15. Nanotechnology in Biotechnology - Conduct nanotechnology experiments in biotechnology
16. Bioinformatics in Biotechnology - Conduct bioinformatics experiments in biotechnology
17. Pharmacogenomics - Conduct pharmacogenomics experiments
18. Immunotherapy - Conduct immunotherapy experiments
19. Stem Cell Technology - Conduct stem cell experiments
20. Tissue Engineering - Conduct tissue engineering experiments

References:

1. Meyers, R. A. (Ed.). (2013). Molecular Biology and Biotechnology: A Comprehensive Desk Reference (2nd ed.). Wiley-Blackwell.

3	Course title: Blood Banking and Transfusion Sciences	Course Code: MLSC-301

Overall Description and Aims:

This course provides an overview of blood banking and transfusion sciences including the principles of blood group serology, transfusion medicine, and the role of the clinical laboratory in the selection and management of blood and blood products. Students will learn the importance of donor screening, blood collection, processing, storage, and transfusion reactions. This course is designed to develop students' knowledge and skills required for the safe and effective use of blood and blood products in clinical practice.

The aims of this course are to:

1. Develop a comprehensive understanding of the principles of blood banking and transfusion sciences
2. Explain the importance of donor screening, blood collection, processing, storage, and transfusion reactions.
3. Develop skills necessary for the safe and effective use of blood and blood products in clinical practice.

Intended Learning Outcomes:

Knowledge and Understanding:

1. Explain the principles of blood group serology
2. Discuss the principles of transfusion medicine and the use of blood products in clinical practice
3. Describe the role of the clinical laboratory in the selection and management of blood and blood products

Intellectual Skills:

1. Analyze and interpret blood bank data and transfusion reactions
2. Evaluate the quality of blood and blood products
3. Synthesize the principles of blood banking and transfusion sciences

Professional and Practical Skills:

1. Demonstrate proper techniques for blood collection and processing
2. Apply the principles of donor screening

3. Perform transfusion reactions and identify possible complications

General Transferable Skills:

1. Communicate effectively in written and oral form
2. Work effectively in a team
3. Manage time effectively and prioritize tasks

Course Topics:

1: Introduction to Blood Banking and Transfusion Sciences :

- Define blood banking and transfusion sciences
- Discuss the importance of blood transfusion in clinical practice

2: Blood Group Antigens and Antibodies :

- Explain the ABO and Rh blood group systems
- Describe the other blood group systems

3: Donor Screening and Blood Collection :

- Discuss the criteria for donor selection
- Explain the process of blood collection

4: Blood Component Preparation :

- Describe the process of blood component preparation
- Discuss the indications for the use of different blood components

5: Blood Group Serology :

- Explain the principles of blood group serology
- Describe the laboratory methods for blood group determination

6: Compatibility Testing :

- Explain the principles of compatibility testing
- Describe the methods used in compatibility testing

7: Transfusion Reactions :

- Define transfusion reactions

- Describe the signs and symptoms of transfusion reactions

8: Blood-Borne Diseases and Safety :

- Discuss the risk of blood-borne diseases in transfusion practice
- Describe the safety measures in blood transfusion

9: Special Transfusion Situations :

- Discuss the principles of neonatal and pediatric transfusion
- Describe the transfusion therapy for patients with bleeding disorders

10: Immunohematology :

- Explain the principles of immunohematology
- Discuss the laboratory techniques used in immunohematology

11: HLA Typing and Transplantation :

- Describe the HLA system and its importance in transplantation
- Explain the laboratory methods for HLA typing

12: Hemolytic Disease of the Newborn :

- Describe the pathophysiology of hemolytic disease of the newborn
- Explain the prevention and treatment of hemolytic disease of the newborn

13: Blood Bank Automation :

- Explain the principles of blood bank automation
- Describe the advantages and disadvantages of blood bank automation

14: Quality Assurance in Blood Banking :

- Define quality assurance in blood banking
- Discuss the importance of quality assurance in blood banking

15: Transfusion Medicine in Surgery :

- Discuss the role of transfusion medicine in surgical practice
- Describe the transfusion therapy for surgical patients

16: Transfusion Medicine in Hematology/Oncology :

- Discuss the role of transfusion medicine in hematology/oncology practice
- Describe the transfusion therapy for patients with hematologic/oncologic disorders

17: Transfusion Medicine in Critical Care :

- Discuss the role of transfusion medicine in critical care practice
- Describe the transfusion therapy for patients in critical care

18: Blood Bank Regulations and Accreditation :

- Explain the regulations governing blood banks
- Describe the process of blood bank accreditation

19: Blood Management and Utilization :

- Discuss the principles of blood management and utilization
- Describe the strategies for reducing blood product usage

20: Transfusion-Transmitted Diseases :

- Explain the principles of transfusion-transmitted diseases
- Discuss the strategies for preventing transfusion-transmitted diseases

21: Autologous and Directed Donations :

- Discuss the principles of autologous and directed donations
- Describe the indications for autologous and directed donations

22: Hemovigilance :

- Define hemovigilance
- Discuss the importance of hemovigilance in transfusion practice

23: Transfusion Alternatives :

- Discuss the principles of transfusion alternatives
- Describe the strategies for using transfusion alternatives

24: Blood Bank Information Systems :

- Explain the principles of blood bank information systems
- Describe the advantages and disadvantages of blood bank information systems

25: Blood Bank Management :

- Discuss the principles of blood bank management
- Describe the skills necessary for effective blood bank management

26: Ethics in Blood Banking :

- Define ethics in blood banking
- Discuss the ethical issues in blood banking

27: Emerging Trends in Blood Banking and Transfusion Sciences :

- Discuss the emerging trends in blood banking and transfusion sciences
- Describe the potential impact of emerging trends on transfusion practice

Practical Classes:

1. Blood Collection Techniques Objective: Demonstrate proper blood collection techniques
2. Blood Component Preparation Objective: Demonstrate the process of blood component preparation
3. Blood Group Serology Objective: Perform blood group serology tests
4. Compatibility Testing Objective: Perform compatibility testing
5. Transfusion Reactions Objective: Identify and manage transfusion reactions
6. Blood-Borne Diseases and Safety Objective: Demonstrate safety measures in blood transfusion
7. Special Transfusion Situations Objective: Apply transfusion therapy in special situations
8. Immunohematology Objective: Perform laboratory techniques used in immunohematology
9. HLA Typing and Transplantation Objective: Perform laboratory methods for HLA typing
10. Hemolytic Disease of the Newborn Objective: Perform prevention and treatment of hemolytic disease of the newborn
11. Blood Bank Automation Objective: Use blood bank automation systems
12. Quality Assurance in Blood Banking Objective: Apply quality assurance in blood banking
13. Transfusion Medicine in Surgery Objective: Apply transfusion therapy for surgical patients

14. Transfusion Medicine in Hematology/Oncology Objective: Apply transfusion therapy for patients with hematologic/oncologic disorders
15. Transfusion Medicine in Critical Care Objective: Apply transfusion therapy for patients in critical care
16. Blood Management and Utilization Objective: Apply strategies for reducing blood product usage
17. Autologous and Directed Donations Objective: Perform autologous and directed donations
18. Hemovigilance Objective: Apply hemovigilance practices in transfusion practice
19. Transfusion Alternatives Objective: Use transfusion alternatives in practice
20. Blood Bank Information Systems Objective: Use blood bank information systems effectively

References:

1. Harmening, D. M. (2019). Modern blood banking & transfusion practices. FA Davis.
2. Fung, M. K., Grossman, B. J., Hillyer, C. D., Westhoff, C. M. (Eds.). (2021). Technical manual. AABB.

4	Course title: Body Fluid Analysis	Course Code: MLSC-302

Overall Description and Aims:

This course provides an in-depth understanding of the principles and techniques used for the analysis of various body fluids, including blood, urine, cerebrospinal fluid, and other body fluids. The course will cover the interpretation of laboratory data, pathophysiology of various diseases, and the role of laboratory analysis in the diagnosis and treatment of diseases.

Course Aims: The primary aim of this course is to provide students with a comprehensive understanding of body fluid analysis and its relevance in clinical practice. By the end of this course, students should be able to demonstrate knowledge and understanding of the principles and techniques used in the analysis of body fluids, develop intellectual and professional skills required for the interpretation of laboratory data, and understand the importance of accurate and timely analysis of body fluids for patient diagnosis and treatment.

Intended Learning Outcomes: Knowledge and Understanding:

1. Demonstrate a comprehensive understanding of the principles and techniques used for the analysis of body fluids.
2. Understand the pathophysiology of various diseases and the role of laboratory analysis in the diagnosis and treatment of diseases.
3. Develop an understanding of laboratory data and its interpretation in the context of patient diagnosis and treatment.

Intellectual Skills:

1. Develop critical thinking and analytical skills required for the interpretation of laboratory data.
2. Develop the ability to critically evaluate laboratory results and diagnose diseases based on the available evidence.

Professional and Practical Skills:

1. Develop practical skills required for the analysis of various body fluids in a clinical laboratory setting.
2. Demonstrate professional and ethical conduct in the laboratory setting.

3. Develop the ability to work effectively in a team and communicate laboratory results effectively to healthcare professionals.

General Transferable Skills:

1. Develop transferable skills, such as problem-solving, time management, and independent learning, required for professional development.

Course Topics:

1: Introduction to Body Fluid Analysis : Understand the importance of body fluid analysis in clinical practice.

2: Blood Analysis - Hematology : Understand the principles and techniques used for the analysis of blood.

3: Blood Analysis - Coagulation Studies : Understand the principles and techniques used for the analysis of coagulation in blood.

4: Blood Analysis - Blood Chemistry : Understand the principles and techniques used for the analysis of blood chemistry.

5: Urine Analysis - Routine Urinalysis : Understand the principles and techniques used for the analysis of routine urine.

6: Urine Analysis - Microscopic Examination : Understand the principles and techniques used for the microscopic examination of urine.

7: Urine Analysis - Chemical Examination : Understand the principles and techniques used for the chemical examination of urine.

8: Cerebrospinal Fluid Analysis : Understand the principles and techniques used for the analysis of cerebrospinal fluid.

9: Other Body Fluids Analysis : Understand the principles and techniques used for the analysis of other body fluids.

10: Quality Control in Body Fluid Analysis : Understand the principles and techniques used for quality control in body fluid analysis.

11: Interpretation of Laboratory Data : Develop critical thinking and analytical skills required for the interpretation of laboratory data.

12: Diagnostic Tests and Clinical Correlations : Understand the role of laboratory analysis in the diagnosis and treatment of diseases.

13: Disease Monitoring and Treatment : Understand the importance of accurate and timely analysis of body fluids for patient diagnosis and treatment.

Practical Classes:

1. Blood Sample Collection and Handling : Develop practical skills required for the collection and handling of blood samples.
2. Hematology and Blood Cell Counting : Understand the principles and techniques used for the analysis of blood cells.
3. Coagulation Studies : Understand the principles and techniques used for the analysis of coagulation in blood.
4. Blood Chemistry : Understand the principles and techniques used for the analysis of blood chemistry.
5. Routine Urinalysis : Understand the principles and techniques used for the analysis of routine urine.
6. Microscopic Examination of Urine : Understand the principles and techniques used for the microscopic examination of urine.
7. Chemical Examination of Urine : Understand the principles and techniques used for the chemical examination of urine.
8. Cerebrospinal Fluid Analysis : Understand the principles and techniques used for the analysis of cerebrospinal fluid.
9. Other Body Fluid Analysis : Understand the principles and techniques used for the analysis of other body fluids.
10. Quality Control in Body Fluid Analysis : Understand the principles and techniques used for quality control in body fluid analysis.
11. Interpretation of Laboratory Data : Develop critical thinking and analytical skills required for the interpretation of laboratory data.
12. Diagnostic Tests and Clinical Correlations : Understand the role of laboratory analysis in the diagnosis and treatment of diseases.
13. Disease Monitoring and Treatment : Understand the importance of accurate and timely analysis of body fluids for patient diagnosis and treatment.
14. Case Studies and Group Discussions : Develop problem-solving skills and the ability to communicate laboratory results effectively to healthcare professionals.
15. Laboratory Safety and Ethical Conduct : Develop an understanding of laboratory safety and ethical conduct in the laboratory setting.

16. Independent Practical Work : Develop practical skills required for the analysis of body fluids in a clinical laboratory setting.

References:

1. Bishop, M. L., Fody, E. P., & Schoeff, L. E. (2018). Clinical Chemistry: Principles, Techniques, Correlations. Wolters Kluwer.
2. Henry, JB. Clinical Diagnosis and Management by Laboratory Methods. Saunders, 2011.

5	Course title: Histopathology	Course Code: CYTO-304

Overall Description and Aims:

Histopathology is the branch of pathology that involves the examination of tissues and cells to diagnose disease. This undergraduate course in Medical Laboratory Sciences program aims to provide students with a comprehensive understanding of histopathology, including the various techniques used for tissue processing, staining, and microscopic examination. The course also covers the interpretation of histopathological findings and their relevance in the diagnosis, treatment, and prognosis of diseases.

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

Knowledge and Understanding:

- Describe the principles and techniques used in histopathology.
- Identify the microscopic features of normal and abnormal tissues.
- Explain the relevance of histopathological findings in disease diagnosis, treatment, and prognosis.

Intellectual Skills:

- Analyze and interpret histopathological findings.
- Evaluate the diagnostic accuracy and reliability of histopathological tests.
- Synthesize information from multiple sources to arrive at a diagnosis.
- Professional and Practical Skills:
- Perform tissue processing, embedding, sectioning, and staining techniques.
- Operate and maintain microscopes and other laboratory equipment.
- Prepare and interpret histopathology reports.

General Transferable Skills:

- Communicate effectively both orally and in writing.
- Work effectively as part of a team.
- Manage time and resources effectively.

Course Topics:

1: Introduction to Histopathology

- Define histopathology and its importance in disease diagnosis.
- Describe the types of specimens collected for histopathological examination.
- Explain the principles and techniques used in tissue processing.

2: Microscopic Techniques in Histopathology

- Describe the different types of microscopes used in histopathology.
- Explain the principles of staining and the different types of stains used in histopathology.

3: Normal Tissue Structure and Function

- Identify the microscopic features of normal tissues.
- Explain the functions of different types of tissues.

4: Inflammation and Repair

- Define inflammation and its causes.
- Describe the different types of cells involved in inflammation.
- Explain the process of tissue repair and the different types of repair.

5: Neoplasia

- Define neoplasia and its causes.
- Describe the different types of neoplasia and their microscopic features.
- Explain the diagnostic criteria for neoplasia.

6: Infectious Diseases

- Define infectious diseases and their causes.
- Describe the different types of infectious agents and their microscopic features.
- Explain the diagnostic criteria for infectious diseases.

7: Cardiovascular Diseases

- Define cardiovascular diseases and their causes.
- Describe the different types of cardiovascular diseases and their microscopic features.
- Explain the diagnostic criteria for cardiovascular diseases.

8: Respiratory Diseases

- Define respiratory diseases and their causes.
- Describe the different types of respiratory diseases and their microscopic features.
- Explain the diagnostic criteria for respiratory diseases.

9: Gastrointestinal Diseases

- Define gastrointestinal diseases and their causes.
- Describe the different types of gastrointestinal diseases and their microscopic features.
- Explain the diagnostic criteria for gastrointestinal diseases.

10: Renal Diseases

- Define renal diseases and their causes.
- Describe the different types of renal diseases and their microscopic features.
- Explain the diagnostic criteria for renal diseases.

11: Liver Diseases

- Define liver diseases and their causes.
- Describe the different types of liver diseases and their microscopic features.
- Explain the diagnostic criteria for liver diseases.

12: Endocrine Diseases

- Define endocrine diseases and their causes.
- Describe the different types of endocrine diseases and their microscopic features.
- Explain the diagnostic criteria for endocrine diseases.

13: Skin Diseases

- Define skin diseases and their causes.
- Describe the different types of skin diseases and their microscopic features.
- Explain the diagnostic criteria for skin diseases.

Practical Classes:

1. Tissue processing

- Demonstrate the proper techniques for tissue processing.
- Identify the different types of tissue processing equipment and reagents.

2. Tissue embedding

- Demonstrate the proper techniques for tissue embedding.
- Identify the different types of embedding materials and molds.

3. Microtomy

- Demonstrate the proper techniques for microtomy.
- Identify the different types of microtomes.

4. Staining

- Demonstrate the proper techniques for staining.
- Identify the different types of stains used in histopathology.

5. Microscopy

- Operate a microscope.
- Identify the different parts of a microscope and their functions.

6. Normal tissues

- Identify the microscopic features of normal tissues.
- Describe the functions of different types of tissues.

7. Inflammation and repair

- Identify the different types of inflammatory cells and their functions.
- Describe the process of tissue repair.

8. Neoplasia

- Identify the different types of neoplasia and their microscopic features.
- Apply diagnostic criteria for neoplasia.

9. Infectious diseases

- Identify the different types of infectious agents and their microscopic features.
- Apply diagnostic criteria for infectious diseases.

10. Cardiovascular diseases

- Identify the different types of cardiovascular diseases and their microscopic features.
- Apply diagnostic criteria for cardiovascular diseases.

11. Respiratory diseases

- Identify the different types of respiratory diseases and their microscopic features.
- Apply diagnostic criteria for respiratory diseases.

12. Gastrointestinal diseases

- Identify the different types of gastrointestinal diseases and their microscopic features.
- Apply diagnostic criteria for gastrointestinal diseases.

13. Renal diseases

- Identify the different types of renal diseases and their microscopic features.
- Apply diagnostic criteria for renal diseases.

14. Liver diseases

- Identify the different types of liver diseases and their microscopic features.
- Apply diagnostic criteria for liver diseases.

15. Endocrine diseases

- Identify the different types of endocrine diseases and their microscopic features.
- Apply diagnostic criteria for endocrine diseases.

16. Skin diseases

- Identify the different types of skin diseases and their microscopic features.
- Apply diagnostic criteria for skin diseases.

References:

1. Kumar, V., Abbas, A. K., Aster, J. C., & Robbins, S. L. (2014). Robbins and Cotran pathologic basis of disease (9th ed.). Elsevier Saunders.
2. Bancroft, J. D., & Gamble, M. (2008). Theory and practice of histological techniques (6th ed.). Churchill Livingstone.

6	Course title: Medical Toxicology	Course Code: MLSC-304

Overall Description and Aims:

This course is designed to provide students with a comprehensive understanding of the principles, practice and management of toxicology in the clinical laboratory sciences. This course is intended to equip students with a sound knowledge base of various toxic agents, their toxic effects, and the corresponding management strategies.

The course aims to enable students to understand the relationship between the body and different toxic agents, assess the extent of damage caused by toxic substances, and implement appropriate treatments to manage and prevent toxicity.

Intended Learning Outcomes:

At the end of this course, students will be able to:

Knowledge and Understanding:

- Understand the principles and fundamentals of medical toxicology
- Describe the various classes of toxic agents and their associated toxic effects
- Understand the pathways of toxicant exposure and the corresponding management strategies
- Analyze and interpret the results of toxicological assays
- Describe the effects of toxins on various organs and systems in the body
- Understand the role of regulatory bodies and ethical considerations in medical toxicology.

Intellectual Skills:

- Critically evaluate the risks and benefits of various treatment options for toxicity management
- Analyze and interpret data from toxicological assays and case reports
- Identify and evaluate the potential toxic risks associated with different chemical agents.

Professional and Practical Skills:

- Conduct appropriate laboratory testing and analysis for the identification and quantification of toxic agents

- Formulate appropriate therapeutic interventions based on the type and extent of toxicity
- Communicate effectively with healthcare professionals, regulatory bodies, and the general public about toxicological issues.

General Transferable Skills:

- Develop effective problem-solving and critical thinking skills
- Develop effective communication and interpersonal skills
- Develop effective time management and organizational skills

Course Topics:

1: Introduction to Medical Toxicology :

- Define Medical Toxicology
- Explain the scope of medical toxicology
- Discuss the relationship between medical toxicology and other branches of medicine.

2: Chemical Hazards and Toxicology :

- Define a chemical hazard
- Describe the different routes of exposure to chemicals
- Explain the different types of toxicity (acute, chronic, etc.)

3: Toxicokinetics and Toxicodynamics :

- Define toxicokinetics and toxicodynamics
- Explain how toxicokinetics and toxicodynamics influence the toxicity of chemicals

4: Analytical Methods in Medical Toxicology :

- Explain the different analytical methods used in medical toxicology
- Discuss the principles of analytical toxicology

5: Toxicity of Metals :

- Describe the different types of metal toxicity
- Explain the mechanisms of metal toxicity

6: Toxicity of Pesticides :

- Describe the different types of pesticide toxicity
- Explain the mechanisms of pesticide toxicity

7: Toxicity of Solvents and Volatile Organic Compounds :

- Describe the different types of solvent and VOC toxicity
- Explain the mechanisms of solvent and VOC toxicity

8: Toxicity of Drugs and Pharmaceuticals :

- Describe the different types of drug and pharmaceutical toxicity
- Explain the mechanisms of drug and pharmaceutical toxicity

9: Toxicity of Biological Toxins :

- Describe the different types of biological toxins
- Explain the mechanisms of biological toxin toxicity

10: Toxicity of Radiation :

- Describe the different types of radiation toxicity
- Explain the mechanisms of radiation toxicity

11: Diagnosis of Toxicity :

- Describe the different methods used in diagnosing toxicity
- Explain the principles of toxicological diagnosis

12: Toxicity Management and Treatment :

- Discuss the different strategies for toxicity management
- Explain the principles of toxicity treatment

13: Risk Assessment and Regulation :

- Discuss the principles of risk assessment in toxicology
- Explain the role of regulatory bodies in toxicology

14: Environmental Toxicology :

- Describe the different types of environmental toxins

- Explain the principles of environmental toxicology

15: Occupational Toxicology :

- Describe the different types of occupational toxins
- Explain the principles of occupational toxicology

16: Pediatric Toxicology :

- Describe the unique considerations for pediatric toxicity
- Explain the principles of pediatric toxicology

17: Toxicology of Abuse and Addiction :

- Describe the different types of abused and addictive substances
- Explain the principles of addiction and dependence in toxicology

18: Food and Water Toxicology :

- Describe the different types of food and water toxins
- Explain the principles of food and water toxicology

19: Chemical Terrorism :

- Describe the principles of chemical terrorism
- Explain the strategies for responding to chemical terrorism events

20: Natural Toxins :

- Describe the different types of natural toxins
- Explain the mechanisms of natural toxin toxicity

21: Chemical Carcinogenesis :

- Describe the principles of chemical carcinogenesis
- Explain the mechanisms of chemical carcinogenesis

22: Chemical Mutagenesis :

- Describe the principles of chemical mutagenesis
- Explain the mechanisms of chemical mutagenesis

23: Reproductive and Developmental Toxicology :

- Describe the principles of reproductive and developmental toxicology
- Explain the mechanisms of reproductive and developmental toxicity

Practical Classes:

1. Safety and handling of toxic agents :
- Demonstrate safe handling of toxic agents
- Explain the principles of safety in toxicological testing

2. Analytical methods in toxicology :
- Perform different types of toxicological assays
- Analyze and interpret toxicological data

3. Toxicity management and treatment :
- Apply appropriate toxicity management and treatment strategies
- Evaluate the efficacy of different treatments

4. Diagnosis of toxicity :
- Perform toxicological diagnosis
- Evaluate the accuracy and reliability of diagnostic methods

5. Risk assessment and regulation :
- Analyze the risks associated with different toxic agents
- Evaluate the effectiveness of regulatory measures

References:

1. Klaassen, C. D., & Watkins, J. B. (2019). Casarett & Doull's essentials of toxicology. New York: McGraw-Hill Education.

2. Dart, R. C. (Ed.). (2018). Medical toxicology. Philadelphia: Wolters Kluwer Health.

7	Course title: Pathophysiology	Course Code: MLSC-305

Overall Description and Aims:

Pathophysiology is a fundamental course that aims to provide students with an understanding of the underlying mechanisms of diseases and disorders at the cellular, tissue, and organ levels. This course is designed to help students comprehend how various factors such as genetic mutations, environmental exposures, lifestyle choices, and infections contribute to the development and progression of diseases.

The primary aim of this course is to provide students with a comprehensive knowledge of the mechanisms underlying various disease states, including their etiology, pathogenesis, and clinical manifestations. By the end of the course, students are expected to be able to apply this knowledge to identify the underlying pathophysiological mechanisms of different diseases and conditions, and critically evaluate the effectiveness of various therapeutic approaches.

Intended Learning Outcomes:

1. Knowledge and Understanding: By the end of the course, students should be able to:

- Demonstrate an understanding of the basic principles of pathophysiology and its relevance to disease development and progression.
- Identify the major cellular and molecular mechanisms underlying different disease states.
- Understand the impact of genetic and environmental factors on disease development and progression.
- Describe the clinical manifestations of various diseases and conditions.

2. Intellectual Skills:

- Analyze and interpret scientific data related to disease pathogenesis.
- Critically evaluate the effectiveness of different therapeutic approaches in treating various diseases and conditions.
- Apply critical thinking skills to diagnose and manage different disease states.

- Professional and Practical Skills: Communicate effectively about pathophysiological concepts to other healthcare professionals and patients.

- Understand and follow ethical principles and guidelines in clinical and research settings.
- Apply principles of evidence-based medicine to make informed decisions in clinical practice.

4. General Transferable Skills:

- Work effectively in a team and collaborate with other healthcare professionals.
- Use different resources to acquire and evaluate scientific knowledge.
- Develop skills in time management, organization, and problem-solving.

Course Topics and Subtopics:

1. Introduction to Pathophysiology

- Definition and scope of pathophysiology
- Historical perspectives on the study of disease
- Basic concepts in pathophysiology: homeostasis, adaptation, and maladaptation

2. Cellular and Molecular Pathophysiology

- Cellular structure and function
- Genetic and epigenetic factors in disease development
- Signaling pathways and cellular communication
- Apoptosis and necrosis

3. Immunopathology

- Innate and adaptive immune responses
- Autoimmunity and hypersensitivity reactions
- Immunodeficiency diseases

4. Inflammation and Healing

- Acute and chronic inflammation
- Wound healing and tissue repair
- Fibrosis and scarring

5. Cardiovascular Pathophysiology

- Structure and function of the heart and blood vessels

- Coagulation disorders
- Vascular disorders
- Thrombosis and emboli
- Edema
- Cardiac diseases
    - Congenital
    - Valvular
    - Coronary heart and artery disease
- Atherosclerosis and coronary artery disease
- Hypertension and heart failure

6. Respiratory Pathophysiology

- Chronic obstructive pulmonary disease
- Infectious respiratory diseases
- Bronchitis and bronchiectasis
- Chronic obstructive pulmonary diseases
- Asthma and bronchitis

7. Renal and Urinary Pathophysiology

- Structure and function of the kidney and urinary system
- Glomerular diseases and nephrotic syndrome
- Acute and chronic kidney failure

8. Gastrointestinal Pathophysiology

- Peptic ulcer disease and gastritis
- Inflammatory bowel disease

9. Hepatobiliary Pathophysiology

- Hepatitis and cirrhosis
- Gallstones and cholecystitis

10. Endocrine Pathophysiology

- Hormones and their functions
- Diabetes mellitus
- Thyroid disorders
- Pituitary disorders

- Thyroid and parathyroid disorders
- Adrenocorticotropic disorders

11. Musculoskeletal Pathophysiology

- Abnormal bone formations
- Arthritis
- Fractures
- Osteoporosis and osteoarthritis
- Rheumatoid arthritis

12. Neurological Pathophysiology

- Stroke and cerebrovascular disease
- Cerebral and spinal disorders
- Cerebrovascular accident
- infections of the nervous system
- Alzheimer's disease and dementia

13. Cancer Pathophysiology

- Biology of cancer cells
- Mechanisms of tumor growth and metastasis
- Cancer treatment modalities

14. Fluid, electrolyte, and acid/base imbalances

- Intracellular and extracellular fluids
- Intracellular and extracellular electrolytes
- Fluid and electrolyte imbalances
- Acid/base imbalances
- Respiratory control mechanisms
- Renal control mechanismsMechanisms of drug action

15. Environmental Pathophysiology

- Environmental toxins and pollutants
- Occupational and environmental diseases

Practical Classes:

1. Laboratory techniques for studying cell and tissue pathology

2. Case-based learning on common diseases and disorders
3. Use of imaging techniques for disease diagnosis
4. Analysis of medical records and patient histories
5. Identification and interpretation of laboratory test results
10. Analysis of medical literature and research papers
11. Use of computer simulations for disease modeling
12. Presentation of case reports and research findings

References:

1. Pathophysiology: The Biologic Basis for Disease in Adults and Children by Kathryn L. McCance and Sue E. Huether, 8th Edition.
2. Robbins and Cotran Pathologic Basis of Disease by Vinay Kumar, Abul Abbas, and Jon Aster, 9th Edition.

8	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

Objectives for Each 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.

9	Course title: Specimen Procurement and Documentation	Course Code: MLSC-307

Overall Description and Aims:

The course is designed to provide students with the knowledge and practical skills necessary for the collection, handling, and documentation of specimens in a clinical laboratory setting. The course will cover a range of topics related to the proper handling and processing of biological specimens, including blood, urine, stool, and tissue samples. The aim of the course is to prepare students for careers in clinical laboratory science by providing them with a strong foundation in the theory and practice of specimen procurement and documentation.

Intended Learning Outcomes:

Upon completion of this course, students will have acquired:

Knowledge and Understanding:

- An understanding of the principles and methods used in the collection, handling, and documentation of biological specimens
- Knowledge of the different types of specimens and their unique handling requirements
- An understanding of the role of the clinical laboratory in the healthcare system
- Knowledge of the ethical and legal considerations surrounding the handling of biological specimens

Intellectual Skills:

- Analyze and interpret laboratory data
- Apply critical thinking to specimen collection and handling
- Evaluate quality assurance and control techniques in the laboratory

Professional and Practical Skills:

- The ability to safely and accurately collect, handle, and document biological specimens
- The ability to use and maintain laboratory equipment related to specimen procurement and documentation

- The ability to communicate effectively with healthcare professionals and laboratory staff
- Demonstrate proper techniques for specimen procurement and documentation
- Practice occupational health and safety measures in the laboratory
- Apply quality assurance and control techniques in the laboratory

General Transferable Skills:

- Communicate effectively in a laboratory setting
- Work effectively as part of a team
- Develop time management and organizational skills

Course Topics:

1. Introduction to Specimen Procurement and Documentation

- Understand the importance of proper specimen procurement and documentation in the clinical laboratory setting.

2. Types of Specimens

- Identify different types of specimens and their unique handling requirements.

3. Patient Identification and Specimen Labeling

- Understand the importance of accurate patient identification and specimen labeling.

4. Specimen Collection and Handling

- Identify proper techniques for the collection and handling of different types of specimens.

5. Specimen Transport and Storage

- Understand the requirements for specimen transport and storage.

6. Quality Assurance and Control

- Understand the importance of quality assurance and control in specimen procurement and documentation.

7. Occupational Health and Safety

- Identify and understand the hazards associated with specimen procurement and documentation and the measures used to protect laboratory staff.

8. Legal and Ethical Issues

- Understand the legal and ethical considerations surrounding the handling of biological specimens.

9. Point of Care Testing

- Understand the principles of point-of-care testing and its impact on specimen procurement and documentation.

10. Clinical Laboratory Workflow

- Understand the role of specimen procurement and documentation in the clinical laboratory workflow.

11. Laboratory Information Systems

- Understand the role of laboratory information systems in specimen procurement and documentation.

13. Hematology

- Understand the principles of hematology and the techniques used to collect and analyze blood specimens.

3. Venipuncture: Demonstrate proper techniques for venipuncture

4. Capillary Blood Collection: Demonstrate proper techniques for capillary blood collection

14. Microbiology

- Understand the principles of microbiology and the techniques used to collect and analyze various microbiological specimens.

15. Clinical Chemistry

- Understand the principles of clinical chemistry and the techniques used to collect and analyze various biochemical specimens.

16. Urinalysis

- Understand the principles of urinalysis and the techniques used to collect and analyze urine specimens.

17. Immunology and Serology

- Understand the principles of immunology and serology and the techniques used to collect and analyze various immunological and serological specimens.

18. Cytology and Histology

- Understand the principles of cytology and histology and the techniques used to collect and analyze various tissue specimens.

19. Specimen Rejection and Unsatisfactory Samples

- Understand and practice techniques for specimen rejection and documentation of unsatisfactory samples

20. Specimen Referral and External Testing

- Understand the process of specimen referral and external testing

21. Newborn Screening

- Understand and practice proper techniques for newborn screening

22. Specimen Collection in Special Populations

- Understand and practice proper techniques for specimen collection in special populations, such as pediatric, geriatric, and critically ill patients

23. Molecular Diagnostics

- Understand and practice proper techniques for collecting and analyzing various molecular specimens

24. Hematopoietic Stem Cell Collection and Processing

- Understand and practice proper techniques for collecting and processing hematopoietic stem cells.

25. Blood Transfusion

- Understand and practice proper techniques for blood transfusion and blood bank specimen collection

26. Collection of Specimens for Drug Monitoring and Toxicology

- Understand and practice proper techniques for collecting specimens for drug monitoring and toxicology testing

27. Specimen Collection and Transport in Public Health

- Understand and practice proper techniques for specimen collection and transport in public health settings

28. Quality Improvement in Specimen Procurement and Documentation

- Understand and apply quality improvement techniques in the laboratory to enhance specimen procurement and documentation processes

29. Emerging Technologies in Specimen Procurement and Documentation

- Understand and apply emerging technologies in specimen procurement and documentation processes to improve efficiency and accuracy

Practical Classes:

1. Patient Identification and Specimen Labeling

- Practice proper techniques for patient identification and specimen labeling

2. Venipuncture

- Practice proper techniques for venipuncture

3. Capillary Blood Collection

- Practice proper techniques for capillary blood collection

4. Specimen Transport and Storage

- Practice proper techniques for specimen transport and storage

5. Quality Assurance and Control

- Apply quality assurance and control techniques in the laboratory

6. Occupational Health and Safety

- Practice occupational health and safety measures in the laboratory

7. Point of Care Testing

- Practice point-of-care testing techniques

8. Clinical Laboratory Workflow

- Apply proper techniques for specimen procurement and documentation in a simulated clinical laboratory setting

9. Hematology

- Practice proper techniques for collecting and analyzing blood specimens

10. Microbiology

- Practice proper techniques for collecting and analyzing various microbiological specimens

11. Clinical Chemistry

- Practice proper techniques for collecting and analyzing various biochemical specimens

12. Urinalysis

- Practice proper techniques for collecting and analyzing urine specimens

13. Immunology and Serology

- Practice proper techniques for collecting and analyzing various immunological and serological specimens

14. Cytology and Histology

- Practice proper techniques for collecting and analyzing various tissue specimens

15. Forensic Specimen Collection

- Practice proper techniques for forensic specimen collection and documentation

16. Specimen Rejection and Unsatisfactory Samples

- Practice techniques for specimen rejection and documentation of unsatisfactory samples

17. Specimen Referral and External Testing

- Understand the process of specimen referral and external testing

18. Newborn Screening

- Practice proper techniques for newborn screening

19. Specimen Collection in Special Populations

- Practice proper techniques for specimen collection in special populations, such as pediatric, geriatric, and critically ill patients

20. Cytology and Histology

- Practice proper techniques for collecting and analyzing various tissue specimens.

References:

1. Nester, E. W., Anderson, D. G., Roberts, C. E., & Nester, M. T. (2012). Microbiology: a human perspective. McGraw-Hill Education.
2. Kaplan, L. A., & Pesce, A. J. (2018). Clinical chemistry: theory, analysis, correlation. Elsevier.
3. Bishop M, Fody E, Schoeff L. Clinical Chemistry: Principles, Techniques, Correlations. Lippincott Williams & Wilkins, 2017.
4. Clinical and Laboratory Standards Institute (CLSI). Collection, Transport, and Processing of Blood Specimens for Testing Plasma-Based Coagulation Assays and Molecular Hemostasis Assays; Approved Guideline, 5th Ed. CLSI document H21-A5. Wayne, PA: Clinical and Laboratory Standards Institute, 2008.

Department of Medical Laboratory Sciences

Proposed Syllabi for all Courses in the Fourth Year

Prepared by

Abdelmuhsen Abusneina, PhD

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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:

1. Demonstrate a broad knowledge of the fundamental principles of biomedical ethics and scientific integrity.
2. Describe the ethical frameworks and principles that are commonly used in biomedical research and practice.
3. 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:

1. Apply ethical frameworks and principles to real-world scenarios in the biomedical sciences.
2. 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: 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.

3	Course title: Medical Laboratory Instrumentations	Course Code: MLSC-401

Overall Description and Aims:

The course aims to provide students with the knowledge and skills necessary to operate and maintain medical laboratory instruments. The course focuses on the use of instrumentation in medical diagnostics, disease monitoring, and treatment. The course aims to provide students with a comprehensive understanding of the principles and practical applications of laboratory instrumentation in medical settings.

Intended Learning Outcomes:

Knowledge and Understanding:

- Understand the principles of medical laboratory instrumentation used in medical diagnostics, disease monitoring, and treatment.
- Demonstrate knowledge of the various types of medical laboratory instruments and their applications in medical settings.
- Understand the importance of quality control and quality assurance in medical laboratory instrumentation.

Intellectual Skills:

- Analyze and interpret medical laboratory data obtained from different laboratory instruments.
- Evaluate the suitability of different laboratory instruments for specific medical applications.
- Identify and troubleshoot common problems associated with medical laboratory instrumentation.

Professional and Practical Skills:

- Operate and maintain medical laboratory instruments safely and effectively.
- Prepare and process patient samples for analysis using appropriate medical laboratory instrumentation.
- Analyze and interpret medical laboratory data accurately and efficiently.

General Transferable Skills:

- Communicate scientific findings effectively in written and oral formats.

- Work effectively in teams to solve complex problems.
- Manage time and resources efficiently to meet project deadlines.

Course Topics:

1. Introduction to Medical Laboratory Instrumentation
    - History and development of medical laboratory instrumentation
    - Types of medical laboratory instruments
2. Hematology
    - Automated blood cell counters
    - Hemoglobin analysis
3. Medical Chemistry
    - Enzyme assays
    - Electrolyte analysis
4. Immunology
    - Enzyme-linked immunosorbent assay (ELISA)
    - Flow cytometry
5. Microbiology
    - Automated culture systems
    - Microbial identification systems
6. Point-of-Care Testing
    - Glucometers
    - Pregnancy tests
7. Coagulation
    - Coagulation analyzers
    - Thrombin time
8. Urinalysis
    - Automated urine analyzers
    - Microscopic analysis
9. Serology
    - Serological tests for infectious diseases
    - Serological tests for autoimmune diseases
10. Toxicology
    - Immunoassays for drugs of abuse
    - Chromatographic methods for drug analysis
11. Molecular Diagnostics
    - Polymerase chain reaction
    - DNA sequencing
12. Cytology
    - Pap smear analysis

- Fine needle aspiration cytology

13. Histology
    - Tissue processing
    - Microtomy
14. Quality Control and Assurance
    - Statistical process control
    - Internal quality control
15. Instrumentation Maintenance
    - Preventive maintenance
    - Calibration and validation

Practical Classes:

1. Blood Cell Counting
2. Hemoglobin Analysis
3. Enzyme Assays
4. Electrolyte Analysis
5. ELISA
6. Flow Cytometry
7. Microbial Culture Techniques
8. Glucometry
9. Urinalysis
10. Serological Testing
11. Immunoassays for Drugs of Abuse
12. Polymerase Chain Reaction
13. Pap Smear Analysis
14. Tissue Processing
15. Instrument Maintenance

References:

1. Laposata, M. (2018). Laboratory medicine education: the patient-centered medicine revolution. Academic Press.
2. McPherson, R. A., & Pincus, M. R. (2017). Henry's Medical Diagnosis and Management by Laboratory Methods. Elsevier.

4	Course title: Medical Terminology	Course Code: MLSC-402

Overall Description and Aims:

The course ology is designed introduce students to the fundamental concepts and principles of medical terminology and provide them with a comprehensive understanding of the language used in healthcare and medical fields. The course also focuses on developing students' intellectual, professional, practical, and transferable skills that are essential for their future careers in healthcare and biomedical sciences.

Intended Learning Outcomes of Course:

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

Knowledge and Understanding:

- Understand and apply the basic principles of medical terminology
- Comprehend and differentiate medical terms based on their roots, prefixes, and suffixes

Intellectual Skills:

- Analyze and interpret medical terms in context
- Synthesize medical terms to develop a comprehensive understanding of medical concepts

Professional and Practical Skills:

- Apply medical terminology to document patient information and communication with healthcare professionals
- Interpret and explain medical terms to patients and their families

General Transferable Skills:

- Develop effective communication skills
- Enhance critical thinking and problem-solving abilities

Course Topics:

- Introduction to Medical Terminology
    - Origin and evolution of medical terminology

- Components of medical terms

- Medical Terminology Structure

  - Root words and combining forms
  - Prefixes and suffixes

3. Medical Abbreviations and Symbols

- Common medical abbreviations
- Medical symbols and their meanings

4. Anatomy and Physiology

  - Basic anatomy terms
  - Major physiological systems

5. Medical Specialties and Procedures

  - Medical specialties and sub-specialties
  - Diagnostic and therapeutic procedures

6. Pharmacology and Medications

  - Medical terminology related to pharmacology
  - Common medication names and abbreviations

7. Symptoms and Conditions

  - Medical terminology related to symptoms
  - Medical terminology related to common conditions and diseases

8. Medical Documentation

- Medical reports and documentation
- Medical charting and terminology

9. Medical Terminology in Practice Settings

- Medical terminology in hospitals and clinics
- Medical terminology in research settings

10. Medical Equipment and Instruments

- a. Medical instruments and devices
- b. Equipment used in diagnostic and therapeutic procedures

11. Medical Tests and Examinations

- Common laboratory tests
- Imaging and diagnostic tests

12. Diseases and Disorders

- Basic medical conditions and diseases
- Diagnostic and treatment procedures for common diseases

13. Cancer Terminology

- Types of cancer
- Cancer treatments and procedures

14. Medical Terminology for the Musculoskeletal System

- Anatomy and physiology of the musculoskeletal system
- Medical terminology for orthopedics

15. Medical Terminology for the Cardiovascular System

- Anatomy and physiology of the cardiovascular system
- Medical terminology for cardiology

16. Medical Terminology for the Respiratory System

- Anatomy and physiology of the respiratory system
- Medical terminology for pulmonology

17. Medical Terminology for the Gastrointestinal System

- Anatomy and physiology of the gastrointestinal system
- Medical terminology for gastroenterology

18. Medical Terminology for the Endocrine System

- Anatomy and physiology of the endocrine system
- Medical terminology for endocrinology

19. Medical Terminology for the Nervous System

- Anatomy and physiology of the nervous system
- Medical terminology for neurology

20. Medical Terminology for the Reproductive System

- Anatomy and physiology of the reproductive system
- Medical terminology for obstetrics and gynecology

21. Medical Terminology for Pediatrics

- Medical terminology for pediatric medicine
- Medical conditions and diseases affecting children

22. Medical Terminology for Geriatrics

- Medical terminology for geriatric medicine
- Medical conditions and diseases affecting the elderly

23. Medical Terminology for Mental Health

- Medical terminology for psychiatry
- Common mental health conditions

24. Medical Terminology for Infectious Diseases

- Medical terminology for infectious diseases
- Common infections and treatments

25. Medical Terminology for Public Health

- Medical terminology for public health
- Epidemiology and biostatistics

References:

1. Rice, P. L. (2016). Medical terminology: A short course (7th ed.). Elsevier Health Sciences.
2. Ehrlich, A. (2018). Medical terminology for health professions (8th ed.). Cengage Learning.

5	Course title: Molecular Diagnostic Techniques	Course Code: MOLD-404

Overall Description and Aims of the Course:

The course aims to provide students with a comprehensive understanding of the principles and applications of molecular diagnostics in the diagnosis and management of diseases. The course will provide students with hands-on experience in laboratory techniques for the detection of genetic mutations, infectious agents, and other disease markers. By the end of the course, students will be able to demonstrate a detailed knowledge of the principles and applications of molecular diagnostics, as well as an ability to apply this knowledge in laboratory settings.

Intended Learning Outcomes of the Course:

The following are the intended learning outcomes of the Molecular Diagnostics Laboratory undergraduate course:

Knowledge and Understanding:

1. Demonstrate a comprehensive understanding of the principles and applications of molecular diagnostics.
2. Understand the molecular basis of genetic mutations, infectious agents, and other disease markers.
3. Analyze and interpret molecular diagnostic data to inform the diagnosis and management of disease.

Intellectual Skills:

1. Critically evaluate the scientific literature on molecular diagnostics and its applications.
2. Apply theoretical knowledge to practical problem-solving scenarios.
3. Formulate and test hypotheses based on molecular diagnostic data.
4. Analyze and interpret complex molecular diagnostic datasets.

Professional and Practical Skills:

1. Perform molecular diagnostic techniques in a laboratory setting, including nucleic acid extraction, PCR, sequencing, and other techniques.
2. Analyze and interpret molecular diagnostic data to inform clinical decision making.

3. Communicate scientific concepts and research findings effectively in written and oral formats.
4. Work effectively in a laboratory environment, including following safety protocols and good laboratory practices.

General Transferable Skills:

1. Develop effective time-management and organizational skills.
2. Develop effective problem-solving and critical thinking abilities.
3. Develop team-working and collaboration skills.

Course Topics:

1. Introduction to Molecular Diagnostics.
    - To introduce students to the principles and applications of molecular diagnostics in the diagnosis and management of diseases.
2. Nucleic Acid Extraction.
    - To provide students with hands-on experience in the extraction of nucleic acids from biological samples.
3. Real-time PCR and Quantitative PCR (qPCR)
    - To provide students with hands-on experience in the use of real-time PCR and Quantitative PCR applications in gene expression analysis and disease diagnosis for the detection of genetic mutations and other disease markers. Validation and quality control of qPCR assays.
4. Sequencing.
    - To provide students with hands-on experience in DNA sequencing techniques for the detection of genetic mutations and other disease markers.
5. Microarrays.
    - To provide students with hands-on experience in the use of microarray techniques for the detection of genetic mutations and other disease markers.
6. Next-Generation Sequencing.
    - To provide students with an understanding of the principles and applications of next-generation sequencing techniques in molecular diagnostics.
7. Digital PCR .

- To provide students with hands-on experience in the use of digital PCR techniques for the detection of genetic mutations and other disease markers.

8. CRISPR/Cas9.
    - To provide students with an understanding of the principles and applications of CRISPR/Cas9 gene editing in molecular diagnostics.
9. Biomarkers.
    - To provide students with an understanding of the principles and applications of biomarkers in molecular diagnostics.
10. Gene Expression Profiling.
    - To provide students with hands-on experience in the use of gene expression profiling techniques in molecular diagnostics.
11. Epigenetics.
    - To provide students with an understanding of the principles and applications of epigenetics in molecular diagnostics.
12. Infectious Disease Diagnostics.
    - To provide students with hands-on experience in the use of molecular diagnostic techniques for the detection of infectious agents.
13. Cancer Diagnostics.
    - To provide students with an understanding of the principles and applications of molecular diagnostics in cancer diagnosis and management.
14. Cardiovascular Disease Diagnostics.
    - To provide students with an understanding of the molecular basis of cardiovascular diseases and the use of molecular diagnostic techniques in their diagnosis and management.
15. Neurological Disease Diagnostics.
    - To provide students with an understanding of the molecular basis of neurological diseases and the use of molecular diagnostic techniques in their diagnosis and management.
16. Respiratory Disease Diagnostics.
    - To provide students with an understanding of the molecular basis of respiratory diseases and the use of molecular diagnostic techniques in their diagnosis and management.

17. Renal Disease Diagnostics.

- To provide students with an understanding of the molecular basis of renal diseases and the use of molecular diagnostic techniques in their diagnosis and management.

18. Digestive Disease Diagnostics.
    - To provide students with an understanding of the molecular basis of digestive diseases and the use of molecular diagnostic techniques in their diagnosis and management.
19. Reproductive Health Diagnostics.
    - To provide students with an understanding of the molecular basis of reproductive health and the use of molecular diagnostic techniques in the diagnosis and management of reproductive disorders.
20. Inherited Genetic Disorder Diagnostics.
    - To provide students with an understanding of the molecular basis of inherited genetic disorders and the use of molecular diagnostic techniques in their diagnosis and management.
21. Emerging Technologies in Molecular Diagnostics.
    - To provide students with an understanding of emerging technologies in molecular diagnostics and their potential applications in disease diagnosis and management.

References:

1. Molecular Diagnostics: Fundamentals, Methods, & Clinical Applications. By Lela Buckingham and Maribeth L. Flaws. Publisher: F.A. Davis Company, 2017.
2. Molecular Diagnostics: For the Clinical Laboratorian. By William B. Coleman and Gregory J. Tsongalis. Publisher: Humana Press, 2018.

6	Course title: Seminar in Medical Laboratory Sciences	Course Code: MLSC-408

Overall Description and Aims:

The student seminar aims to provide students with an opportunity to apply the knowledge and skills they have acquired throughout their studies. The seminar is designed to allow students to present and discuss current topics and research findings in medical laboratory sciences. The seminar also aims to promote critical thinking and analytical skills, effective communication, and teamwork. Overall, a student seminar in medical laboratory sciences is an excellent opportunity for students to enhance their research and presentation skills, gain knowledge and insight into a particular topic, and engage with their peers and instructors in a collaborative learning environment.

Intended Learning Outcomes:

By the end of the seminar, students are expected to have achieved the following learning outcomes:

Knowledge and Understanding:

- Understand the importance of medical laboratory sciences in biomedical research and clinical practice
- Understand the current research trends and findings in medical laboratory sciences
- Analyze and critically evaluate scientific literature in medical laboratory sciences

Intellectual Skills:

- Develop critical thinking skills and the ability to evaluate and interpret scientific literature
- Develop analytical skills and the ability to apply theoretical knowledge to practical problems
- Develop the ability to formulate hypotheses and design experiments

Professional and Practical Skills:

- Develop effective communication skills in presenting and discussing scientific topics
- Develop teamwork skills and the ability to work collaboratively with others
- Develop the ability to apply ethical principles in scientific research and practice

General Transferable Skills:

- Develop time-management skills and the ability to meet deadlines
- Develop independent learning skills and the ability to manage self-directed learning
- Develop the ability to adapt to changing situations and work effectively in a variety of contexts

Suggested topics:

1. Molecular Diagnosis of Infectious Diseases
2. Clinical Hematology: Principles and Applications
3. Clinical Microbiology: Diagnosis and Management of Infectious Diseases
4. Clinical Chemistry: Principles and Applications
5. The Role of Medical Laboratory Science in Precision Medicine
6. Applications of Mass Spectrometry in Clinical Diagnosis
7. Advancements in Blood Transfusion Science and Technology
8. Next-generation Sequencing for Genetic Diagnosis
9. Quality Assurance and Quality Control in Clinical Laboratories
10. Role of Medical Laboratory Science in the Diagnosis and Treatment of Cancer
11. Laboratory Diagnosis of Autoimmune Diseases
12. Clinical Enzymology: Principles and Applications
13. Laboratory Diagnosis and Management of Infectious Diseases in Resource-limited Settings.
14. Emerging Technologies in Clinical Laboratory Science.

How seminar is performed:

Here are the 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. 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.
3. Promote the Seminar: Advertise the seminar through various channels such as social media, email, and flyers to attract attendees.
4. 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.
5. 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.
6. 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 audience, and their responses to questions from the audience.

7	Course title: Thesis	Course Code: MLSC-409

Overall Description and Aims:

The thesis aims to provide students with the opportunity to demonstrate their knowledge and skills in a specific area of laboratory medicine. The thesis involves conducting original research, analyzing data, and presenting findings in a written format. The aim of the thesis is to prepare students to contribute to the advancement of laboratory medicine through research and development.

Intended Learning Outcomes of Course:

Upon completion of the thesis, students should be able to:

Knowledge and Understanding:

1. Demonstrate an in-depth understanding of a specific area of laboratory medicine.
2. Understand research methodologies and their application in laboratory medicine.
3. Understand the ethical considerations involved in laboratory research.
4. Understand the importance of data analysis and interpretation in laboratory medicine.

Intellectual Skills:

1. Apply theoretical knowledge to design and conduct laboratory research.
2. Analyze and interpret laboratory data.
3. Critically evaluate research findings and draw conclusions.

Professional and Practical Skills:

1. Demonstrate proficiency in laboratory techniques and instrumentation.
2. Communicate research findings effectively through written reports and presentations.
3. Apply ethical principles and professional standards in laboratory research.

General Transferable Skills:

1. Work independently and manage time effectively.
2. Adapt to changing circumstances and new technologies.
3. Demonstrate problem-solving and critical thinking skills.

How thesis is performed in medical laboratory 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 medical laboratory sciences involves working closely with an advisor or supervisor throughout the entire research process. Here are the typical steps for performing a thesis in medical laboratory sciences:

1. Topic Selection: Work with your supervisor to select a research topic that is relevant to the field of medical laboratory 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 immunology or microbiology, 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 urine 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 medical laboratory 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 medical laboratory sciences.

8	Course title: Tumor Biology	Course Code: MLSC-403

Overall Description and Aims:

This course focuses on providing students with a comprehensive understanding of the fundamental principles of cancer biology, including the molecular and cellular mechanisms underlying cancer development, progression, and metastasis. Through a combination of lectures, practical classes, and team-based research projects, students will develop the necessary knowledge and skills to critically evaluate scientific literature and contribute to cancer research.

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

- Demonstrate a comprehensive understanding of the fundamental principles of cancer biology, including the molecular and cellular mechanisms underlying cancer development, progression, and metastasis.
- Critically evaluate and interpret scientific literature related to cancer biology and cancer research.
- Apply their knowledge of cancer biology to propose and design research projects aimed at investigating cancer mechanisms or developing novel cancer therapies.
- Communicate scientific ideas effectively in written and oral formats.
- Work effectively in teams to achieve common goals.

Knowledge and Understanding:

- The molecular and cellular mechanisms underlying cancer development, progression, and metastasis.
- The genetic and epigenetic alterations that drive cancer initiation and progression.
- The role of tumor microenvironment in cancer development and progression.
- The principles of cancer therapy, including chemotherapy, radiation therapy, and immunotherapy.
- The principles of cancer prevention and early detection.

Intellectual Skills:

- Critical evaluation of scientific literature related to cancer biology and cancer research.

- Development of research questions and hypotheses.
- Design and implementation of research projects aimed at investigating cancer mechanisms or developing novel cancer therapies.
- Analysis and interpretation of research data.
- Identification of knowledge gaps and development of strategies to address them.

Professional and Practical Skills:

- Effective communication of scientific ideas in written and oral formats.
- Teamwork and collaboration.
- Laboratory techniques used in cancer research.
- Data analysis and statistical methods used in cancer research.
- Ethical and regulatory considerations in cancer research.

General Transferable Skills:

- Problem-solving and analytical thinking.
- Time management and organization.
- Adaptability and flexibility.
- Effective communication and presentation skills.
- Teamwork and collaboration.

Course Topics:

1. Introduction to Cancer Biology
    - Historical perspectives and current challenges in cancer research
    - Hallmarks of cancer and tumor microenvironment
2. Cancer Genetics and Epigenetics
    - Oncogenes and tumor suppressor genes
    - Epigenetic mechanisms of gene regulation in cancer
3. Cancer Signaling Pathways
    - Cell cycle regulation and checkpoint pathways
    - Growth factor signaling pathways and their dysregulation in cancer
4. Cancer Metabolism and Bioenergetics
    - Metabolic rewiring in cancer cells
    - Mitochondrial function and bioenergetics in cancer
5. Tumor Immunology

- Immune surveillance and immune escape in cancer
- Tumor-associated antigens and immune checkpoint inhibitors

6. Cancer Stem Cells and Plasticity
   - The role of stem cells in cancer initiation and progression
   - Tumor heterogeneity and plasticity
7. Cancer Invasion and Metastasis
   - Mechanisms of cancer cell invasion and migration
   - Metastasis to different organs and tumor microenvironment
8. Tumor Angiogenesis
   - The role of angiogenesis in tumor growth and progression
   - Targeting angiogenesis for cancer therapy
9. Cancer Therapy I: Chemotherapy and Radiation
   - Mechanisms of chemotherapy and radiation therapy
   - Limitations and toxicities of chemotherapy and radiation therapy
10. Cancer Therapy II: Immunotherapy
    - Mechanisms of immune checkpoint inhibitors and CAR-T cell therapy
    - Limitations and toxicities of immunotherapy
11. Cancer Prevention and Early Detection
    - Riskfactors and preventive measures for cancer
    - Early detection methods for cancer
12. Tumor Microenvironment
    - The role of stromal cells in tumor growth and progression
    - Extracellular matrix and its influence on tumor behavior
13. Cancer Epigenetics and Chromatin Remodeling
    - The role of chromatin remodeling in gene expression and cancer
    - Epigenetic therapies for cancer treatment
14. Cancer Immunotherapy:
    - Tumor Vaccines and Adoptive Cell Therapy
    - Tumor vaccines and their development
    - Adoptive cell therapy and its potential for cancer treatment
15. Tumor Microenvironment and Therapy Resistance

- Resistance mechanisms to chemotherapy and immunotherapy
- Tumor microenvironment and therapy resistance - Adoptive cell therapy and its potential for cancer treatment

16. Cancer Prevention and Epidemiology

- Cancer risk factors and prevention strategies
- Epidemiological studies and their role in cancer prevention and control Cancer Immunotherapy:

17. Cancer Diagnosis and Prognosis

- Diagnostic tests for cancer detection and characterization
- Prognostic factors and their role in patient management - Tumor vaccines and their development

18. - Cancer Therapy III: Targeted Therapy and Gene Therapy

- Targeted therapies and their mechanisms of action
- Gene therapy and its potential for cancer treatment

19. Personalized Cancer Medicine

- Precision medicine approaches for cancer treatment
- Patient stratification and biomarker discovery

20. Cancer Clinical Trials

- Phases of clinical trials and their objectives
- Regulatory considerations and ethical issues in clinical trials

Practical Classes:

1. Cell Culture Techniques for Cancer Research
2. Gene Expression Analysis in Cancer Cells
3. Protein Expression Analysis in Cancer Cells
4. Tumor Xenograft Models
5. Flow Cytometry for Cancer Research
6. Immunohistochemistry and Tissue Analysis
7. Cancer Immunotherapy: CAR-T Cell Generation and Assay

8. Targeted Gene Editing in Cancer Cells
9. High-Throughput Screening for Cancer Drug Discovery
10. Drug Resistance Assays for Cancer Therapy
11. In vivo Imaging Techniques for Cancer Research
12. 3D Tumor Models for Cancer Research
13. Analysis of Tumor Microenvironment
14. Clinical Trial Design and Implementation
15. Ethical Considerations in Cancer Research

References:

1. Weinberg, R. A. (2013). The biology of cancer. Garland Science.
2. Hanahan, D., & Weinberg, R. A. (2011). Hallmarks of cancer: the next generation. Cell, 144(5), 646-674.

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

Overall Aims of the Course:

The overall aim of this course is to provide undergraduate medical laboratory sciences students with the necessary knowledge, skills, and competencies to excel in their chosen profession. Through this course, students will gain a comprehensive understanding of laboratory sciences, including theoretical principles, practical applications, and professional competencies.

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

1. Demonstrate a comprehensive understanding of the theoretical principles of laboratory sciences.
2. Apply theoretical knowledge to practical applications in the laboratory setting.
3. Develop professional competencies in laboratory sciences, including communication, teamwork, and ethical practices.
4. Apply critical thinking and problem-solving skills to laboratory sciences scenarios.
5. Demonstrate proficiency in laboratory safety procedures.
6. Apply appropriate laboratory techniques to analyze and interpret laboratory data.
7. Communicate laboratory findings effectively through written and oral presentations.
8. Apply principles of quality control and quality assurance to laboratory processes.

Intellectual Skills:

1. Critical thinking and problem-solving skills: Students will develop their ability to analyze and evaluate laboratory data, identify problems, and propose appropriate solutions.
2. Research skills: Students will develop their ability to conduct research, including literature reviews and experimental design.
3. Analytical skills: Students will develop their ability to analyze and interpret laboratory data, including statistical analysis.
4. Technical skills: Students will develop their ability to use laboratory equipment and techniques to analyze and interpret data.

Professional and Practical Skills:

1. Laboratory safety: Students will learn to identify and mitigate laboratory hazards, develop safety protocols, and maintain safety records.
2. Laboratory techniques: Students will learn laboratory techniques relevant to their field of study, including sample preparation, analysis, and interpretation.
3. Communication skills: Students will learn to communicate laboratory findings effectively through written and oral presentations.
4. Professionalism: Students will learn professional competencies, including ethical practices, teamwork, and collaboration.

General Transferable Skills:

1. Time management: Students will learn to manage their time effectively to meet project deadlines.
2. Teamwork: Students will learn to work effectively in teams to achieve common goals.
3. Presentation skills: Students will learn to prepare and deliver effective presentations.
4. Problem-solving: Students will develop problem-solving skills that are transferable to other fields of study and professional settings.

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

Week 1-2: Introduction to Laboratory Safety (2 hours)

- Hazard identification and risk assessment
- Personal protective equipment (PPE)
- Chemical safety
- Electrical safety
- Fire safety

Week 3-4: Laboratory Techniques I (2 hours)

- Pipetting techniques
- Dilutions and solution preparation
- Measurement and calibration
- Sample preparation and handling

Week 5-6: Laboratory Techniques II (2 hours)

- Microscopy techniques
- Staining techniques
- Microbiological techniques
- Immunological techniques

Week 7-8: Quality Control and Quality Assurance in Clinical Laboratories (2 hours)

- Quality control measures
- Quality assurance programs
- Quality indicators and performance evaluation
- Proficiency testing

Week 9-10: Clinical Chemistry I (2 hours)

- Principles of clinical chemistry
- Carbohydrate metabolism
- Lipid metabolism
- Protein metabolism

Week 11-12: Clinical Chemistry II (2 hours)

- Enzymes and their clinical significance
- Electrolyte and acid-base balance
- Liver function tests
- Renal function tests

Week 13-14: Hematology I (2 hours)

- Hematopoiesis and erythrocyte physiology
- Hemoglobin and its variants
- Red blood cell indices
- Anemia and its classification

Week 15-16: Hematology II (2 hours)

- White blood cell physiology and classification
- Platelet physiology and hemostasis
- Coagulation disorders and their laboratory evaluation
- Blood banking and transfusion medicine

Week 17-18: Medical Microbiology (2 hours)

- Bacteriology
- Mycology
- Virology
- Parasitology

Week 19-20: Clinical Microbiology (2 hours)

- Laboratory diagnosis of bacterial infections
- Laboratory diagnosis of fungal infections
- Laboratory diagnosis of viral infections
- Laboratory diagnosis of parasitic infections

Week 21-22: Blood Bank and Transfusion Medicine (2 hours)

- Blood group systems and their clinical significance
- Principles of transfusion medicine
- Blood component preparation and storage
- Transfusion reactions and their management

Week 23-24: Professional Competencies in Clinical Laboratories (2 hours)

- Laboratory management and organization
- Laboratory regulations and accreditation
- Ethics and professionalism in laboratory sciences
- Career development and opportunities in clinical laboratories.

Methods 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
Dept. of Medical Laboratory 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
Dept. of Medical Laboratory Sciences

خاص بالقسم:
موافقة ❒
رفض ❒

نموذج تسجيل 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
Dept. of Medical Laboratory 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: [ ]

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Faculty of Biomedical Sciences
Dept. of Medical Laboratory 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
Dept. of Medical Laboratory 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
Dept. of Medical Laboratory 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

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
Dept. of Medical Laboratory Sceinces

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
Dept. of Medical Laboratory 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
Dept. of Medical Laboratory 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.				

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Academic year: 20____/20____