Department of Laboratory Management

Proposed Syllabi for all Courses

Prepared by

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March 9, 2023

Faculty of Biomedical Sciences
University of Benghazi

كلية العلوم الطبية الحيوية
جامعة بنغازي

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

السادة الأفاضل /السيدات الفضليات:

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

تحية طيبة وبعد،

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

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

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

كل توصيف مقرر يحتوي على:

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

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

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كذلك، ستجدون مرفقا الآتي:

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

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

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

أتمنى لكم كل التوفيق

والسلام عليكم ورحمة الله وبركاته

د. عبدالمحسن محمد بوسنينة

وكيل الكلية للشؤون العلمية

نسخة لكل من:

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

السيدة/د. عميد الكلية- للتفضل بالاطلاع.

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

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

السيد/أ. مسجل الكلية-للتفضل بالاطلاع.

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

الملف الصـــــــــــادر.

الملف الدوري العـــــــــأم.

بوسنينة

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Table of content:

Vision, Mission, and Objectives of the Department of Laboratory Management

Vision:

The Laboratory Management program aims to be a distinguished center and reference for training and education in laboratory management at the local and international levels, and to contribute effectively to the development and improvement of laboratory performance in various fields.

Mission:

To provide high-quality education and comprehensive training in laboratory management for students and graduates, by providing a stimulating learning environment suitable for enhancing the knowledge and skills necessary to develop and improve laboratory performance.

Objectives:

- Providing innovative and effective educational and training programs in laboratory management for students.
- Equipping students with the necessary basic and specialized skills to manage laboratories effectively according to international best practices.
- Developing students' capabilities in scientific, technological, and administrative laboratory management.
- Encouraging students to contribute to laboratory management through research and scientific publications.
- Enhancing relationships and collaboration with various laboratories and related institutions at the local and international levels.
- Contributing to the development and improvement of practices and systems related to laboratory management.
- Encouraging students to innovate, think critically, and creatively in the field of laboratory management.
- Providing opportunities for experiential learning and practical training through partnerships with government and industrial institutions.

الرؤية والرسالة والأهداف لقسم إدارة المختبرات

الرؤية :

أن يكون برنامج إدارة المختبرات مركزًا مرموقًا ومرجعًا للتدريب والتعليم في إدارة المختبرات على المستوى المحلي والعالمي، وأن يساهم بشكل فعال في تطوير وتحسين أداء المختبرات في مختلف المجالات.

الرسالة:

توفير تعليم عالي الجودة وتدريب شامل ومتكامل في إدارة المختبرات للطلاب والخريجين، من خلال توفير بيئة تعليمية محفزة ومناسبة لتعزيز المعرفة والمهارات اللازمة لتطوير وتحسين أداء المختبرات.

الأهداف:

1. **تقديم برامج تعليمية وتدريبية مبتكرة وفعالة في إدارة المختبرات للطلاب.**
2. **تزويد الطلاب بالمهارات الأساسية والتخصصية اللازمة لإدارة المختبرات بشكل فعال وفقًا لأفضل الممارسات الدولية.**
3. **تطوير قدرات الطلاب في الإدارة العلمية والتكنولوجية والإدارية للمختبرات.**
4. **تشجيع الطلاب على الإسهام في مجال إدارة المختبرات من خلال الأبحاث والنشرات العلمية.**
5. **تعزيز العلاقات والتعاون مع مختلف المختبرات والمؤسسات المرتبطة بها على المستوى المحلي والدولي.**
6. **الإسهام في تطوير وتحسين الممارسات والأنظمة المتعلقة بإدارة المختبرات.**
7. **تشجيع الطلاب على الابتكار والتفكير النقدي والإبداعي في مجال إدارة المختبرات.**
8. **توفير فرص التعلم التجريبي والتدريب العملي من خلال الشراكات مع المؤسسات الحكومية والصناعية.**

University of Benghazi

Faculty of Biomedical Sciences
Dept. of Laboratory Management

Course Requirements for Laboratory Management (LBMT) 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/T	
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	Finance for the Nonfinancial Manager	التمويل لغير المتخصصين	LBMT-201	4	3	2	
4	Integrative Physiology	علم وظائف الأعضاء التكاملي	BMSC-201	4	3	2	
5	Introduction to Biotechnology	مقدمة في التقنية الحيوية	MOLD-202	2	1	2	
6	Medical Microbiology	علم الأحياء الدقيقة الطبية	MLSC-206	4	3	2	
7	Organizational Behavior	السلوك التنظيمي	LBMT-203	4	3	2	
8	Principle of Management	مبادئ الإدارة الأعمال	LBMT-204	4	3	2	
9	Principles of Human Genetics	مبادئ علم الوراثة البشري	MOLD-205	4	3	2	
CREDIT HOURS				**33**			
3RD YEAR							
No	Course title		Course Code	Cr. hrs.	Teaching hrs		Remarks
	English	Arabic			Th	Lab/T	
1	Bioinformatics and Genomics	المعلومانية الحيوية وعلم الجينوم	MOLD-301	4	3	2	
2	Human Resources Management	إدارة الموارد البشرية	LBMT-302	3	2	2	
3	Immunology and Virology	علم المناعة والفيروسات	MLSC-303	4	3	2	
4	Introductory Pharmacology and Toxicology	مقدمة في علم الأدوية والسموم	MLSC-306	3	2	2	
5	Laboratory Management	إدارة المختبرات	LBMT-301	3	2	2	
6	Managerial Leadership & Communication Skills	القيادة الإدارية ومهارات الإتصال	LBMT-303	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/T	
1	Advanced Laboratory Management	إدارة المختبرات المتقدمة	LBMT-401	4	3	2	
2	Biomedical Ethics and Scientific Integrity	إخلاقيات الطب الحيوي والنزاهة العلمية	BMSC-401	2	2	-	
3	Entrepreneurship	ريادة الأعمال	LBMT-402	3	2	2	
4	Infection Control and Safety	مكافحة العدوى والسلامة	BMSC-402	2	2	-	
5	Medical Laboratory Instrumentation	الأجهزه المخبرية الطبية	MLSC-401	2	1	2	
6	Medical Terminology	علم المصطلحات الطبية	MLSC-402	2	2	-	
7	Seminar in Laboratory Management	ندوة علمية في إدارة المختبرات	LBMT-408	1	1	-	
8	Thesis	مشروع التخرج	LBMT-409	4	4	-	
9	Workplace Experience	التدريب الميداني	LBMT-410	10	-	10	
CREDIT HOURS				**30**			
TOTAL CREDIT HOURS				126			

Department of Laboratory Management

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:

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: Finance for the Nonfinancial Manager	Course Code: LBMT-201

Overall Description and Aims:

The course is designed specifically for students studying biomedical sciences, who may not have a background in finance or accounting. The course aims to provide students with the essential financial skills and knowledge needed to effectively manage resources, make informed decisions, and communicate with financial professionals in a healthcare organization. The course will cover topics such as financial statements, financial analysis, budgeting, and cost management. The course will also emphasize the role of finance in the healthcare industry, such as the importance of managing costs while providing high-quality patient care.

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

Knowledge and Understanding:

1. Understand the fundamental concepts of financial management
2. Identify and interpret financial statements
3. Analyze financial data using appropriate tools and techniques
4. Understand the role of finance in healthcare organizations
5. Knowledge of budgeting and financial planning
6. Understanding of financial analysis and decision-making techniques

Intellectual Skills:

1. Critically evaluate financial data to make informed decisions
2. Use financial analysis to solve problems and make recommendations
3. Synthesize financial information to support decision-making

Professional and Practical Skills:

1. Preparing and analyzing financial statements
2. Develop and manage a budget
3. Using financial software and tools
4. Conducting financial analysis and making recommendations
5. Understanding the regulatory environment of financial reporting in biomedical organizations

6. Communicate effectively with financial professionals
7. Use financial information to support organizational goals

General Transferable Skills:

1. Analytical thinking
2. Problem-solving
3. Communication
4. Teamwork and collaboration
5. Time management

Course Topics:

1. Introduction to finance

- Define finance and its role in biomedical organizations
- Understand the financial environment of biomedical organizations
- Understand the key concepts of financial management.

2. Financial statements and analysis

- Identify the components of financial statements
- Interpret and analyze financial statements to understand an organization's financial position.
- Analyze financial statements using financial ratio analysis and other tools to analyze financial data and assess an organization's financial performance.

3. Budgeting and financial planning

- Develop a budget for a biomedical organization
- Use of forecasting and variance analysis.
- Understand the importance of financial planning
- Develop and use financial models to support strategic decision-making.

4. Time value of money

- Understand the concept of time value of money
- Calculate present and future values of money

5. Capital budgeting

- Evaluate capital budgeting techniques

- Apply capital budgeting techniques to biomedical organizations
- Understand the different types of costs and how to manage them effectively

6. Cost management

- Define cost of capital and its components
- Calculate the weighted average cost of capital for a biomedical organization

7. Financial markets and securities

- Understand the role of financial markets and securities
- Analyze stock and bond prices

8. Financing decisions

- Understand the sources of financing for biomedical organizations
- Evaluate the advantages and disadvantages of debt and equity financing

9. Financing healthcare operations

- Understand different sources of financing and how to select the appropriate source for healthcare organizations.
- Understand Health insurance and the different types of health insurance and how they impact healthcare finance.
- Understand healthcare reimbursement and the different types of healthcare reimbursement and how they impact healthcare finance.

10. Working capital management

- Understand the components of working capital
- Develop a working capital management strategy for a biomedical organization

14. Financial reporting and regulation

- Understand the regulatory environment of financial reporting in biomedical organizations
- Understand the different types of financial reporting and how to prepare financial reports
- Evaluate the impact of financial reporting regulations on biomedical organizations

15. Valuation techniques

- Understand the concept of business valuation
- Evaluate different valuation techniques for biomedical organizations

16. Dividend policy

- Define dividend policy and its impact on shareholder wealth
- Evaluate different dividend policies for biomedical organizations

17. International finance

- Understand the role of international finance in biomedical organizations
- Analyze the risks and opportunities of international finance for biomedical organizations

18. Financial risk management:

- Understand the different types of financial risks and how to manage them.

19. International healthcare finance:

- Understand the differences in healthcare finance across different countries and regions.

20. Financial leadership:

- Understand the role of financial leadership in healthcare organizations.

21. Financial management of projects:

- Understand the financial aspects of managing projects and how to evaluate project financial performance

22. Financial regulation and compliance:

- Understand the regulatory environment and compliance requirements in healthcare finance.

23. Information technology and finance

- Understand the role of information technology in finance and its impact on healthcare organizations.

24. Ethics and financial decision-making

- Understand the ethical considerations in financial decision-making
- Evaluate the impact of ethical considerations on financial decision-making in biomedical organizations

Practical Classes:

1. Analyzing financial statements

- Identify the components of financial statements
- Analyze financial statements using ratio analysis

2. Developing a budget for a biomedical organization

- Develop a budget for a biomedical organization
- Understand the importance of financial planning

3. Calculating present and future values of money

- Understand the concept of time value of money
- Calculate present and future values of money

4. Evaluating capital budgeting techniques

- Evaluate capital budgeting techniques
- Apply capital budgeting techniques to biomedical organizations

5. Calculating the weighted average cost of capital

- Define cost of capital and its components
- Calculate the weighted average cost of capital for a biomedical organization

7. Evaluating debt and equity financing

- Understand the sources of financing for biomedical organizations
- Evaluate the advantages and disadvantages of debt and equity financing

9. Developing a working capital management strategy

- Understand the components of working capital
- Develop a working capital management strategy for a biomedical organization

10. Developing a financial forecasting model

- Understand the importance of financial forecasting
- Develop a financial forecasting model for a biomedical organization

11. Developing a financial plan

- Develop a financial plan for a biomedical organization
- Analyze the financial performance of a biomedical organization

12. Analyzing financial statements and interpreting the results

- Analyze and interpret financial statements
- Evaluate the financial performance of a biomedical organization

13. Understanding financial reporting regulations

- Understand the regulatory environment of financial reporting in biomedical organizations
- Evaluate the impact of financial reporting regulations on biomedical organizations

14. Evaluating business valuation techniques

- Understand the concept of business valuation
- Evaluate different valuation techniques for biomedical organizations

15. Evaluating dividend policy

- Define dividend policy and its impact on shareholder wealth
- Evaluate different dividend policies for biomedical organizations

16. Analyzing international finance

- Understand the role of international finance in biomedical organizations
- Analyze the risks and opportunities of international finance for biomedical organizations

17. Evaluating corporate governance

- Understand the concept of corporate governance

- Evaluate the impact of corporate governance on financial decision-making in biomedical organizations

18. Ethical considerations in financial decision-making

- Understand the ethical considerations in financial decision-making
- Evaluate the impact of ethical considerations on financial decision-making in biomedical organizations

References:

1. Brigham, E. F., & Ehrhardt, M. C. (2013). Financial management: Theory and practice. Cengage Learning.
2. Gitman, L. J., & Zutter, C. J. (2015). Principles of managerial finance. Pearson.

4	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.

5	Course title: Introduction to Biotechnology	Course Code: MOLD-202

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:

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.

6	Course title: Medical Microbiology	Course Code: MLSC-206

Overall Description and Aims:

The course is designed to provide students with a comprehensive understanding of the microbes that cause infectious diseases, their pathogenesis, and their clinical management. The course will cover topics such as the structure and function of microbes, host-microbe interactions, host defense mechanisms, diagnosis and treatment of infectious diseases, and prevention of transmission. The course aims to equip students with the knowledge and skills required to pursue a career in biomedical research, public health, or clinical practice.

Intended Learning Outcomes:

Knowledge and Understanding:

- Describe the structure and function of microorganisms, including bacteria, fungi, viruses, and parasites
- Explain the mechanisms of pathogenesis and virulence of microbial infections
- Understand the principles of antimicrobial agents and resistance
- Describe the principles of immunology and immune responses to microbial infections
- Understand the principles of public health and infectious disease control
- Understand the principles of clinical microbiology and infectious disease management
- Understand the principles of microbial genetics and genomics

Intellectual Skills:

- Analyze and interpret scientific data related to infectious diseases
- Apply critical thinking to evaluate the significance of research findings
- Formulate hypotheses and design experiments to test them

Professional and Practical Skills:

- Demonstrate proficiency in basic microbiological techniques, such as culturing and identifying microbes
- Apply the principles of infection control and prevention in clinical and research settings

- Communicate scientific information clearly and effectively to different audiences

General Transferable Skills:

- Work effectively in a team environment
- Manage time and resources effectively
- Demonstrate ethical and professional conduct

Course Topics:

1. Introduction to medical microbiology and infectious diseases Objective: Understand the scope and significance of medical microbiology
2. The microbial world: Bacteria, viruses, fungi, and parasites Objective: Understand the diversity and characteristics of microbes that cause infectious diseases
3. Microbial structure and function Objective: Understand the structure and function of microbial cells
4. Microbial growth and control Objective: Understand the principles of microbial growth and control
5. Host-microbe interactions Objective: Understand the interactions between microbes and their hosts
6. Host defense mechanisms Objective: Understand the mechanisms of host defense against infectious agents
7. Laboratory diagnosis of infectious diseases Objective: Understand the principles of laboratory diagnosis of infectious diseases
8. Antimicrobial agents and chemotherapy Objective: Understand the principles of antimicrobial agents and their clinical use
9. Mechanisms of bacterial pathogenesis Objective: Understand the mechanisms of bacterial pathogenesis
10. Mechanisms of viral pathogenesis Objective: Understand the mechanisms of viral pathogenesis
11. Mechanisms of fungal and parasitic pathogenesis Objective: Understand the mechanisms of fungal and parasitic pathogenesis
12. Epidemiology and transmission of infectious diseases Objective: Understand the principles of epidemiology and transmission of infectious diseases
13. Immunization and vaccination Objective: Understand the principles of immunization and vaccination
14. Respiratory infections Objective: Understand the pathogenesis, diagnosis, and treatment of respiratory infections

15. Gastrointestinal infections Objective: Understand the pathogenesis, diagnosis, and treatment of gastrointestinal infections
16. Genitourinary infections Objective: Understand the pathogenesis, diagnosis, and treatment of genitourinary infections
17. Skin and soft tissue infections Objective: Understand the pathogenesis, diagnosis, and treatment of skin and soft tissue infections
18. Systemic infections Objective: Understand the pathogenesis, diagnosis, and treatment of systemic infections
19. Sexually transmitted infections Objective: Understand the pathogenesis, diagnosis, and treatment of sexually transmitted infections
20. Opportunistic infections Objective: Understand the pathogenesis, diagnosis, and treatment of opportunistic infections
21. Antibiotic resistance and stewardship Objective: Understand the principles of antibiotic resistance and stewardship
22. Emerging and re-emerging infectious diseases Objective: Understand the principles of emerging and re-emerging infectious diseases
23. Public health Objective: Understand the principles of public health and infectious disease control
24. Clinical microbiology and infectious disease management Objective: Understand the principles of clinical microbiology and infectious disease management
25. Infection control and prevention Objective: Understand the principles of infection control and prevention in clinical and research settings
26. Microbial genetics and genomics Objective: Understand the principles of microbial genetics and genomics
27. Bioinformatics and data analysis in medical microbiology Objective: Understand the principles of bioinformatics and data analysis in medical microbiology
28. Research methods in medical microbiology Objective: Understand the principles of research methods in medical microbiology

Practical classes:

1. Microscopy techniques for the observation of microorganisms.
2. Staining techniques
3. Isolation and identification of common bacterial pathogens.
4. Culturing techniques for viruses and parasites
5. Antimicrobial susceptibility testing.
6. Sterilization and disinfection techniques.

7. Serological techniques for the diagnosis of infectious diseases.
8. Molecular techniques for the detection of microbial pathogens.
9. Bacterial culture techniques for the diagnosis of tuberculosis.
10. Fungal culture and identification techniques.
11. Parasitological techniques for the diagnosis of intestinal parasites.
12. Diagnosis of sexually transmitted infections.
13. Diagnosis of viral infections.
14. Laboratory diagnosis of zoonotic infections.
15. Microbial identification using commercial systems.
16. Laboratory quality control and quality assurance.
17. Biosafety and biosecurity practices in the laboratory.
18. Critical analysis of laboratory results and interpretation of findings.

References:

1. Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2019). Medical microbiology. Elsevier Health Sciences.
2. Wessner, D. R., Dupont, C., & Charles, T. C. (2019). Global health: an introduction to current and future trends. John Wiley & Sons.

7	Course title: Organizational Behavior	Course Code: LBMT-203

Overall Description and Aims:

The course aims to provide students with an understanding of the behavioral factors that influence individuals and groups within organizations, with a focus on the biomedical and healthcare industry. The course will cover topics such as motivation, communication, leadership, team dynamics, and organizational culture. Students will develop skills to analyze, interpret and manage behavior within Biomedical Organizations, and to recognize the importance of effective communication and leadership in promoting a positive work environment.

Intended Learning Outcomes:

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

- Demonstrate knowledge and understanding of the fundamental theories and concepts of organizational behavior, and how they apply to Biomedical Organizations.
- Analyze and interpret behavior within Biomedical Organizations, and evaluate the impact of organizational culture on behavior.
- Evaluate the impact of individual differences and diversity on organizational behavior in the biomedical and healthcare industry.

Intellectual Skills:

- Apply theoretical concepts to practical organizational situations within the biomedical and healthcare industry.
- Evaluate and analyze healthcare organizational structures and strategies.
- Develop and present solutions to healthcare organizational problems.

Professional and Practical Skills:

- Demonstrate effective communication and interpersonal skills within a biomedical context.
- Develop leadership skills and recognize the importance of leadership in promoting a positive work environment within the biomedical and healthcare industry.

- Demonstrate effective teamwork and team management skills within a biomedical context.

General Transferable Skills:

- Develop critical thinking and problem-solving skills.
- Develop research skills and the ability to critically evaluate sources of information within a biomedical context.
- Develop time management and organizational skills within a biomedical context.

Course Topics:

1. Introduction to Organizational Behavior in Biomedical Organizations :

- Historical overview of biomedical and healthcare organizational behavior
- The impact of organizational behavior on healthcare outcomes
- The challenges of organizational behavior in Biomedical Organizations

2. Individual Differences and Diversity in Biomedical Organizations :

- Cultural diversity in Biomedical Organizations
- The role of diversity in healthcare outcomes
- The impact of individual differences on behavior in Biomedical Organizations

3. Personality and Emotions in Biomedical Organizations:

- The influence of personality on healthcare behavior
- The impact of emotional intelligence on healthcare outcomes
- The role of emotions in Biomedical Organizations

4. Perception and Attribution in Biomedical Organizations :

- The impact of perception on healthcare decision-making
- The role of attribution in healthcare organizational behavior
- The challenges of perception and attribution in Biomedical Organizations

5. Motivation in Biomedical Organizations :

- The impact of motivation on healthcare behavior
- The challenges of motivating healthcare employees

- The role of intrinsic and extrinsic motivation in Biomedical Organizations

6. Job Design and Work Stress in Biomedical Organizations :

- The impact of job design on healthcare behavior
- The challenges of work stress in Biomedical Organizations
- Strategies for managing work stress in Biomedical Organizations

7. Communication in Biomedical Organizations :

- The impact of communication on healthcare outcomes
- The challenges of communication in Biomedical Organizations
- Effective communication strategies for Biomedical Organizations

8. Leadership in Biomedical Organizations :

- The role of leadership in Biomedical Organizations
- The challenges of healthcare leadership
- Strategies for effective healthcare leadership

9. Power and Influence in Biomedical Organizations :

- The sources of power and influence in Biomedical Organizations
- The impact of power and influence on healthcare outcomes
- Strategies for managing power and influence in Biomedical Organizations

10. Decision Making in Biomedical Organizations :

- The challenges of decision-making in Biomedical Organizations
- The impact of decision-making on healthcare outcomes
- Strategies for effective decision-making in Biomedical Organizations

11. Groups and Teams in Biomedical Organizations :

- The role of groups and teams in Biomedical Organizations

- The challenges of group and team dynamics in Biomedical Organizations
- Strategies for effective group and team management in Biomedical Organizations

12. Organizational Culture in Biomedical Organizations :

- The impact of organizational culture on healthcare behavior
- The challenges of managing organizational culture in Biomedical Organizations
- Strategies for promoting a positive organizational culture in Biomedical Organizations

13. Organizational Change in Biomedical Organizations :

- The challenges of organizational change in Biomedical Organizations
- The impact of organizational change on healthcare outcomes
- Strategies for managing organizational change in Biomedical Organizations

14. Ethics and Social Responsibility in Biomedical Organizations :

- The role of ethics and social responsibility in Biomedical Organizations
- The challenges of promoting ethical behavior in Biomedical Organizations
- Strategies for promoting ethical behavior and social responsibility in Biomedical Organizations

15. International and Cross-Cultural Issues in Biomedical Organizations :

- The challenges of international and cross-cultural issues in Biomedical Organizations
- The impact of cultural differences on healthcare outcomes
- Strategies for promoting cross-cultural understanding and effective communication in Biomedical Organizations

Practical Classes Objectives:

1. Team Building: Objective: To develop effective teamwork and team management skills within a healthcare context.
2. Communication Skills: Objective: To develop effective communication and interpersonal skills within a healthcare context.
3. Leadership Skills: Objective: To develop leadership skills and recognize the importance of leadership in promoting a positive work environment within the biomedical and healthcare industry.
4. Decision-Making Skills: Objective: To develop decision-making skills within a healthcare context.
5. Job Design and Work Stress: Objective: To evaluate and analyze the impact of job design on healthcare behavior, and to develop strategies for managing work stress in Biomedical Organizations.

6. Motivation: Objective: To evaluate the impact of motivation on healthcare behavior, and to develop strategies for motivating healthcare employees.
7. Power and Influence: Objective: To analyze the sources of power and influence in Biomedical Organizations, and to develop strategies for managing power and influence in Biomedical Organizations.
8. Organizational Culture: Objective: To evaluate the impact of organizational culture on healthcare behavior, and to develop strategies for promoting a positive organizational culture in Biomedical Organizations.
9. Organizational Change: Objective: To evaluate the challenges of organizational change in Biomedical Organizations, and to develop strategies for managing organizational change in Biomedical Organizations.
10. Ethics and Social Responsibility: Objective: To evaluate the role of ethics and social responsibility in Biomedical Organizations, and to develop strategies for promoting ethical behavior and social responsibility in Biomedical Organizations.
11. International and Cross-Cultural Issues: Objective: To evaluate the challenges of international and cross-cultural issues in Biomedical Organizations, and to develop strategies for promoting cross-cultural understanding and effective communication in Biomedical Organizations.
12. Perception and Attribution: Objective: To evaluate the impact of perception and attribution on healthcare decision-making and organizational behavior.
13. Personality and Emotions: Objective: To evaluate the influence of personality and emotions on healthcare behavior.
14. Groups and Teams: Objective: To evaluate the role of groups and teams in Biomedical Organizations and develop strategies for effective group and team management in Biomedical Organizations.
15. Motivation: Objective: To evaluate the impact of motivation on healthcare behavior, and to develop strategies for motivating healthcare employees.

References:

1. Robbins, S. P., & Judge, T. A. (2017). Organizational behavior. Pearson Education Limited.
2. Mullins, L. J. (2013). Management and Organisational Behaviour. Pearson.

8	Course title: Principle of Management	Course Code: LBMT-204

Overall Description and Aims:

The undergraduate course aims to introduce students to the fundamental concepts and theories of management and their application in different types of organizations. The course provides an overview of the key functions of management, including planning, organizing, leading, and controlling, and their roles in achieving organizational goals. Through this course, students will gain an understanding of the challenges and opportunities of managing people and resources in a dynamic and complex environment.

Intended Learning Outcomes:

Knowledge and Understanding:

1. Demonstrate an understanding of the fundamental concepts and theories of management.
2. Apply management theories to real-world organizational situations.
3. Analyze the impact of environmental factors on organizational performance.

Intellectual Skills:

1. Critically evaluate management theories and practices.
2. Apply creative and innovative thinking to solve management problems.
3. Develop strategic plans and make informed decisions.

Professional and Practical Skills:

1. Communicate effectively in different contexts and with different stakeholders.
2. Manage resources efficiently and effectively.
3. Lead and motivate individuals and teams to achieve organizational goals.

General Transferable Skills:

1. Develop analytical and problem-solving skills.
2. Enhance interpersonal and teamwork skills.
3. Develop time management and organizational skills.

Course Topics:

1. Introduction to Management:

- Definition and functions of management
- Historical development of management
- Current issues in management

2. The External Environment:

- Economic, political, and legal factors affecting management
- Social and cultural factors affecting management
- Technological factors affecting management

3. Planning:

- Types of plans and planning processes
- SWOT analysis and strategic planning
- Contingency planning and risk management

4. Organizing:

- Principles of organizational design
- Types of organizational structures
- Organizational culture and change management

5. Leading:

- Leadership theories and styles
- Motivation and employee engagement
- Communication and conflict resolution

6. Controlling:

- Types of control mechanisms
- Performance measurement and evaluation
- Quality management and continuous improvement

7. Human Resource Management:

- Recruitment and selection
- Training and development

- Performance appraisal and compensation

8. Operations Management:

- Production and service processes
- Inventory management and supply chain management
- Quality assurance and process improvement

9. Marketing Management:

- Market segmentation and targeting
- Product development and pricing strategies
- Promotion and advertising strategies

10. Financial Management:

- Financial statements and analysis
- Budgeting and financial planning
- Capital investment and financing decisions

11. Information Management:

- Information systems and technology
- Data management and analytics
- Cybersecurity and privacy

12. Project Management:

- Project planning and scheduling
- Resource allocation and risk management
- Project evaluation and closure

13. Entrepreneurship and Innovation:

- Entrepreneurial mindset and opportunities
- Business model development and innovation management
- Venture financing and growth strategies

14. Ethics and Social Responsibility:

- Ethical theories and principles
- Corporate social responsibility and sustainability

- Ethical decision-making and leadership

15. Global Management:

- Globalization and its impact on management
- Cross-cultural management and communication
- International business strategies and operations

Practical Classes:

1. Case Study Analysis: To develop critical thinking and analytical skills by analyzing management cases and identifying management challenges and solutions.
2. Business Simulation: To apply management theories and principles in a realistic business simulation and evaluate the outcomes.
3. Strategic Planning Exercise: To develop strategic plans for a hypothetical business and practice decision-making skills.
4. Organizational Design Project: To design an organizational structure for a hypothetical business and evaluate its effectiveness.
5. Employee Motivation Exercise: To develop employee motivation strategies and practice communication and leadership skills.
6. Budgeting Exercise: To develop a budget for a business and practice financial management skills.
7. Recruitment and Selection Exercise: To practice recruitment and selection skills and evaluate candidates for a hypothetical job opening.
8. Service Process Analysis: To analyze a service process and identify opportunities for improvement and efficiency.
9. Marketing Campaign Development: To develop a marketing campaign for a hypothetical product or service and practice marketing management skills.
10. Financial Statement Analysis: To analyze financial statements and evaluate the financial performance of a business.
11. Information Management Project: To develop an information management system for a hypothetical business and practice information management skills.
12. Project Management Exercise: To plan and manage a project and practice project management skills.
13. Entrepreneurship and Innovation Project: To develop a business idea and plan for a hypothetical startup and practice entrepreneurship and innovation skills.

14. Ethics and Social Responsibility Discussion: To discuss ethical and social responsibility issues in management and practice ethical decision-making skills.
15. Cross-Cultural Communication Exercise: To practice cross-cultural communication skills and analyze the impact of culture on management.

References:

1. Robbins, S. P., Coulter, M., & DeCenzo, D. A. (2021). Fundamentals of management. Pearson.
2. Daft, R. L. (2021). Management. Cengage Learning.

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 Laboratory Management

Proposed Syllabi for all Courses in the Third Year

Prepared by

Abdelmuhsen Abusneina, PhD

March 9, 2023

Department of Laboratory Management

Proposed Syllabi for all Courses in the Fourth Year

Prepared by

Abdelmuhsen Abusneina, PhD

March 9, 2023

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: Human Resources Management	Course Code: LBMT-302

Overall Description:

The course aims to provide students with an understanding of the principles and practices involved in managing people within biomedical and healthcare organizations. Students will learn about the importance of effective human resource management in ensuring the success of an organization, including recruitment, selection, training and development, performance management, and employee relations. The course will cover a range of topics that are relevant to the management of human resources in the healthcare industry.

Aims:

The course aims to:

1. Provide an overview of the key principles and practices of human resource management in biomedical and healthcare organizations.
2. Develop an understanding of the importance of effective human resource management for organizational success.
3. Equip students with the skills and knowledge required to manage people effectively in a healthcare setting.

Intended Learning Outcomes of Course:

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

Knowledge and Understanding:

- Understand the principles and practices of human resources management in the biomedical and healthcare industry.
- Understand the legal and ethical issues in human resources management in biomedical and healthcare settings.
- Understand the impact of organizational culture and structure on human resources management in biomedical and healthcare settings.

Intellectual Skills:

- Analyze and evaluate the effectiveness of human resources management practices in biomedical and healthcare settings.
- Develop and implement human resources policies and procedures in biomedical and healthcare settings.
- Critically evaluate the impact of various factors on employee engagement and productivity in biomedical and healthcare settings.

Professional and Practical Skills:

- Apply effective recruitment and selection techniques in biomedical and healthcare settings.
- Develop and deliver effective training programs in biomedical and healthcare settings.
- Manage employee relations and resolve conflicts in biomedical and healthcare settings.

General Transferable Skills:

- Demonstrate effective communication skills.
- Work collaboratively and effectively in a team.
- Apply problem-solving and critical thinking skills.

Course Topics:

1. Introduction to Human Resource Management

- Functions and roles of HR
- HR and organizational strategy
- HR planning and forecasting

2. Recruitment and Selection

- Job analysis and job description
- Recruitment methods
- Selection methods

3. Training and Development

- Training needs assessment
- Designing and implementing training programs
- Evaluating training effectiveness

4. Performance Management

- Performance appraisal methods
- Managing performance problems
- Performance feedback

5. Employee Relations

- Employee motivation
- Employee engagement
- Workplace culture

6. Diversity

- Definition of diversity
- Benefits of diversity
- Managing diversity in the workplace

7. Health and Safety

- Occupational Health and Safety regulations
- Workplace hazards and risks
- Developing and implementing a health and safety program

8. Compensation and Benefits

- Types of compensation
- Employee benefits
- Managing compensation and benefits

9. Legal and Ethical Issues

- Employment laws
- Ethical considerations in HR
- Employment discrimination

10. HR Information Systems

- HR information systems
- HR analytics
- HR metrics

11. Global HR Management

- International HR management
- Expatriate management
- Cross-cultural communication

12. Change Management

- Managing change in organizations
- Resistance to change
- Leading change

13. Employee Retention

- Reasons for employee turnover
- Strategies for retaining employees
- Exit interviews

14. Leadership Development

- Leadership theories
- Leadership styles
- Developing effective leaders

15. Team Building

- Characteristics of effective teams
- Stages of team development
- Building high-performing teams

Practical Classes Objectives:

1. Job Analysis and Description

- To understand the process of conducting a job analysis
- To develop skills in writing a job description

2. Recruitment Methods

- To understand the different methods of recruitment
- To develop skills in selecting the most appropriate recruitment method for a specific position

3. Training Needs Assessment

- To understand the process of conducting a training needs assessment
- To develop skills in identifying training needs

4. Performance Appraisal

- To understand the process of conducting a performance appraisal
- To develop skills in providing feedback

5. Employee Motivation

- To understand the different theories of motivation
- To develop skills in applying motivation theories in a workplace setting

6. Workplace Culture

- To understand the importance of workplace culture
- To develop skills in creating a positive workplace culture

7. Health and Safety Program

- To understand the process of developing a health and safety program
- To develop skills in identifying hazards and risks in a workplace

8. Compensation and Benefits

- To understand the different types of compensation and benefits
- To develop skills in creating a compensation and benefits package

9. Employment Laws

- To understand the different employment laws
- To develop skills in applying employment laws in a workplace setting

10. HR Information Systems

- To understand the different types of HR information systems

11. Cross-Cultural Communication

- To understand the importance of cross-cultural communication in a global workplace

- To develop skills in communicating effectively with people from different cultures

12. Change Management

- To understand the process of managing change in an organization
- To develop skills in leading and managing change

13. Employee Retention Strategies

- To understand the different strategies for retaining employees
- To develop skills in creating an effective employee retention program

14. Leadership Styles

- To understand the different leadership styles
- To develop skills in identifying and applying effective leadership styles in a workplace setting

15. Team Building

- To understand the importance of team building
- To develop skills in building and leading high-performing teams

References:

1. Banfield, P., Kay, R., & Royles, D. (2018). Introduction to human resource management. Oxford University Press.
2. Armstrong, M., & Taylor, S. (2014). Armstrong's handbook of human resource management practice. Kogan Page Publishers.

3	Course title: Immunology and Virology	Course Code: MLSC-303

Overall Description and Aims:

The course aims to provide students with a fundamental understanding of the immune system and the molecular and cellular mechanisms of viral infections. The course covers topics ranging from the basics of immunology and virology to more advanced concepts such as the immune response to cancer and emerging viral infections. The course is designed to provide students with a comprehensive understanding of the role of the immune system in health and disease, and to equip them with the skills required to carry out research in the field of immunology and virology.

Intended Learning Outcomes:

Upon completion of this course, students will have gained:

Knowledge and Understanding:

- Understanding of the basic concepts and principles of immunology and virology
- Knowledge of the molecular and cellular mechanisms of immune responses to pathogens and tumors
- Understanding of the strategies used by viruses to evade the host immune system
- Identify and describe the main techniques and assays used in immunology and virology research.

Intellectual Skills:

- Analyze and interpret immunological and virological data.
- Critically evaluate scientific literature in the field of immunology and virology.
- Develop hypotheses and design experiments to test them.
- Ability to interpret and present experimental data

Professional and Practical Skills:

- Practical experience in techniques commonly used in immunology and virology research
- Ability to design and execute experiments to study immune responses to pathogens and tumors

- Work safely and efficiently in a laboratory setting.
- Ability to effectively communicate scientific findings to a diverse audience

General Transferable Skills:

- Problem-solving skills
- Time management skills
- Teamwork and collaboration skills

Course Topics:

1. Introduction to Immunology and Virology

- Overview of the immune system and viral infections
- Components of the innate and adaptive immune system
- Classification of viruses

2. Innate Immunity

- Recognition of pathogens by the innate immune system
- Activation of innate immune responses
- Role of cytokines in innate immunity

3. Adaptive Immunity

- Antigen recognition by B and T cells
- Activation and differentiation of B and T cells
- Mechanisms of immune memory

4. Antibodies and B Cell Responses

- Structure and function of antibodies
- Production and maturation of B cells
- Mechanisms of antibody-mediated immunity

5. T Cell Responses

- Structure and function of T cells
- Activation and differentiation of T cells
- Mechanisms of T cell-mediated immunity

6. Immunological Memory

- Development and maintenance of immunological memory
- Role of memory cells in secondary immune responses
- Mechanisms of memory cell generation

7. Immunological Disorders

- Autoimmunity and autoimmune diseases
- Allergic reactions and hypersensitivity
- Immunodeficiency disorders

8. Mechanisms of Viral Infection

- Entry, replication, and release of viruses
- Viral pathogenesis
- Host-virus interactions

9. Innate Immune Responses to Viral Infection

- Recognition of viral infections by the innate immune system
- Role of interferons in antiviral immunity
- Activation of natural killer cells in viral infections

10. Adaptive Immune Responses to Viral Infection

- Activation and differentiation of T and B cells in response to viral infection
- Mechanisms of viral immune evasion
- Role of CD8+ T cells in antiviral immunity

11. Viral Vaccines and Antiviral Therapies

- Types of viral vaccines
- Development and testing of viral vaccines
- Antiviral therapies and their mechanisms of action

12. Immune Responses to Cancer

- Mechanisms of tumor immune evasion
- Role of the immune system in tumor surveillance
- Strategies for cancer immunotherapy

13. Emerging Viral Infections

- Overview of emerging viral infections
- Pathogenesis and immune responses to emerging viral infections
- Global health implications of

14. Immune Modulation

- Immunomodulatory agents and their mechanisms of action
- Immunotherapy approaches for autoimmune diseases and allergies
- Immune modulation in cancer therapy

15. Translational Immunology and Virology

- Preclinical and clinical research in immunology and virology
- Translational approaches for the development of immunotherapies and antiviral therapies
- Ethical considerations in the use of immunological and virological interventions

16. Future Directions in Immunology and Virology

- Current challenges and opportunities in immunology and virology research
- Emerging technologies and approaches in immunology and virology
- Predictions for the future of immunology and virology research

Practical Classes:

1. Microscopy and Cell Culture Techniques Objective: To learn the basics of microscopy and cell culture techniques for the observation and manipulation of immune and viral cells.
2. ELISA and Western Blotting Objective: To learn and perform ELISA and Western blotting assays for the detection and quantification of immune molecules and viral proteins.
3. Flow Cytometry Objective: To learn and perform flow cytometry analysis for the characterization and quantification of immune and viral cells.
4. Immunohistochemistry Objective: To learn and perform immunohistochemistry techniques for the detection and localization of immune and viral cells in tissues.
5. Serology and Viral Neutralization Assays Objective: To learn and perform serology and viral neutralization assays for the detection and quantification of viral antibodies and neutralizing activity.

6. Immune Cell Isolation and Purification Objective: To learn and perform techniques for the isolation and purification of immune cells for further analysis.
7. T Cell Proliferation Assay Objective: To learn and perform T cell proliferation assays for the analysis of T cell activation and proliferation.
8. B Cell Isolation and Culture Objective: To learn and perform techniques for the isolation and culture of B cells for the analysis of antibody production.
9. Viral Infection Assays Objective: To learn and perform viral infection assays for the analysis of viral entry, replication, and release.
10. Cytokine Measurement Assays Objective: To learn and perform cytokine measurement assays for the analysis of cytokine production and secretion.
11. RNA Extraction and PCR Objective: To learn and perform RNA extraction and PCR assays for the detection and quantification of viral RNA.
12. CRISPR/Cas9 Genome Editing Objective: To learn and perform CRISPR/Cas9 genome editing techniques for the manipulation of immune and viral cells.
13. Gene Expression Analysis Objective: To learn and perform gene expression analysis techniques for the analysis of immune and viral gene expression.
14. Animal Models of Immunology and Virology Objective: To learn and perform techniques for the use of animal models in the study of immunology and virology.
15. Bioinformatics Analysis Objective: To learn and perform bioinformatics analysis techniques for the analysis of large-scale immunological and virological data.

References:

1. Janeway CA Jr, Travers P, Walport M, Shlomchik MJ. Immunobiology: The Immune System in Health and Disease. 5th edition. Garland Science; 2001.
2. Knipe DM, Howley PM, Griffin DE, Lamb RA, Martin MA, Roizman B, Straus SE. Fields Virology. 6th edition. Lippincott Williams & Wilkins; 2013.

4	Course title: Introductory Pharmacology and Toxicology	Course Code: MLSC-306

Overall Description and Aims:

The course is designed to provide students with a fundamental understanding of the basic principles of drug actions and toxicology. The course aims to provide an overview of the mechanisms of drug action, drug development, and toxicological effects of drugs and environmental agents. Students will learn the principles of pharmacokinetics and pharmacodynamics, drug-receptor interactions, and drug metabolism. They will also learn how drugs can cause toxic effects in the body, the factors that influence toxicity, and the strategies for drug development and toxicology testing.

Intended Learning Outcomes of Course:

Upon completion of the course, students should have achieved the following learning outcomes:

Knowledge and Understanding:

- Demonstrate a fundamental understanding of pharmacology and toxicology concepts, principles, and mechanisms.
- Identify the pharmacological and toxicological effects of drugs and environmental agents on the body.
- Describe the mechanisms of drug absorption, distribution, metabolism, and elimination.
- Understand the principles of drug development and toxicology testing.

Intellectual Skills:

- Analyze and evaluate the scientific literature in pharmacology and toxicology.
- Apply pharmacological and toxicological concepts and principles to real-world situations.
- Synthesize and integrate knowledge from multiple sources to solve problems in pharmacology and toxicology.

Professional and Practical Skills:

- Design and perform experiments to evaluate drug effects and toxicity.
- Interpret and communicate scientific data in pharmacology and toxicology.

- Apply ethical and regulatory principles to the conduct of pharmacology and toxicology research.

General Transferable Skills:

- Develop effective written and oral communication skills.
- Enhance critical thinking and problem-solving skills.
- Develop time management and organizational skills.

Course Topics:

1. Introduction to Pharmacology and Toxicology
    - Basic concepts and terminology
    - Pharmacokinetics and pharmacodynamics
    - Routes of administration
2. Drug Receptors and Signal Transduction
    - Receptor types and properties
    - Signal transduction pathways
    - Agonists and antagonists
3. Drug Metabolism and Excretion
    - Phase I and Phase II metabolism
    - Enzymes involved in drug metabolism
    - Factors affecting drug metabolism
4. Drug Development and Regulation
    - Drug discovery and development process
    - Clinical trials and drug approval
    - Drug regulation and post-marketing surveillance
5. Autonomic Nervous System Drugs
    - Sympathomimetics and sympatholytics
    - Parasympathomimetics and parasympatholytics
    - Cholinesterase inhibitors and their uses
6. Cardiovascular Drugs
    - Antiarrhythmic drugs
    - Vasodilators and their uses
    - Antihypertensive drugs
7. Central Nervous System Drugs
    - Anxiolytics and hypnotics
    - Antidepressants and antipsychotics
    - Opioids and their uses
8. Chemotherapy and Antimicrobial Agents

- Antibiotics and their modes of action
- Antiviral and antifungal agents
- Cancer chemotherapy and targeted therapies

9. Toxicology and Risk Assessment
   - Toxicokinetics and toxicodynamics
   - Types of toxicity and their mechanisms
   - Risk assessment and hazard identification
10. Environmental Toxicology
   - Environmental pollutants and their effects
   - Sources and routes of environmental exposure
   - Risk assessment and management
11. Developmental and Reproductive Toxicology
   - Principles of developmental toxicology
   - Teratogens and their effects
   - Reproductive toxicology and fertility

12. Immunotoxicology and Allergy
   - Immune system components and functions
   - Immunotoxicity and autoimmune diseases
   - Allergic reactions and hypersensitivity
13. Occupational and Industrial Toxicology
   - Workplace hazards and exposures
   - Occupational toxicology and health effects
   - Hazard communication and control
14. Neurotoxicology
   - Nervous system components and functions
   - Neurotoxicants and their effects
   - Neurodegenerative diseases and treatments
15. Food and Drug Interactions
   - Effects of food on drug absorption and metabolism
   - Drug-nutrient interactions
   - Adverse reactions to food and drugs
16. Herbal and Alternative Medicines
   - Principles and use of herbal medicines
   - Efficacy and safety of alternative medicines
   - Interactions between herbal medicines and conventional drugs
17. Pediatric and Geriatric Pharmacology
   - Age-related changes in pharmacokinetics and pharmacodynamics
   - Dosage and toxicity considerations in children and elderly
   - Age-related diseases and their treatments

18. Pharmacogenomics and Personalized Medicine
    - Principles of pharmacogenomics
    - Genetic variations and drug responses
    - Personalized medicine and its implications

Practical Class:

1. Introduction to laboratory safety and basic techniques
2. Analysis of drug absorption and distribution in animals
3. Analysis of drug metabolism and elimination in animals
4. Evaluation of drug-receptor interactions using radioligand binding assays
5. Evaluation of signal transduction pathways using cell culture models
6. Analysis of drug toxicity in animal models
7. Evaluation of drug effects on cardiovascular function in animal models
8. Evaluation of drug effects on nervous system function in animal models
9. Analysis of microbial growth and drug susceptibility using culture-based methods
10. Analysis of environmental pollutants in water and soil samples
11. Evaluation of developmental toxicity in animal models
12. Analysis of immunotoxicity using cell-based assays
13. Analysis of occupational and industrial exposures using biomonitoring
14. Analysis of neurotoxicity using behavioral and histological methods
15. Evaluation of drug metabolism and drug-drug interactions using human samples

References:

1. Rang, H. P., Dale, M. M., Ritter, J. M., & Flower, R. J. (2019). Rang and Dale's pharmacology. Elsevier Health Sciences.
2. Klaassen, C. D., & Watkins III, J. B. (Eds.). (2019). Casarett and Doull's toxicology: the basic science of poisons. McGraw-Hill Education.

5	Course title: Laboratory Management	Course Code: LBMT-301

Overall Description and Aims:

The course is designed to provide students with the knowledge, skills, and abilities necessary to manage laboratory operations in the biomedical field. The course covers the principles of laboratory management, quality assurance, personnel management, financial management, and regulatory compliance. The course is intended to equip students with the necessary knowledge and skills to function effectively in laboratory management roles in the biomedical industry, government agencies, and academic research institutions.

Aims:

- To provide students with an understanding of laboratory management principles and practices in the biomedical field.
- To provide students with practical knowledge and skills to effectively manage laboratory operations in the biomedical industry.
- To equip students with the knowledge and skills required to ensure regulatory compliance in laboratory management.
- To develop students' critical thinking and problem-solving skills in the context of laboratory management.

Intended Learning Outcomes of Course:

Knowledge and Understanding:

- Understand the principles of laboratory management in the biomedical field.
- Understand the principles of quality assurance and regulatory compliance in laboratory management.
- Understand the principles of financial management and personnel management in laboratory management.

Intellectual Skills:

- Analyze laboratory operations and identify areas for improvement.
- Apply critical thinking and problem-solving skills to laboratory management scenarios.
- Evaluate the effectiveness of laboratory management strategies and practices.

Professional and Practical Skills:

- Develop laboratory standard operating procedures (SOPs) for quality assurance and regulatory compliance.
- Manage laboratory personnel, including hiring, training, and evaluation.
- Develop laboratory budgets and financial plans.
- Design and implement laboratory safety programs.

General Transferable Skills:

- Communicate effectively in writing and verbally.
- Work collaboratively with others in a team.
- Manage time and resources effectively.

Course Topics:

1. Introduction to Laboratory Management

- Understand the history and evolution of laboratory management.
- Identify the key principles of laboratory management.
- Understand the roles and responsibilities of laboratory managers.

2. Laboratory Quality Management Systems

- Understand the principles of laboratory quality management.
- Develop laboratory standard operating procedures (SOPs) for quality assurance.
- Implement laboratory quality control measures.

3. Regulatory Compliance in Laboratory Management

- Understand the regulations governing laboratory operations in the biomedical industry.
- Develop laboratory standard operating procedures (SOPs) for regulatory compliance.
- Implement laboratory compliance measures.

4. Personnel Management in Laboratory Operations

- Understand the principles of personnel management in laboratory operations.
- Develop laboratory personnel policies and procedures.
- Develop laboratory job descriptions and performance evaluations.

5. Financial Management in Laboratory Operations

- Understand the principles of financial management in laboratory operations.
- Develop laboratory budgets and financial plans.
- Implement laboratory financial control measures.

6. Laboratory Safety Programs

- Understand the principles of laboratory safety.
- Develop laboratory safety policies and procedures.
- Implement laboratory safety measures.

7. Laboratory Information Management Systems

- Understand the principles of laboratory information management systems.
- Develop laboratory information management policies and procedures.
- Implement laboratory information management systems.

8. Laboratory Equipment Maintenance and Calibration

- Understand the principles of laboratory equipment maintenance and calibration.
- Develop laboratory equipment maintenance policies and procedures.
- Implement laboratory equipment maintenance and calibration programs.

9. Laboratory Design and Construction

- Understand the principles of laboratory design and construction.
- Develop laboratory design specifications.
- Implement laboratory construction and renovation projects.

10. Laboratory Waste Management

- Understand the principles of laboratory waste management.
- Develop laboratory waste management policies and procedures.
- Implement laboratory waste management programs.

11. Laboratory Inventory Management

- Understand the principles of laboratory inventory management.
- Develop laboratory inventory management policies and procedures.
- Implement laboratory inventory management systems.

12. Laboratory Information Privacy and Security

- Understand the principles of laboratory information privacy and security.
- Develop laboratory information privacy and security policies and procedures.
- Implement laboratory information privacy and security measures.

13. Laboratory Accreditation and Certification

- Understand the principles of laboratory accreditation and certification.
- Develop laboratory accreditation and certification policies and procedures.
- Implement laboratory accreditation and certification programs.

14. Laboratory Emergency Response Planning

- Understand the principles of laboratory emergency response planning.
- Develop laboratory emergency response plans.
- Implement laboratory emergency response drills and training.

15. Laboratory Communication Strategies

- Understand the principles of effective laboratory communication.
- Develop laboratory communication policies and procedures.
- Implement laboratory communication strategies.

16. Laboratory Project Management

- Understand the principles of laboratory project management.
- Develop laboratory project management plans.
- Implement laboratory project management strategies.

17. Laboratory Performance Metrics and Reporting

- Understand the principles of laboratory performance metrics and reporting.
- Develop laboratory performance metrics and reporting policies and procedures.
- Implement laboratory performance metrics and reporting systems.

18. Laboratory Ethics and Professionalism

- Understand the principles of laboratory ethics and professionalism.
- Develop laboratory ethics and professionalism policies and procedures.

- Implement laboratory ethics and professionalism training and evaluation.

19. Laboratory Career Development

- Understand the principles of laboratory career development.
- Develop laboratory career development programs.
- Implement laboratory career development strategies.

Practical Classes:

1. Laboratory Quality Management System Implementation

- Develop laboratory standard operating procedures (SOPs) for quality assurance.
- Implement laboratory quality control measures.

2. Regulatory Compliance Implementation

- Develop laboratory standard operating procedures (SOPs) for regulatory compliance.
- Implement laboratory compliance measures.

3. Personnel Management in Laboratory Operations

- Develop laboratory personnel policies and procedures.
- Develop laboratory job descriptions and performance evaluations.

4. Financial Management in Laboratory Operations

- Develop laboratory budgets and financial plans.
- Implement laboratory financial control measures.

5. Laboratory Safety Program Development

- Develop laboratory safety policies and procedures.
- Implement laboratory safety measures.

6. Laboratory Information Management System Implementation

- Develop laboratory information management policies and procedures.
- Implement laboratory information management systems.

7. Laboratory Equipment Maintenance and Calibration

- Develop laboratory equipment maintenance policies and procedures.
- Implement laboratory equipment maintenance and calibration programs.

8. Laboratory Design and Construction

- Develop laboratory design specifications.
- Implement laboratory construction and renovation projects.

9. Laboratory Waste Management Implementation

- Develop laboratory waste management policies and procedures.
- Implement laboratory waste management programs.

10. Laboratory Inventory Management Implementation

- Develop laboratory inventory management policies and procedures.
- Implement laboratory inventory management systems.

11. Laboratory Information Privacy and Security Implementation

- Develop laboratory information privacy and security policies and procedures.
- Implement laboratory information privacy and security measures.

12. Laboratory Accreditation and Certification Implementation

- Develop laboratory accreditation and certification policies and procedures.
- Implement laboratory accreditation and certification programs.

13. Laboratory Emergency Response Planning

- Develop laboratory emergency response plans.
- Implement laboratory emergency response drills and training.

14. Laboratory Communication Strategies

- Develop laboratory communication policies and procedures.
- Implement laboratory communication strategies.

15. Laboratory Project Management

- Develop laboratory project management plans.
- Implement laboratory project management strategies.

16. Laboratory Performance Metrics and Reporting Implementation

- Develop laboratory performance metrics and reporting policies and procedures.
- Implement laboratory performance metrics and reporting systems.

17. Laboratory Ethics and Professionalism Implementation

- Develop laboratory ethics and professionalism policies and procedures.
- Implement laboratory ethics and professionalism training and evaluation.

18. Laboratory Career Development Implementation

- Develop laboratory career development programs.
- Implement laboratory career development strategies.

19. Laboratory Management Case Study Analysis

- Analyze and evaluate laboratory management case studies.
- Develop solutions and strategies for laboratory management scenarios.

References:

1. McManus, P., & Petocz, P. (Eds.). (2018). Developing and managing a successful biomedical research program. Springer International Publishing.
2. O'Neal, S. R., & Schervish, M. J. (2018). Laboratory management: Principles and processes. Routledge.

6	Course title: Managerial Leadership & Communication Skills	Course Code: LBMT-303

Overall Description and Aims:

The course is designed to equip students with the knowledge and skills necessary to effectively lead and communicate in a biomedical context. The course aims to provide students with an understanding of the principles of effective leadership, communication, and management, as well as practical experience in these areas. The course will also focus on developing students' professional and practical skills, as well as general transferable skills that can be applied in a variety of contexts.

Intended Learning Outcomes:

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

Knowledge and Understanding:

- Understand the principles of effective leadership and management in a biomedical context
- Understand the principles of effective communication in a biomedical context

Intellectual Skills:

- Analyze and evaluate leadership and management strategies in a biomedical context
- Develop effective communication strategies in a biomedical context

Professional and Practical Skills:

- Develop effective leadership and management skills in a biomedical context
- Develop effective communication skills in a biomedical context
- Work collaboratively in a team environment

General Transferable Skills:

- Analyze and evaluate complex problems
- Develop effective problem-solving strategies
- Demonstrate effective time management and organization skills

Course Topics:

1. Introduction to Leadership and Management

- Theories of leadership
- The role of a leader in a biomedical context
- Basic principles of management

2. Communication in a Biomedical Context

- The importance of effective communication
- Barriers to effective communication
- Techniques for effective communication

3. Leadership Styles

- Different leadership styles
- Advantages and disadvantages of different leadership styles
- Choosing an appropriate leadership style in a biomedical context

4. Team Building and Collaboration

- The importance of teamwork in a biomedical context
- Strategies for building effective teams
- Techniques for resolving conflicts within teams

5. Ethical Considerations in Biomedical Leadership and Management

- Ethical considerations in decision-making
- Ethical considerations in communication
- Ethical considerations in teamwork

6. Project Management

- Basic principles of project management
- The importance of project management in a biomedical context
- Techniques for effective project management

7. Effective Decision-Making

- Basic principles of decision-making
- The role of decision-making in a biomedical context

- Techniques for effective decision-making

8. Problem-Solving

- Basic principles of problem-solving
- Techniques for effective problem-solving
- The role of problem-solving in a biomedical context

9. Negotiation Skills

- Basic principles of negotiation
- Techniques for effective negotiation
- The role of negotiation in a biomedical context

10. Strategic Planning

- Basic principles of strategic planning
- Techniques for effective strategic planning
- The role of strategic planning in a biomedical context

11. Performance Management

- Basic principles of performance management
- Techniques for effective performance management
- The role of performance management in a biomedical context

12. Change Management

- Basic principles of change management
- Techniques for effective change management
- The role of change management in a biomedical context

13. Leadership and Management in Biomedical Research

- The role of leadership and management in biomedical research
- Strategies for effective leadership and management in biomedical research
- Ethical considerations in biomedical research

14. Leadership and Management in Biomedical Technology

- The role of leadership and management in biomedical technology
- Strategies for effective leadership and management in biomedical technology

- Ethical considerations in biomedical technology

15. Leadership and Management in Biomedical Business

- The role of leadership and management in biomedical business
- Strategies for effective leadership and management in biomedical business
- Ethical considerations in biomedical business

Practical Classes:

1. Leadership Styles and Self-Assessment

- Students will assess their own leadership styles and develop strategies for improvement.

2. Effective Communication Techniques

3. Team Building and Collaboration Exercises

- Students will work in teams to complete a task, and then reflect on their teamwork and communication.

4. Ethical Considerations Case Studies

- Students will analyze and discuss case studies that involve ethical considerations in a biomedical context.

5. Project Management Simulation

- Students will work in teams to complete a simulated project, and then reflect on their project management strategies.

6. Decision-Making and Problem-Solving Exercises

- Students will work in groups to analyze and solve complex problems, and then reflect on their decision-making and problem-solving strategies.

7. Negotiation Role-Play

- Students will participate in a negotiation role-play, and then reflect on their negotiation strategies.

8. Strategic Planning Exercises

- Students will work in groups to develop strategic plans for a biomedical organization, and then reflect on their strategic planning strategies.

9. Performance Management Case Studies

- Students will analyze and discuss case studies that involve performance management in a biomedical context.

10. Change Management Simulation

- Students will participate in a simulated change management scenario, and then reflect on their change management strategies.

11. Biomedical Research Leadership and Management Case Studies

- Students will analyze and discuss case studies that involve leadership and management in biomedical research.

12. Biomedical Technology Leadership and Management Case Studies

- Students will analyze and discuss case studies that involve leadership and management in biomedical technology.

13. Biomedical Business Leadership and Management Case Studies

- Students will analyze and discuss case studies that involve leadership and management in biomedical business.

14. Professional Development Planning

- Students will develop a plan for their professional development in leadership and communication skills.

15. Presentation of Professional Development Plans

- Students will present their professional development plans to the class.

References:

1. Northouse, P. G. (2018). Leadership: Theory and practice. Sage Publications.
2. Hackman, M. Z., & Johnson, C. E. (2013). Leadership: A communication perspective. Routledge.

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:

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

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
19. Practice proper techniques for newborn screening

20. Specimen Collection in Special Populations

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

21. 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 Laboratory Management

Proposed Syllabi for all Courses in the Third Year

Prepared by

Abdelmuhsen Abusneina, PhD

March 9, 2023

Department of Laboratory Management

Proposed Syllabi for all Courses in the Fourth Year

Prepared by

Abdelmuhsen Abusneina, PhD

March 9, 2023

Syllabus of Fourth Year Courses

1	Course title: Advanced Laboratory Management	Course Code: LBMT-401

Overall Description and Aims:

The course aims to provide students with the knowledge and skills required to effectively manage a biomedical laboratory. The course covers various aspects of laboratory management, including personnel management, financial management, quality control, and safety regulations. The course aims to prepare students for future leadership roles in the biomedical industry.

Intended Learning Outcomes of Course:

Knowledge and Understanding:

- Understand the principles of laboratory management and the regulations that govern laboratory operations.
- Understand the different types of laboratory equipment and their uses.
- Understand the different types of laboratory tests and their applications.

Intellectual Skills:

Analyze laboratory data and interpret the results.
Develop experimental designs for laboratory tests.
Evaluate laboratory procedures and protocols.

Professional and Practical Skills:

- Manage laboratory personnel and resources effectively.
- Implement and maintain quality control measures in the laboratory.
- Comply with safety regulations and ensure a safe working environment for laboratory staff.

General Transferable Skills:

- Communicate effectively with laboratory staff and stakeholders.
- Work collaboratively with other professionals in the biomedical industry.

- Adapt to changing situations and technologies in the laboratory.

Course Topics:

Laboratory Regulations and Compliance
- Overview of laboratory regulations
- Good Laboratory Practices
- Regulatory compliance and reporting

Laboratory Equipment and Maintenance
- Types of laboratory equipment
- Maintenance and calibration of laboratory equipment
- Troubleshooting laboratory equipment issues

Laboratory Tests and Techniques
- Types of laboratory tests
- Techniques for laboratory testing
- Applications of laboratory testing

Laboratory Personnel Management
- Roles and responsibilities of laboratory personnel
- Recruitment and training of laboratory personnel
- Performance evaluation and feedback

Laboratory Financial Management
- Budgeting and financial planning
- Inventory management and procurement
- Cost analysis and profitability assessment

Quality Control and Assurance
- Quality control measures in the laboratory
- Standard operating procedures (SOPs)
- Quality assurance audits and assessments

Laboratory Safety and Hazardous Waste Management
- Laboratory safety regulations and guidelines
- Hazardous waste management and disposal
- Emergency preparedness and response planning

Data Management and Analysis

- Data management and storage
- Statistical analysis of laboratory data
- Interpretation and reporting of laboratory results

Laboratory Information Systems

- Overview of laboratory information systems (LIS)
- Selection and implementation of LIS
- Maintenance and troubleshooting of LIS

Laboratory Accreditation and Certification

- Overview of laboratory accreditation and certification
- Accreditation and certification processes
- Maintenance of accreditation and certification

Project Management in the Laboratory

- Project planning and management
- Team coordination and communication
- Risk assessment and management

Laboratory Automation and Robotics

- Overview of laboratory automation and robotics
- Selection and implementation of laboratory automation and robotics
- Maintenance and troubleshooting of laboratory automation and robotics

Laboratory Marketing and Communication

- Marketing strategies for laboratory services
- Communication with laboratory stakeholders
- Client relations and customer service in the laboratory

Emerging Technologies in the Laboratory

- Overview of emerging laboratory technologies
- Implementation and integration of emerging laboratory technologies
- Future trends in laboratory technology and their impact on laboratory management

Practical Classes:

1. Safety and Hazardous Waste Management : To ensure that students are able to identify and manage laboratory safety risks, as well as handle hazardous materials safely and correctly.

2. Quality Control and Assurance: To enable students to implement and maintain quality control measures in the laboratory, and to conduct quality assurance audits and assessments.

3. Laboratory Equipment Maintenance and Calibration: To equip students with the skills to troubleshoot and maintain laboratory equipment, as well as calibrate equipment correctly.

4. Data Management and Analysis: To enable students to manage laboratory data effectively, analyze the data using statistical methods, and interpret the results correctly.

5. Laboratory Information Systems: To enable students to select, implement, and maintain laboratory information systems, as well as troubleshoot any problems that may arise.

6. Laboratory Accreditation and Certification: To provide students with an understanding of the accreditation and certification processes and equip them with the skills to maintain accreditation and certification.

7. Project Management in the LaboratoryTo enable students to plan and manage laboratory projects effectively, coordinate teams, and identify and manage risk.

8. Laboratory Automation and Robotics: To equip students with the skills to select, implement, and maintain laboratory automation and robotics, as well as troubleshoot any problems that may arise.

References:

1. Forbes, B. A., Sahm, D. F., & Weissfeld, A. S. (Eds.). (2007). Bailey & Scott's Diagnostic Microbiology (12th ed.). St. Louis, MO: Mosby Elsevier.
2. CLSI. (2018). Quality Management Systems: A Model for Laboratory Services; Approved Guideline (5th ed.). CLSI document QMS01. Wayne, PA: Clinical and Laboratory Standards Institute.

2	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.

3	Course title: Entrepreneurship	Course Code: LBMT-402

Overall Description and Aims:

The course to provide students with the knowledge and skills required to develop and implement business ideas in the biomedical industry. The course aims to promote an entrepreneurial mindset among students and help them understand the various aspects of starting and running a successful biomedical business.

Intended Learning Outcomes of the Course:

Knowledge and Understanding:

- Explain the principles and concepts of entrepreneurship in the biomedical industry.
- Analyze the key factors that contribute to the success of a biomedical startup.
- Understand the legal and regulatory frameworks governing biomedical businesses.
- Evaluate the market potential of biomedical products and services.

Intellectual Skills:

- Critically analyze and evaluate biomedical business models.
- Develop innovative and creative solutions to business challenges in the biomedical industry.
- Demonstrate effective communication and presentation skills.

Professional and Practical Skills:

- Develop a business plan for a biomedical startup.
- Conduct market research to identify potential customers and competitors.
- Develop a marketing and sales strategy for biomedical products and services.

General Transferable Skills:

- Demonstrate effective team working skills.
- Demonstrate effective time management skills.
- Develop a lifelong learning attitude.

Course Topics:

1. Introduction to entrepreneurship in Biomedical Sciences

- Importance of entrepreneurship in Biomedical Sciences
- Key entrepreneurship concepts
- Overview of the Biomedical industry

2. Biomedical Business Models

- Business model innovation
- Types of business models in Biomedical Sciences
- Developing a successful business model

3. Identifying Opportunities in Biomedical Sciences

- Market research in Biomedical Sciences
- Intellectual property protection
- Technology transfer and commercialization

4. Funding for Biomedical Startups

- Funding sources for Biomedical startups
- Pitching and presenting to investors
- Valuation of Biomedical startups

5. Regulatory and Legal Frameworks in Biomedical Sciences

- Regulatory frameworks for Biomedical products and services
- Intellectual property law in Biomedical Sciences
- Ethical considerations in Biomedical Sciences

6. Marketing and Sales Strategies for Biomedical Products

- Marketing in Biomedical Sciences
- Developing a marketing strategy for Biomedical products
- Sales strategies for Biomedical products

7. Financial Management for Biomedical Startups

- Financial planning for Biomedical startups
- Managing cash flow
- Financial reporting and analysis

8. Business Planning for Biomedical Startups

- Developing a business plan
- Writing a business proposal
- Business plan competitions

9. Biomedical Product Development

- Product development process in Biomedical Sciences
- Designing and testing Biomedical products
- Quality control in Biomedical Sciences

10. Biomedical Service Development

- Service development process in Biomedical Sciences
- Service design and testing
- Service quality management

11. Biomedical Entrepreneurial Ecosystem

- Entrepreneurial ecosystem in Biomedical Sciences
- Biomedical incubators and accelerators
- Networking and collaborations in Biomedical Sciences

12. Managing Biomedical Startups

- Leadership and management in Biomedical Sciences
- Managing teams and resources
- Scaling up Biomedical startups

13. Globalization of Biomedical Businesses

- Globalization and Biomedical Sciences
- Expanding Biomedical businesses internationally
- Cross-cultural challenges in Biomedical Sciences

14. Entrepreneurial Mindset

- Developing an entrepreneurial mindset
- Creativity and innovation in Biomedical Sciences
- Resilience and adaptability in entrepreneurship

15. Case Studies in Biomedical Entrepreneurship

- Analyzing case studies in Biomedical entrepreneurship
- Learning from successful Biomedical startups
- Lessons from failed Biomedical startups

Practical Classes:

1. Idea Generation Biomedical Organizations: To generate and evaluate ideas for a biomedical startup.
2. Market Research Biomedical Organizations: To conduct market research and analyze the market potential of a biomedical product or service.
3. Intellectual Property Protection Biomedical Organizations: To understand the basics of intellectual property protection in Biomedical Sciences.
4. Developing a Business Model Biomedical Organizations: To develop a business model for a biomedical startup.
5. Pitching to Investors Biomedical Organizations: To develop effective pitching skills and present a business idea to potential investors.
6. Financial Planning Biomedical Organizations: To develop financial plans and projections for a biomedical startup.
7. Writing a Business Plan Biomedical Organizations: To write a comprehensive business plan for a biomedical startup.
8. Designing Biomedical Products Biomedical Organizations: To design and develop a prototype for a biomedical product.
9. Quality Control in Biomedical Sciences Biomedical Organizations: To understand the importance of quality control in Biomedical Sciences and develop quality management plans.
10. Service Design and Testing Biomedical Organizations: To design and test a biomedical service.
11. Leadership and Team Management Biomedical Organizations: To develop effective leadership and team management skills in the context of a biomedical startup.
12. Cross-Cultural Challenges in Biomedical Sciences Biomedical Organizations: To understand the cross-cultural challenges of operating a biomedical business in an international context.
13. Creativity and Innovation in Biomedical Sciences Biomedical Organizations: To develop creative and innovative solutions to business challenges in Biomedical Sciences.

14. Networking and Collaborations in Biomedical Sciences Biomedical Organizations: To develop effective networking and collaboration skills in the context of Biomedical entrepreneurship.
15. Scaling up Biomedical Startups Biomedical Organizations: To understand the process of scaling up a biomedical startup and develop strategies for growth.

References:

1. Barron, A. E., & Hannigan, T. J. (2018). Biomedical entrepreneurship education: The pathway from ideas to inventions. New York: Springer.
2. Biotech entrepreneurship. (2019). Nature Biotechnology, 37(6), 675-676. doi: 10.1038/s41587-019-0171-2

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

Overall Description and Aims:

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

Intended Learning Outcomes:

Knowledge and Understanding:

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

Intellectual Skills:

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

Professional and Practical Skills:

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

General Transferable Skills:

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

Course Topics and Objectives:

1. Introduction to Infection Control and Safety

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

2. Infection Control Practices

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

3. Personal Protective Equipment (PPE)

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

4. Hand Hygiene

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

5. Environmental Cleaning and Disinfection

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

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

6. Sterilization and Disinfection of Medical Devices

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

7. Infection Prevention and Control in Special Situations

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

8. Occupational Health and Safety

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

9. Emergency Preparedness

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

10. Risk Assessment

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

11. Healthcare-Associated Infections (HAIs)

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

12. Outbreak Management

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

13. Communicable Diseases

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

14. Immunization and Vaccination

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

15. Infectious Waste Management

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

16. Emerging Infectious Diseases

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

17. Infection Control Policies and Procedures

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

18. Infection Control Auditing and Surveillance

- Define infection control auditing and surveillance.

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

21. Management of Infectious Diseases

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

22. Infection Control in the Community

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

23. Infection Control in Outpatient Settings

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

24. Infection Control in Long-Term Care Facilities

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

25. Infection Control in the Laboratory

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

27. Infection Control Program Evaluation

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

28. Infection Control in a Pandemic

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

References:

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

5	Course title: Medical Laboratory Instrumentation	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.

6	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.

7	Course title: Seminar in Laboratory Management	Course Code: LBMT-408

Overall Description and Aims:

In this course, students will have the opportunity to research and present on a variety of topics related to laboratory management. These seminars are designed to allow students to apply the knowledge and skills they have gained throughout the course to a specific topic of interest. The seminars aim to promote critical thinking, effective communication, and research skills.

Intended Learning Outcomes:

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

Knowledge and Understanding:

- Demonstrate a deep understanding of a specific topic related to laboratory management.
- Explain the relevance of the chosen topic to laboratory management in the biomedical field.
- Identify and evaluate the key concepts and ideas related to the chosen topic.

Intellectual Skills:

- Analyze and interpret research data and literature related to the chosen topic.
- Synthesize and integrate information from various sources to present a cohesive and evidence-based argument.
- Evaluate and critique the strengths and weaknesses of various laboratory management strategies related to the chosen topic.

Professional and Practical Skills:

- Develop and deliver effective and engaging seminar presentations.
- Address and respond to questions and concerns raised by peers and instructors.
- Apply ethical principles to laboratory management strategies related to the chosen topic.

General Transferable Skills:

- Communicate complex information in a clear and concise manner.
- Work collaboratively with peers to develop and deliver seminar presentations.
- Apply critical thinking and problem-solving skills to analyze and evaluate laboratory management strategies related to the chosen topic.

Suggested topics:

1. Implementing Lean Six Sigma principles in biomedical laboratories.
2. Optimizing laboratory workflows to improve efficiency and reduce errors.
3. Developing effective quality control measures for biomedical laboratory operations.
4. Understanding and complying with regulatory requirements in biomedical laboratories.
5. Best practices for managing inventory and supplies in biomedical laboratories.
6. Developing and implementing effective safety protocols in biomedical laboratories.
7. Ensuring data integrity in biomedical laboratory operations.
8. Strategies for effective communication and collaboration among laboratory staff.
9. Addressing ethical considerations in biomedical laboratory research.
10. Managing laboratory finances and budgeting for biomedical research.
11. Developing and implementing effective training programs for laboratory staff.
12. Best practices for equipment maintenance and calibration in biomedical laboratories.
13. Addressing challenges in managing multi-site or multi-disciplinary biomedical laboratories.
14. Applying project management principles to biomedical laboratory operations.
15. Harnessing the power of technology and automation to optimize laboratory operations in biomedical research.

How seminar is performed:

A student seminar in typically conducted as follows:

1. Selection of a topic: Students are given the opportunity to select a seminar topic from a list provided by the instructor or from a topic of their own choice.
2. Research and preparation: Students are expected to conduct extensive research on their chosen topic and prepare a well-organized presentation that

includes relevant data, case studies, and visual aids such as PowerPoint slides, videos, or diagrams.

3. Rehearsal: Prior to the actual seminar, students are expected to rehearse their presentation in front of their peers and instructors to receive feedback and suggestions for improvement.
4. Seminar day: On the day of the seminar, students present their work to the class, with each presentation typically lasting 20-30 minutes. After each presentation, there is usually a question-and-answer session, during which the audience can ask questions and engage in discussions with the presenter.
5. 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.

8	Course title: Thesis	Course Code: LBMT-409

Overall Description and Aims:

The course is designed to provide students with an opportunity to apply the principles and practices of laboratory management in a real-world context. Students will work on a research project that involves managing a laboratory, and will be expected to apply their knowledge and skills to develop and implement laboratory policies and procedures that support the research objectives. Through the completion of a thesis, students will demonstrate their ability to manage a laboratory effectively and efficiently. The overall aim of the course is to equip students with the practical experience and skills needed to succeed in a laboratory management career.

Intended Learning Outcomes: Upon completion of the course, students will have achieved the following learning outcomes:

Knowledge and Understanding:

- Demonstrate a deep understanding of laboratory management principles and practices
- Understand the importance of regulatory compliance and safety in laboratory management
- Analyze and interpret laboratory data to make informed management decisions

Intellectual Skills:

- Critically evaluate laboratory policies and procedures to identify areas for improvement
- Develop and implement effective laboratory management strategies based on research objectives
- Communicate complex laboratory management concepts and ideas clearly and effectively

Professional and Practical Skills:

- Manage laboratory resources effectively, including budgeting, staffing, and inventory management

- Develop and implement laboratory policies and procedures that comply with regulatory requirements and support research objectives
- Apply problem-solving skills to address complex laboratory management challenges

General Transferable Skills:

- Demonstrate effective time management skills in completing a research project
- Work independently and as part of a team to achieve research objectives
- Apply research skills and critical thinking to other areas of study and future careers.

Suggested topics:

1. Evaluating the effectiveness of laboratory safety policies and procedures in a research facility
2. Analyzing the impact of budgetary constraints on laboratory management practices
3. Investigating the role of effective communication in laboratory management
4. Developing and implementing a comprehensive inventory management system for a laboratory
5. Examining the impact of technology on laboratory management practices
6. Investigating the challenges associated with managing a multi-disciplinary laboratory
7. Analyzing the importance of quality control in laboratory management
8. Developing and implementing effective staff training programs in laboratory management
9. Investigating the benefits and challenges of using automated laboratory equipment
10. Examining the role of data management in laboratory management
11. Analyzing the impact of laboratory management on research outcomes
12. Investigating the role of leadership in laboratory management
13. Developing and implementing effective laboratory waste management policies and procedures
14. Examining the challenges associated with managing a laboratory in a remote or challenging environment
15. Analyzing the importance of ethical considerations in laboratory management practices.

How thesis is performed in laboratory management

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

1. Topic Selection: Work with your supervisor to select a research topic that is relevant to the field of laboratory management 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 surveys or case studies, 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 data, such as by conducting surveys or interviews.
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 laboratory management.
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 laboratory management.

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

Course Overview:

This course is designed to provide undergraduate students in biomedical sciences with the knowledge and skills required to effectively manage a laboratory. The course will cover topics such as laboratory safety, quality control, personnel management, budgeting, and procurement. Through a combination of lectures, case studies, and hands-on exercises, students will develop the intellectual, professional, practical, and general transferable skills necessary to succeed in a laboratory management role.

Intended Learning Outcomes:

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

- Understand the principles and importance of laboratory safety, quality control, and regulatory compliance in biomedical research.
- Develop effective laboratory management strategies, including personnel management, budgeting, and procurement.
- Analyze and interpret data from laboratory experiments and use this information to improve laboratory processes.
- Identify and solve problems that arise in laboratory operations, including troubleshooting instrumentation and addressing personnel issues.
- Apply critical thinking and decision-making skills to optimize laboratory processes and improve experimental outcomes.

Intellectual Skills:

- Critical thinking and problem-solving skills: Students will develop the ability to analyze complex problems and identify effective solutions.
- Data analysis and interpretation: Students will learn how to analyze and interpret data from laboratory experiments and use this information to make informed decisions.

Professional and Practical Skills:

- Laboratory management: Students will develop practical skills in laboratory management, including personnel management, budgeting, and procurement.
- Communication: Students will learn how to communicate effectively with laboratory personnel, colleagues, and other stakeholders.

- Safety and regulatory compliance: Students will learn the principles of laboratory safety and regulatory compliance and how to ensure compliance within a laboratory.

General Transferable Skills:

- Time management: Students will develop time-management skills necessary to effectively manage multiple tasks and priorities.
- Teamwork: Students will develop the ability to work collaboratively with others to achieve common goals.
- Adaptability: Students will develop the ability to adapt to changing circumstances and respond effectively to new challenges.

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

Week 1:

- Introduction to laboratory management in biomedical sciences
- Safety protocols and procedures in the laboratory
- Laboratory equipment and their functions

Week 2:

- Laboratory data management and record keeping
- Introduction to laboratory information management systems (LIMS)

Week 3:

- Quality assurance and quality control in the laboratory
- Basic statistical analysis for laboratory data

Week 4:

- Laboratory workflow and process optimization
- Standard operating procedures (SOPs) in the laboratory

Week 5:

- Inventory management in the laboratory
- Procurement and management of laboratory supplies and reagents

Week 6:

- Laboratory accreditation and certification
- Laboratory audits and inspections

Week 7:

- Introduction to project management in the laboratory
- Planning and scheduling laboratory activities

Week 8:

- Effective communication in the laboratory
- Collaborative work in the laboratory

Week 9:

- Laboratory financial management
- Budgeting and cost management in the laboratory

Week 10:

- Environmental and waste management in the laboratory
- Ethical considerations in laboratory management

Week 11:

- Laboratory safety audits and inspections
- Incident management and reporting in the laboratory

Week 12:

- Introduction to lean management in the laboratory
- Continuous improvement and problem-solving in the laboratory

Week 13:

- Risk management in the laboratory
- Emergency preparedness and response in the laboratory

Week 14:

- Laboratory information security and data privacy
- Cybersecurity in the laboratory

Week 15:

- Introduction to regulatory affairs in the laboratory
- Compliance with regulatory requirements in the laboratory

Week 16:

- Human resource management in the laboratory
- Employee training and development in the laboratory

Week 17:

- Laboratory marketing and customer service
- Relationship management with laboratory clients and stakeholders

Week 18:

- Laboratory information system integration
- Integration of LIMS with other laboratory systems

Week 19:

- Laboratory management software applications
- Implementation and customization of laboratory management software

Week 20:

- Introduction to project management software
- Use of project management software in the laboratory

Week 21:

- Laboratory benchmarking and performance measurement
- Key performance indicators (KPIs) in the laboratory

Week 22:

- Laboratory automation and robotics
- Implementation and maintenance of laboratory automation systems

Week 23:

- Laboratory performance evaluation and improvement
- Use of performance metrics to drive laboratory improvements

Week 24:

- Wrap-up and review of laboratory management training program
- Final project presentation and evaluation.

Method of assessment

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

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

FORMS

University of Benghazi
Faculty of Biomedical Sciences
Dept. of Laboratory Management

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 Laboratory Management

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 Laboratory Management

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 Laboratory Management

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.				

University of Benghazi

Faculty of Biomedical Sciences
Dept. of Laboratory Management

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 Laboratory Management

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 Laboratory Managemnt

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 Laboratory Management

Undergraduate Thesis Student Progress Form

Academic year: 20____/20____

Meeting number ( )

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

Progress Overview:

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

Tasks Completed:

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

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

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

University of Benghazi
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Dept. of Laboratory Management

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

Print title her

Academic year: 20____/20____