Department of Cytotechnology

Proposed Syllabi for all Courses

Prepared by

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Faculty of Biomedical Sciences
University of Benghazi

كلية العلوم الطبية الحيوية
جامعة بنغازي

التاريـــــــخ: 11_/ مارس/2023
الرقم الأشاري :2.و.ك_ ٩٠ /2023

السادة الأفاضل /السيدات الفضليات:

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

تحية طيبة وبعد،

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

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

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

كل توصيف مقرر يحتوي على:

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

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

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كذلك، ستجدون مرفقا الآتي:

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

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

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

أتمنى لكم كل التوفيق

والسلام عليكم ورحمة الله وبركاته

د. عبدالمحسن محمد بوسنينة

وكيل الكلية للشؤون العلمية

نسخة لكل من:

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

السيدة/د. عميد الكلية- للتفضل بالاطلاع.

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

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

السيد/أ. مسجل الكلية-للتفضل بالاطلاع.

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

الملف الصـــــــــــادر.

الملف الدوري العـــــــــأم.

بوسنينة

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Table of content:

الرؤية والرسالة والأهداف لقسم التقنية الخلوية

الرؤية :

أن يكون قسم التقنية الخلوية رائدا في هذا المجال ، معترفًا بإنتاجه لخريجين متخصصين عاليي المهارة والمعرفة يساهمون في تطوير الرعاية الصحية من خلال وضع الحلول الابتكارية والفعالة في مجال التقنيات الخلوية.

الرسالة :

يهدف قسم التقنية الخلوية إلى توفير تعليم وتدريب عالي الجودة في مجال التقنية الخلوية. من خلال منهج شامل، سيحصل من خلاله الطالب على المعرفة النظرية والمهارات العملية اللازمة للتميز في هذا المجال. ويلتزم القسم بتوفير بيئة داعمة للطلاب، وتعزيز ثقافة الابتكار والتفكير النقدي.

الأهداف:

1. **توفير أساس قوي للطالب في مبادئ التقنيات الخلوية، بما في ذلك علم الخلية وعلم الأنسجة والتقنيات الخلوية**
2. **تجهيز الطلاب بالمهارات اللازمة لإجراء مجموعة متنوعة من التقنيات الخلوية، مثل جمع العينات ومعالجتها وتحليلها.**
3. **تطوير قدرات الطلاب في التفكير النقدي وحل المشكلات، وتشجيع الابتكار والإبداع في تطبيق التقنيات الخلوية.**
4. **إعداد الطلاب ليكونوا متحدثين ومتعاونين فعالين في بيئة الرعاية الصحية، وللعمل بفعالية مع المهنيين الصحيين الآخرين.**
5. **تشجيع البحث والدراسة في مجال التقنيات الخلوية، وتشجيع الطلاب على المساهمة في تطوير المعرفة في هذا المجال من خلال مشاريع البحث الخاصة بهم.**
6. **إقامة شراكات مع مؤسسات الرعاية الصحية والمنظمات الأخرى لتوفير فرص التدريب العملي.**

Vision, Mission, and Objectives for the Department of Cytotechnology

Vision:

To be a leading department in the field of cytotechnology, recognized for producing highly skilled and knowledgeable graduates who contribute to the advancement of healthcare through innovative and effective cytological techniques.

Mission:

The Department of Cytotechnology aims to provide high-quality education and training in the field of cytotechnology. Through a comprehensive curriculum, students will gain the theoretical knowledge and practical skills necessary to excel in the field. The department is committed to providing students with a supportive learning environment, and to fostering a culture of innovation and critical thinking.

Objectives:

- To provide students with a strong foundation in the principles of cytotechnology, including cell biology, histology, and cytological techniques.
- To equip students with the necessary skills to perform a variety of cytological procedures, such as sample collection, processing, and analysis.
- To develop students' critical thinking and problem-solving abilities, and to encourage innovation and creativity in the application of cytological techniques.
- To prepare students to be effective communicators and collaborators in a healthcare setting, and to work effectively with other healthcare professionals.
- To promote research and scholarship in the field of cytotechnology, and to encourage students to contribute to the advancement of knowledge in the field through their own research projects.
- To establish partnerships with healthcare institutions and other organizations in order to provide students with opportunities for experiential learning and professional development.

Course Requirements for Cytotechnology (CYTO) BSc Degree

Department of Cytotechnology

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

5. Carbohydrate Metabolism and Diabetes

- Biochemistry of carbohydrates and their metabolism
- Pathophysiology of diabetes mellitus
- Laboratory tests for diabetes diagnosis and management

6. 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

7. Protein Metabolism and Renal Function

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

8. Liver Function and Hepatobiliary Diseases

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

9. Endocrine and Reproductive Systems

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

10. Hormones and Signaling

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

11. Biochemical Techniques

- Chromatography
- Spectrophotometry
- Electrophoresis

12. Diagnostic Techniques in Clinical Biochemistry

- Analytical methods in clinical biochemistry
- Immunoassays
- Molecular diagnostics

13. 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

17. Iron Metabolism

- Overview of iron metabolism
- Iron deficiency anemia
- Hemochromatosis

18. Inborn Errors of Metabolism

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

Practical Classes and Objectives:

1. Introduction to Clinical Chemistry Assays

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

2. Serum Lipid Assays

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

3. Urine Analysis and Renal Function Tests

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

4. Liver Function Tests

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

5. Glucose Tolerance Test

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

6. Hormone Assays

- To perform hormone assays (e.g. TSH, LH, FSH) using standard laboratory procedures and equipment

- To interpret hormone assay results in the context of endocrine disorders

7. Therapeutic Drug Monitoring Assays

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

8. Blood Gas Analysis

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

9. Coagulation Assays

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

10. Immunological Assays

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

11. Enzyme Assays

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

References:

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

3	Course title: Histotechniques	Course Code: CYTO-201

Overall Description and Aims:

The course aims to introduce students to the fundamental principles and techniques used in the preparation, processing, and staining of biological tissues. The course aims to provide students with a strong foundation in the theoretical and practical aspects of histotechnology, as well as to develop their professional and transferable skills.

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

Knowledge and Understanding:

1. The principles of microtechnique and the role of histology in biomedical sciences
2. The different types of fixatives and their effects on tissue structure and antigenicity
3. The various methods used for decalcification and other treatments for hard tissues
4. The steps involved in tissue processing and mounting
5. The types of dyes used in histotechnology and their staining mechanisms
6. The staining techniques used for tissues, blood, and other cell suspensions
7. The methods used for connective tissues, nucleic acids, organic functional groups, carbohydrates, lipids, pigments, and inorganic ions
8. The principles of enzyme histochemistry and the different classes of enzymes
9. The methods used for soluble organic compounds and metal reduction and precipitation
10. The principles of immunohistochemistry and the different types of antibodies

Intellectual Skills:

1. Analyze and interpret histological images and data
2. Apply critical thinking to solve problems in histotechnology
3. Evaluate the quality of tissue samples and staining protocols

Professional and Practical Skills:

1. Perform tissue processing, embedding, and sectioning
2. Prepare and use staining solutions for histological samples

3. Perform enzyme histochemistry and immunohistochemistry techniques

General Transferable Skills:

1. Work collaboratively in a team
2. Communicate scientific ideas effectively in written and oral formats
3. Develop effective time management and organizational skills

Course Topics:

1. Introduction to microtechnique

- Principles of histotechnology
- Types of histological techniques
- Ethical considerations in histology

2. Fixation

- Types of fixatives and their effects on tissue structure and antigenicity
- Factors affecting fixation
- Fixation protocols for different tissue types

3. Decalcification and other treatments for hard tissues

- Types of decalcifying agents and their effects on tissue structure
- Decalcification protocols for different tissue types
- Other treatments for hard tissues

4. Processing and mounting

- Tissue processing steps
- Types of embedding media
- Mounting techniques for histological sections

5. Dyes

- Types of dyes used in histotechnology
- Staining mechanisms of dyes
- Characteristics of good staining solutions

6. Staining with dyes in one or two colours

- Single and double staining techniques
- Staining protocols for different tissue types
- Troubleshooting staining problems

7. Staining blood and other cell suspensions

- Preparation of blood and other cell suspensions
- Staining techniques for blood and other cell suspensions
- Interpretation of stained blood smears

8. Methods for connective tissue

- Staining techniques for collagen and elastin fibers
- Other methods for connective tissue staining
- Troubleshooting connective tissue staining problems

9. Methods for nucleic acids

- Staining techniques for DNA and RNA
- Interpretation of nucleic acid stains
- Troubleshooting nucleic acid staining problems

10. Organic functional groups and protein histochemistry

- Staining techniques for organic functional groups
- Protein staining techniques
- Interpretation of protein stains

11. Carbohydrate histochemistry

- Staining techniques for carbohydrates
- Interpretation of carbohydrate stains
- Troubleshooting carbohydrate staining problems

12. Lipids

- Staining techniques for lipids
- Interpretation of lipid stains
- Troubleshooting lipid staining problems

13. Methods for pigments and inorganic ions

- Staining techniques for pigments and inorganic ions
- Interpretation of pigment and ion stains
- Troubleshooting pigment and ion staining problems

14. Enzyme histochemistry: general considerations

- Principles of enzyme histochemistry
- Types of enzymes and their substrates
- Factors affecting enzyme activity

15. Hydrolytic enzymes

- Staining techniques for hydrolases
- Interpretation of hydrolase stains
- Troubleshooting hydrolase staining problems

16. Oxidoreductases

- Staining techniques for oxidoreductases
- Interpretation of oxidoreductase stains
- Troubleshooting oxidoreductase staining problems

17. Methods for soluble organic compounds of low molecular weight

- Staining techniques for small molecules
- Interpretation of small molecule stains
- Troubleshooting small molecule staining problems

18. Metal reduction and precipitation methods

- Staining techniques for metals
- Interpretation of metal stains
- Troubleshooting metal staining problems

19. Immunohistochemistry

- Principles of immunohistochemistry
- Types of antibodies and their uses
- Troubleshooting immunohistochemistry problems

20. Special techniques

- Special techniques and staining protocols
- New developments in histotechnology
- Future directions in histotechnology research

Practical Class:

1. Introduction to microtechnique:

- Objective: To introduce students to the basic principles of histotechnology.
- Practical: Preparation and examination of plant and animal tissues using light microscopy.

2. Fixation:

- Objective: To familiarize students with the different types of fixatives and their effects on tissue structure and antigenicity.
- Practical: Fixation of different tissue types using different fixatives, and examination of the effects of fixation on tissue structure.

3. Decalcification and other treatments for hard tissues:

- Objective: To teach students the different methods used for decalcification and other treatments for hard tissues.
- Practical: Decalcification of bone tissue using different decalcifying agents and examination of the effects of decalcification on tissue structure.

4. Processing and mounting:

- Objective: To teach students the steps involved in tissue processing and mounting.
- Practical: Processing and embedding of different tissue types, sectioning and mounting of histological sections.

5. Dyes:

- Objective: To teach students the different types of dyes used in histotechnology and their staining mechanisms.
- Practical: Preparation and use of different staining solutions for histological samples, and examination of the effects of different dyes on tissue structure.

6. Staining with dyes in one or two colours:

- Objective: To teach students the different staining techniques used in histotechnology.
- Practical: Single and double staining of different tissue types using different staining protocols.

7. Staining blood and other cell suspensions:

- Objective: To teach students the preparation and staining of blood and other cell suspensions.
- Practical: Preparation of blood and other cell suspensions, staining of blood smears and examination of stained cells.

8. Methods for connective tissue:

- Objective: To teach students the different methods used for connective tissue staining.
- Practical: Staining of collagen and elastin fibers using different staining protocols, and examination of the effects of staining on tissue structure.

9. Methods for nucleic acids:

- Objective: To teach students the different methods used for nucleic acid staining.
- Practical: Staining of DNA and RNA using different staining protocols, and examination of the effects of staining on tissue structure.

10. Organic functional groups and protein histochemistry:

- Objective: To teach students the different methods used for organic functional group and protein staining.
- Practical: Staining of different organic functional groups and proteins using different staining protocols, and examination of the effects of staining on tissue structure.

11. Carbohydrate histochemistry:

- Objective: To teach students the different methods used for carbohydrate staining.
- Practical: Staining of different carbohydrates using different staining protocols, and examination of the effects of staining on tissue structure.

12. Lipids:

- Objective: To teach students the different methods used for lipid staining.
- Practical: Staining of different lipids using different staining protocols, and examination of the effects of staining on tissue structure.

13. Methods for pigments and inorganic ions:

- Objective: To teach students the different methods used for pigment and inorganic ion staining.
- Practical: Staining of different pigments and inorganic ions using different staining protocols, and examination of the effects of staining on tissue structure.

14. Enzyme histochemistry: general considerations:

- Objective: To teach students the different methods used for enzyme staining.
- Practical: Staining of different enzymes using different staining protocols, and examination of the effects of staining on tissue structure.

15. Hydrolytic enzymes:

- Objective: To teach students the different methods used for hydrolytic enzyme staining.
- Practical: Staining of different hydrolytic enzymes using different staining protocols, and examination of the effects of staining on tissue structure.

16. Oxidoreductases:

- Objective: To teach students the different methods used for oxidoreductase staining.
- Practical: Staining of different oxidoreductases using different staining protocols, and examination of the effects of staining on tissue structure.

17. Methods for soluble organic compounds of low molecular weight:

- Objective: To teach students the different methods used for staining small organic compounds.
- Practical: Staining of different small organic compounds using different staining protocols, and examination of the effects of staining on tissue structure.

18. Metal reduction and precipitation methods:

- Objective: To teach students the different methods used for metal staining.

- Practical: Staining of different metals using different staining protocols, and examination of the effects of staining on tissue structure.

19. Immunohistochemistry:

- Objective: To teach students the different methods used for immunohistochemistry staining.
- Practical: Staining of different antigens using different immunohistochemistry protocols, and examination of the effects of staining on tissue structure.

References:

1. Bancroft, J.D. and Gamble, M. Theory and Practice of Histological Techniques. 6th edition. Churchill Livingstone, Elsevier, 2008.
2. Kiernan, J.A. Histological and Histochemical Methods: Theory and Practice. 5th edition. Scion Publishing Ltd, 2015.

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:

- Demonstrate an understanding of the fundamental principles of physiology and homeostasis
- Analyze the organization and function of different physiological systems in the body
- Evaluate the mechanisms that control cellular communication and signaling pathways
- Understand the role of different physiological systems in maintaining homeostasis and responding to environmental challenges
- Describe the function of the reproductive system and its hormonal regulation
- Demonstrate the ability to design and conduct laboratory experiments in physiology
- 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:

- Effective communication of physiological concepts and mechanisms
- 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: Lab Management and Medical Informatics	Course Code: LBMT-202

Overall Aims of the Course:

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

Intended Learning Outcomes of the Course:

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

Knowledge and Understanding:

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

Intellectual Skills:

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

Professional and Practical Skills:

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

General Transferable Skills:

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

Course topics:

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

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

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

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

- Data security and confidentiality in LIMS

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

6: Laboratory Equipment Management and Maintenance
- Equipment selection and procurement
- Calibration and maintenance of laboratory equipment
- Troubleshooting equipment problems
- Replacement and retirement of laboratory equipment

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

8: Laboratory Accreditation and Certification
- Overview of laboratory accreditation and certification programs
- The benefits of accreditation and certification
- The accreditation and certification process
- Maintaining accreditation and certification

9: Laboratory Budgeting and Finance
- Budget development and management
- Cost analysis and resource allocation
- Revenue generation and funding opportunities
- Financial reporting and accountability

10: Laboratory Auditing and Inspection
- Types of laboratory audits and inspections
- Audit and inspection planning and preparation
- Audit and inspection execution and follow-up
- Corrective action and continuous improvement

11: Laboratory Project Management
- The principles of project management

- Project planning and scheduling
- Resource allocation and budgeting for projects
- Project monitoring and evaluation

12: Laboratory Ethics and Professionalism

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

13: Data Analysis and Reporting

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

14: Medical Informatics Applications in Healthcare

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

15: Leadership and Team Management in the Laboratory

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

16: Laboratory Waste Management

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

17: Laboratory Personnel Management

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

18: Laboratory Inventory Control

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

19: Laboratory Informatics and Analytics

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

20: Laboratory Automation and Robotics

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

Practical Classes:

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

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

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

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

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

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

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

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

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

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

References:

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

6	Course title: Medical Immunology	Course Code: MLSC-205

Overall Description and Aims:

The course aims to provide students with a comprehensive understanding of the immune system, its mechanisms, functions, and clinical applications. The course intends to equip students with knowledge and skills to enable them to pursue careers in biomedical sciences, immunology research, and clinical practice. The course aims to develop students' ability to think critically and analytically, communicate effectively, and work collaboratively in a team.

Intended Learning Outcomes:

Knowledge and Understanding:

1. Describe the components, organization, and functions of the immune system
2. Explain the molecular basis of immune recognition and response
3. Discuss the role of immune system in health and disease
4. Describe the genetic, ontogenic, and clinical implications of immune system function

Intellectual Skills:

1. Analyze and interpret immunological data and literature
2. Evaluate the contribution of immune system in disease pathogenesis
3. Design and execute immunological experiments
4. Develop critical thinking and problem-solving skills

Professional and Practical Skills:

1. Communicate effectively about immunological concepts and findings
2. Work collaboratively in a team
3. Develop laboratory skills and techniques in immunological research
4. Demonstrate ethical and professional behavior in biomedical sciences

General Transferable Skills:

1. Develop effective written and oral communication skills
2. Enhance time-management and organization skills
3. Develop computer literacy and data analysis skills
4. Develop leadership and team management skills

1: Introduction

- The historical evolution of immunology as a scientific discipline
- The basic principles and terminology of immunology
- The role of immunology in health and disease research

2: Leucocytes and Lymphoid Tissues: The Framework of the Immune System

- Classification and differentiation of leukocytes
- The anatomy and functions of lymphoid tissues and organs
- Leukocyte trafficking and migration in the immune system

Chapter 3: Major Histocompatibility Complex

- The structure and organization of MHC molecules
- MHC class I and class II molecules and their roles in antigen presentation
- MHC polymorphism and its clinical implications

4: The Adaptive Immune Response: Antigens, Lymphocytes and Accessory Cells

- The structure and diversity of antigens
- The differentiation and maturation of B and T lymphocytes
- The roles of accessory cells in the adaptive immune response

Chapter 5: Immunoglobulins: Structure and Diversity

- The structure and properties of immunoglobulins
- The diversity of immunoglobulin genes and proteins
- The role of immunoglobulins in immune defense

6: Immunoglobulins: Metabolism and Biological Properties

- The metabolism and catabolism of immunoglobulins
- The biological functions of immunoglobulins
- The clinical implications of immunoglobulin abnormalities

7: Genetics of Immunoglobulins: Ontogenic, Biological and Clinical Implications

- The genetics of immunoglobulin production
- The ontogeny of immunoglobulin production and maturation
- The clinical implications of immunoglobulin gene mutations

8: Antigen-Antibody Reactions

- The principles and mechanisms of antigen-antibody reactions
- The kinetics and specificity of antigen-antibody interactions
- The clinical applications of antigen-antibody reactions

9: The Complement System in Health and Disease

- The components and functions of the complement system
- The mechanisms of complement activation and regulation
- The clinical implications of complement deficiencies and abnormalities

10: Monocyte and Lymphocyte Membrane Markers: Ontogeny and Clinical Significance

- The structure and functions of monocyte and lymphocyte membrane markers
- The ontogeny and differentiation of monocyte and lymphocyte subsets
- The clinical applications of monocyte and lymphocyte membrane markers

11: Cell-Mediated Immunity

- The structure and functions of T lymphocytes
- The mechanisms of T cell activation and differentiation
- The clinical implications of T cell abnormalities

12: Adaptive Humoral Immunity and Immunoprophylaxis

- The principles and mechanisms of humoral immune responses
- The clinical applications of immunoprophylaxis
- The role of immunization in public health

13: Phagocytic Cells and their Functions

- The structure and functions of phagocytic cells
- The mechanisms of phagocytosis and microbial killing

- The clinical implications of phagocytic cell abnormalities

14: Anti-Infectious Innate and Adaptive Immune Responses

- The mechanisms and components of innate immune responses to infections
- The mechanisms and components of adaptive immune responses to infections
- The clinical implications of immune responses to infections

15: Diagnostic Applications of Immunology

- The principles and techniques of immunological diagnostic tests
- The clinical applications of serological tests

16: Tolerance and Autoimmunity

- Mechanisms of immune tolerance induction
- Self-reactive lymphocyte selection
- Central and peripheral tolerance

17: Organ-Specific Autoimmune Diseases

- Pathogenesis of autoimmune diseases affecting organs such as thyroid, pancreas, and liver
- Diagnosis and treatment of organ-specific autoimmune diseases
- Current research on the underlying mechanisms of organ-specific autoimmune diseases

18: Systemic Lupus Erythematosus

- Clinical presentation and diagnosis of systemic lupus erythematosus (SLE)
- Pathogenesis of SLE, including genetic and environmental factors
- Treatment options for SLE, including immunosuppressive therapy and targeted biologic agents

19: Rheumatoid Arthritis

- Pathogenesis of rheumatoid arthritis (RA), including genetic and environmental factors
- Clinical presentation and diagnosis of RA
- Treatment options for RA, including nonsteroidal anti-inflammatory drugs (NSAIDs), disease-modifying antirheumatic drugs (DMARDs), and biologic agents

20: Overview of Hypersensitivity

- Types of hypersensitivity reactions (Type I-IV)
- Mechanisms underlying different types of hypersensitivity reactions
- Clinical manifestations and treatment options for hypersensitivity reactions

21: IgE-mediated (Immediate) Hypersensitivity

- Pathogenesis and clinical manifestations of IgE-mediated hypersensitivity
- Diagnosis of IgE-mediated hypersensitivity, including skin testing and in vitro assays
- Treatment options for IgE-mediated hypersensitivity, including avoidance of allergens and immunotherapy

22: Immunohematology

- Blood groups and their clinical significance
- Mechanisms of blood transfusion reactions
- Clinical laboratory techniques for blood typing and crossmatching

23: The Pathogenic Role of Antigen-Antibody Complexes

- Mechanisms of immune complex formation
- Pathogenic consequences of immune complex deposition
- Relationship between immune complex deposition and autoimmune diseases

24: Immune System Modulators

- Pharmacological agents that modulate the immune system, such as corticosteroids and immunosuppressive drugs
- Mechanisms of action of immune system modulators
- Side effects and potential complications of immune system modulators

25: Transplantation Immunology

- Types of organ and tissue transplantation
- Mechanisms of graft rejection
- Strategies to prevent and treat graft rejection, including immunosuppressive drugs and tolerance induction

26: Tumor Immunology

- Immunological mechanisms underlying tumor development and progression
- Approaches to cancer immunotherapy, including checkpoint inhibitors and CAR-T cell therapy
- Challenges and limitations of cancer immunotherapy

27: Lymphocyte and Plasma Cell malignancies

- Classification and clinical characteristics of lymphocyte and plasma cell malignancies, such as leukemia, lymphoma, and myeloma
- Diagnostic methods for lymphocyte and plasma cell malignancies, including flow cytometry and molecular testing
- Treatment options for lymphocyte and plasma cell malignancies, including chemotherapy and immunotherapy

28: Diagnosis of Immune Deficiency Diseases

- Different types of immune deficiency diseases, including primary and secondary immunodeficiencies
- Diagnostic criteria and laboratory testing for immune deficiency diseases
- Treatment options for immune deficiency diseases, including immunoglobulin replacement therapy and bone marrow transplantation

29: Primary Immunodeficiency Diseases

- Inherited primary immunodeficiency diseases, such as severe combined immunodeficiency (SCID) and common variable immunodeficiency (CVID)
- Clinical manifestations and diagnostic criteria for primary immunodeficiency diseases
- Current research on novel therapies for primary immunodeficiency diseases

30: AIDS and Other Acquired Immunodeficiencies

- Pathogenesis of HIV and AIDS
- Clinical manifestations and diagnosis of AIDS
- Treatment and prevention of AIDS and other acquired immunodeficiencies

Practical Classes:

1. Microscopy Techniques in Immunology
    - Objective: To learn how to prepare samples and perform immunofluorescence microscopy.
2. Flow Cytometry and Cell Sorting
    - Objective: To learn how to perform flow cytometry and analyze data.
3. ELISA and Western Blotting
    - Objective: To learn how to perform ELISA and Western blotting assays.
4. T Cell Proliferation Assay
    - Objective: To learn how to perform a T cell proliferation assay.
5. B Cell ELISPOT Assay
    - Objective: To learn how to perform a B cell ELISPOT assay.
6. Antibody Production and Purification
    - Objective: To learn how to produce and purify monoclonal antibodies.
7. Immunohistochemistry and Immunofluorescence
    - Objective: To learn how to perform immunohistochemistry and immunofluorescence techniques.
8. Tissue Culture Techniques
    - Objective: To learn how to maintain and manipulate cell lines in tissue culture.

Reference:

Virella, G. (2021). Medical Immunology, 7th Edition. CRC Press.

7	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

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.

8	Course title: Principles of Pathology	Course Code: CYTO-202

Overall description and aims:

The course aims to provide students with a comprehensive understanding of the mechanisms and processes involved in the development and progression of diseases. The course covers a wide range of topics related to the study of pathology, including the study of diseases, cell injury and cellular adaptations, immunopathology, neoplasia, environmental and nutritional diseases, and disorders of the haematopoietic system. The course aims to equip students with the necessary knowledge and skills to identify and diagnose pathological conditions, understand the underlying mechanisms, and develop appropriate treatment strategies.

Intended learning outcomes: Knowledge and understanding:

- Develop a deep understanding of the molecular, cellular, and systemic mechanisms involved in the development and progression of diseases.
- Gain knowledge of the key pathological processes involved in various diseases and disorders.
- Understand the role of the immune system in the development and progression of diseases.
- Understand the epidemiology, etiology, and clinical manifestations of various pathological conditions.

Intellectual skills:

- Develop analytical and critical thinking skills to evaluate complex pathological mechanisms.
- Develop the ability to apply theoretical knowledge to practical situations.
- Develop the ability to critically evaluate scientific literature and research.

Professional and practical skills:

- Develop practical skills to diagnose and treat pathological conditions.
- Understand the importance of ethical and professional conduct in clinical practice.
- Develop effective communication skills to communicate with patients, colleagues, and other healthcare professionals.

General transferable skills:

- Develop problem-solving and decision-making skills.
- Develop independent learning and self-management skills.
- Develop the ability to work effectively in teams.

Course topics:

Introduction to Pathology
- Study of Diseases
- Evolution of Pathology
- Subdivisions of Pathology

Cell Injury and Cellular Adaptations
- The Normal Cell
- Etiology of Cell Injury
- Pathogenesis of Cell Injury
- Morphology of Cell Injury
- Intracellular Accumulations
- Morphology of Irreversible Cell Injury
- Cell Death
- Cellular Adaptations
- Cellular Aging

Immunopathology Including Amyloidosis
- Structure of Immune System
- HLA System and Major Histocompatibility Complex
- Transplant Rejection
- Diseases of Immunity
- Amyloidosis

Derangements of Homeostasis and Haemodynamics
- Homeostasis
- Disturbances of Body Fluids
- Disturbances of Electrolytes
- Acid-base Imbalance (Abnormalities in pH of Blood)
- Haemodynamic Derangements

Inflammation and Healing
- Inflammation
- Introduction
- Acute Inflammation
- Healing

Infectious and Parasitic Diseases
- Diseases Caused by Bacteria, Spirochaetes and Mycobacteria

- Diseases Caused by Fungi
- Diseases Caused by Viruses
- Diseases Caused by Parasites
- Torch Complex

Neoplasia
- Nomenclature and Classification
- Characteristics of Tumours
- Epidemiology and Predisposition to Neoplasia
- Carcinogenesis: Etiology and Pathogenesis of Cancer
- Clinical Aspects of Neoplasia

Environmental and Nutritional Diseases
- Environmental Pollution
- Chemical and Drug Injury
- Injury by Physical Agents
- Nutritional Diseases
- Disorders of Vitamins
- Metals and Trace Elements
- Diet and Cancer

Introduction to Haematopoietic System and Disorders of Erythroid Series
- Bone Marrow
- Red Blood Cells

Disorders of Platelets, Bleeding
- Thrombopoiesis
- Bleeding Disorders (Haemorrhagic Diathesis)

Disorders and Basic Transfusion Medicine
- Blood Groups and Blood Transfusion

Disorders of Leucocytes and Lymphoreticular Tissues
- Lymph Nodes: Normal and Reactive
- White Blood Cells: Normal and Reactive Haematologic Neoplasms (Leukaemias-lymphomas)
- Myeloid Neoplasms
- Lymphoid Neoplasms
- Histiocytic Neoplasms
- Spleen
- Thymus

References:

1. Harsh Mohan. (2010). Textbook of Pathology, 6th Edition. Jaypee Brothers Medical Publishers (P) Ltd.

9	Course title: Systemic Histology	Course Code: CYTO-203

Overall Description and Aims:

The course is designed to provide students with a comprehensive understanding of the microscopic structure and function of tissues, and organs that make up the human body. The course aims to equip students with the knowledge and skills necessary to analyze and interpret complex biological structures and their functions at the cellular and tissue level.

Intended Learning Outcomes of Course:

Knowledge and Understanding:

1. Describe the cellular and tissue organization of the human body
2. Explain the physiological functions of various tissues and organs in the human body
3. Analyze and interpret histological images and identify the structures and functions of cells, tissues, and organs.
4. Understand the processes involved in tissue development and differentiation.
5. Understand the regulation of tissue and organ function.

Intellectual Skills:

1. Apply knowledge of histology to analyze and interpret pathological changes in cells, tissues, and organs.
2. Develop hypotheses and design experiments to investigate histological changes associated with disease
3. Develop the ability to integrate knowledge of tissue structure and function into broader physiological concepts.

Professional and Practical Skills:

1. Develop skills in laboratory techniques and specimen preparation for microscopic analysis.
2. Develop skills in the use of microscopy and image analysis.

3. Work collaboratively in a team to perform experiments and analyze data.

General Transferable Skills:

1. Critical thinking and problem-solving skills
2. Time management and organizational skills
3. Adaptability and flexibility in response to changing circumstances.

Course Topics:

1. Cardiovascular System

- Anatomy of the heart and blood vessels
- Histology of the heart and blood vessels
- Cardiac and vascular diseases

2. Respiratory System

- Anatomy of the respiratory system
- Histology of the respiratory system
- Gas exchange and respiratory diseases

3. Digestive System

- Anatomy of the digestive system
- Histology of the digestive system
- Digestive enzymes and nutrient absorption

4. Urinary System

- Anatomy of the urinary system
- Histology of the urinary system
- Renal function

5. Endocrine System

- Anatomy of endocrine system
- Histology of endocrine glands
- Hormonal regulation

6. Reproductive System

- Anatomy of the male and female reproductive system
- Histology of male and female reproductive organs
- Hormonal regulation

7. Lymphatic System

- Anatomy of the lymphatic system
- Histology of lymphoid tissues
- Immune system

8. Integumentary System

- Anatomy of the skin
- Histology of the skin
- Skin functions

9. Sensory Organs

- Anatomy of the eye and ear
- Histology of the eye and ear
- Vision and hearing mechanisms and related diseases

References:

1. Young, B., O'Dowd, G., & Woodford, P. (2013). Wheater's Functional Histology: A Text and Colour Atlas (6th ed.). Elsevier.
2. Mescher, A. (2017). Junqueira's Basic Histology: Text and Atlas (15th ed.). McGraw-Hill Education.

Department of Cytotechnology

Proposed Syllabi for all Courses in the Third Year

Prepared by

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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: Blood and Body Fluid Analysis	Course Code: CYTO-301

Overall Description and Aims:

The overall aim of the Blood and Body Fluid Analysis Course is to provide students with an in-depth understanding of the principles and techniques of cytological analysis of blood and body fluids. This course aims to develop the students' knowledge and skills in the interpretation of cytological samples, including identifying pathological conditions and diseases.

Intended Learning Outcomes:

Knowledge and Understanding:

- Develop an understanding of the principles and techniques of blood and body fluid cytology analysis.
- Understand the normal and abnormal features of blood and body fluid cells.
- Develop knowledge of the etiology and pathophysiology of hematological and non-hematological disorders.

Intellectual Skills:

- Develop critical thinking skills in the interpretation of cytological samples.
- Develop skills in problem-solving and decision-making in the identification of pathological conditions and diseases.

Professional and Practical Skills:

- Develop skills in sample collection and preparation for cytological analysis.
- Develop skills in the interpretation and reporting of cytological samples.
- Develop knowledge of laboratory safety and quality assurance in the analysis of blood and body fluids.

General Transferable Skills:

- Develop skills in communication and teamwork.
- Develop skills in data management and analysis.

Course Topics:

1: Introduction to Blood and Body Fluid Cytology.

Objective: Understand the principles and techniques of blood and body fluid cytology analysis.

2: Normal Blood Cell Morphology.

Objective: Understand the normal features of blood cells and their morphology.

3: Abnormal Blood Cell Morphology.

Objective: Develop skills in the identification of abnormal blood cells and their morphology.

4: Hematological Disorders.

Objective: Develop knowledge of the etiology and pathophysiology of hematological disorders.

5: Non-Hematological Disorders.

Objective: Develop knowledge of the etiology and pathophysiology of non-hematological disorders.

6: Cytology of Serous Fluids.

Objective: Develop skills in the interpretation of serous fluid samples.

7: Cytology of Cerebrospinal Fluid.

Objective: Develop skills in the interpretation of cerebrospinal fluid samples.

8: Cytology of Urine.

Objective: Develop skills in the interpretation of urine samples.

9: Cytology of Synovial Fluid.

Objective: Develop skills in the interpretation of synovial fluid samples.

10: Cytology of Pleural Fluid.

Objective: Develop skills in the interpretation of pleural fluid samples.

11: Cytology of Pericardial Fluid.

Objective: Develop skills in the interpretation of pericardial fluid samples.

12: Cytology of Peritoneal Fluid.

Objective: Develop skills in the interpretation of peritoneal fluid samples.

13: Cytopathology of Breast Lesions.

Objective: Develop skills in the interpretation of breast lesion samples.

14: Cytopathology of Thyroid Lesions.

Objective: Develop skills in the interpretation of thyroid lesion samples.

15: Cytopathology of Salivary Gland Lesions.

Objective: Develop skills in the interpretation of salivary gland lesion samples.

16: Cytopathology of Lymph Nodes.

Objective: Develop skills in the interpretation of lymph node samples.

17: Cytopathology of Soft Tissue Lesions.

Objective: Develop skills in the interpretation of soft tissue lesions.

laboratory classes for tissue examination:

1. Introduction to Blood and Body Fluid Cytology: This laboratory class provides an overview of blood and body fluid cytology, including sample collection, processing, and preparation for examination.
2. Basic Cytological Techniques: This laboratory class covers basic techniques for preparing and staining cytology slides, including fixation, staining, and coverslipping.
3. Blood Cell Morphology: This laboratory class covers the identification and interpretation of blood cells, including red blood cells, white blood cells, and platelets.

4. Cerebrospinal Fluid Examination: This laboratory class covers the examination of cerebrospinal fluid (CSF) samples, including identification of cells, bacteria, and other abnormalities.
5. Pleural Fluid Examination: This laboratory class covers the examination of pleural fluid samples, including identification of cells, bacteria, and other abnormalities.
6. Peritoneal Fluid Examination: This laboratory class covers the examination of peritoneal fluid samples, including identification of cells, bacteria, and other abnormalities.
7. Synovial Fluid Examination: This laboratory class covers the examination of synovial fluid samples, including identification of cells, crystals, and other abnormalities.
8. Urine Cytology: This laboratory class covers the examination of urine samples, including identification of cells, bacteria, and other abnormalities.
9. Fine Needle Aspiration (FNA): This laboratory class covers the techniques and interpretation of FNA samples, including preparation and staining of cytology slides.

1. Koss, L. G., & Melamed, M. R. (1992). Koss's diagnostic cytology and its histopathologic bases (5th ed.). Lippincott Williams & Wilkins.
2. Bibbo, M., & Wilbur, D. C. (2018). Comprehensive cytopathology (4th ed.). Elsevier

3	Course title: Cytogenetics and Cell Culture	Course Code: CYTO-302

Overall Description and Aims:

The overall aim of the Course is to provide students with a thorough understanding of the principles and techniques of cytogenetics and cell culture, and their application in clinical and research settings. The course will cover topics related to cell culture techniques, chromosome analysis, and molecular cytogenetics, enabling students to gain a broad knowledge of the subject area.

Intended Learning Outcomes:

Knowledge and Understanding:

- Understand the principles and techniques of cell culture, chromosome analysis, and molecular cytogenetics.
- Understand the normal and abnormal karyotypes and genetic variation.
- Understand the molecular and genetic basis of inherited and acquired diseases.
- Understand the ethical and legal considerations related to the use of human cells and tissues for research and clinical purposes.

Intellectual Skills:

- Analyze and interpret cytogenetic and molecular data.
- Critically evaluate scientific literature related to cytogenetics and cell culture.
- Design and plan experiments for chromosome analysis and molecular cytogenetics.
- Synthesize and communicate scientific data.

Professional and Practical Skills:

- Demonstrate proficiency in cell culture techniques.
- Perform chromosome analysis using karyotyping and FISH techniques.
- Perform molecular cytogenetic techniques such as PCR, NGS, and array CGH.
- Interpret the results of cytogenetic and molecular analyses.

General Transferable Skills:

- Work effectively as part of a team.

- Communicate scientific data and ideas effectively.
- Manage and organize data and laboratory work.
- Adapt to new technologies and approaches.

Course Topics and Objectives:

Topic 1: Introduction to Cell Culture Techniques Objectives:

- Understand the principles of cell culture techniques.
- Understand the different types of cells that can be cultured.
- Demonstrate proficiency in cell culture techniques.

Topic 2: Cell Line Characterization Objectives:

- Understand the importance of cell line characterization.
- Understand the techniques used for cell line characterization.
- Analyze and interpret cell line characterization data.

3. Primary cell culture

- Understand the principles and applications of primary cell culture
- Identify the different types of primary cells and their sources
- Isolate and culture primary cells from different tissues
- Perform basic experiments using primary cells

4. Immortalized cell lines

- Understand the principles and applications of immortalized cell lines
- Identify the different types of immortalized cell lines and their sources
- Culture and maintain immortalized cell lines
- Perform basic experiments using immortalized cell lines

5. Cytotoxicity assays

- Understand the principles and applications of cytotoxicity assays
- Identify the different types of cytotoxicity assays and their limitations
- Perform basic cytotoxicity assays using different cell lines
- Interpret and analyze the results of cytotoxicity assays

6. Apoptosis assays

- Understand the principles and applications of apoptosis assays
- Identify the different types of apoptosis assays and their limitations

- Perform basic apoptosis assays using different cell lines
- Interpret and analyze the results of apoptosis assays

7. Cell signaling assays
- Understand the principles and applications of cell signaling assays
- Identify the different types of cell signaling assays and their limitations
- Perform basic cell signaling assays using different cell lines
- Interpret and analyze the results of cell signaling assays

8. Flow cytometry
- Understand the principles and applications of flow cytometry
- Describe the different components of a flow cytometer and their functions
- Identify the different types of flow cytometry and their applications
- Perform basic flow cytometry experiments

9. Cell sorting
- Understand the principles and applications of cell sorting
- Describe the different types of cell sorters and their functions
- Identify the different methods of cell sorting and their applications
- Perform basic cell sorting experiments

10: Chromosome Structure and Function Objectives:

- Understand the structure and function of chromosomes.
- Understand the role of chromosomal abnormalities in disease development.

11: Chromosome Analysis Techniques Objectives:

- Understand the principles of chromosome analysis techniques such as karyotyping and FISH.
- Demonstrate proficiency in chromosome analysis techniques.

12: Normal and Abnormal Karyotypes Objectives:

- Understand the normal and abnormal karyotypes.
- Understand the clinical implications of chromosomal abnormalities.

13: Molecular Cytogenetics Techniques Objectives:

- Understand the principles of molecular cytogenetics techniques such as PCR, NGS, and array CGH.

- Demonstrate proficiency in molecular cytogenetics techniques.

14: Inherited Genetic Disorders Objectives:

- Understand the genetic basis of inherited disorders.
- Understand the principles of genetic counseling.

15: Acquired Genetic Disorders Objectives:

- Understand the genetic basis of acquired disorders.
- Understand the principles of cancer genetics.

16: Prenatal Diagnosis Objectives:

- Understand the techniques used for prenatal diagnosis.
- Understand the ethical and legal considerations related to prenatal diagnosis.

17: Chromosome Abnormalities in Cancer Objectives:

- Understand the role of chromosomal abnormalities in cancer development.
- Understand the principles of cancer cytogenetics.

18: Gene Expression Analysis Objectives:

- Understand the principles of gene expression analysis.
- Understand the techniques used for gene expression analysis.

19: Epigenetic Modifications Objectives:

- Understand the principles of epigenetic modifications.

20. Quality control in cell culture

- Understand the importance of quality control in cell culture
- Identify the potential sources of contamination in cell culture
- Perform basic tests to ensure the quality of cell culture
- Maintain proper documentation of cell culture experiments

Practical Classes:

1. Introduction to Cytogenetics and Cell Culture: This laboratory class provides an overview of the principles and techniques of cytogenetics and cell culture.
2. Cell Culture Techniques: This laboratory class covers the basic techniques used in cell culture, including sterile technique, cell isolation, and culture maintenance.
3. Chromosome Preparation: This laboratory class covers the techniques used to prepare chromosomes for cytogenetic analysis, including metaphase chromosome spreading and banding techniques.
4. Karyotyping: This laboratory class covers the techniques used to analyze and interpret karyotypes, including identification of chromosomal abnormalities.
5. Fluorescence in situ Hybridization (FISH): This laboratory class covers the principles and techniques of FISH, including probe selection, probe labeling, hybridization, and interpretation.
6. Microarray Analysis: This laboratory class covers the principles and techniques of microarray analysis, including probe selection, hybridization, and data analysis.
7. Chromosome Abnormalities in Cancer: This laboratory class covers the identification and interpretation of chromosomal abnormalities in cancer cells, including identification of specific oncogenes and tumor suppressor genes.
8. Chromosome Abnormalities in Genetic Disorders: This laboratory class covers the identification and interpretation of chromosomal abnormalities in genetic disorders, including identification of specific chromosomal loci and gene mutations.
9. Mitotic Index Analysis: This laboratory class covers the techniques used to determine the mitotic index in cell cultures, including identification of mitotic cells and calculation of the mitotic index.
10. Cytogenetic Analysis of Hematologic Malignancies: This laboratory class covers the principles and techniques used in cytogenetic analysis of hematologic malignancies, including identification of specific chromosomal abnormalities and their prognostic significance.
11. Cell Cycle Analysis: This laboratory class covers the techniques used to analyze the cell cycle, including identification of specific phases and calculation of cell cycle distribution.
12. Cell Proliferation Assays: This laboratory class covers the techniques used to measure cell proliferation, including the use of BrdU, MTT, and other assays.
13. Flow Cytometry: This laboratory class covers the principles and techniques of flow cytometry, including instrument operation, cell labeling, and data analysis.

14. Cell Sorting: This laboratory class covers the principles and techniques of cell sorting, including instrument operation, cell labeling, and isolation of specific cell populations.
15. Cell Differentiation: This laboratory class covers the techniques used to induce and study cell differentiation, including the use of growth factors, differentiation markers, and other assays.
16. Stem Cell Culture and Differentiation: This laboratory class covers the principles and techniques of stem cell culture and differentiation, including isolation and maintenance of stem cell populations, and induction of differentiation.
17. Quality Control and Quality Assurance: This laboratory class covers the principles of quality control and quality assurance in cytogenetics and cell culture, including quality control measures for cell culture, chromosome preparation, and data analysis

1. Rooney, D. E., & Czepulkowski, B. H. (Eds.). (2013). Human cytogenetics: a practical approach (3rd ed.). Oxford University Press.
2. Masters, J. R. (Ed.). (2010). Human cell culture: a practical approach (2nd ed.). Wiley-Blackwell.

4	Course title: Gynecologic Cytology	Course Code: CYTO-303

Overall Description and Aims:

The overall aim of the Course is to provide students with a comprehensive understanding of the principles of gynecologic cytology, including the interpretation of Pap smears, HPV testing, and other diagnostic tests. The course aims to equip students with the knowledge, skills, and competencies required to practice gynecologic cytology in a professional and effective manner, with a focus on patient care and quality assurance.

Intended Learning Outcomes of Course:

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

Knowledge and Understanding:

- Understand the principles and techniques of gynecologic cytology, including the interpretation of Pap smears, HPV testing, and other diagnostic tests.
- Understand the anatomy and physiology of the female reproductive system and its associated diseases.
- Understand the principles and practices of quality assurance in gynecologic cytology.

Intellectual Skills:

- Interpret and evaluate gynecologic cytology samples, including the identification of abnormal cells and the determination of the appropriate management plan.
- Critically evaluate and integrate research evidence into practice.

Professional and Practical Skills:

- Conduct gynecologic cytology procedures in a safe, ethical, and effective manner.
- Communicate effectively with patients and healthcare professionals regarding gynecologic cytology results and management plans.
- Demonstrate an understanding of professional and ethical standards of practice in gynecologic cytology.

General Transferable Skills:

- Analyze and solve problems in a logical and systematic manner.
- Work effectively in a team and communicate effectively with others.
- Demonstrate lifelong learning skills and engage in professional development.

Course Topics and Objectives:

1. Introduction to Gynecologic Cytology

- Understand the history and evolution of gynecologic cytology as a diagnostic tool.
- Understand the role of gynecologic cytology in the prevention and early detection of gynecologic cancers.

2. Anatomy and Physiology of the Female Reproductive System

- Understand the anatomy and physiology of the female reproductive system.
- Understand the etiology and pathogenesis of gynecologic diseases.

3. Introduction to Pap Smear Collection and Preparation

- Understand the principles and techniques of Pap smear collection and preparation.
- Understand the importance of proper specimen collection and handling to ensure accurate results.

4. Pap Smear Interpretation: Normal and Reactive Changes

- Interpret normal and reactive changes in Pap smear samples.
- Understand the significance of reactive changes and their management.

5. Pap Smear Interpretation: Atypical Squamous Cells

- Identify and interpret atypical squamous cells in Pap smear samples.
- Understand the management and follow-up of atypical squamous cells.

6. Pap Smear Interpretation: Squamous Intraepithelial Lesions

- Identify and interpret squamous intraepithelial lesions in Pap smear samples.
- Understand the management and follow-up of squamous intraepithelial lesions.

7. Pap Smear Interpretation: Glandular Lesions

- Identify and interpret glandular lesions in Pap smear samples.
- Understand the management and follow-up of glandular lesions.

8. HPV Testing

- Understand the principles and techniques of HPV testing.
- Understand the significance of HPV testing in the management of gynecologic lesions.

9. Colposcopy and Cervical Biopsy

- Understand the principles and techniques of colposcopy and cervical biopsy.
- Understand the indications for colposcopy and cervical biopsy.

10. Cervical Cancer Screening Guidelines

- Understand the current guidelines for cervical cancer screening.
- Understand the role of gynecologic cytology and HPV testing in cervical cancer screening.

11. Cervical Cancer Pathology and Staging

- Understand the pathology and staging of cervical cancer.
- Understand the principles of treatment for cervical cancer.

12. Endometrial Cancer Screening and Diagnosis

- Understand the principles and techniques of endometrial cancer screening and diagnosis.
- Understand the significance of endometrial cancer screening and diagnosis in the management of gynecologic lesions.

13. Ovarian Cancer Screening and Diagnosis

- Understand the principles and techniques of ovarian cancer screening and diagnosis.
- Understand the significance of ovarian cancer screening and diagnosis in the management of gynecologic lesions.

14. Vulvar and Vaginal Cancer Screening and Diagnosis

- Understand the principles and techniques of vulvar and vaginal cancer screening and diagnosis.
- Understand the significance of vulvar and vaginal cancer screening and diagnosis in the management of gynecologic lesions.

15. Benign Gynecologic Lesions

- Identify and interpret benign gynecologic lesions in Pap smear samples.
- Understand the management and follow-up of benign gynecologic lesions.

16. Infectious Diseases of the Female Reproductive System

- Identify and interpret infectious diseases of the female reproductive system in Pap smear samples.
- Understand the principles of treatment for infectious diseases of the female reproductive system.

17. Bethesda System for Reporting Cervical Cytology

- Understand the principles and techniques of the Bethesda System for Reporting Cervical Cytology.
- Understand the significance of the Bethesda System in standardizing Pap smear reporting and improving communication among healthcare professionals.

18. ASCCP Guidelines for Abnormal Pap Smears

- Understand the principles and techniques of the ASCCP Guidelines for Abnormal Pap Smears.
- Understand the significance of the ASCCP Guidelines in guiding the management of abnormal Pap smear results.

19. Cervical Cancer Screening and Diagnosis

- Understand the principles and techniques of cervical cancer screening and diagnosis.
- Understand the significance of cervical cancer screening and diagnosis in the early detection and prevention of cervical cancer.

20. Colposcopy and Cervical Biopsy

- Understand the principles and techniques of colposcopy and cervical biopsy.

- Understand the indications for colposcopy and cervical biopsy in the management of abnormal Pap smear results.

21. Management of Cervical Intraepithelial Neoplasia (CIN)

- Understand the principles and techniques of managing CIN.
- Understand the indications for treatment of CIN.

22. Cervical Cancer Treatment and Follow-up

- Understand the principles and techniques of cervical cancer treatment and follow-up.
- Understand the importance of follow-up in monitoring for recurrence or metastasis of cervical cancer.

Laboratory classes:

1. Introduction to Gynecologic Cytology: This lab class will introduce the students to the basic principles of gynecologic cytology and terminology used in Pap smear reporting.
2. Pap Smear Preparation: This lab class will focus on the preparation of cervical smears and techniques for fixing and staining.
3. Pap Smear Microscopic Evaluation: This lab class will focus on the evaluation of normal and abnormal cervical cells in a Pap smear using the Bethesda System for reporting cervical cytology.
4. ASC-US and LSIL Interpretation: This lab class will focus on the interpretation of atypical squamous cells of undetermined significance (ASC-US) and low-grade squamous intraepithelial lesions (LSIL) in Pap smear samples.
5. HSIL Interpretation: This lab class will focus on the interpretation of high-grade squamous intraepithelial lesions (HSIL) in Pap smear samples.
6. Unsatisfactory Pap Smear Interpretation: This lab class will focus on the interpretation of unsatisfactory Pap smears and techniques for improving sample quality.
7. Endocervical Cell Interpretation: This lab class will focus on the interpretation of endocervical cells in Pap smear samples.
8. Adequacy Assessment: This lab class will focus on the assessment of specimen adequacy and the identification of common specimen artifacts.

9. HPV Testing: This lab class will focus on the principles and techniques of human papillomavirus (HPV) testing, including sample collection, processing, and interpretation of results.
10. Colposcopy: This lab class will focus on the principles and techniques of colposcopy, including visualization of abnormal cervical cells and biopsy techniques.
11. Cervical Biopsy Interpretation: This lab class will focus on the interpretation of cervical biopsies and the identification of common benign and malignant lesions.
12. Vulvar and Vaginal Cytology: This lab class will introduce the students to the principles and techniques of cytology of the vulva and vagina.
13. Benign and Malignant Vulvar Lesions: This lab class will focus on the interpretation of benign and malignant lesions of the vulva.
14. Benign and Malignant Vaginal Lesions: This lab class will focus on the interpretation of benign and malignant lesions of the vagina.

1. Solomon, D., Nayar, R., & The Bethesda System for Reporting Cervical Cytology. (2015). The Bethesda System for Reporting Cervical Cytology: Definitions, Criteria, and Explanatory Notes (3rd ed.). Springer.
2. Wilbur, D. C., & Nayar, R. (Eds.). (2015). The Bethesda System for Reporting Thyroid Cytopathology: Definitions, Criteria, and Explanatory Notes (2nd ed.). Springer.

5	Course title: Molecular Basis of Disease	Course Code: MOLD-305

Overall Description and Aims:

The overall aim of the course is to provide students with an in-depth understanding of the molecular mechanisms that underlie human disease. This course will introduce students to a wide range of molecular and cellular processes that contribute to the development and progression of disease. By the end of the course, students should be able to analyze and interpret the molecular mechanisms underlying a wide range of diseases.

Intended Learning Outcomes of the Course:

The following are the intended learning outcomes of the course:

Knowledge and Understanding:

1. Demonstrate a detailed understanding of the molecular basis of human disease.
2. Explain the key molecular and cellular processes that contribute to the development and progression of disease.
3. Understand the genetic and environmental factors that contribute to disease susceptibility.
4. Analyze the molecular mechanisms underlying the pathogenesis of a range of human diseases.

Intellectual Skills:

1. Critically evaluate the scientific literature on the molecular basis of disease.
2. Apply theoretical knowledge to practical problem-solving scenarios.
3. Formulate and test hypotheses based on molecular data.
4. Synthesis of information from multiple sources to identify the molecular mechanisms of a specific disease.
5. Analyze and interpret complex datasets from a range of molecular techniques.

Professional and Practical Skills:

1. Communicate scientific concepts and research findings effectively in written and oral formats.

2. Work effectively in a laboratory environment, including handling of biological materials and molecular techniques.
3. Understanding of laboratory techniques commonly used in molecular biology and disease research.

General Transferable Skills:

1. Independent learning and time management.
2.
3. Demonstrate effective time-management and organizational skills.
4. Develop effective problem-solving and critical thinking abilities.
5. Develop written and oral communication skills.
6. Develop team-working and collaboration skills.

Course Topics:

1. Introduction to Molecular Basis of Disease.
    - Objective: To introduce students to the molecular mechanisms that underlie human disease, including genetic and environmental factors.
2. DNA Replication, Repair and Mutations.
    - Objective: To understand the molecular basis of DNA replication and repair, as well as the causes and consequences of mutations.
3. Cell Cycle and Cancer.
    - Objective: To understand the molecular basis of the cell cycle and the molecular mechanisms underlying the development and progression of cancer.
4. Apoptosis and Cell Death.
    - Objective: To understand the molecular mechanisms of apoptosis and other forms of cell death, and their roles in disease.
5. Protein Folding and Misfolding.
    - Objective: To understand the molecular mechanisms of protein folding and misfolding, and their roles in disease.
6. Prion Diseases.
    - Objective: To understand the molecular mechanisms of prion diseases and their transmission.
7. Protein Trafficking and Secretion.
    - Objective: To understand the molecular mechanisms of protein trafficking and secretion, and their roles in disease.

8. Metabolism and Disease.
    - Objective: To understand the molecular mechanisms of metabolism and their roles in disease, including metabolic disorders.
    - Diabetes
        1. Diabetes,
        2. Lipoproteins and Lipid Dysregulation
        3. Insulin Resistance
9. Immune Response and Inflammation.
    - Objective: To understand the molecular mechanisms of the immune response and inflammation, including:
    - Autoimmune diseases:
    - Immune Dysregulation
    - Viral Infection and Immunopathology
        1. Viral infection: Hepatitis C Virus
    - Chronic Liver Disease and Clinical Consequences
    - Disturbances in Immunity
    - intestinal Immune Responses
        1. inflammatory Bowel Diseases (IBD)
10. Systemic Inflammation and Cancer
    - Cancer Cachexia
    - inflammation and Cancer
    - Cancer Cachexia - Inflammation and Muscle Effects
    - Muscle Wasting in Cancer Cachexia
    - Inflammation and Pancreatic Cancer
    - Hepatitis and Hepatocellular Carcinoma
11. Infectious Diseases.
    - Objective: To understand the molecular mechanisms of infectious diseases, including viral and bacterial infections, and the host response to infection.
12. Neurodegenerative.

    - Diseases Objective: To understand the molecular mechanisms of neurodegenerative diseases, including Alzheimer's, Parkinson's and Huntington's diseases.

16. Cardiovascular Diseases.
    - Objective: To understand the molecular mechanisms of cardiovascular diseases, including:
    - Systemic Inflammation

1. Coronary Artery Disease
2. Atherosclerosis

- hypertension
- heart failure:
- Cardiovascular Disease
- Inflammation and Cardiovascular Dysfunction
- Heart Diseases and Congenital Heart Defects

17. Respiratory Diseases.
    - Objective: To understand the molecular mechanisms of respiratory diseases, including asthma and chronic obstructive pulmonary disease (COPD).
    - Allergy and Hypersensitivity
        1. Molecular basis of Allergy
        2. Molecular basis of Asthma
18. Digestive Diseases .
    - Objective: To understand the molecular mechanisms of digestive diseases, including inflammatory bowel disease and liver disease.
19. Endocrine Diseases.
    - Objective: To understand the molecular mechanisms of endocrine diseases, including diabetes and thyroid disorders.
20. Renal Diseases.
    - Objective: To understand the molecular mechanisms of renal diseases, including kidney disease and renal failure.
21. Musculoskeletal Diseases.
    - Objective: To understand the molecular mechanisms of musculoskeletal diseases, including osteoarthritis and rheumatoid arthritis.
22. Reproductive Health and Disease.
    - Objective: To understand the molecular mechanisms of reproductive health and disease, including infertility and reproductive cancers.
23. Genetic Diseases.
    - Objective: To understand the molecular mechanisms of genetic diseases, including inherited disorders and chromosomal abnormalities
    - Cystic Fibrosis
    - Ataxia Telangiectasia and Related Diseases

Laboratory classes:

- Cell Culture and Cell Proliferation Assays
- Cell Cycle Analysis by Flow Cytometry
- Cancer Cell Invasion and Metastasis Assays
- Apoptosis Assays
- Necrosis and Autophagy Assays
- Caspase Activation and Inhibition Assays
- Protein Expression and Purification
- Protein Folding and Misfolding Assays
- Protein Aggregation and Clearance Assays
- Prion Protein Expression and Purification
- Protein Trafficking Assays
- Endoplasmic Reticulum Stress and Unfolded Protein Response Assays
- Glucose and Lipid Metabolism Assays
- Mitochondrial Dysfunction assay
- Immune Cell Isolation and Activation Assays
- Inflammatory Cytokine and Chemokine Assays
- Cancer Cell Immune Evasion Assays
- Cancer Cachexia and Muscle Wasting Assays
- Viral and Bacterial Pathogen Detection and Identification
- Host-Pathogen Interaction Assays
- Neurotransmitter Release and Reuptake Assays
- Protein Aggregation and Neuroinflammation Assays
- Neurodegeneration and Neuroprotection Assays
- Vascular Cell Biology and Atherosclerosis Assays
- Cardiac Function and Remodeling Assays
- Lung Function and Airway Resistance Assays
- Inflammatory Signaling and Asthma Assays
- COPD and Lung Fibrosis Assays
- Gut Microbiome Analysis and Dysbiosis Assays
- Liver Function and Disease Assays

References:

1. Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2015). Molecular biology of the cell (6th ed.). Garland Science.
2. Kumar, V., Abbas, A. K., & Aster, J. C. (2017). Robbins and Cotran pathologic basis of disease (10th ed.). Elsevier.

6	Course title: Molecular Diagnostics Laboratory	Course Code: MOLD-306

Overall Description and Aims:

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

Intended Learning Outcomes of the Course:

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

Knowledge and Understanding:

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

Intellectual Skills:

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

Professional and Practical Skills:

1. Perform molecular diagnostic techniques in a laboratory setting, including nucleic acid extraction, PCR, sequencing, and other techniques.

2. Analyze and interpret molecular diagnostic data to inform clinical decision making.
3. Communicate scientific concepts and research findings effectively in written and oral formats.
4. Work effectively in a laboratory environment, including following safety protocols and good laboratory practices.

General Transferable Skills:

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

Course Topics:

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

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

17. Renal Disease Diagnostics.

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

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

References:

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

7	Course title: Non- Gynecologic Cytology	Course Code: CYTO-306

Overall Description and Aims:

The course aims to provide students with a comprehensive understanding of the principles of cytology in the diagnosis and management of non-gynecologic diseases. The course covers the basic and advanced aspects of non-gynecologic cytology, including the analysis of cells and tissues from various organs and systems, such as the respiratory, gastrointestinal, urinary, and lymphatic systems. The course also focuses on the interpretation and reporting of cytology results and the use of ancillary techniques, such as immunocytochemistry and molecular testing, in the diagnosis of non-gynecologic diseases.

Intended Learning Outcomes:

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

Knowledge and Understanding:

1. Demonstrate a comprehensive understanding of the principles and techniques of non-gynecologic cytology.
2. Identify the key differences between gynecologic and non-gynecologic cytological specimens.
3. Recognize the range of non-gynecologic specimens that can be analyzed using cytological techniques.
4. Understand the normal anatomy and physiology of the various non-gynecologic sites.
5. Understand the etiology, pathogenesis, and clinical significance of the common diseases affecting the various non-gynecologic sites.
6. Explain the different types of specimens used in non-gynecologic cytology and their preparation methods.
7. Identify the common diagnostic challenges and pitfalls in non-gynecologic cytology interpretation.

Intellectual Skills:

1. Evaluate the morphological features of non-gynecologic cytology specimens and correlate them with clinical and radiological findings.

2. Analyze the advantages and limitations of ancillary techniques used in non-gynecologic cytology diagnosis.
3. Synthesize cytology findings and provide a comprehensive diagnostic report.

Professional and Practical Skills:

1. Perform non-gynecologic cytology techniques, including sample collection, preparation, and staining.
2. Demonstrate effective communication skills and teamwork in the reporting and management of non-gynecologic cytology cases.

General Transferable Skills:

1. Develop critical thinking and problem-solving skills through the analysis and interpretation of cytology specimens.
2. Enhance written and oral communication skills through the preparation and presentation of cytology reports.
3. Build teamwork, time management, and leadership skills through group projects and practical sessions.

Course Topics:

1. Introduction to Non-Gynecologic Cytology

- Definition and principles of cytology
- Types of specimens used in non-gynecologic cytology
- Historical development of non-gynecologic cytology

2. Sample Collection and Preparation

- Collection techniques and equipment
- Sample preparation methods, including fixation and staining
- Quality control and assurance in sample preparation

3. Respiratory System Cytology

- Anatomy and physiology of the respiratory system
- Common respiratory cytology specimens and their interpretation
- Role of ancillary techniques in respiratory cytology diagnosis

4. Gastrointestinal System Cytology

- Anatomy and physiology of the gastrointestinal system
- Common gastrointestinal cytology specimens and their interpretation
- Role of ancillary techniques in gastrointestinal cytology diagnosis

5. Urinary System Cytology

- Anatomy and physiology of the urinary system
- Common urinary cytology specimens and their interpretation
- Role of ancillary techniques in urinary cytology diagnosis

6. Lymphatic System Cytology

- Anatomy and physiology of the lymphatic system
- Common lymphatic cytology specimens and their interpretation
- Role of ancillary techniques in lymphatic cytology diagnosis

7. Soft Tissue and Bone Cytology

- Anatomy and physiology of soft tissues and bones
- Common soft tissue and bone cytology specimens and their interpretation
- Role of ancillary techniques in soft tissue and bone cytology diagnosis

8. Breast Cytology

- Anatomy and physiology of the breast
- Common breast cytology specimens and their interpretation
- Role of ancillary techniques in breast cytology diagnosis

9. Salivary Gland and Thyroid Cytology

- Anatomy and physiology of the salivary glands and thyroid
- Common salivary gland and thyroid cytology specimens and their interpretation
- Role of ancillary techniques in salivary gland and thyroid cytology diagnosis

10. Central Nervous System Cytology

- Anatomy and physiology of the central nervous system
- Common central nervous system cytology specimens and their interpretation
- Role of ancillary techniques in central nervous system cytology diagnosis

11. Skin and Soft Tissue Cytology

- Anatomy and physiology of the skin and soft tissues
- Common skin and soft tissue cytology specimens and their interpretation
- Role of ancillary techniques in skin and soft tissue cytology diagnosis

12. Non-Gynecologic Cytology in Pediatrics

- Unique considerations and challenges in non-gynecologic cytology in pediatric patients
- Common pediatric cytology specimens and their interpretation
- Role of ancillary techniques in pediatric non-gynecologic cytology diagnosis

13. Non-Gynecologic Cytology in Geriatrics

- Unique considerations and challenges in non-gynecologic cytology in geriatric patients
- Common geriatric cytology specimens and their interpretation
- Role of ancillary techniques in geriatric non-gynecologic cytology diagnosis

14. Non-Gynecologic Cytology in Immunocompromised Patients

- Unique considerations and challenges in non-gynecologic cytology in immunocompromised patients
- Common immunocompromised cytology specimens and their interpretation
- Role of ancillary techniques in immunocompromised non-gynecologic cytology diagnosis

18. Emerging Trends and Future Directions in Non-Gynecologic Cytology

- Current and future trends in non-gynecologic cytology practice
- Innovations and advancements in non-gynecologic cytology techniques and technologies
- Future directions and challenges in non-gynecologic cytology practice

19. Review and Exam Preparation

- Comprehensive review of non-gynecologic cytology principles, techniques, and applications
- Exam preparation strategies and techniques
- Practical exam review and preparation

Practical Classes:

1. Sample Collection Techniques

- Objective: Demonstrate proficiency in sample collection techniques for non-gynecologic cytology specimens

2. Sample Preparation and Staining

- Objective: Demonstrate proficiency in sample preparation and staining techniques for non-gynecologic cytology specimens

3. Respiratory System Cytology Analysis

- Objective: Develop proficiency in the analysis and interpretation of respiratory system cytology specimens

4. Gastrointestinal System Cytology Analysis

- Objective: Develop proficiency in the analysis and interpretation of gastrointestinal system cytology specimens

5. Urinary System Cytology Analysis

- Objective: Develop proficiency in the analysis and interpretation of urinary system cytology specimens

6. Breast Cytology Analysis

- Objective: Develop proficiency in the analysis and interpretation of breast cytology specimens

7. Fine Needle Aspiration Biopsy Techniques

- Objective: Demonstrate proficiency in fine needle aspiration biopsy techniques for non-gynecologic cytology specimens

8. Ancillary Technique Applications

- Objective: Develop proficiency in the application and interpretation of ancillary techniques in non-gynecologic cytology diagnosis

9. Report Writing and Communication with Clinicians

- Objective: Develop proficiency in report writing and communication with clinicians in the management of non-gynecologic cytology cases

References:

1. Bibbo, M., & Wilbur, D. C. (2010). Comprehensive cytopathology (4th ed.). Saunders.
2. Stewart, C. J., & Stewart, I. A. (2015). Non-gynaecological cytology: A practical guide. Cambridge University Press.
3. Dey, P., & Kaur, H. (2013). Common diagnostic challenges in fine needle aspiration cytology. Jaypee Brothers Medical Publishers.

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

Overall Description and Aims:

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

Knowledge and Understanding:

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

Intellectual Skills:

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

- Develop the ability to evaluate the strengths and limitations of different research methodologies in biomedical fields

Professional and Practical Skills:

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

General Transferable Skills:

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

Course Topics:

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

- Reviewing selected literature
- Developing theoretical and conceptual frameworks

4. Writing Protocol

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

5. Formulating a Research Problem and Research Question

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

6. Ethics in Research
7. Introduction to Epidemiology

- Understanding the concept of epidemiology

8. Measurement Tools in Epidemiology

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

9. Descriptive Studies

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

10. Case-Control Studies

- Basic principles and design of case-control studies

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

11. Cohort Studies

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

12. Questionnaire Design

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

13. Medical Reading and Writing

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

14. Structure of a Medical Research Paper

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

15. Screening

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

16. Association and Causation

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

17. Basic Concepts and Definitions in Statistics

- Types of variables in statistics (e.g., categorical, continuous)
- Measures of central tendency and variability
- Probability distributions and hypothesis testing in epidemiology

8. Selecting a Method of Data Collection

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

19. Descriptive Statistics

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

20. Inferential Statistics and Significant Test

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

21. The Use of Excel and SPSS

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

22. Research Proposal Projects

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

Tutorial Classes:

1. Introduction to Research Methodology and Data Analysis course

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

2. Literature Search and Review

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

3. Writing a Research Proposal

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

4. Formulating a Research Question

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

5. Research Ethics

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

6. Descriptive Statistics

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

7. Inferential Statistics and Significance Testing

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

8. Epidemiology Concepts and Measurements

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

9. Questionnaire Design

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

10. Research Proposal Presentations

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

Objectives for Each Tutorial Class:

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

References:

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

9	Course title: Systemic Pathology	Course Code: CYTO-307

Overall Description and Aims:

The aims to provide students with an extensive comprehension of the etiology, pathogenesis, and pathological changes of different diseases affecting various organ systems. The course covers the fundamental principles of pathogenesis, including molecular and cellular mechanisms, host responses, and diagnostic methods used to identify diseases. By incorporating interactive lectures, case studies, and laboratory sessions, the course aims to establish a robust foundation in the principles and practice of systemic pathology. By the end of the course, students are expected to possess comprehensive knowledge of the pathology of different organs and organ systems, which will serve as a basis for understanding clinical manifestations and developing treatment strategies.

Intended Learning Outcomes:

Knowledge and Understanding:

- Understand the basic principles of pathogenesis, including molecular and cellular mechanisms, host responses, and diagnostic methods used to identify diseases.
- Demonstrate an in-depth understanding of the pathology of different organs and organ systems, including the etiology, pathogenesis, and pathological changes that occur in various diseases.
- Analyze the correlation between the pathological changes and clinical manifestations of different diseases.

Intellectual Skills:

- Apply critical thinking and problem-solving skills to diagnose diseases based on pathological findings.
- Evaluate the evidence-based practice of various diagnostic methods and treatment strategies in different diseases.
- Interpret and analyze data from various laboratory tests and imaging techniques.

Professional and Practical Skills:

- Develop effective communication skills to communicate with other healthcare professionals and patients.
- Understand the importance of professional and ethical behavior in the practice of systemic pathology.
- Develop technical and practical skills in laboratory techniques used in the diagnosis of diseases.

General Transferable Skills:

- Develop effective time-management and organizational skills to manage workload and meet deadlines.
- Develop independent learning skills and the ability to work collaboratively with peers.
- Develop research skills to critically evaluate and synthesize scientific literature.

Course Topics and Objectives:

Topic 1: Introduction to Systemic Pathology:

- Understand the basic concepts and principles of systemic pathology.
- Identify the different approaches used to study diseases affecting different organs.

Topic 2: The Cardiovascular System:

- Understand the anatomy and physiology of the cardiovascular system.
- Analyze the pathological changes that occur in different diseases affecting the cardiovascular system.

Topic 3: The Respiratory System:

- Understand the anatomy and physiology of the respiratory system.
- Analyze the pathological changes that occur in different diseases affecting the respiratory system.

Topic 4: The Gastrointestinal System:

- Understand the anatomy and physiology of the gastrointestinal system.
- Analyze the pathological changes that occur in different diseases affecting the gastrointestinal system.

Topic 5: The Hepatobiliary System:

- Understand the anatomy and physiology of the hepatobiliary system.
- Analyze the pathological changes that occur in different diseases affecting the hepatobiliary system.

Topic 6: The Endocrine System:

- Understand the anatomy and physiology of the endocrine system.
- Analyze the pathological changes that occur in different diseases affecting the endocrine system.

Topic 7: The Nervous System:

- Understand the anatomy and physiology of the nervous system.
- Analyze the pathological changes that occur in different diseases affecting the nervous system.

Topic 8: The Hematopoietic System:

- Understand the anatomy and physiology of the hematopoietic system.
- Analyze the pathological changes that occur in different diseases affecting the hematopoietic system.

Topic 9: The Lymphatic System:

- Understand the anatomy and physiology of the lymphatic system.
- Analyze the pathological changes that occur in different diseases affecting the lymphatic system.

Topic 10: The Musculoskeletal System:

- Understand the anatomy and physiology of the Musculoskeletal System

11. Neoplastic Disorders of Hematopoietic and Lymphoid Tissues

- To describe the morphologic and genetic features of various neoplastic disorders affecting hematopoietic and lymphoid tissues
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

12. Endocrine and Metabolic Disorders

- To describe the histopathologic and biochemical features of various endocrine and metabolic disorders
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

17. Disorders of the Gastrointestinal Tract

- To describe the histopathologic features of various disorders affecting the gastrointestinal tract
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

18. Disorders of the Liver and Biliary System

- To describe the histopathologic features of various disorders affecting the liver and biliary system
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

19. Disorders of the Pancreas

- To describe the histopathologic features of various disorders affecting the pancreas
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

20. Disorders of the Kidney and Urinary Tract

- To describe the histopathologic features of various disorders affecting the kidney and urinary tract
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

21. Disorders of the Male Reproductive System

- To describe the histopathologic features of various disorders affecting the male reproductive system
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

22. Disorders of the Female Reproductive System

- To describe the histopathologic features of various disorders affecting the female reproductive system
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

23. Disorders of the Breast

- To describe the histopathologic features of various disorders affecting the breast
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

24. Dermatopathology

- To describe the histopathologic features of various disorders affecting the skin
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

25. Neuropathology

- To describe the histopathologic features of various disorders affecting the nervous system
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

26. Musculoskeletal Pathology

- To describe the histopathologic features of various disorders affecting the musculoskeletal system

- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

27. Ophthalmic Pathology

- To describe the histopathologic features of various disorders affecting the eye
- To explain the pathogenesis of these disorders and their clinical manifestations
- To discuss the diagnostic modalities used to evaluate and differentiate these disorders

28. Forensic Pathology

- Students will be able to describe the role of the pathologist in forensic investigations, including the determination of cause and manner of death. They will learn to recognize the characteristic features of different types of traumatic injuries, such as gunshot wounds and blunt force injuries, and understand the importance of scene investigation and collaboration with law enforcement agencies.

laboratory class:

1. Introduction to Systemic Pathology: Basic Histological Techniques and Tissue Examination
2. Epithelial Tissues: Histology and Pathology of the Skin and Mucous Membranes
3. Connective Tissues: Histology and Pathology of Bone, Cartilage, and Tendons
4. Muscle Tissues: Histology and Pathology of Skeletal, Cardiac, and Smooth Muscle
5. Nervous Tissues: Histology and Pathology of the Brain, Spinal Cord, and Peripheral Nerves
6. Hematopoietic Tissues: Histology and Pathology of Blood and Bone Marrow
7. Lymphoid Tissues: Histology and Pathology of Lymph Nodes, Spleen, and Thymus
8. Endocrine Tissues: Histology and Pathology of the Pituitary, Thyroid, Parathyroid, Adrenal, and Pancreatic Islets
9. Respiratory Tissues: Histology and Pathology of the Lung and Pleura
10. Cardiovascular Tissues: Histology and Pathology of the Heart and Blood Vessels
11. Gastrointestinal Tissues: Histology and Pathology of the Esophagus, Stomach, Intestines, Liver, and Pancreas

12. Renal Tissues: Histology and Pathology of the Kidney and Urinary System
13. Reproductive Tissues: Histology and Pathology of the Male and Female Genital Tract and Breast
14. Endothelial Tissues: Histology and Pathology of Blood Vessels and Lymphatics
15. Miscellaneous Tissues: Histology and Pathology of Adipose Tissue, Skin Appendages, and Peripheral Nerves.

References:

1. Kumar, V., Abbas, A. K., & Aster, J. C. (Eds.). (2021). Robbins and Cotran Pathologic Basis of Disease (10th ed.). Elsevier.

Department of Cytotechnology

Proposed Syllabi for all Courses in the Fourth Year

Prepared by

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March 9, 2023

Syllabus of Fourth Year Courses

1	Course title: Aspiration Cytology	Course Code: CYTO-401

Overall Description and Aims:

The course is designed to provide students with a comprehensive understanding of the basic techniques, evaluation, and ancillary techniques used in fine needle aspiration cytology (FNAC). The course aims to train students in the identification of various lesions and to provide an understanding of the techniques involved in different areas of the body such as head, neck, orbit, thyroid, breast, lymph nodes, lung, mediastinum, liver and spleen, pancreas, gastrointestinal tract, kidney and adrenal, gonads and prostate, soft tissue lesions, skin, and bone.

Intended learning outcomes of the course include:

Knowledge and Understanding:

- Students will gain an understanding of the basic techniques of fine needle aspiration cytology and the principles underlying the evaluation of cytology smears.
- Students will be able to identify the normal and abnormal structures of the various body areas covered in the course.

Intellectual Skills:

- Students will develop critical thinking and analytical skills to assess the cellular changes observed in cytology smears.
- Students will be able to evaluate the limitations and diagnostic accuracy of cytology smears.

Professional and Practical Skills:

- Students will gain practical experience in performing FNAC and sample preparation techniques.
- Students will develop the ability to evaluate and interpret cytology reports and communicate findings to colleagues.

General Transferable Skills:

- Students will develop skills in teamwork and collaboration, communication, problem-solving, and time management.
- Students will gain experience in interpreting and presenting data, a critical skill required in biomedical research and clinical practice.

Course topics

Introduction and Basic Techniques of Fine Needle Aspiration Cytology

- Definition and history of fine needle aspiration cytology
- Types of aspiration needles, syringes, and specimen preparation techniques

FNAC of Deep-seated Lesions

- Fluoroscopy guided FNAC
- Mammographically guided FNAC

Evaluation of Aspiration Cytology Smears

- Cell arrangement and rosettes
- Nucleus, nucleoli, and chromatin pattern

Ancillary Techniques in Aspiration Cytology

- Immunocytochemistry and flow cytometry
- Molecular techniques and DNA content analysis

Head, Neck, and Orbital Lesion

- Branchial cyst and thyroglossal cyst
- Nasopharyngeal carcinoma and olfactory neuroblastoma

Salivary Gland

- Sialolithiasis and mucocele
- Sialadenitis and lymphoepithelial sialadenitis

Thyroid

- Bethesda terminology and Graves' disease

- Cold nodule and thyroid scan

Breast

- Atypical ductal hyperplasia and granulomatous mastitis
- Mammogram and core needle biopsy

Lymph Node

- Reactive lymphoid hyperplasia and acute lymphadenitis
- Sarcoidosis and Kimura's disease

Lung

- Reactive squamous cells and immunocytochemistry
- Pulmonary cryptococcus and pneumocystis carinii

Mediastinum

- Thymoma and malignant thymoma
- Teratoma and seminoma

Liver and Spleen

- Pyogenic abscess and amebic abscess
- Focal nodular hyperplasia and hepatocellular carcinoma

Pancreas, Gallbladder, and Gastrointestinal Tract

- Carcinoid and GIST
- Ductal adenocarcinoma and chronic pancreatitis

Kidney and Adrenal

- Xanthogranulomatous inflammation and angiomyolipoma
- Papillary adenoma and urothelial carcinoma

Gonads and Prostate:

- Testicular anatomy and histology
- Diagnosis of prostatic disease through aspiration cytology

Soft Tissue Lesions:

- Grading of soft tissue sarcomas
- Diagnosis of liposarcoma through aspiration cytology

Skin:

- Basal cell carcinoma
- Squamous cell carcinoma
- Malignant melanoma

Bone:

- Osteosarcoma
- Chondrosarcoma
- Ewing's sarcoma

Round Cell Tumor:

- Non-Hodgkin lymphoma
- Neuroblastoma
- Rhabdomyosarcoma

Central Nervous System:

- Astrocytomas
- Oligodendroglioma
- Medulloblastoma

lab classes:

Evaluation of Aspiration Cytology Smears:

1. Cell morphology assessment: Understanding the different types of cells that can be observed in cytology smears, including their shapes, sizes, and structures, as well as how to recognize and interpret the different types of cellular abnormalities.
2. Background material evaluation: Learning how to assess the background material in aspiration cytology smears and its importance in the diagnosis of

different diseases. This includes being able to identify the presence of blood, necrotic debris, and other non-cellular elements.

Ancillary Techniques in Aspiration Cytology:

1. Molecular Techniques: Understanding the principles behind molecular techniques used in cytology, such as PCR, DNA content analysis, and FISH, and their application in the diagnosis of different diseases.
2. Flow Cytometry: Learning the principles behind flow cytometry and its applications in the diagnosis of hematological malignancies, lymphomas, and leukemias.

Thyroid:

1. Thyroid cancer: Learning how to differentiate between benign and malignant thyroid nodules, including identifying cytological features that indicate thyroid cancer.
2. Thyroiditis: Understanding the cytological features of thyroiditis, including Hashimoto's thyroiditis and subacute thyroiditis, and their differential diagnoses.

Breast:

1. Breast cancer: Learning how to perform and interpret FNAC of breast lesions, including the use of the triple test for diagnosis and the role of cytology in the management of breast cancer.
2. Benign breast lesions: Understanding the cytological features of benign breast lesions, including fibroadenomas and phyllodes tumors.

1. Cangiarella, J., Waisman, J., Symmans, W. F., Sneige, N., Orucevic, A., & Klimberg, V. S. (2003). Fine-needle aspiration for cytology and flow cytometry: is there still a role? Cancer, 99(3), 154-160.
2. Sauer, T., & Wiedermann, G. (2006). Fine-needle aspiration cytology of the breast: advantages and limitations. Expert review of anticancer therapy,
3. Pranab Dey (2015) Fine Needle Aspiration Cytology: Interpretation and Diagnostic Difficulties. .jaypeedigital Publishing

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: Gynecologic Diagnostic Laboratory	Course Code: CYTO-402

Overall Description and Aims:

The aim of this course is to equip students with a thorough understanding of the laboratory tests and procedures employed to diagnose gynecological conditions. The course primarily focuses on the principles and techniques of gynecologic laboratory testing, emphasizing the analysis and interpretation of test results to identify specific gynecologic diseases. The overall objective is to provide students with a comprehensive understanding of the principles and techniques of gynecologic laboratory testing and their significance in diagnosing and managing gynecologic diseases. The course uses a combination of lectures, practical sessions, and case studies to develop students' knowledge and skills, enabling them to perform gynecologic laboratory testing safely and accurately and communicate laboratory results effectively to other healthcare professionals. The course is intended to provide students with a solid foundation in the field of gynecologic laboratory testing, preparing them for further study or a career in the healthcare sector.

Intended Learning Outcomes:

Knowledge and Understanding:

- Demonstrate a thorough understanding of the anatomy, physiology, and pathology of the female reproductive system.
- Understand the principles and techniques of gynecologic laboratory testing.
- Analyze and interpret gynecologic laboratory data accurately.
- Understand the clinical relevance of gynecologic laboratory results and their implications in the diagnosis and treatment of gynecologic diseases.

Intellectual Skills:

- Critically analyze and evaluate gynecologic laboratory data.
- Interpret and apply laboratory data in the context of clinical cases.
- Identify the limitations and potential sources of error in laboratory testing.

Professional and Practical Skills:

- Communicate laboratory results effectively to other healthcare professionals.
- Demonstrate proficiency in laboratory techniques and procedures.

- Utilize laboratory testing to monitor disease progression and treatment efficacy.

General Transferable Skills:

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

Course Topics:

1. Introduction to Gynecologic Laboratory Testing: Understand the basics of gynecologic laboratory testing, including sample collection, processing, and analysis.
2. Anatomy and Physiology of the Female Reproductive System: Understand the structure and function of the female reproductive system and its role in gynecologic diseases.
3. Hormonal Regulation of the Female Reproductive System: Understand the role of hormones in the menstrual cycle and their impact on gynecologic disease.
4. Principles of Laboratory Safety and Quality Control: Understand the principles of laboratory safety and quality control in gynecologic laboratory testing.
5. Specimen Collection and Transport: Understand the principles and techniques of specimen collection and transport for gynecologic testing.
6. Cervical Cytology: Understand the principles and techniques of cervical cytology and its role in the diagnosis of gynecologic diseases.
7. Vaginal Microbiology: Understand the principles and techniques of vaginal microbiology and its role in the diagnosis of gynecologic infections.
8. Sexually Transmitted Infections: Understand the principles and techniques of testing for sexually transmitted infections and their impact on gynecologic health.
9. Fertility Testing: Understand the principles and techniques of fertility testing and its role in the diagnosis and management of infertility.
10. Pregnancy Testing: Understand the principles and techniques of pregnancy testing and its role in the diagnosis of pregnancy.
11. Placental and Fetal Testing: Understand the principles and techniques of placental and fetal testing and their role in the diagnosis and management of fetal abnormalities.
12. Endometrial Biopsy: Understand the principles and techniques of endometrial biopsy and its role in the diagnosis of gynecologic diseases.

13. Ovarian Function Testing: Understand the principles and techniques of ovarian function testing and its role in the diagnosis and management of ovarian diseases.
14. Tumor Markers: Understand the principles and techniques of tumor marker testing and its role in the diagnosis and management of gynecologic tumors.
15. Immunohistochemistry: Understand the principles and techniques of immunohistochemistry and its role in the diagnosis and management of gynecologic tumors.
16. Pap Smears and Cervical Cancer Screening

- Understand the principles and techniques of Pap smears and cervical cancer screening.
- Interpret Pap smear results and understand their clinical implications.

17. Human Papillomavirus (HPV) Testing

- Understand the principles and techniques of HPV testing.
- Interpret HPV test results and understand their clinical implications.

18. Cervical Cancer Diagnosis and Staging

- Understand the principles and techniques of cervical cancer diagnosis and staging.
- Describe the role of laboratory testing in the diagnosis and management of cervical cancer.

19. Endometrial Cancer Diagnosis and Staging

- Understand the principles and techniques of endometrial cancer diagnosis and staging.
- Describe the role of laboratory testing in the diagnosis and management of endometrial cancer.

20. Gestational Trophoblastic Disease

- Understand the principles and techniques of gestational trophoblastic disease diagnosis and staging.
- Describe the role of laboratory testing in the diagnosis and management of gestational trophoblastic disease.

21. Sexually Transmitted Infections (STIs)

- Identify common STIs and their associated laboratory findings.
- Understand the role of laboratory testing in the diagnosis and management of STIs.

22. Bacterial Vaginosis (BV)

- Understand the principles and techniques of BV diagnosis and management.
- Describe the role of laboratory testing in the diagnosis and management of BV.

23. Vulvovaginal Candidiasis

- Understand the principles and techniques of vulvovaginal candidiasis diagnosis and management.
- Describe the role of laboratory testing in the diagnosis and management of vulvovaginal candidiasis.

24. Pelvic Inflammatory Disease (PID)

- Understand the principles and techniques of PID diagnosis and management.
- Describe the role of laboratory testing in the diagnosis and management

17. Colposcopy: Understand the principles and techniques of colposcopy and its role in the diagnosis and management of cervical abnormalities.
18. Hysteroscopy: Understand the principles and techniques of hysteroscopy and its role in the diagnosis and management of uterine abnormalities.
19. Laparoscopy: Understand the principles and techniques of laparoscopy and its role in the diagnosis and management of gynecologic diseases.
20. Magnetic Resonance Imaging: Understand the principles and techniques of magnetic resonance imaging and its role in the diagnosis and management of gynecologic diseases.
21. Case Studies: Apply the principles and techniques of gynecologic laboratory testing to analyze and interpret laboratory data in the context of specific clinical scenarios.

1. Bibbo, M., & Wilbur, D. (2018). Comprehensive Cytopathology: Expert Consult: Online and Print (4th ed.). Elsevier.
2. Crum, C. P., Nucci, M. R., & Lee, K. R. (2019). Diagnostic Gynecologic and Obstetric Pathology (3rd ed.). Elsevier.
3. Clement, P. B., & Young, R. H. (2013). Atlas of Gynecologic Surgical Pathology (4th ed.). Elsevier.

4	Course title: Histopathology Diagnostics Techniques	Course Code: CYTO-403

Overall Aims of Course:

The course aims to provide students with a comprehensive understanding of the techniques used in the preparation and examination of human tissue samples for diagnostic purposes. Students will gain practical experience in preparing and staining tissue samples, as well as learning about the different methods and technologies used in histopathological analysis.

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

- Understand the principles of histopathology and the different techniques used in tissue preparation
- Perform routine histopathological techniques, such as fixation, sectioning, and staining of tissue samples
- Use and maintain laboratory equipment, including microscopes and other analytical tools
- Evaluate the quality of tissue samples and interpret the results of histopathological analysis
- Understand the importance of quality control and safety procedures in the laboratory
- Communicate effectively with colleagues and superiors in a laboratory environment
- Analyze and interpret histopathological data and communicate the results of their analysis effectively.

Intellectual Skills: The course develops a range of intellectual skills, including:

- Critical thinking: students will learn to evaluate the quality of tissue samples and the reliability of results obtained from histopathological techniques
- Analytical skills: students will develop the ability to analyze and interpret complex histopathological data
- Problem-solving skills: students will learn to identify and solve technical problems that may arise during tissue preparation and analysis
- Research skills: students will gain experience in conducting research and evaluating scientific literature related to histopathology and tissue analysis.

Professional and Practical Skills: The Histopathology Techniques course also provides students with a range of practical and professional skills, including:

- Technical skills: students will gain practical experience in tissue preparation and staining techniques, as well as the use of laboratory equipment and analytical tools
- Safety skills: students will learn about safety procedures and protocols in the laboratory, as well as how to handle and dispose of hazardous materials
- Communication skills: students will develop the ability to communicate effectively with colleagues and superiors in a laboratory environment
- Time management skills: students will learn to manage their time effectively and prioritize tasks to ensure that work is completed to deadline.

General Transferable Skills: In addition to the skills listed above, the Histopathology Techniques course also develops a range of general transferable skills, including:

- Teamwork: students will have the opportunity to work in teams and develop their ability to collaborate effectively with others
- Adaptability: students will learn to adapt to new technologies and methods as they emerge in the field of histopathology and tissue analysis
- Attention to detail: students will develop a keen eye for detail and the ability to focus on the small but important aspects of their work
- Independent learning: students will learn how to work independently and take responsibility for their own learning and development.

Topics:

1. Introduction to Histopathology
2. Principles of Tissue Preparation and Fixation
3. Tissue Processing and Embedding Techniques
4. Microtomy and Sectioning Techniques
5. Hematoxylin and Eosin (H&E) Staining Techniques
6. Special Staining Techniques for Histopathology
7. Immunohistochemistry (IHC) Techniques for Diagnostic Purposes
8. Standard Operating Procedures (SOPs) in Histopathology
9. Histopathological Analysis of Normal and Abnormal Tissues
10. Histopathological Analysis of Cancer and Other Diseases
11. Fluorescence Microscopy Techniques for Histopathology
12. Electron Microscopy Techniques for Histopathology
13. In-situ Hybridization Techniques for Diagnostic Purposes

14. Tissue Microarray Techniques for Diagnostic Purposes
15. Laser Capture Microdissection (LCM) Techniques for Histopathology
16. Digital Pathology Techniques for Diagnostic Purposes
17. Laboratory Safety and Hazardous Waste Management in Histopathology

References:

1. Bancroft, J. D., & Gamble, M. (2008). Theory and practice of histological techniques. Elsevier Health Sciences.
2. Kumar, V., Abbas, A. K., Aster, J. C., & Robbins, S. L. (2019). Robbins basic pathology. Elsevier Health Sciences.

5	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:

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.

6	Course title: Non- Gynecologic Diagnostic Laboratory	Course Code: CYTO-404

Overall Description and Aims:

The course focuses on the principles, techniques, and applications of non-gynecologic cytology diagnostic tests. The course aims to provide students with a thorough understanding of the diagnostic tests used to diagnose various disorders and conditions through the examination of cells and tissues. Students will learn about the principles and applications of various diagnostic tests and develop practical and professional skills needed to work in a cytology laboratory. The course will also emphasize the ethical, legal, and regulatory issues related to cytology laboratory diagnostics.

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

Knowledge and Understanding:

- Understand the principles and applications of different cytology diagnostic tests
- Recognize different disorders and conditions that can be diagnosed through the examination of cells and tissues
- Understand the ethical, legal, and regulatory issues related to cytology laboratory diagnostics

Intellectual Skills:

- Apply critical thinking and problem-solving skills to analyze and interpret cytology diagnostic test results
- Develop skills for troubleshooting and resolving diagnostic errors

Professional and Practical Skills:

- Develop practical skills for working in a cytology laboratory, including equipment handling, data analysis, and communication
- Develop skills for accurately documenting and reporting diagnostic test results
- Understand the role of cytology diagnostic tests in disease management and patient care

General Transferable Skills:

- Develop skills for working collaboratively with colleagues and other healthcare professionals
- Develop skills for effective communication, both orally and in writing
- Develop skills for independent learning and self-directed study

Course Topics:

1. Introduction to Non-Gynecologic Cytology

- Understand the principles and applications of non-gynecologic cytology diagnostic tests
- Recognize different sample types and collection methods

2. Urine Cytology

- Understand the principles and applications of urine cytology
- Recognize different urinary tract disorders and conditions that can be diagnosed using urine cytology

3. Respiratory Cytology

- Understand the principles and applications of respiratory cytology
- Recognize different respiratory tract disorders and conditions that can be diagnosed using respiratory cytology

4. Gastrointestinal Cytology

- Understand the principles and applications of gastrointestinal cytology
- Recognize different gastrointestinal disorders and conditions that can be diagnosed using gastrointestinal cytology

6. Salivary Gland Cytology

- Understand the principles and applications of salivary gland cytology
- Recognize different salivary gland disorders and conditions that can be diagnosed using salivary gland cytology

7. Pleural and Peritoneal Cytology

- Understand the principles and applications of pleural and peritoneal cytology
- Recognize different pleural and peritoneal disorders and conditions that can be diagnosed using pleural and peritoneal cytology

8. Central Nervous System Cytology

- Understand the principles and applications of central nervous system cytology
- Recognize different central nervous system disorders and conditions that can be diagnosed using central nervous system cytology

9. Lymph Node Cytology

- Understand the principles and applications of lymph node cytology
- Recognize different lymphatic system disorders and conditions that can be diagnosed using lymph node cytology

10. Skin and Soft Tissue Cytology

- Understand the principles and applications of skin and soft tissue cytology
- Recognize different skin and soft tissue disorders and conditions that can be diagnosed using skin and soft tissue cytology

11. Diagnostic Criteria and Interpretation

- Develop skills for analyzing and interpreting cytology diagnostic test results
- Understand the criteria used for the diagnosis of different disorders and conditions using cytology diagnostic tests

13. Digital Imaging and Telecytology

- Understand the principles and applications of digital imaging and telecytology in a cytology laboratory
- Develop skills for using digital imaging and telecytology for diagnostic purposes

14. Ancillary Testing in Cytology

- Understand the principles and applications of ancillary testing in cytology, including immunocytochemistry and molecular testing
- Develop skills for using ancillary testing for diagnostic purposes

15. Specimen Preparation Techniques

- Understand the principles and applications of different specimen preparation techniques, including fixation, staining, and mounting
- Develop skills for performing different specimen preparation techniques

16. Cytology Equipment and Instrumentation

- Understand the principles and applications of different cytology equipment and instrumentation, including microscopes and cytology processors
- Develop skills for handling and maintaining cytology equipment and instrumentation

17. Safety in the Cytology Laboratory

- Understand the principles of safety in a cytology laboratory
- Develop skills for implementing safety measures in a cytology laboratory

20. Diagnostic Accuracy and Error Management

- Understand the principles of diagnostic accuracy and error management in a cytology laboratory
- Develop skills for identifying and resolving diagnostic errors

22. Reporting and Documentation of Cytology Results

- Understand the principles and applications of reporting and documenting cytology results
- Develop skills for accurately documenting and reporting cytology results

23. Quality Control and Quality Assurance

- Understand the principles of quality control and quality assurance in a cytology laboratory
- Develop skills for implementing quality control and quality assurance measures in a cytology laboratory

24. Cytology in Cancer Diagnosis and Management

- Understand the role of cytology in cancer diagnosis and management
- Develop skills for using cytology for cancer diagnosis and management

25. Cytology in Cancer Diagnosis and Management

- Understand the role of cytology in cancer diagnosis and management
- Develop skills for using cytology for cancer diagnosis and management

26. Research in Cytology

- Understand the importance of research in cytology
- Develop skills for designing and conducting research studies in cytology

27. Case Studies and Critical Analysis

- Develop skills for analyzing and interpreting complex cytology diagnostic test results through the analysis of case studies and critical analysis exercises.

References:

McKee, G. T. (2005). Atlas of Non-Gynecologic Cytology. Taylor & Francis Ltd

7	Course title: Seminar in Cytotechnology	Course Code: CYTO-408

Overall Description and Aims:

The seminars course aim to provide students with an in-depth understanding of the theoretical and practical aspects of cytotechnology. Through these seminars, students will have the opportunity to explore and present on a variety of topics related to the microscopic examination of cells to diagnose and treat diseases. 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 cytotechnology.
- Explain the relevance of the chosen topic to cytotechnology 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 cytology techniques 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 cytology techniques 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 cytology techniques related to the chosen topic.

Suggested Topics:

1. Introduction to Cytotechnology Seminar
2. Emerging Trends in Cytotechnology
3. Research in Cytotechnology
5. Quality Control and Quality Assurance in Cytology
6. Digital Imaging and Telecytology
7. The use of flow cytometry in clinical diagnosis
8. The role of cytotechnology in HPV screening and detection
9. The impact of liquid-based cytology on cervical cancer screening
10. The role of cytotechnology in the diagnosis and management of thyroid nodules
11. The use of cytotechnology in the diagnosis of lung cancer
12. Emerging trends in molecular cytology and their clinical applications
13. The application of cytotechnology in the diagnosis and management of hematological disorders
14. The use of cytotechnology in the diagnosis of gastrointestinal cancers
15. The role of cytotechnology in the diagnosis of breast cancer
16. The use of cytotechnology in the diagnosis of infectious diseases, such as COVID-19 and tuberculosis
17. The role of cytotechnology in biobanking and research
18. The use of cytotechnology in the diagnosis and management of rare diseases
19. Cytology Equipment and Instrumentation
20. Diagnostic Criteria and Interpretation
21. Safety in the Cytology Laboratory
22. Diagnostic Accuracy and Error Management

    - Diagnostic pitfalls in cytology: Students will learn about common errors in cytological diagnosis, including technical errors and misinterpretations. They will learn how to identify these errors and how to minimize their occurrence.

How seminar is performed:

The course is delivered through a combination of lectures, discussions, case studies, group projects, and presentations. Students are expected to actively participate in class discussions and group activities, and to complete assignments and projects on time.

Here are the typical steps for organizing and conducting a seminar by students:

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

8	Course title: Thesis	Course Code: CYTO-409

Overall description and Aims:

The course is designed to provide students with the opportunity to conduct independent research on a topic related to cytology. This course aims to develop the students' research and analytical skills, as well as their ability to communicate scientific findings.

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

- Demonstrate an understanding of the research process, including formulating research questions, designing experiments, collecting and analyzing data, and drawing conclusions
- Apply knowledge of cytological techniques and concepts to a specific research question
- Critically evaluate scientific literature in the field of cytology
- Communicate scientific findings in a clear and concise manner, both orally and in writing
- Demonstrate ethical and professional conduct in the conduct of research

Knowledge and Understanding:

1. Introduction to research in cytology: Students will learn about the research process, including the formulation of research questions, study design, data collection and analysis, and interpretation of results.
2. Literature review: This topic will cover how to conduct a literature review and critically evaluate scientific literature in the field of cytology.
3. Research ethics: Students will learn about ethical considerations in research, including informed consent, data confidentiality, and institutional review board (IRB) approval.
4. Experimental design: This topic will cover how to design experiments in cytology, including choosing appropriate controls, sample size calculation, and randomization.
5. Data collection: Students will learn how to collect cytological data and perform laboratory techniques for their research projects.

6. Data analysis: This topic will cover statistical analysis of cytological data, including descriptive statistics, hypothesis testing, and correlation analysis.
7. Interpretation of results: Students will learn how to interpret their results in the context of the research question, including the identification of limitations and future directions for research.
8. Oral presentation skills: This topic will cover the development of oral presentation skills, including the use of visual aids and effective communication of scientific findings.
9. Scientific writing: Students will learn how to write a scientific paper, including the development of a clear and concise abstract, introduction, methods, results, and discussion sections.
10. Publication process: This topic will cover the publication process, including how to select appropriate journals, the peer-review process, and responding to reviewers' comments.

Intellectual Skills:

1. Critical thinking: Students will develop critical thinking skills by evaluating scientific literature and their own research findings.
2. Problem-solving: This topic will cover how to identify research problems, generate hypotheses, and design experiments to test hypotheses.
3. Analytical skills: Students will develop analytical skills through the analysis of cytological data using statistical software.
4. Synthesis: Students will learn how to synthesize research findings into a coherent scientific paper.

Professional and Practical Skills:

1. Time management: Students will develop time management skills by meeting deadlines for the submission of project milestones and the final thesis.
2. Teamwork: This topic will cover how to work collaboratively with supervisors, colleagues, and laboratory staff.
3. Laboratory skills: Students will develop laboratory skills by performing laboratory techniques for their research projects.
4. Data management: Students will learn how to manage data, including data entry, storage, and backup.
5. Presentation skills: Students will learn how to effectively communicate scientific findings through oral presentations.

General Transferable Skills:

1. Written communication: This topic will cover how to write a clear and concise scientific paper, which is an essential transferable skill.
2. Oral communication: Students will develop oral communication skills by presenting their research findings to their supervisors and peers.
3. Information literacy: This topic will cover how to conduct a literature review and find relevant scientific literature.
4. Independent learning: Students will develop the ability
5. Data analysis techniques in cytology research: Understand and apply statistical analysis techniques commonly used in cytology research

- Writing and presenting scientific research: Identify the essential components of a research paper or thesis in cytology. Develop scientific writing skills and adhere to accepted formatting and citation standards. Deliver effective oral presentations and engage in constructive scientific discourse

- Time management and project planning: Develop strategies for effective time management and project planning. Manage competing priorities and deadlines in a research project.

- Collaboration and teamwork: Understand the principles of effective collaboration and teamwork in scientific research. Work effectively with others and communicate clearly and professionally. Recognize the strengths and contributions of team members and foster a positive working environment

How thesis is performed?

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

1. Topic Selection: Work with your supervisor to select a research topic that is relevant to the field of cytotechnology 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 laboratory experiments or clinical 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 biological samples, such as blood or tissue samples, or 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 cytotechnology.
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 cytotechnology.

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

Overall Aims of the Course:

The aim of this course is to provide undergraduate cytotechnology students with the necessary knowledge and practical skills required for working in a pathology laboratory and medical laboratory. The course will cover a range of topics related to cytology, histology, and medical laboratory procedures. By the end of the course, students will be able to apply their knowledge and skills to perform laboratory procedures, identify and analyze abnormal cells and tissues, and provide accurate results to physicians and other healthcare professionals.

Aims:

- Develop practical skills in the preparation and analysis of cytology specimens
- Enhance knowledge and understanding of laboratory equipment and techniques

- Gain experience working in a professional laboratory setting
- Develop professional skills and attitudes relevant to the workplace
- Foster teamwork and collaboration with laboratory staff
- Reflect on personal learning and growth throughout the experience

Intended Learning Outcomes:

Knowledge and Understanding:

- Demonstrate knowledge and understanding of cytology laboratory equipment and techniques
- Explain the principles of cytology and histology and describe the different types of cells and tissues.
- Identify and analyze abnormal cells and tissues, and interpret the results of laboratory tests.
- Describe the different types of medical laboratory tests, including blood tests, microbiological tests, and molecular tests.
- Apply laboratory safety procedures and adhere to ethical guidelines in the laboratory.
- Demonstrate the ability to use laboratory equipment and instruments and perform laboratory procedures accurately and efficiently.
- Collaborate with other healthcare professionals, including pathologists, physicians, and nurses, to provide accurate and timely laboratory results.
- Evaluate and interpret laboratory results, and communicate them effectively to physicians and other healthcare professionals.
- Understand laboratory safety procedures and protocols
- Understand the role and responsibilities of cytotechnologists in a laboratory setting

Intellectual Skills:

- Critical thinking and analysis: students will be able to critically evaluate laboratory results and identify any discrepancies or abnormalities.
- Problem-solving: students will be able to use their knowledge and skills to solve problems in the laboratory.
- Apply critical thinking and problem-solving skills in the laboratory
- Analyze and interpret cytology specimens and test results
- Develop strategies for quality control and improvement in laboratory processes

Professional and Practical Skills:

- Perform laboratory tasks accurately and efficiently
- Laboratory techniques: students will be able to perform a range of laboratory procedures, including staining, microscopical examination, and cell culture.
- Laboratory safety: students will understand and apply laboratory safety procedures to ensure a safe working environment for themselves and others.
- Ethical and professional conduct: students will adhere to ethical guidelines and demonstrate professional conduct in the laboratory and in their interactions with other healthcare professionals.
- Communicate effectively with laboratory staff and other healthcare professionals
- Maintain accurate and complete laboratory records and documentation
- Follow laboratory protocols and standard operating procedures

General Transferable Skills:

- Time management: students will be able to manage their time effectively and meet deadlines.
- Teamwork: students will be able to work collaboratively with others in the laboratory and in other healthcare settings.
- Information management: students will be able to manage information and data effectively using laboratory information systems and other software.
- Self-directed learning: students will be able to identify their learning needs and take responsibility for their own learning and development.

Course Topics and Objectives:

The training program covers a range of topics, from laboratory safety and specimen preparation to quality control and communication skills. It also includes a focus on professional development and self-assessment, which is important for ongoing learning and growth.

The training schedule in each week focused on a specific topic or set of skills. The first few weeks provide an introduction to cytotechnology and laboratory safety, which is foundational knowledge for the rest of the program. The later weeks cover specific areas of testing and analysis, as well as quality control and data management.

The program also includes a focus on communication skills and teamwork, which is important for working effectively in a laboratory setting. Overall, this training program was prepared to be a comprehensive approach to developing the skills and knowledge required for a career in cytotechnology:

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

Week 1:

- 2 hours: Introduction to cytotechnology and laboratory safety
- 2 hours: Cell structure and function
- 2 hours: Microscopy and specimen preparation

Week 2:

- 2 hours: Anatomy and Physiology: Respiratory System
- 2 hours: Histology techniques: Fixation and embedding of tissues
- 2 hours: Cytology applications: Preparation and staining of respiratory specimens

Week 3:

- 2 hours: Microbiology: Basic microbiology and culture techniques
- 2 hours: Anatomy and Physiology: Cardiovascular System
- 2 hours: Histology techniques: Microtomy and sectioning techniques

Week 4:

- 2 hours: Cytology applications: Interpretation of respiratory specimens
- 2 hours: Anatomy and Physiology: Digestive System
- 2 hours: Histology techniques: Hematoxylin and eosin staining and its applications

Week 5:

- 2 hours: Microbiology: Bacterial morphology and identification techniques
- 2 hours: Anatomy and Physiology: Urinary System
- 2 hours: Cytology applications: Cytology of urinary specimens

Week 6:

- 2 hours: Histology techniques: Special stains and their applications
- 2 hours: Anatomy and Physiology: Endocrine System

- 2 hours: Cytology applications: Interpretation of urinary specimens

Week 7:

- 2 hours: Microbiology: Antimicrobial susceptibility testing and interpretation
- 2 hours: Anatomy and Physiology: Nervous System
- 2 hours: Histology techniques: Immunohistochemistry and its applications

Week 8:

- 2 hours: Cytology applications: Cytology of female genital tract specimens
- 2 hours: Anatomy and Physiology: Musculoskeletal System
- 2 hours: Laboratory safety: Chemical safety and handling

Week 9:

- 2 hours: Microbiology: Viral identification and characterization techniques
- 2 hours: Anatomy and Physiology: Integumentary System
- 2 hours: Cytology applications: Interpretation of female genital tract specimens

Week 10:

- 2 hours: Histology techniques: Frozen sectioning and its applications
- 2 hours: Anatomy and Physiology: Reproductive System
- 2 hours: Laboratory safety: Electrical safety and equipment handling

Week 11:

- 2 hours: Cytology applications: Cytology of male genital tract specimens
- 2 hours: Anatomy and Physiology: Immune System
- 2 hours: Histology techniques: Specialized staining techniques for reproductive tissue

Week 12:

- 2 hours: Microbiology: Fungal identification and characterization techniques
- 2 hours: Anatomy and Physiology: Lymphatic System
- 2 hours: Cytology applications: Interpretation of male genital tract specimens

Week 13:

- 2 hours: Histology techniques: In situ hybridization and its applications
- 2 hours: Anatomy and Physiology: Homeostasis and regulation
- 2 hours: Laboratory safety: Biosafety and biosecurity

Week 14:

- 2 hours: Cytology applications: Ancillary techniques in cytology diagnosis
- 2 hours: Anatomy and Physiology: Development and growth
- 2 hours: Histology techniques: Tissue microarray and its applications

Week 15:

- 2 hours: Microbiology: Parasitology and identification techniques
- 2 hours: Anatomy and Physiology: Sensory Systems
- 2 hours: Cytology applications

Week 16:

- 2 hours: Histology techniques: Digital pathology and its applications
- 2 hours: Anatomy and Physiology: Aging and disease
- 2 hours: Laboratory management: Laboratory quality control and assurance

Week 17:

- 2 hours: Cytology applications: Cytology of serous cavity fluids
- 2 hours: Anatomy and Physiology: Pathophysiology and disease processes
- 2 hours: Histology techniques: Electron microscopy and its applications

Week 18:

- 2 hours: Microbiology: Molecular techniques in microbiology
- 2 hours: Anatomy and Physiology: Pharmacology and therapeutics
- 2 hours: Cytology applications: Interpretation of serous cavity fluid specimens

Week 19:

- 2 hours: Histology techniques: Laser capture microdissection and its applications

- 2 hours: Anatomy and Physiology: Medical imaging and diagnostics
- 2 hours: Laboratory management: Laboratory information systems and data management

Week 20:

- 2 hours: Cytology applications: Cytology of body cavity fluids
- 2 hours: Anatomy and Physiology: Medical genetics and genomics
- 2 hours: Histology techniques: Whole slide imaging and its applications

Week 21:

- 2 hours: Microbiology: Emerging infectious diseases and public health
- 2 hours: Anatomy and Physiology: Medical ethics and law
- 2 hours: Cytology applications: Interpretation of body cavity fluid specimens

Week 22:

- 2 hours: Histology techniques: Cell culture and its applications
- 2 hours: Anatomy and Physiology: Health promotion and disease prevention
- 2 hours: Laboratory management: Laboratory accreditation and regulation

Week 23:

- 2 hours: Cytology applications: Cytology of fine needle aspiration specimens
- 2 hours: Anatomy and Physiology: Medical research and clinical trials
- 2 hours: Histology techniques: Tissue engineering and regenerative medicine

Week 24:

- 2 hours: Laboratory management: Laboratory finances and budgeting
- 2 hours: Anatomy and Physiology: Medical education and professional development
- 2 hours: Cytology applications: Interpretation of fine needle aspiration specimens

Methods of assessment

The following are some methods of assessment that could be used for this course:

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.

FORMS

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

Student Seminar Evaluation Form

Academic year: 20___/20___

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

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

Presentation Skills (25%)

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

Overall score: [ ]

Content (25%)

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

Overall score: [ ]

Critical Thinking (15%)

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

Overall score: [ ]

Organization and Clarity (15%)

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

Overall score: [ ]

Time Management (10%)

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

Overall score: [ ]

Student Seminar Evaluation Form

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

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

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

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

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

خاص بالقسم:
موافقة ❒
رفض ❒

نموذج مقترح مشروع تخرج _____20/_____20

فردي ❒	جماعي ❒	

بيانات الطالب

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

بيانات المشرف

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

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

ملاحظة:

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

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

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

Undergraduate Thesis Student Progress Form

Academic year: 20____/20____

Meeting number ( )

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

Progress Overview:

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

Tasks Completed:

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

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

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

Undergraduate Thesis
Student Progress Form

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

Thesis Supervisor Comments:
Student Comments:

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

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

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

University of Benghazi

Faculty of Biomedical Sciences
Department of Cytotechnology

Thesis Defense Evaluation Form

Academic year: 20___/20___

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

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

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

Presentation (10%)

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

Overall score: [ ]

Content (40%)

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

Overall score: [ ]

Critical Thinking and Analysis (30%)

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

Overall score: [ ]

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

Thesis Defense Evaluation Form

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

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

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

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

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

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: [ ]					

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

Thesis Evaluation Form

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

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

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

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

University of Benghazi
Faculty of Biomedical Sciences
Department of Cytotechnology

Student Performance Evaluation Form for Workplace Experience

Academic year: 20____/20____

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

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

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

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

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

University of Benghazi

Faculty of Biomedical Sciences
Department of Cytotechnology

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
Department of Cytotechnology

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.				

Print title her

Academic year: 20____/20____