GURU KASHI UNIVERSITY

Bachelor of Science in Medical Laboratory Technology

Session: 2023-24

Department of Paramedical Sciences

Graduate Outcomes of the Programme:

The programme B.Sc. MLT imparts to the students an intensive knowledge of Medical Laboratory Technology. Graduates of the programme will be competent enough to perform routine Medical Laboratory procedures within acceptable quality control parameters in Hematology, Clinical-biochemistry, Immunohematology, and Clinical-Microbiology under the supervision of a Medical Laboratory Scientist or Pathologist.

Programme Learning Outcomes: After completion of this Programme learner will be able to:

1. Perform routine medical laboratory procedures within acceptable quality control parameters in hematology, biochemistry, immunohematology, and microbiology.
2. Function in an ethical and professional manner without bias against any ethnicity, race, religion, caste, or gender with a high degree of credibility, integrity, and social concern.
3. Handle, Operate, and maintain laboratory equipment utilizing appropriate quality control and safety procedures.
4. Recognize the impact of laboratory tests in a global and environmental context.
5. Apply problem-solving techniques in the identification and correction of pre-analytical, post-analytical & analytical variables.
6. Formulate technical skills, social behavior, and professional awareness for functioning effectively as a laboratory technician.

Programme Structure

Semester: I							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**Credits**
1	BML101	General Anatomy	Core	4	0	0	4
2	BML102	General Physiology	Core	4	0	0	4
3	BML109	Haematology- I	Core	4	0	0	4
4	BML104	General Anatomy (Practical)	Skill Based	0	0	4	2
5	BML105	General Physiology (Practical)	Skill Based	0	0	4	2
6	BML110	Haematology- I (Practical)	Skill Based	0	0	4	2
7	BML199	XXXX	MOOC	-	-	-	2
Disciplinary Elective-I (Any one of the following)							
8	BML111	Clinical Enzymology and Automation	Disciplinary Elective-I	3	0	0	3
9	BML112	Medical Ethics					
			Total	**15**	**0**	**12**	**23**

Semester: II							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**Credits**
1	BML210	Immunology and Serology	Core	4	0	0	4
2	BML211	Biochemical Metabolism	Core	4	0	0	4
3	BML212	Haematology- II	Core	4	0	0	4
4	BML213	Immunology and Serology (Practical)	Skill Based	0	0	4	2
5	BML214	Biochemical Metabolism (Practical)	Skill Based	0	0	4	2
6	BML220	Hospital Infection control practices	Value Added Course	2	0	0	2
7	BML215	Haematology- II (Practical)	Skill Based	0	0	2	1
Disciplinary Elective-II (Any one of the following)							
8	BML216	Museum Techniques	Disciplinary Elective-II	3	0	0	3
9	BML217	Introduction to Quality and Patient Safety					
Disciplinary Elective-III(Any one of the following)							
10	BML218	Molecular Cell Biology	Disciplinary Elective-III	3	0	0	3
11	BML219	Medical Laboratory Management					
			Total	**20**	**0**	**10**	**25**

Semester: III							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**Credits**
1	BML312	Basic Histopathological Diseases	Core	4	0	0	4
2	BML313	Transfusion Medicine	Core	4	0	0	4
4	BML314	Transfusion Medicine (Practical)	Skill Based	0	0	4	2
5	BML315	Basic Histopathological Diseases (Practical)	Skill Based	0	0	4	2
6	BML316	Biostatics	Elective Foundation	4	0	0	4
7	BML399	XXXX	MOOC	0	0	0	2
Disciplinary Elective-IV(Any one of the following)							
8	BML317	Health Education and Health Communication	Disciplinary Elective-IV	3	0	0	3
9	BML318	Principle of lab management and medical ethics					
Open Elective Course (for other Department)							
10	XXXX	XXXX	IDC	2	0	0	2
			Total	**17**	**0**	**8**	**23**
Open Elective Courses (for other Department)							
11	BML319	Biomedical waste Management	Open Elective	2	0	0	2
12	BML320	Health care and Nutrition					

Semester: IV							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**Credits**
1	BML410	Histopathological Techniques	Core	4	0	0	4
2	BML411	Mycology and Virology	Core	4	0	0	4
3	BML412	Basic Cytopathology	Core	4	0	0	4
4	BML413	Environmental Science	Compulsory Foundation	2	0	0	2
5	BML414	Histopathological Techniques (Practical)	Skill Based	0	0	4	2
6	BML415	Mycology and Virology (Practical)	Skill Based	0	0	4	2
Value Added Course(for other discipline student also)							
7	BML416	Toxicology	VAC	2	0	0	2
Disciplinary Elective-V(Any one of the following)							
8	BML417	Community Medicine	Disciplinary Elective-V	3	0	0	3
9	BML418	Clinical Endocrinology					
			Total	**19**	**0**	**8**	**23**

Semester: V							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**Credits**
1	BML511	Blood Transfusion & Immune Haematology	Core	4	0	0	4
2	BML512	Parasitology	Core	4	0	0	4
3	BML513	Applied Cytopathology	Core	4	0	0	4
4	BML514	Blood Transfusion & Immune Haematology (Practical)	Skill Based	0	0	4	2
5	BML515	Parasitology (Practical)	Skill Based	0	0	4	2
6	BML516	Microbial Nutrition	AEC	2	0	0	2
7	BML599	XXXX	MOOC	0	0	0	2
Disciplinary Elective-VIII (Any one of the following)							
8	BML517	First Aid	Disciplinary Elective-VIII	3	0	0	3
9	BML518	Essentials of Medical Pharmacology					
			Total	**17**	**0**	**8**	**23**

Semester: VI							
Sr. No.	**Course Code**	**Course Name**	**Type of course**	**L**	**T**	**P**	**Credits**
1	BML601	Industrial Training/Internship (6 Months)	Skill Enhancement Course	0	0	0	20
			Total	**0**	**0**	**0**	**20**

Evaluation Criteria for Theory Courses

A. Continuous Assessment: [25 Marks]

CA1- Surprise Test (Two best out of three) (10 Marks)
CA2- Assignment(s) (10 Marks)
CA3- Term paper/ Quiz/Presentation (05 Marks)

B. Attendance (05 Marks)
C. Mid-Semester Test: (30 Marks)
D. End-Semester Exam: (40 Marks)

Semester -1st

Course Title: General Anatomy

Course Code: BML101

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability.
2. Demonstrate the different properties of nerve fibers, anatomy of neuralgia, synapse, CNS, CSF, brain, cranial nerves.
3. Illustrate the anatomy of cell organelles, blood component, skeletal system, circulatory system, lymphatic system and its structure.
4. Classify the various muscles, organs, bones, joints, tendons, ligaments, blood vessels and cells.

Course Contents

UNIT-I **15 Hours**

Introduction to Anatomy, Definition and scope of anatomy, Anatomical terminology and directional terms, Anatomical planes and sections, Bones: Classification, structure, and functions, Bone development and growth Joints: Types and functions, Axial and appendicular skeleton, Muscular System: Muscle types: Skeletal, smooth, and cardiac function of skeletal muscles, Central nervous system (CNS): Brain and spinal cord, Peripheral nervous system (PNS): Cranial and spinal nerves

Autonomic nervous system (ANS): Sympathetic and parasympathetic divisions

UNIT-II **15 Hours**

Cardiovascular System, Heart anatomy, Blood vessels: Arteries, veins, and capillaries, Blood composition and functions, Circulation and cardiac cycle, Respiratory tract anatomy: Nasal cavity, pharynx, larynx, trachea, bronchi, and lungs, Gas exchange and respiration, Mechanics of breathing

Digestive System, Alimentary canal: Mouth, pharynx, oesophagus, stomach, small and large intestine, Accessory digestive organs: Liver, pancreas, and gallbladder

UNIT-III **15 Hours**

Urinary System: Kidney structure and function, Urinary tract: Ureters, urinary bladder, and urethra, Urine formation and excretion Fluid and electrolyte balance, Reproductive System: Male reproductive system: Testes, ducts, accessory glands, and penis, Female reproductive system: Ovaries, uterus, uterine tubes, and vagina, Menstrual cycle and hormonal regulation and Fertilization.

UNIT-IV **15 Hours**

Endocrine System: Endocrine glands and hormones, Regulation of hormone secretion, Major endocrine organs: Pituitary, thyroid, parathyroid, adrenal, pancreas, and gonads, Hormonal control and homeostasis, Olfactory system, taste apparatus, Skin - Features of skin, hair, sebaceous glands, sweat glands, nails.

Transaction Modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Chaurasia, B. D. (2010). BD Chaurasia's Human Anatomy. CBS Publishers & Distributors Pvt. Ltd.*
- *Mescher, A. L. (2013). Junqueira's basic histology: text and atlas (Vol. 12). 13th ed. New York: McGraw-Hill*
- *Halim, A. (2008). Human Anatomy: Volume I: Upper Limb And Thorax. IK International Pvt Ltd.*
- *Hallam, J. (2009). Grey's Anatomy: Scalpels, sex and stereotypes. Medical Humanities, 35(1), 60-61.*
- *"Gray's Anatomy for Students" by Richard Drake, A. Wayne Vogl, and Adam W. M. Mitchell.*
- *"Clinically Oriented Anatomy" by Keith L. Moore, Arthur F. Dalley, and Anne M. R. Agur.*

Course Title: General Physiology

Course Code: BML102

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the function of each structures related to human body.
2. Show the physiological activity of cell organelles, blood component, function, skeletal system, circulatory system, lymphatic system and its structure
3. Explain properties of nerve fibers, function of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
4. Provide knowledge about functioning of Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability

Course Contents

UNIT-I **15 Hours**

Introduction to physiology of the human body –Composition of body, Homeostasis, Organization of the human body at the tissue level – Function of Epithelial, Connective, Muscular & Nervous tissues, Blood –haemostasis, coagulation of blood, blood transfusion, Lymphatic system – Function of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus, Resistance & immunity – Innate immunity, acquired immunity, humoral & cell mediated immunity.

UNIT-II **15 Hours**

Respiratory system – Physiology of respiration, gas exchange in lungs, transport of gases between lungs & tissues, regulation of respiration, cardiovascular system - Heart & blood vessels: Systemic circulation, pulmonary circulation, cardiac output, blood pressure.

Digestive system – Process of digestion, function of oral cavity, pharynx, salivary glands, oesophagus, stomach, small intestine, large intestine, liver,

gallbladder, pancreas, Urinary system – Function of kidneys, glomerular apparatus, Ureter, urinary bladder and urethra.

UNIT-III **15 Hours**

Reproductive system– female: Physiology of female reproductive system, Reproductive system – male: Physiology of male reproductive system, Endocrine system - Mechanism of action of hormones, function of pituitary gland, thyroid gland, parathyroid glands and adrenal glands.

UNIT-IV **15 Hours**

Nervous system – Properties of nerve fibres, function of neuroglia, synapse, CNS, CSF, brain, cranial nerves, Skeletal system and bone physiology

Muscular system –Types of Muscles, Properties of skeletal muscle, cardiac muscle, smooth muscle, muscles of the body, Skeletal system – Functions of bones, axial skeleton, and appendicular skeleton, Special senses Skin – Function of skin, hair, sebaceous glands, sweat glands and nails

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
- *Chatterjee, C. C. (2020). Human Physiology. (13 th edition). CBS Publisher and Distributor Pvt. Ltd.Colorimetry.*
- *Heilbrunn, L. V. (1952). General physiology. Saunders, Philadelphia.*
- *Hall, J. E. 1. (2016). Guyton and Hall textbook of* medical physiology *(13th edition.). Philadelphia, PA: Elsevier.*
- *"Principles of Physiology" by Robert M. Berne and Matthew N. Levy.*
- *"Textbook of Medical Physiology" by Arthur C. Guyton and John E. Hall.*

Course Title: Haematology – I

Course Code: BML109

L	T	P	Cr.
4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand about the various abnormalities related to blood and blood component
2. Prepare and analyze blood smears accurately, identifying and quantifying blood cell types and abnormalities..
3. Provide knowledge of Internal and external quality control including reference preparation
4. Handle Routine quality assurance protocol in hematology

Course Contents

UNIT-I **15 Hours**

Introduction to Haematology, Definition, Importance, Important equipment used, Laboratory organization and safety measures in Hematology Laboratory, Introduction to blood, its composition, function and normal cellular components.

UNIT-II **15 Hours**

Anticoagulants Types, mode of action and preference of anticoagulants for different haematological studies, Collection and preservation of blood sample for various haematological investigations.

UNIT-III **15 Hours**

Formation of cellular components of blood (Haemopoesis) Erythropoiesis, Leucopoiesis, Thrombopoiesis, Haemoglobin: definition, types, structure, synthesis and degradation, Morphology of normal blood cells, Normal Haemostasis & physiological properties of coagulation factors, Radioactivity

Definition, half-life, physical decay and units, Urine analysis, Physical and Chemical Examination of Urine

UNIT-IV **15 Hours**

Quality assurance in Hematology, Internal and external quality control including reference, preparation, Routine quality assurance protocol, Statistical

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bain, Imelda, B. and John V. D. (2001). Practical Haematology. London: Churchill Livingstone.*
- *Christopher, A. L. (1990) Clinical Haematology.*
- *John, B. H. (2001). Clinical Diagnosis & Management by Laboratory methods.*
- *McDonald, G.A. (1989). Atlas of haematology*
- *Godkar, P. B., &Godkar, D. P. (2003). Textbook of medical laboratory technology. Bhalani.*
- *Stephen, M. (2001). Clinical Hematology (Pathophysiological basis for clinical practice***.**

Course Title: General Anatomy (Practical)

Course Code: BML104

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability.
2. Demonstrate the different properties of nerve fibers, anatomy of neuralgia, synapse, CNS, CSF, brain, cranial nerves.
3. Illustrate the anatomy of cell organelles, blood component, skeletal system, circulatory system, lymphatic system and its structure.
4. Classify the various muscles, organs, bones, joints, tendons, ligaments, blood vessels and cells.

Course Content

List of Practical's / Experiments: **30 Hours**

1. Demonstration of-Basic anatomical terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body
2. Lymphatic system - Features of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus.
3. Nervous system - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system.
4. Muscular system - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.
5. Skeletal system - Features of bones, axial skeleton, appendicular skeleton.
6. Musculoskeletal system - Joints of upper & lower limb.
7. Respiratory system - Nose &paranasal sinuses, pharynx, larynx, trachea,

lungs

8. Cardiovascular system - Heart & blood vessels
9. Digestive system - Oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.
10. Urinary system - Kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra
11. Introduction to genetics - Features of chromosomes, DNA.
12. Reproductive system in females - External & internal genital organs, breast.
13. Reproductive system in males - Penis, scrotum, testes, prostate gland
14. Endocrine system - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Chaurasia, B. D. (2010). BD Chaurasia's Human Anatomy. CBS Publishers & Distributors Pvt. Ltd.*
- *Mescher, A. L. (2013). Junqueira's basic histology: text and atlas (Vol. 12). 13th ed. New York: McGraw-Hill*
- *Halim, A. (2008). Human Anatomy: Volume I: Upper Limb And Thorax. IK International Pvt Ltd.*
- *Hallam, J. (2009). Grey's Anatomy: Scalpels, sex and stereotypes. Medical Humanities, 35(1), 60-61*

Course Title: General Physiology (Practical)

Course Code: BML105

L	T	P	Cr.
0	0	4	2

Total Hours 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the function of each structures related to human body.
2. Show the physiological activity of cell organelles, blood component, function, skeletal system, circulatory system, lymphatic system and its structure
3. Explain properties of nerve fibers, function of neuralgia, synapse, CNS, CSF, brain, cranial nerves, demonstration of reflexes.
4. Provide knowledge about functioning of Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas, help in employability

Course Content

List of Practical's / Experiments: 30 Hours

1. Introduction to laboratory equipment and techniques
2. Demonstration of-Basic physiological terminology, anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body.
3. Lymphatic system - Features of lymph vessels, lymphatic tissue & organs, lymphatics, spleen, tonsil, thymus.
4. Nervous system - Central nervous system, brain, cerebellum, spinal cord, cranial nerves, autonomic nervous system.
5. Muscular system - Skeletal muscle, cardiac muscle, smooth muscle, muscles of the body.
6. Skeletal system - Features of bones, axial skeleton, appendicular skeleton.
7. Musculoskeletal system - Joints of upper & lower limb.
8. Respiratory system - Nose & paranasal sinuses, pharynx, larynx, trachea,

lungs

9. Cardiovascular system - Heart & blood vessels
10. Digestive system - Oral cavity, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, liver, gallbladder, pancreas.
11. Urinary system - Kidneys, juxtaglomerular apparatus, Ureter, urinary bladder, urethra
12. Introduction to genetics - Features of chromosomes, DNA.
13. Reproductive system in females - External & internal genital organs, breast.
14. Reproductive system in males - Penis, scrotum, testes, prostate gland
15. Endocrine system - Hormones, pituitary gland, thyroid gland, parathyroid glands, adrenal glands, endocrine pancreas.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Ashalatha, P. R., &Deepa, G. (2012). Textbook of Anatomy & Physiology for Nurses. JP Medical Ltd.*
- *Chatterjee, C. C. (2020). Human Physiology. (13 th edition). CBS Publisher and Distributor Pvt. Ltd.Colorimetry*
- *Heilbrunn, L. V. (1952). General physiology. Saunders, Philadelphia.*
- *Hall, J. E. 1. (2016). Guyton and Hall textbook of* medical physiology*, Philadelphia, PA: Elsevier.*

Course Title: Haematology - I (Practical)

Course Code: BML110

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: On completion of this course, the learner will be able to

1. Analyze and interpret laboratory results, identify potential sources of error, troubleshoot technical issues, and propose appropriate solutions.
2. maintain and monitor the quality of laboratory reagents, equipment, and procedures to ensure accurate and reliable results.
3. determination of red blood cell count, hemoglobin concentration, hematocrit, white blood cell count, and platelet count.
4. Identify and describe normal and abnormal cell types, including differentiating between various types of white blood cells.

Course Content

List of Practical's / Experiments: 30 Hours

1. Preparation of various anticoagulants: EDTA, Sodium Citrate, Oxalate with Fluoride
2. Collection of blood sample for various Lab Investigations
3. Demonstration of- Microscopes, Haemocytometers, Colorimeter, Spectrophotometer**,** Glass pipettes & Auto pipettes, Glassware
4. Haemoglobin (Hb) level: Measures the amount of haemoglobin, the protein responsible for carrying oxygen, in the blood.
5. Identification of Normal blood cells

Urine Analysis:

1. Physical and Chemical Examination of Urine
2. Routine biochemistry of Urine for: pH, Specific Gravity, Glucose, Ketones, Bilirubin, Albumin
3. Microscopic Examination of Urine

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bain, Imelda, B. and John V. D. (2001). Practical Haematology. London: Churchill Livingstone*
- *Christopher, A. L. (1990) Clinical Haematology.*
- *John, B. H. (2001). Clinical Diagnosis &Management by Laboratory methods.*
- *McDonald, G.A. (1989). Atlas of haematology*
- *Godkar, P. B., &Godkar, D. P. (2003). Textbook of medical laboratory technology. Bhalani.*
- *Stephen, M. (2001). Clinical Haematology (Pathophysiological basis for clinical practice(3rd edition)***.**

Course Title: Clinical Enzymology and Automation

Course Code: BML111

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: On completion of this course, the learner will be able to:

1. Demonstrate the basic principles of enzymology and the role of enzymes in clinical diagnostics.
2. Identify and describe the common enzymatic markers used in clinical practice.
3. Explain the techniques and methodologies employed in enzymatic analysis.
4. Perform enzymatic tests accurately using automated systems and instruments.

Course Contents

UNIT-I **15 Hours**

Definition and significance of clinical enzymology, Classification and nomenclature of enzymes, Enzyme kinetics and catalytic activity, Enzymatic Markers and Clinical Significance, Liver function enzymes (AST, ALT, ALP, GGT), Renal function enzymes (Creatine Kinase, Creatinine), Other enzymatic markers (LDH, ACP, ALD, etc.)

UNIT-II **10 Hours**

Colorimetric assays, Spectrophotometry, Immunoassays (ELISA) Chromatography (HPLC, GC), Electrophoresis (Native, SDS-PAGE), Automation and Instrumentation in Clinical Enzymology, Overview of automated analysers: Principles of operation, Sample handling and processing.

UNIT-III **10 Hours**

Pre-analytical considerations (sample collection, handling, storage), Analytical factors affecting enzymatic analysis, Reference ranges and interpretation of results, Clinical correlations and disease states, Troubleshooting and Quality Control

UNIT-IV **10 Hours**

Identification and resolution of technical issues, Quality control measures and interpretation, Proficiency testing and external quality assessment, Advances in Clinical Enzymology and Automation, Emerging technologies and trends, Molecular diagnostics and genetic markers

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Burtis, C. A., & Ashwood, E. R. (2012). Tietz fundamentals of clinical chemistry and molecular diagnostics (7th ed.). Elsevier Saunders.*
- *Kaplan, L. A., & Pesce, A. J. (2012). Clinical chemistry: Theory, analysis, and correlation (6th ed.). Mosby.*
- *Fuehrer, H. (2015). Automation in analytical chemistry. CRC Press.*
- *Holmes, E. W., & Wingard, L. B. (Eds.). (2016). Automation in the clinical laboratory: A practical guide. Springer.*

Course Title: Medical Ethics

Course Code: BML112

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: On completion of this course, the learner will be able to:

1 Interact with the patients and health care professionals in working area.

2 Handle Legal Responsibilities, Patient safety and quality.

3 Manage Biomedical waste generated from hospital.

4 Employs a body systems-oriented, word-analysis approach to learning medical terminology.

Course Contents

UNIT-I **10 Hours**

Introduction to Medical Ethics:

Definition and scope of medical ethics, Importance of ethical principles in healthcare, Historical development of medical ethics, Ethical Theories and Principles: Utilitarianism, Deontology, Virtue ethics, Autonomy, Beneficence, Non-maleficence, Justice.

UNIT-II **10 Hours**

Role of medical laboratory Technician, Definition and Interaction with the patients and health care professionals, Ethical, Moral, and Legal Responsibilities, Patient safety and quality, restrain policies and role of health professionals, Biomedical waste Management, medical records and reports.

UNIT-III **15 Hours**

Medical terminology- The course employs a body systems-oriented, word-analysis approach to learning medical terminology. Confidentiality and Privacy: Importance of patient confidentiality, Legal and ethical aspects of patient privacy, Ethical dilemmas related to confidentiality and privacy

UNIT-IV **10 Hours**

The goal of the class is to prepare students for the terminology they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *Pozgar, G. D. (2012). Legal aspects of health care administration. Sudbury, Mass: Jones & Bartlett Learning*
- *Morrison, E. E., & Furlong, E. (2014). Health care ethics: Critical issues for the 21st century. Burlington, MA: Jones & Bartlett Learning.*
- *Kliegman, R., Stanton, B., St. Geme, J. W., Schor, N. F., & Behrman, R. E. (2016). Nelson textbook of pediatrics (Edition 20.). Phialdelphia, PA: Elsevier.*
- *"Principles of Biomedical Ethics" by Tom L. Beauchamp and James F. Childress.*
- *"Medical Ethics: Accounts of Ground-Breaking Cases" edited by Gregory E. Pence.*

Semester -2nd

Course Title: Immunology and Serology

Course Code: BML210

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: On completion of this course, the learner will be able to

1. Demonstrate the structure and functions of the immune system.
2. Explain the immune response mechanisms to different pathogens, including viruses.
3. Describe the principles of virology, including viral replication, pathogenesis, and diagnostic techniques.
4. Identify and classify different types of immune disorders and viral infections.

Course Contents

Unit I **15 Hours**

Introduction to Immunology

Overview of the immune system, Cells and tissues of the immune system, Innate immunity and adaptive immunity, Major histocompatibility complex (MHC), Antigens and antibodies, Complement system, Immunological techniques and assays

Unit II **15 Hours**

Immune Response, Humoral immune response, Cell-mediated immune response, Immunological memory, Hypersensitivity reactions

Autoimmunity and autoimmune diseases, Immunodeficiency disorders

Transplantation and rejection

Unit III **15 Hours**

Introduction to Virology, Viral structure and classification, Viral replication strategies, Viral pathogenesis, Host-virus interactions, Antiviral drugs and therapies

Unit IV **15 Hours**

Viral Infections, DNA viruses, RNA viruses, Respiratory viruses, gastrointestinal viruses, Hepatitis viruses, sexually transmitted viruses, Retroviruses and HIV/AIDS, Laboratory Diagnosis of Viral Infections, Serological tests for viral infections, Molecular diagnostic techniques (PCR, RT-PCR), Virus isolation and identification, Viral antigen detection methods

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Abbas, A. K., Lichtman, A. H., Pillai, S., & Baker, D. (2020). Cellular and Molecular Immunology. Elsevier.*
- *Dimmock, N. J., Easton, A. J., & Leppard, K. N. (2019). Introduction to Modern Virology. Wiley-Blackwell.*
- *"Janeway's Immunobiology" by Kenneth Murphy, Casey Weaver, and Allan Mowat.*
- *"Kuby Immunology" by Judy Owen, Jenni Punt, and Sharon Stranford.*
- *"Clinical Immunology and Serology: A Laboratory Perspective" by Christine Dorresteyn Stevens.*

Course Title: Biochemical Metabolism

Course Code: BML211

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to

1. Develop a comprehensive understanding of metabolism, including catabolic and anabolic pathways, and how they are interconnected.
2. Describe major biochemical pathways, such as glycolysis, the citric acid cycle, gluconeogenesis, fatty acid metabolism, and the urea cycle.
3. Comprehend the principles of enzyme kinetics, including enzyme-substrate interactions, enzyme catalysis, and factors influencing enzyme activity.
4. Analyze the metabolism of various macronutrients (carbohydrates, lipids, and proteins) and how they contribute to energy production and cellular function.

Course Contents

Unit I **15 Hours**

Introduction to Biochemical Metabolism, Definition and scope of biochemical metabolism, Overview of metabolic pathways and their regulation

Role of metabolism in maintaining homeostasis, Cellular Biochemistry, Cell structure and organelles relevant to metabolism, Metabolic reactions and enzymes, Energy metabolism and ATP production, Carbohydrate Metabolism

Unit II **15 Hours**

Structure and function of carbohydrates, Glycolysis and gluconeogenesis, Citric acid cycle (Krebs cycle), Glycogen metabolism and regulation, Lipid Metabolism, Structure and function of lipids, Fatty acid metabolism and beta-oxidation, Biosynthesis of fatty acids and cholesterol, Regulation of lipid metabolism and Lipoprotein metabolism.

Unit III **15 Hours**

Structure and function of amino acids, Protein digestion and amino acid absorption, Transamination and deamination, Urea cycle and ammonia detoxification, Biosynthesis and catabolism of amino acids, Nucleotide Metabolism, Structure and function of nucleotides, Purine and pyrimidine biosynthesis.

Unit IV **15 Hours**

Regulation of nucleotide metabolism, Integration of Metabolic Pathways
Hormonal regulation of metabolism, metabolic interconversions and integration, metabolic adaptations during fasting, feasting, and exercise
Metabolic diseases and their molecular basis, Clinical Biochemistry and Metabolic Disorders

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox*
- *"Biochemistry" by Donald Voet, Judith G. Voet, and Charlotte W. Pratt*
- *"Metabolic Regulation: A Human Perspective" by Keith N. Frayn*
- *"Biochemical Pathways: An Atlas of Biochemistry and Molecular Biology" by Gerhard Michal and Dietmar Schomburg.*

Course Title: Haematology-II

Course Code: BML212

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to.

1. Classify and differentiate between a broader range of hematological disorders, including rare and uncommon conditions, based on laboratory findings and clinical symptoms.
2. Explore advanced topics in hemostasis, including the molecular mechanisms of coagulation disorders, such as hemophilia and von Willebrand disease.
3. Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.
4. Determine suitability of hematology specimens and dispose of them in the appropriate bio-hazard containers.

Course Contents

Unit I **15 Hours**

Introduction to Hematology: Overview of haematopoiesis, Components of blood and their functions, Haematological disorders and their classification, Laboratory Techniques in Hematology, Haemoglobin Types, functions and structure.

Unit II **15 Hours**

Blood collection methods, Hematological staining techniques, Automated cell counting and analysis, Examination of bone marrow samples, Hematological Parameters: Red blood cell parameters (RBC count, hemoglobin, hematocrit, etc.), White blood cell parameters (total count, differential count, etc.), Platelet parameters (count, indices, etc.)

Unit III **15 Hours**

Red Blood Cell Disorders: Anaemia: types, classification, and laboratory diagnosis, Hemoglobinopathies (e.g., thalassemia, sickle cell disease)

Polycythaemia and related disorders, White Blood Cell Disorders: Leukaemia: types, classification, and laboratory diagnosis, Lymphoma and myeloma, Myeloproliferative disorders (e.g., chronic myeloid leukaemia)

Unit IV **15 Hours**

Haemostasis and Coagulation Disorders: Blood coagulation pathways, Haemostasis and clotting factors, Bleeding disorders (e.g., haemophilia, von Willebrand disease), Thrombotic disorders (e.g., deep vein thrombosis, disseminated intravascular coagulation, Quality Control and Quality Assurance in Hematology: Quality control measures for haematological tests External quality assurance programs, Troubleshooting common issues in Hematology testing.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Course Title: Immunology and Serology (Practical)

Course Code: BML213

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Promote effective communication and teamwork skills through laboratory activities.
2. Introduce students to the basic principles and concepts of immunology and virology.
3. Develop practical skills in the laboratory techniques used in immunology and virology.
4. Analyze the role of immunology and virology in the diagnosis, prevention, and treatment of infectious diseases.

Course Content

List of Practical's / Experiments **30 Hours**

1. Immunological Techniques: Immunodiffusion and immune electrophoresis
2. Enzyme-linked immunosorbent assay (ELISA), Immunofluorescence and immunohistochemistry
3. Viral structure and classification, Viral replication cycle,
4. Viral pathogenesis and host responses,
5. Diagnostic Virology: Laboratory diagnosis of viral infections
6. Serological tests for viral antibodies,
7. Molecular techniques for viral detection (PCR, RT-PCR)

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Abbas, A. K., Lichtman, A. H., Pillai, S., & Baker, D. (2020). Cellular and Molecular Immunology. Elsevier.*

- *Dimmock, N. J., Easton, A. J., & Leppard, K. N. (2019). Introduction to Modern Virology. Wiley-Blackwell.*

Course Title: Biochemical Metabolism (Practical)

Course Code: BML214

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. The primary objective is to gain a comprehensive understanding of the fundamental concepts and principles of biochemical metabolism.
2. To understanding of metabolic disorders and their underlying biochemical abnormalities.
3. Students will acquire practical skills related to biochemical metabolism.
4. Students should be able to interpret and analyze biochemical test results related to metabolism, identify abnormalities, and correlate them with specific diseases or conditions.

List of Practical's / Experiments: 30 Hours

Demonstration of-

1. To demonstrate the principle, working & maintenance of spectrophotometer
2. To demonstrate the principle, working & maintenance of colorimeter.
3. To demonstrate the principle, working & maintenance of flame photometer.
4. To demonstrate the principle, procedure of paper chromatography.
5. To demonstrate the principle & procedure of Gas chromatography.
6. To demonstrate the principle & demonstration of TLC.
7. To demonstrate the principle & procedure of column chromatography.
8. To demonstrate the principle & procedure of Electrophoresis

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested readings

- *Champe, P. C., Harvey, R. A., & Ferrier, D. R. (2005). Biochemistry. Lippincott Williams & Wilkins.*
- *Ferrier, D. R. (2014). Biochemistry. Lippincott Williams & Wilkins.*
- *Varley, H. (1954). Practical clinical biochemistry. Practical clinical biochemistry.*
- *Lucock, M. (2000). Folic acid: nutritional biochemistry, molecular biology, and role in disease processes. Molecular genetics and metabolism, 71(1-2), 121-138.*
- *Nelson, D. L., Lehninger, A. L., & Cox, M. M. (2008). Lehninger principles of biochemistry. Macmillan.*
- *Vasudevan, D. M., Sreekumari, S., &Vaidyanathan, K. (2013). Textbook of biochemistry for medical students. JP Medical Ltd.*

Course Title: Haematology-II (Practical)

Course Code: BML215

L	T	P	Cr.
0	0	4	2

Total Hours 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop a comprehensive understanding of metabolism, including catabolic and anabolic pathways, and how they are interconnected.
2. Describe major biochemical pathways, such as glycolysis, the citric acid cycle, gluconeogenesis, fatty acid metabolism, and the urea cycle.
3. Comprehend the principles of enzyme kinetics, including enzyme-substrate interactions, enzyme catalysis, and factors influencing enzyme activity.
4. Analyze the metabolism of various macronutrients (carbohydrates, lipids, and proteins) and how they contribute to energy production and cellular function.

Course Content

List of Practical's / Experiments: **30 Hours**

1. Preparation of Staining reagents (Wright's stain, Romanowsky stain)
2. Laboratory coats, gloves, and other necessary safety equipment Complete Blood Count (CBC) with Differential Count, Wright's stain or Romanowsky stain.

3. Examine the stained blood smear under the microscope at different magnifications and identify and differentiate various types of white blood
4. Interpretation:
5. Determine the complete blood count parameters, including red blood cell count, white blood cell count,
6. haemoglobin concentration, haematocrit, and platelet count.
7. Reticulocyte Count,
8. ESR-its methods.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Hoffbrand's Essential Haematology by A.Victor Hoffbrand and Paul A. H. Moss*
- *Hematology: Basic Principles and Practice by Ronald Hoffman, Edward J. Benz Jr., Leslie E. Silberstein.*
- *"Rodak's Hematology: Clinical Principles and Applications" by Elaine Keohane, Larry Smith, and Jeanine Walenga.*
- *"Hoffbrand's Essential Haematology" by A. Victor Hoffbrand and Paul A. H. Moss*
- *"Clinical Hematology Atlas" by Bernadette F. Rodak and Jacqueline H. Carr.*

Course Title: Museum Techniques

Course Code: BML216

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify the role of museums in society and their significance in preserving cultural heritage.
2. Demonstrate knowledge of collections management practices, including acquisition, cataloging, and documentation.
3. Apply basic conservation techniques for artifact preservation.
4. Design and plan museum exhibitions considering principles of display, lighting, and visitor flow.

Course Contents

UNIT-I **10 Hours**

Introduction to Museum Techniques**,** Overview of museum types and their functions**,** History of medical and scientific museums**,** Roles and responsibilities of museum professionals, Digital Technologies in Museums

UNIT-II **10 Hours**

Museum Management, Collection policies and acquisition procedures, Museum ethics and legal considerations, Funding and financial management of museums, Artefact Handling and Conservation, Principles of artefact handling and safety precautions.

UNIT-III **10 Hours**

Introduction to conservation techniques and materials, Preventive conservation and environmental control, Collections Management, cataloguing systems and documentation standards, Inventory management and database software, Loans, acquisitions, and deaccessioning procedures.

UNIT-IV **15 Hours**

Curatorial Practices, Curatorial roles and responsibilities, Object interpretation and research methods, Exhibition planning and design principles, Exhibition Design, Space planning and layout, Graphics and labelling techniques, Lighting and display case considerations.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Greenwald, Michael T. "Techniques for collecting large vertebrate fossils." Paleontological Society Special Publications 4 (1989): 264–74*
- *Valtysson, Bjarki, Sanne Lynge Nilsson, and Christine Eva Pedersen. "Reaching Out to be in Reach. Museum Communication in the Current Museum Zeitgeist." Nordisk Museologi 31, no. 1 (May 31, 2021): 8.*
- *Valtysson, Bjarki, Sanne Lynge Nilsson, and Christine Eva Pedersen. "Reaching Out to be in Reach. Museum Communication in the Current Museum Zeitgeist." Nordisk Museologi 31, no. 1 (May 31, 2021): 8.*
- *The Manual of Museum Exhibitions" by Barry Lord and Gail Dexter Lord.*
- *"Museum Registration Methods" by Rebecca Buck and Jean Allman Gilmore*

Course Title: Introduction To Quality And Patient Safety

Course Code: BML217

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Explore the historical development and evolution of quality improvement and patient safety initiatives in healthcare.
2. Emphasize the importance of ongoing monitoring and continuous improvement in healthcare quality and patient safety.
3. Consider ethical issues related to quality improvement and patient safety, including informed consent and disclosure of errors.
4. Develop the ability to work collaboratively with healthcare teams to promote a culture of safety and quality improvement.

Course Contents

UNIT-I **15 Hours**

Quality assurance and Management Introduction, Quality improvement approaches, standards and norms, quality improvement tools, introduction to NABH guidelines. Basic of Emergency care and Life support skills Basic life support (BLS) following cardiac arrest, recognition of sudden cardiac arrest and activation of emergency response system, early cardiopulmonary resuscitation (CPR) and rapid defibrillation with an automated external defibrillator (AED)

UNIT-II **10 Hours**

Basic emergency care First aid, choking, rescue breathing methods, ventilation including use of bag valve masters (BVMs) Biomedical Waste Management Definition, waste minimization.

UNIT-III **10 Hours**

BMW-segregation, collection, transportation, treatment and disposal (Including color coding), Liquid BMW, Radioactive waste, metals/chemicals/drug waste, BMW management and methods of disinfection, use of Personal protective

equipment (PPE), Infection Prevention and Control, Sterilization, Disinfection, Effective hand hygiene, use of PPE,

UNIT-IV **10 Hours**

Prevention and control of common health care associated infections, Guidelines (NABH) and JCI for hospital infection control. Disaster preparedness and management Fundamentals of emergency management

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Vincent, C. (2011). Patient safety. John Wiley & Sons.*
- *Hall, L. M. (Ed.). (2005). Quality work environments for nurse and patient safety. Jones & Bartlett Learning.*
- *Sandars, J., & Cook, G. (Eds.). (2009). ABC of patient safety (Vol. 72). John Wiley & Sons.*
- *Carayon, P. (2006). Handbook of human factors and ergonomics in health care and patient safety. CRC press.*

Course Title: Molecular Cell Biology

Course Code: BML218

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe the organization and structure of cellular components at the molecular level.
2. Analyze cellular signaling pathways and their role in cellular communication.
3. Explore the principles of cell cycle regulation and cell division.
4. Examine the molecular basis of genetic inheritance and mutation.

Course Contents

UNIT-I **10 Hours**

Cell structure and organelles, Biomolecules and Molecular Structure, Structure and function of nucleic acids, Structure and function of proteins, Structure and function of lipids and carbohydrates

UNIT-II **10 Hours**

DNA Replication and Repair, DNA replication, DNA repair mechanisms, Transcription and Translation, Gene expression and regulation, Transcription and RNA processing, Translation and protein synthesis, Cellular Signalling, Cell signalling pathways, Signal transduction mechanisms

UNIT-III **15 Hours**

Cell Cycle and Cell Division, Cell cycle regulation, Mitosis and meiosis, Molecular Genetics and Inheritance, Mendelian genetics, Chromosomal abnormalities and genetic disorders Immunology, Molecular basis of immune response, Major histocompatibility complex (MHC) and antigen presentation,

UNIT-IV **10 Hours**

Molecular Basis of Cancer, Oncogenes and tumour suppressor genes, Mechanisms of cancer development and progression, Techniques in Molecular Biology, DNA extraction and purification, Polymerase chain reaction (PCR), Gel electrophoresis, DNA sequencing

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2014). Molecular biology of the cell (6th ed.). Garland Science*
- *Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., & Darnell, J. (2000). Molecular cell biology (4th ed.). W. H. Freeman*
- *Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2017). Lehninger principles of biochemistry (7th ed.). W. H. Freeman.*
- *Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D., & Darnell, J. (2019). Molecular cell biology (8th ed.). W. H. Freeman.*
- *Lewin, B. (2007). Genes IX. Jones & Bartlett Learning.*
- *Cooper, G. M., & Hausman, R. E. (2013). The cell: A molecular approach (6th ed.). Sinauer Associates*

Course Title: Medical Laboratory Management

Course Code: BML219

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Explain the organizational structure and functions of a medical laboratory.
2. Apply quality management principles and tools to ensure accurate and reliable laboratory results.
3. Demonstrate knowledge of financial management techniques specific to medical laboratories.
4. Comply with relevant regulations, accreditation standards, and ethical considerations in laboratory management

Course Contents

UNIT-I **10 Hours**

Introduction to Medical Laboratory Management Definition and scope of medical laboratory management, Roles and responsibilities of a laboratory manager, Trends and challenges in laboratory management, Laboratory Organization and Workflow

UNIT-II **15 Hours**

Organizational structures in medical laboratories, Laboratory workflow and process optimization, Equipment and inventory management

Quality Management Systems, Introduction to quality management in laboratories, Quality control and assurance, Accreditation and regulatory requirements, Risk management and error prevention, Financial Management in Medical Laboratories

UNIT-III **10 Hours**

Budgeting and financial planning, Cost analysis and pricing of laboratory services, Reimbursement systems and insurance considerations, Revenue cycle management, Human Resource Management, Recruitment, training, and

development of laboratory staff, Performance evaluation and staff motivation, Teamwork and effective communication

UNIT-IV **10 Hours**

Compliance with relevant laws and regulations (e.g., HIPAA), Ethical considerations in laboratory management, Data privacy and security
Strategic Planning and Continuous Improvement, developing a strategic plan for a medical laboratory, Monitoring and improving laboratory performance
Implementing change and innovation

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Harr, R. B. (2016). Medical Laboratory Management and Supervision: Operations, Review, and Study Guide (2nd ed.). American Society for Clinical Pathology Press.*
- *O'Connor, M. L., & Williams, A. (2019). Clinical Laboratory Management (2nd ed.). Elsevier.*
- *Garza, D., & Becan-McBride, K. (2015). The Laboratory Manager's Handbook (4th ed.). ASQ Quality Press.*
- *Vallero, D. A. (2017). Clinical Laboratory Management: A Guide for Clinical Laboratory Scientists. CRC Press.*
- *Mayo Clinic (Eds.). (2016). Mayo Clinic Medical Laboratory Science and Pathology Board Review (3rd ed.). Oxford University Press.*

Semester -3rd

Course Title: Basic Histopathological Diseases

Course Code: BML312

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify the diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block.
2. Carry out basics procedures used in diagnose in Diseases of GIT.
3. Explain Glomerulonephritis, Nephrotic syndrome, renal failure, UTI.
4. Find out the abnormalities in endocrine system.

Course Contents

UNIT-I **15 Hours**

Alimentary System: Diseases of mouth, Diseases of Oesophagus- Oesophageal varices. Digestive System: Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal obstructions & mal absorption. Accessory Digestive glands: Salivary glands- mumps Liver – hepatitis, liver failure, cirrhosis. Pancreas- pancreatitis. Gall Bladder- Gall stones, jaundice and cardiovascular diseases.

UNIT-II **15 Hours**

Circulatory System: Diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block. Disorders of Blood Pressure Hyper & Hypotension. Respiratory System: Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

UNIT-III **15 Hours**

Urinary System: Glomerulonephritis, Nephrotic syndrome, renal failure, renal calculi, Urinary obstruction, Urinary tract infection. Reproductive system: Sexually transmitted diseases, Pelvic inflammatory disease, disorder of cervix (CIN), Disease of ovaries, ectopic pregnancy, prostatitis, Infertility

UNIT-IV **15 Hours**

Diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block. Glomerulonephritis, Nephrotic syndrome, renal failure, UTI. Nervous System: Neuronal damage, Cerebral Infarction, head injury, Alzheimer 's disease, dementia. Endocrine System: Pituitary: Hyper & Hypo secretions Thyroid: Goitre Adrenal: Cushing Syndrome, Addison Disease.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *M.Imran (2023).Basics and Techniques of Histopathology Cape Comorin Publisher Kanyakumari, TamilNadu*
- *Clark R.K. (2010).Anatomy and Physiology: Understanding the Human Body.*
- *Pearce, E. C. (1968). Anatomy and Physiology for Nurses*
- *Sears, Gordon, W., Winwood, R. S. and Smith J. L. (1985). Anatomy and Physiology for Nurses*

Course Title: Transfusion Medicine

Course Code: BML313

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe the basic concepts of blood banking and transfusion medicine.
2. Perform and interpret routine blood bank tests and procedures.
3. Identify blood groups, antibodies, and antigens involved in blood transfusion.
4. Demonstrate knowledge of blood component preparation and storage.

Course Contents

UNIT-I **15 Hours**

Introduction to Blood Banking, History and evolution of blood banking, Role and responsibilities of a blood bank technologist, Regulatory and ethical considerations in blood banking, Quality assurance and quality control in blood banking, Standard operating procedures (SOPs) and documentation, Blood bank safety measures and infection control.

UNIT-II **15 Hours**

Blood Collection and Processing, Blood collection techniques and anticoagulants, Blood component separation and processing methods, Donor screening and blood donor selection criteria, Transfusion guidelines and protocols, Documentation and record-keeping in blood transfusion

UNIT-III **15 Hours**

Blood Group Systems, ABO and Rh blood group systems, Other significant blood group systems (Kell, Duffy, etc.) Inheritance patterns and clinical significance of blood groups, Immunological and non-immunological adverse reactions, Blood bank organization and staffing.

UNIT-IV **15 Hours**

Blood Components and Storage, Preparation and storage of packed red blood cells (PRBCs), Platelet concentrates and cryoprecipitate preparation, Fresh frozen plasma (FFP) and other blood components, Haemolytic disease of the foetus and new-born (HDFN), Transfusion support in patients with autoimmune disorders

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Lewis, S. M., Bain, B. J., Bates, I., &Dacie, J. V. (2001). Dacie and Lewis practical haematology.London: Churchill Livingstone*
- *Lawicki, S., Covin, R. and Powers, A., 2017.The Kidd (JK) Blood Group System. Transfusion.Medicine Reviews, 31(3), pp.165-172.*
- *Lazarus, H. and Schmaier, A., 2012. Concise guide to hematology.Chichester, West Sussex, UK: Wiley-Blackwell, pp.77-81.*
- *Overfield, J., Dawson, M. and Hamer, D., 2008. Transfusion science.Bloxham, Oxfordshire:Scion.*

Course Title: Transfusion Medicine (Practical)

Course Code: BML314

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply advanced blood bank and blood transfusion knowledge to make appropriate and effective on-the-job professional decisions.
2. Perform and interpret commonly utilized procedures in the blood bank laboratory.
3. Recognize normal and abnormal test results and correlate these data with appropriate pathologic conditions to accurately advise health care providers.
4. Adapt immunohematology laboratory techniques and procedures when errors and discrepancies in results are obtained to effect resolution in a professional and timely manner.

Course Content

List of Practical's / Experiments **30 Hours**

1. Safety precautions in the blood bank laboratory
2. Identification and labeling of blood samples
3. Aseptic techniques in blood collection
4. Blood group typing techniques (ABO and Rh systems), cross matching techniques
5. Blood transfusion reactions and their management
6. Blood Component Preparation and Storage
7. Preparation of packed red blood cells (PRBCs)
8. Preparation of fresh frozen plasma (FFP)
9. Blood component storage and transportation
10. Quality control and quality assurance in blood component preparation
11. Donor selection criteria
12. Venipuncture techniques for blood collection, Donor adverse

reactions and their management

13. Screening tests for transfusion-transmitted infections (HIV, Hepatitis B and C, syphilis, etc.)

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Lewis, S. M., Bain, B. J., Bates, I., &Dacie, J. V. (2001). Dacie and Lewis practical haematology.London: Churchill Livingstone*
- *Lawicki, S., Covin, R. and Powers, A., 2017.The Kidd (JK) Blood Group System. Transfusion.Medicine Reviews, 31(3), pp.165-172.*
- *Lazarus, H. and Schmaier, A., 2012. Concise guide to hematology.Chichester, West Sussex, UK: Wiley-Blackwell, pp.77-81.*
- *Overfield, J., Dawson, M. and Hamer, D., 2008. Transfusion science.Bloxham, Oxfordshire:Scion.*

Course Title: Basic Histopathological Diseases (Practical)

Course Code: BML315

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Recognize and differentiate between normal and abnormal tissue structures, identify specific cell types, and assess the degree of tissue damage or abnormality.
2. Maintain accurate records, following standardized protocols, and ensuring the quality and reliability of laboratory reagents, equipment, and procedures.
3. Handle and disposal of hazardous materials, use personal protective equipment, and maintain a clean and organized work environment.
4. Identify specific cell types, and assess the degree of tissue damage or abnormality.

Course Content

List of Practical's / Experiments **30 Hours**

1. To study squamous cell from cheek cells (Buccal mucosa)
2. To study stained slide preparation from organs of digestive system
3. Study of stained slides of liver, pancreas, gall bladder
4. Study of various types of microscope and draw diagram in practical notebook
5. To study stained slide preparation from organs of circulatory system
6. To study stained slide preparation from organs of Respiratory system
7. To study stained slide preparation from organs of Nervous system
8. To study stained slide preparation from organs of Urinary system
9. To study stained slide preparation from organs of Endocrine system

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *M.Imran (2023).Basics and Techniques of Histopathology Cape Comorin Publisher Kanyakumari, TamilNadu*
- *Clark R.K. (2010).Anatomy and Physiology: Understanding the Human Body.*
- *Pearce, E. C. (1968). Anatomy and Physiology for Nurses*
- *Sears, Gordon, W., Winwood, R. S. and Smith J. L. (1985). Anatomy and Physiology for Nurses*

Course Title: Biostatics

Course Code: BML316

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the basic principles and concepts of biostatistics.
2. Apply appropriate statistical techniques to analyze and interpret medical laboratory data.
3. Evaluate the validity and reliability of research studies and clinical trials.
4. Communicate statistical findings effectively in written and oral formats.

Course Contents

UNIT I **15 Hours**

Introduction to Biostatistics, Definition and scope of biostatistics, Types of data and levels of measurement, Descriptive statistics and graphical representation, Probability and Probability Distributions, Basic principles of probability

UNIT II **15 Hours**

Discrete and continuous probability distributions, Normal distribution and its properties, Sampling Techniques and Study Design, Types of sampling methods, Randomization and bias in study design, Sample size determination

UNIT III **15 Hours**

Descriptive Statistics, Measures of central tendency (mean, median, mode), Measures of dispersion (variance, standard deviation), Percentiles and quartiles, Inferential Statistics, Introduction to statistical software packages (e.g., SPSS, R, Excel).

UNIT IV **15 Hours**

Hypothesis testing, Confidence intervals, Parametric and non-parametric tests, Regression and Correlation Analysis, Simple linear regression, Multiple linear regression, Correlation analysis, Study Design and Clinical Trials, Basic data manipulation and analysis using software.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Glantz, S. A. (2012). Primer of biostatistics (7th ed.). McGraw-Hill.*
- *Rosner, B. (2015). Fundamentals of biostatistics (8th ed.). Cengage Learning.*
- *Pagano, M., & Gauvreau, K. (2018). Principles of biostatistics (2nd ed.). Cengage Learning.*
- *Altman, D. G. (2018). Practical statistics for medical research. Chapman and Hall/CRC.*
- *Zar, J. H. (2010). Biostatistical analysis (5th ed.). Pearso*

Course Title: Health Education and Health Communication

Course Code: BML317

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe the importance of health education and health communication in promoting individual and community health.
2. Identify key theories and models related to health behavior change.
3. Explore different communication strategies and techniques used in health education.
4. Develop skills in designing and implementing health education programs.

Course Contents

UNIT-I **10 Hours**

Introduction to Health Education and Health Communication, Importance and goals of health education, Role of health communication in behaviour change, Historical perspectives on health education and communication

UNIT-II **10 Hours**

Theories and Models of Health Behaviour Change Social cognitive theory, Trans theoretical model, Health belief model, Ecological model, Effective Communication Strategies, Principles of effective communication

UNIT-III **10 Hours**

Designing Health Education Programs, assessing needs and setting objectives, developing educational materials, Planning and implementing health education programs, Evaluating program effectiveness, Verbal and non-verbal communication, Health literacy and plain language, Cultural competence in communication

UNIT-IV **15 Hours**

Media and Technology in Health Communication, Role of media in health communication, Social media and online platforms, Health campaigns and mass media interventions, Ethical considerations in media use, Ethical and Cultural Considerations in Health Education, Ethical guidelines and principles, Informed consent and confidentiality, Health communication with vulnerable populations, Evaluation of Health Education and Communication Interventions.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bandura, A. (2004).Health promotion by social cognitive means. Health Education & Behavior, 31(2), 143-164.*
- *Brashers, D. E., Haas, S. M., & Neidig, J. L. (2014). Health communication and the social networks of older adults: Implications for health and aging. In R. N. Bostrom & B. H. Westley (Eds.), Communication and aging (pp. 193-222). Routledge.*
- *Freimuth, V. S., Quinn, S. C., Thomas, S. B., Cole, G., Zook, E., & Duncan, T. (2001). African Americans' views on research and the Tuskegee Syphilis Study. Social Science & Medicine, 52(5), 797-808.*
- *Kreps, G. L., & Sparks, L. (2008). Meeting the health literacy needs of immigrant populations. Patient Education and Counseling, 71(3), 328-332.*

Course Title: Principle of Lab Management and Medical Ethics	L	T	P	Cr.
Course Code: BML318	**3**	**0**	**0**	**3**

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Efficiently manage laboratory resources, including personnel, equipment, supplies, and budget, to optimize productivity and provide timely and cost-effective services.
2. Develop and implement efficient processes and workflows to maximize productivity, minimize errors, and reduce turnaround time for laboratory tests.
3. Adhere to professional standards of behavior, including maintaining patient confidentiality, respecting patient autonomy and dignity, and practicing non-discrimination.
4. Understand the importance of maintaining patient confidentiality and privacy, including handling and protecting sensitive patient information in accordance with legal and ethical guidelines

Course Contents

UNIT-I **15 Hours**

Introduction to Management: Definition, nature, and scope of management, Evolution of management theories, Functions of management: planning, organizing, staffing, directing, and controlling. Planning: Importance and types of planning, Setting goals and objectives, Decision-making process, Strategies, policies, and procedures

UNIT-II **10 Hours**

Organizing: Organizational structure and design, Departmentalization and delegation, Authority, responsibility, and accountability, Span of control and coordination, Staffing: Human resource planning, Recruitment and selection process.

UNIT-III **10 Hours**

Leadership styles and theories, Motivation and employee engagement, Communication and effective teamwork, Conflict management and negotiation, Controlling: Importance of control, Types of control mechanisms, Performance measurement and evaluation, Corrective action and feedback.

UNIT-IV **10 Hours**

Managerial Ethics and Corporate Social Responsibility: Ethical decision-making, corporate social responsibility and sustainability, Ethical issues in management, Contemporary Issues in Management: Globalization and international management, Innovation and change management, Diversity and inclusion in the workplace, Technology and digital transformation.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Brennan, M. (2015). Laboratory Management: Principles and Processes (3rd ed.). Academic Press.*
- *Cohen, R., & Erickson, A. (2019). Medical Ethics: A Very Short Introduction. Oxford University Press.*
- *Galloway, M. (2017). Principles of Laboratory Management: A Review. Medical Laboratory Observer, 49(8), 22-25.*
- *Johnston, C. (2016). Medical Ethics: A Case-Based Approach. John Wiley & Sons.*
- *Pettit, J., & Weaver, K. (2018). Laboratory Management: Principles and Processes (2nd ed.). Routledge.*

Course Title: Biomedical waste Management

Course Code: BML319

L	T	P	Cr.
2	0	0	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the importance of biomedical waste management in protecting public health and the environment.
2. Explore various treatment technologies used for biomedical waste, such as autoclaving, incineration, chemical treatment, and alternative methods.
3. Explore various waste management methods, including segregation, storage, transportation, treatment, and disposal.
4. Comprehend the safe storage practices for biomedical waste, including container requirements, location, and duration.

Course Contents

UNIT-I **05 Hours**

Introduction to Biomedical Waste Management Definition and classification of biomedical waste Historical overview and importance of biomedical waste management Legal and regulatory framework Types and Sources of Biomedical Waste Classification of biomedical waste based on infectious, hazardous, and general waste.

UNIT-II **05 Hours**

Health Hazards and Risks Potential and hazards associated with improper biomedical waste management, Infection control and prevention measures Waste Segregation and Collection Segregation guidelines and colour coding Collection methods and container types

UNIT-III **10 Hours**

Waste Disposal and Environmental Impact Landfilling, landfill requirements, and considerations Environmental consequences of improper waste disposal Waste-to-energy and recycling options Storage and Transportation Storage requirements and guidelines Transportation regulations and safety measures Treatment Technologies Overview of treatment methods: autoclaving,

incineration, chemical disinfection, etc. Emerging technologies and advancements in waste treatment

UNIT-IV **10 Hours**

Waste Management Planning and Implementation Developing waste management plans for healthcare facilities Staff training and awareness programs monitoring and auditing waste management practices, Biomedical Waste Management Rules 2016.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Bhattacharya, S., Biswas, S., Das, D., & Nair, P. (2019). Biomedical waste management in India: Critical appraisal. Journal of International Environmental Application & Science, 14(2), 91-97.*
- *Prüss-Üstün, A., & Rapiti, E. (2008). Safe management of wastes from health-care activities. World Health Organization.*
- *Srivastava, A., & Kaushal, R. K. (2020). Biomedical waste management during COVID-19 pandemic: A review. Environmental Sustainability and Resource Management, 2(1), 53-61.*
- *Rao, P. V., & Patnaik, S. K. (2016). Biomedical waste management: An exploratory study. International Journal of Environmental Science and Technology, 13(7), 1607-1616.*

Course Title: Health care Nutrition

Course Code: BML320

L	T	P	Cr.
2	0	0	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Explore special diets, including therapeutic diets for conditions like celiac disease, food allergies, and renal disease, as well as cultural and religious dietary restrictions.
2. Explore the principles of nutritional support for patients who are unable to meet their dietary needs through regular oral intake due to illness, surgery, or other factors.
3. Develop skills in providing nutrition counseling and education to patients, emphasizing behavior change and adherence to dietary recommendations.
4. Explore current research in the field of nutrition and apply evidence-based practices in healthcare settings.

Course Contents

UNIT-I **05 Hours**

Introduction to Health Care: Definition and scope of health care, Roles and responsibilities of medical laboratory technologists, Ethical considerations in health care, Overview of human anatomy and physiology, Organ systems and their functions, understanding body systems related to laboratory diagnostics, Health promotion and disease prevention strategies

UNIT-II **05 Hours**

Laboratory information systems and management principles, Introduction to biochemistry and its significance in health care, Carbohydrates, lipids, proteins, and nucleic acids, Enzymes and their role in metabolic processes

UNIT-III **10 Hours**

Hematology: Blood components, blood disorders, and laboratory tests, Clinical microbiology: Basics of microbiology, identification of microorganisms, and antimicrobial susceptibility testing, Quality control and quality assurance in the laboratory, Laboratory safety and regulations

UNIT-IV **10 Hours**

Overview of the immune system, Antibodies, antigens, and their interactions, Immunological techniques and diagnostic tests, Principles of nutrition and its

importance in health care, Essential nutrients and their functions, Dietary guidelines and nutritional assessment, Dietetics and Therapeutic Nutrition: Therapeutic diets for various diseases and conditions, Public Health and Epidemiology:

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Smith, J. (2021). The Future of Healthcare: Innovations and Challenges. Publisher.*
- *Johnson, M., & Davis, L. (2019). Healthcare Management: Principles and Practices. Publisher.*
- *Brown, A., Johnson, M., Davis, L., & Thompson, R. (2018). The Economics of Healthcare: Trends and Issues. Publisher.*
- *Jones, R. (Ed.). (2020). Perspectives on Mental Health: Innovations and Interventions. Publisher.*

Semester-4th

Course Title: Histopathological Techniques

Course Code: BML410

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop proficiency in microtomy, including the use of microtomes to cut thin tissue sections of consistent thickness.
2. Recognize decalcification agent, technique of decalcification.
3. Classify dyes, principles of Dye Chemistry sand their uses.
4. Demonstrate the applications of various types of microscopes i.e. dark field, polarizing, phase contrast, interference and fluorescent microscope

Course Contents

UNIT-I **15 Hours**

Introduction to Histotechnology, Compound microscope: Optical system, magnification, and, maintenance, Safety measures in histopathology laboratory Basic concepts about routine methods of examination of tissues, Collection and Transportation of specimens for histological examination,

UNIT-II **15 Hours**

Basic concepts of fixation, various types of fixatives used in a routine, histopathology laboratory Simple Fixatives Compound, fixatives Special fixatives for demonstration of various tissue elements, Decalcification Criteria of a good decalcification agent, Technique of decalcification followed with selection of tissue, fixation and decalcification, neutralization of acid and thorough washing.

UNIT-III **15 Hours**

Various types of decalcifying fluids: Organic & Inorganic Acid, chelating agents, Use of Ion-exchange resigns and Electrophoretic decalcification and treatment of hard tissues which are not calcified. Processing of various tissues for

histological examination Procedure followed by Dehydration, Clearing, and Infiltration and routine timing schedule for, manual, or automatic tissue processing, its care and Maintenance Embedding: Definition, Various types of embedding media, Museum Technology its steps.

UNIT-IV **15 Hours**

Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications, Freezing Microtome, Faults in paraffin section cutting with reason and remedy, mounting cover slip Protocol, Impregnation and Mountants , Classifications of Dyes, Principles of Dye, Mounting of Cover Slips, Labelling and Cataloguing the Slides Routine Staining Procedures, Haematoxylin and Eosin Staining, various types of Haematoxylins Mallory's Phosphotungstic Acid Haematoxylin(PTAH), Autopsy: External Examination and Internal Examination, Mortuary.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *M.Imran (2023).Basics and Techniques of Histopathology Cape Comorin Publisher Kanyakumari, TamilNadu*
- *Bancroft, J. D., & Gamble, M. (Eds.).(2008). Theory and practice of histological techniques.Elsevier health sciences.*
- *Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). Cellular pathology technique.Elsevier.*
- *Mohan, H. (2015). Textbook of pathology.Jaypee Brothers Medical Publishers.*

Course Title: Mycology and Serology

Course Code: BML411

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate different types of immunological tests, State the principle of immunological tests
2. Examine the major aspects of human fungal infections and how to identify the pathogens.
3. Describe the basic structure and classification of pathogenic fungi;
4. Demonstrate knowledge and understanding of the pathogenesis of the various mycoses, their clinical manifestations, diagnosis and management.

Course Contents

UNIT-I **15 Hours**

Introduction to Mycology, Definition, scope, and importance of mycology Classification and nomenclature of fungi, Structure and morphology of fungi

Reproduction and life cycles of fungi, Classification of Medically Important Fungi, Systematic classification of pathogenic fungi, Identification and characterization of common pathogenic fungi, Clinical manifestations and diseases caused by pathogenic fungi.

UNIT-II **15 Hours**

Laboratory Techniques in Mycology, Collection, transportation, and processing of clinical specimens, Preparation and staining of fungal smears, Culture media and methods for fungal isolation, Identification of fungi using microscopic and macroscopic techniques, Antifungal susceptibility testing Fungal Infections, Superficial, cutaneous, and subcutaneous fungal infections, Systemic fungal infections, Opportunistic fungal infections, Diagnosis, treatment, and prevention of fungal infections

UNIT-III **15 Hours**

Introduction to Serology, Definition, scope, and importance of serology, Antigens and antibodies: structure, properties, and interactions, Immunological techniques used in serology, Serological Tests for Infectious Diseases, Principles and applications of serological tests, Serological diagnosis of viral, bacterial, and parasitic infections, Serological markers for specific diseases (e.g., HIV, hepatitis, syphilis)

UNIT-IV **15 Hours**

Immunological Disorders, Autoimmune diseases and serological markers, Allergic reactions and immunoglobulin measurements, Serological markers in immunodeficiency disorders, Serological Techniques and Instrumentation: Enzyme-Linked Immunosorbent Assay (ELISA), Western blotting Immunofluorescence assays.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Alexopoulos, C. J., Mims, C. W., & Blackwell, M. (1996). Introductory mycology. John Wiley & Sons.*
- *Kirk, P. M., Cannon, P. F., Minter, D. W., & Stalpers, J. A. (2008). Dictionary of the fungi (10th ed.). CABI.*
- *Deacon, J. W. (2013). Fungal biology (4th ed.). Wiley-Blackwell.*
- *Coligan, J. E., Kruisbeek, A. M., Margulies, D. H., Shevach, E. M., & Strober, W. (Eds.). (2014). Current protocols in immunology. John Wiley & Sons.*
- *Rose, N. R., Hamilton, R. G., & Detrick, B. (Eds.). (2018). Manual of clinical laboratory immunology (8th ed.). ASM Press.*

Total Hours 60

Course Title: Basic Cytopathology

Course Code: BML412

L	T	P	Cr.
4	0	0	4

Learning Outcomes: After completion of this course, the learner will be able to:

1. Follow Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune- cytochemistry.
2. Gain the ability to interpret cellular specimens, recognizing cellular abnormalities, inflammation, and signs of malignancy.
3. Diagnose the fluid cytology urine, CSF , body fluids (pleural, pericardial, ascetic).
4. Narrate indications & utility of the technique with special emphasis on role in FNAC.

Course Contents

UNIT- I **15 Hours**

Cryostat sectioning, its applications in diagnostic Cytopathology, Enzyme Cytochemistry, Diagnostic applications Demonstration of Phosphates, Dehydrogenises, Oxidase & Peroxides

UNIT- II **15 Hours**

Vital staining for Sex Chromatin, Aspiration cytology: Principle Indications & utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics

UNIT-III **15 Hours**

Exfoliative cytology (Papanicolaoue technique for the staining of cervical smears), Cervical cytology

Fluid Cytology, Urine, CSF, Body Fluids (Pleural, Pericardial, Ascetic)

UNIT-IV **15 Hours**

Automation in cytology, Liquid based cytology: Principles and preparation, Cytocentrifuge, molecular cytology, Cell Block and Immune-cytochemistry.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Kumar, V., Abbas, A. K., & Aster, J. C. (2017). Robbins basic pathology e-book.Elsevier Health Sciences.*
- *Bancroft, J. D., & Gamble, M. (Eds.).(2008). Theory and practice of histological techniques.Elsevier health sciences.*
- *Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). Cellular pathology technique.Elsevier.*
- *Mohan, H. (2015). Textbook of pathology.Jaypee Brothers Medical Publishers.*
- *Mohan, H. (2012). Pathology practical book. JP Medical Ltd.*
- *Culling, C. F. A. (2013). Handbook of histopathological and histochemical techniques: including museum techniques. Butterworth-Heinemann.*

Total Hours 30

Course Title: Environmental Science

Course Code: BML413

L	T	P	Cr.
2	0	0	2

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyze the sources, types, and effects of pollution, including air pollution, water pollution, soil contamination, and noise pollution.
2. Classify the causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution
3. Examine waste generation, disposal methods, recycling, and waste reduction strategies to minimize environmental impacts.
4. Explore the science of climate change, its causes, consequences, and mitigation strategies.

Course Contents

UNIT-I **05 Hours**

Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness. Natural Resources - Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

UNIT-II **05 Hours**

Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards

UNIT-III **10 Hours**

Solid waste management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution

case studies, Disaster management: Floods, earthquake, cyclone and landslides. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, Environment Protection Act, Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act.

UNIT-IV **10 Hours**

Human Population and the Environment, Population growth, variation among nations. Population explosion–Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare, Role of Information Technology in Environment and human health. Case studies. Understanding the Hospital Environment Understanding the environment in the following clinical laboratories: Microbiology, Biochemistry, Histopathology, Hematology Clinical laboratory hazards to the environment from the following and means to prevent: Infectious material, Toxic Chemicals, Radioactive Material, Other miscellaneous wastes

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Vincent, C. (2011). Patient safety. John Wiley & Sons.*
- *Hall, L. M. (Ed.). (2005). Quality work environments for nurse and patient safety. Jones & Bartlett Learning.*
- *Sandars, J., & Cook, G. (Eds.). (2009). ABC of patient safety (Vol. 72). John Wiley & Sons.*
- *Carayon, P. (2006). Handbook of human factors and ergonomics in health care and patient safety. CRC press.*

Course Title: Histopathological Techniques (Practical)

Course Code: BML414

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Cut frozen section and stain for Hematoxylin and Eosin.
2. Prepare Schiff ‘s reagent in the lab and do Periodic Acid Schiff ‘s (PAS) stain on a paraffin section.
3. Stain Decalcified paraffin embedded section for the presence of calcium salts.
4. Demonstrate the presence of bacteria and fungi in paraffin embedded sections using the following staining procedures.

Course Content

List of Practical’s / Experiments: 30 Hours

1. Introduction to Compound Microscope, Tissue processing
2. To cut frozen section and stain for Haematoxylin and Eosin, Metachromatic stain Toluidine blue, Oil Red O staining for the demonstration of fat
3. To prepare Schiff ‘s reagent in the lab and do Periodic Acid Schiff ‘s (PAS) stain on a paraffin section
4. To prepare ammonical silver bath in the laboratory and stain paraffin embedded section for the demonstration of reticulin fibres.
5. To stain a paraffin section for the demonstration of smooth muscle by Van Gieson‘s Stain
6. To perform Masson ‘s trichrome stain on a paraffin section for the demonstration of collagen fibre, muscle fibre and other cell elements.
7. To stain for nucleic acid (DNA and RNA) To stain the paraffin section for the demonstration of the elastic fibres (EVG).
8. To stain a paraffin section for the demonstration of iron (Perl ‘s stain) staining procedures:
9. Gram ‘s staining
10. AFB staining (Ziehl Neilson ‘s staining) for M. tuberculosis and leprae

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *M.Imran (2023).Basics and Techniques of Histopathology Cape Comorin Publisher Kanyakumari, TamilNadu*
- *Bancroft, J. D., & Gamble, M. (Eds.).(2008). Theory and practice of histological techniques.Elsevier health sciences.*
- *Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). Cellular pathology technique.Elsevier.*
- *Mohan, H. (2015). Textbook of pathology.Jaypee Brothers Medical Publishers.*

Course Title: Mycology and Virology (Practical)

Course Code: BML415

L	T	P	Cr.
0	0	4	3

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Perform different types of immunological tests, State the principle of immunological tests.
2. Examine the major aspects of human fungal infections and how to identify the pathogens.
3. Describe the basic structure and classification of pathogenic fungi.
4. Demonstrate knowledge and understanding of the pathogenesis of the various mycoses, their clinical manifestations, diagnosis and management.

Course Content

List of Practical's / Experiments: **30 Hours**

1. Fungal morphology and structure
2. Fungal life cycle and reproduction
3. KOH mount Procedure
4. Lab Diagnosis of Fungal infections
5. Agglutination tests (e.g., Widal, VDRL, RPR))
6. Enzyme-linked immunosorbent assays (ELISAs)
7. Western blotting
8. Fluorescent antibody techniques
9. Rheumatoid factor
10. Antinuclear antibodies (ANA)
11. Anti-double stranded DNA (anti-dsDNA) antibodies
12. Anti-cyclic citrullinated peptide (anti-CCP) antibodies
13. Serological markers for specific autoimmune diseases (e.g., lupus, rheumatoid arthritis)

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Alexopoulos, C. J., Mims, C. W., & Blackwell, M. (1996). Introductory mycology. John Wiley & Sons.*
- *Kirk, P. M., Cannon, P. F., Minter, D. W., & Stalpers, J. A. (2008). Dictionary of the fungi (10th ed.). CABI.*
- *Deacon, J. W. (2013). Fungal biology (4th ed.). Wiley-Blackwell.*
- *Coligan, J. E., Kruisbeek, A. M., Margulies, D. H., Shevach, E. M., & Strober, W. (Eds.). (2014). Current protocols in immunology. John Wiley & Sons.*
- *Rose, N. R., Hamilton, R. G., & Detrick, B. (Eds.). (2018). Manual of clinical laboratory immunology (8th ed.). ASM Press.*

Total Hours 30

Course Title: Toxicology

Course Code: BML416

L	T	P	Cr.
2	0	0	2

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the basic principles of toxicology and its significance in healthcare.
2. Identify different types of toxic agents and their routes of exposure.
3. Explain the mechanisms of toxicity and the factors influencing toxicity.
4. Apply appropriate laboratory techniques for toxicological analysis.

Course Contents

UNIT I **05 Hours**

Introduction to Toxicology, Definition and scope of toxicology, Historical overview of toxicology, Toxicokinetics and toxicodynamics, Dose-response relationship, Types of Toxic Agents, Chemical toxicants, Biological toxins

UNIT II **05 Hours**

Environmental pollutants, Occupational hazards, Food and drug toxicology, Routes of Exposure: Inhalation, Ingestion, Dermal exposure, Injection, Mechanisms of Toxicity, Cellular and molecular mechanisms, Organ-specific toxicity, Genotoxicity and carcinogenesis, Immunotoxicity, Neurotoxicity, Toxicity Assessment, Acute toxicity testing, Subchronic and chronic toxicity testing

UNIT III **10 Hours**

Reproductive and developmental toxicity testing, Ecotoxicology and environmental risk assessment, Toxicology Laboratory Techniques, Sample collection and handling, Screening tests for toxic substances, Analytical techniques: spectroscopy, chromatography, immunoassays

UNIT IV **10 Hours**

Ethical and Safety Considerations, Legal and ethical issues in toxicology, Occupational health and safety in the laboratory, Toxicology and public health, Risk communication and management, Emerging Trends in Toxicology, Nanotoxicology, Genetic toxicology, Computational toxicology, Toxicogenomics.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Casarett, L. J., Klaassen, C. D., & Watkins, J. B. (Eds.). (2019). Casarett & Doull's toxicology: The basic science of poisons (9th ed.). McGraw-Hill Education.*
- *Hayes, A. W. (Ed.). (2014). Principles and methods of toxicology (6th ed.). CRC Press.*
- *Gupta, R. C. (Ed.). (2020). Biomarkers in toxicology (2nd ed.). Academic Press.*
- *Gupta, R. C. (Ed.). (2016). Handbook of toxicology of chemical warfare agents. Academic Press.*
- *Ballantyne, B., Marrs, T. C., & Syversen, T. (Eds.). (2019). General and applied toxicology (3rd ed.). John Wiley & Sons.*

Course Title: Community Medicine

Course Code; BML417

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Diagnose and manage common health problems and emergencies at individual, family and community levels keeping in mind the existing health care resources and prevailing socio cultural beliefs
2. Describe the principles and components of primary health care and the national health policies to achieve the goal of "Health for all".
3. Describe the demographic pattern of the country and appreciate the roles of the individual, family, community and socio – cultural milieu in health and disease.
4. List epidemiological methods and describe the application to control communicable and non-communicable diseases in the community.

Course Contents

UNIT I **10 Hours**

Definition, scope, and objectives of Community Medicine. Principles and concepts of primary healthcare and public health, Epidemiology: Introduction to epidemiology and its importance in public health. Child health and immunization, Growth and development monitoring, Introduction to biomedical waste management and disposal

UNIT II **10 Hours**

Measures of disease frequency and association., Study designs in epidemiology, Outbreak investigation and control, Screening of diseases, Environmental Principles of health education and communication, Communication techniques and methods, Health promotion strategies, Health behavior change theories.

UNIT III **10 Hours**

Principles of infection and disease transmission, Epidemiology, prevention, and control of common communicable diseases such as tuberculosis, malaria,

HIV/AIDS, hepatitis, etc, Immunization and vaccine preventable diseases, Control of vector-borne diseases, Non-communicable Diseases: Integrated Management of Childhood Illness (IMCI), Health Education and Communication

UNIT IV **15 Hours**

Introduction to non-communicable diseases (NCDs) and their risk factors., Epidemiology, prevention, and control of NCDs like cardiovascular diseases, diabetes, cancer, respiratory diseases, etc, Lifestyle modifications and health promotion, Reproductive health and family planning, Primary healthcare and healthcare facilities.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Anderson, M. B., & Blue, C. L. (Eds.). (2018). Community/public health nursing: Promoting the health of populations (7th ed.). Elsevier.*
- *Green, L. W., & Kreuter, M. W. (2005). Health program planning: An educational and ecological approach (4th ed.). McGraw-Hill.*
- *Nies, M. A., & McEwen, M. (2019). Community/public health nursing: Promoting the health of populations (7th ed.). Saunders.*
- *Terris, M. (2012). Epidemiology for the uninitiated (5th ed.). BMJ Books.*
- *Wilson, J. F., & Brownstein, R. H. (2017). Community health nursing: Caring for the public's health (3rd ed.). Jones & Bartlett Learning.*

Course Title: Clinical Endocrinology

Course Code: BML418

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the basic principles of endocrinology, including hormone synthesis, regulation, and signaling pathways.
2. Identify the major endocrine glands and describe their anatomical location, structure, and function.
3. Explain the mechanisms of hormone action and their role in maintaining homeostasis.
4. Demonstrate proficiency in laboratory techniques and procedures used in the diagnosis and monitoring of endocrine diseases.

Course Contents

UNIT I **15 Hours**

Introduction to Endocrinology, Definition and scope of endocrinology, Hormones and their classification, Endocrine glands and their anatomical features, Mechanisms of hormone action, Pancreas and Diabetes Mellitus, Anatomy and function of the pancreas, Insulin synthesis, secretion, and action, Diabetes mellitus types and pathogenesis

UNIT II **15 Hours**

Hypothalamus and Pituitary Gland, Anatomy and function of the hypothalamus, Hypothalamic hormones and their regulation, Disorders of growth and puberty, Laboratory Techniques in Endocrinology, Collection and handling of samples for endocrine testing, Immunoassays and other laboratory methods

UNIT III **10 Hours**

Thyroid Gland, Anatomy and function of the thyroid gland, Thyroid hormone synthesis and regulation, Thyroid function tests, Hyperthyroidism and hypothyroidism, Thyroid nodules and cancer, Parathyroid Gland and Calcium Metabolism

UNIT IV **10 Hours**

Anatomy and function of the parathyroid gland, Calcium homeostasis and regulation, Parathyroid hormone (PTH) and its actions, Disorders of calcium metabolism, Adrenal Glands, Anatomy and function of the adrenal glands, Adrenal cortex and its hormones

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Burtis, C. A., Bruns, D. E., & Wu, A. H. B. (2015). Tietz textbook of clinical chemistry and molecular diagnostics (6th ed.). Elsevier Saunders.*
- *Gardner, D. G., & Shoback, D. M. (Eds.). (2016). Greenspan's basic & clinical endocrinology (10th ed.). McGraw-Hill Education.*
- *Melmed, S., Auchus, R. J., Goldfine, A. B., & Koenig, R. J. (Eds.). (2019). Williams textbook of endocrinology (14th ed.). Elsevier.*
- *Poretsky, L. (Ed.). (2010). Principles of diabetes mellitus (2nd ed.). Springer.*
- *Rosen, C. J. (Ed.). (2019). Primer on the metabolic bone diseases and disorders of mineral metabolism (9th ed.). Wiley.*

Semester -5th

Course Title: Blood transfusion and immune Hematology

Course Code: BML511

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Perform ABO and/or Rh testing, red blood cell (RBC) antibody screen and antibody identification
2. Perform pre-transfusion testing, including ABO and/or Rh testing, red blood cell (RBC) antibody screen and antibody identification.
3. Describe different red cell antigen systems and their importance.
4. Perform different cross matching methods and indications (e.g., electronic, immediate-spin, anti-globulin).

Course Contents

UNIT-I **15 Hours**

Blood Components and Functions: Blood composition and functions of different blood components, Haematopoiesis and erythropoiesis, Blood groups and typing, Blood Transfusion Basics: Transfusion reactions and their management, Blood Transfusion Practices: Pre-transfusion testing and patient identification, Blood product administration and monitoring

UNIT-II **15 Hours**

Blood donor selection and screening, Blood collection, processing, and storage, Transfusion-related infections and complications, Blood Group Systems and Typing: ABO and Rh blood grouping systems, other important blood group systems (e.g., Kell, Duffy, Kidd, etc.)Blood typing techniques and interpretation of results

UNIT-III **15 Hours**

Compatibility Testing and Cross matching: Principles of compatibility testing, Cross matching procedures (major and minor cross match), Quality control and quality assurance in blood transfusion services, Blood bank safety protocols

and standard operating procedures, Regulatory and accreditation standards for blood banks

UNIT-IV **15 Hours**

Immune Hematology: Autoimmune and allo-immune haemolytic anaemias, Hemolytic disease of the foetus and new-born (HDFN), Transfusion-related immune complications (e.g., transfusion-associated graft-versus-host disease, alloimmunization), Transfusion-Transmitted Infections: Screening and testing for infectious diseases in donated blood, Common transfusion-transmitted infections (e.g., HIV, hepatitis B and C, syphilis, malaria), Strategies for prevention and control of transfusion-transmitted infections

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Hillyer, C. D., Silberstein, L. E., Ness, P. M., & Anderson, K. C. (Eds.). (2019). Blood transfusion therapy: A physician's handbook. AABB.*
- *Roback, J. D., Grossman, B. J., Harris, T., & Hillyer, C. D. (Eds.). (2020). Technical manual. AABB.*
- *Rosse, W. F., & Domen, R. E. (2018). Immune hematology: Diagnosis and management of autoimmune cytopenias. Springer.*
- *Sachais, B. S., & Slichter, S. J. (2021). The scientific basis for platelet transfusion: Current practice and future prospects. CRC Press.*
- *Vamvakas, E. C., & Blajchman, M. A. (2008). Transfusion-related immunomodulation (TRIM): An update. Blood Reviews, 22(4), 203-217.*

Course Title: Parasitology

Course Code: BML512

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe geographical distribution, Habitat, Morphology, life cycle, Mode of action and laboratory diagnosis of various parasites.
2. Apply basic diagnostic principles in Parasitology.
3. List general characteristics of Cestodes, Trematodes and Nematodes
4. Examine slides of Stool, blood samples for parasites for intestinal protozoan infections.

Course Contents

UNIT 1 **15 Hours**

Introduction to Medical Parasitology ,General characteristics of protozoa, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Endamoebas sp., Giardia, Trichomonas sp., Plasmodium and Toxoplasma sp., Helminthology.

UNIT 2 **15 Hours**

Helminths parasites: General characteristics of Cestodes, Trematodes and Nematodes, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of: Taenia solium and saginata, Hymenolepis nana, Schistosoma haematobium and mansoni, Fascioloa hepatica, Ancyclostoma duodenale,

UNIT 3 **15 Hours**

General rules for microscopic examination and collection of stool samples of intestinal protozoa infections, Concentration techniques i.e. Flotation and sedimentation techniques, Egg counting techniques, Examination of blood for parasites

UNIT 4 **15 Hours**

Preparation of thin and thick blood film, Leishman staining, Examination of thick and thin smear, Field's stain, JSB stain, Examination of blood film for Malaria parasite and Microfilaria, Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Leventhal, R. (1997). Medical Parasitology, A self-Instruction Text.*
- *Hegazi M. (1994). Applied Human Parasitology. 1st ed, Egypt*
- *Chatterjee, K. D. (2011). A text book by parasitology.*
- *Ichhpujani, R.L. and Bhatia, R (2003).Medical parasitology*

Course Title: Cytopathology

Course Code: BML513

L	T	P	Cr.
4	0	0	4

Total Hours 60

Learning Outcomes: After completion of this course, the learner will be able to:

1 Examine the cryostat sectioning, its applications in diagnostic Cytopathology

2 Develop proficiency in the Automation in cytology, and use of automatic slide strainers.

3 Explore fluid cytology urine, CSF , body fluids (pleural, pericardial, ascetic)

4 Classify the indications & utility of the technique with special emphasis on role in FNAC

Course Contents

UNIT-I **15 Hours**

Sample Collection and Preparation: Principles of sample collection and handling in cytopathology, Techniques for obtaining various types of specimens (e.g., fine needle aspiration, exfoliative cytology), Fixation and preservation methods for cytological specimens, Specialized Cytopathology Techniques: Fine needle aspiration cytology (FNAC) of various organs (e.g., thyroid, lymph nodes, breast)

UNIT-II **15 Hours**

Vital staining for Sex Chromatin: Aspiration cytology: Principle Indications & utility of the technique with special emphasis on role of cytotechnologist in FNAC clinics, Cryostat sectioning, its applications in diagnostic Cytopathology.

UNIT-III **15 Hours**

Exfoliative cytology (Papanicolaoue technique for the staining of cervical smears), Cervical cytology

Fluid Cytology, Urine, CSF, Body Fluids (Pleural, Pericardial, Ascetic), Central nervous system cytology (e.g., cerebrospinal fluid)

UNIT-IV **15 Hours**

Quality Control and Quality Assurance in Cytopathology: Principles of quality control and quality assurance in cytopathology, External quality assessment programs, Regulatory guidelines and accreditation in cytopathology, Automation in cytology, Liquid based cytology: Principles and preparation, Cytocentrifuge, and Immune-cytochemistry

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Kumar, V., Abbas, A. K., & Aster, J. C. (2017). Robbins basic pathology e-book. Elsevier Health Sciences.*
- *Bancroft, J. D., & Gamble, M. (Eds.). (2008). Theory and practice of histological techniques. Elsevier health sciences.*
- *Culling, C. F. A., Allison, R. T., & Barr, W. T. (2014). Cellular pathology technique. Elsevier.*
- *Mohan, H. (2015). Textbook of pathology. Jaypee Brothers Medical Publishers.*
- *Mohan, H. (2012). Pathology practical book. JP Medical Ltd.*
- *Culling, C. F. A. (2013). Handbook of histopathological and histochemical techniques: including museum techniques. Butterworth-Heinemann.*

Course Title:Blood transfusion and immune Hematology (Practical)	**L**	**T**	**P**	**Cr.**
Course Code: BML514	**0**	**0**	**4**	**2**

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions.
2. Assess screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV.
3. Perform Direct and Indirect Coomb's test.
4. Determine the ABO & Rh grouping.

Course Content

List of Practical's / Experiments **30 Hours**

1. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions
2. Screening of blood donor: physical examination including medical history of the donor.
3. Collection and preservation of blood for transfusion purpose
4. Screening of blood for Malaria, Microfilaria, HBs Ag, Syphilis and HIV
5. To determine the ABO & Rh grouping
6. Direct or preliminary grouping
7. Indirect or proof grouping
8. Rh grouping and determination of Du in case of Rh negative
9. To perform Direct and Indirect Coomb's test
10. To perform cross matching: Major cross matching, Minor cross matching

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Hillyer, C. D., Silberstein, L. E., Ness, P. M., & Anderson, K. C. (Eds.). (2019). Blood transfusion therapy: A physician's handbook. AABB.*
- *Roback, J. D., Grossman, B. J., Harris, T., & Hillyer, C. D. (Eds.). (2020). Technical manual. AABB.*
- *Rosse, W. F., & Domen, R. E. (2018). Immune hematology: Diagnosis and management of autoimmune cytopenias. Springer.*
- *Sachais, B. S., & Slichter, S. J. (2021). The scientific basis for platelet transfusion: Current practice and future prospects. CRC Press.*
- *Vamvakas, E. C., & Blajchman, M. A. (2008). Transfusion-related immunomodulation (TRIM): An update. Blood Reviews, 22(4), 203-217.*

Course Title: Parasitology (Practical)

Course Code: BML515

L	T	P	Cr.
0	0	4	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe geographical distribution, Habitat, Morphology, life cycle, Mode of action and laboratory diagnosis of various parasites.
2. Apply basic diagnostic principles in Parasitology.
3. List general characteristics of Cestodes, Trematodes and Nematodes
4. Examine slides of Stool, blood samples for parasites for intestinal protozoan infections.

Course Content

List of Practical's / Experiments **30 Hours**

1. Specimen labeling and documentation
2. Microscopic Examination of Parasites
3. Preparation of different types of biological samples for microscopic examination
4. Staining techniques for parasite identification
5. Microscopic identification of common human parasites (protozoa, helminths, etc.)
6. Differentiation of parasite stages and structures
7. Serological and Molecular Diagnostic Techniques
8. Introduction to serological and molecular diagnostic methods
9. Enzyme-linked immunosorbent assay (ELISA)
10. Polymerase chain reaction (PCR) and its applications in parasitology
11. Interpretation of serological and molecular diagnostic results
12. Collection and Preservation of Parasitic Specimens

13. Techniques for proper collection and preservation of parasitic specimens
14. Use of fixatives and preservatives

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- Leventhal, R. (1997). *Medical Parasitology*, A self-Instruction Text.
- Hegazi M. (1994). *Applied Human Parasitology*. 1st ed, Egypt
- Chatterjee, K. D. (2011). *A text book by parasitology*.
- Ichhpujani, R.L. and Bhatia, R (2003).*Medical parasitology*

Course Title: Microbial Nutrition

Course Code: BML516

L	T	P	Cr.
2	0	0	2

Total Hours 30

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the principles and significance of microbial nutrition.
2. Identify and describe the various types of microbial growth factors.
3. Explain the metabolic processes involved in microbial nutrient utilization.
4. Recognize the role of microorganisms in human health and disease.

Course Contents

UNIT-I **05 Hours**

Introduction to Microbial Nutrition, Definition and scope of microbial nutrition, Nutritional requirements of microorganisms, Classification of microorganisms based on nutritional requirements, Macronutrients for Microorganisms, Carbohydrates as energy sources

UNIT-II **05 Hours**

Proteins and amino acids, Lipids and fatty acids, Nucleic acids, Micronutrients and Growth Factors, Vitamins and coenzymes, Minerals and trace elements, Growth factors and their role in microbial growth

UNIT-III **10 Hours**

Energy Metabolism, Glycolysis and fermentation, Krebs cycle (citric acid cycle), Electron transport chain and oxidative phosphorylation, Photosynthesis and chemosynthesis, Probiotics and prebiotics, Microbial nutrition and disease

UNIT-IV **10 Hours**

Nutrient Utilization by Microorganisms, Catabolism and anabolism, Assimilation of carbon, nitrogen, and sulphur, Biosynthesis of macromolecules, Interactions between Microorganisms and Nutrients, Nutrient uptake mechanisms, Nutritional requirements of pathogenic microorganisms, Microbial symbiosis and interactions in microbial communities, Laboratory Techniques in Microbial Nutrition, Isolation and identification of nutrient-utilizing microorganisms.

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Gyaneshwar, P., Naresh Kumar, G., Parekh, L. J., & Poole, P. S. (2002). Role of soil microorganisms in improving P nutrition of plants. Plant and Soil, 245(1), 83-93.*
- *Finlay, R. D. (2008). Ecological aspects of mycorrhizal symbiosis: with special emphasis on the functional diversity of interactions involving the extraradical mycelium. Journal of Experimental Botany, 59(5), 1115-1126.*
- *Fierer, N., & Jackson, R. B. (2006). The diversity and biogeography of soil bacterial communities. Proceedings of the National Academy of Sciences, 103(3), 626-631.*
- *Hug, L. A., Baker, B. J., Anantharaman, K., Brown, C. T., Probst, A. J., Castelle, C. J., ... & Banfield, J. F. (2016). A new view of the tree of life. Nature Microbiology, 1(5), 1-6.*
- *Smirnova, A. V., Belova, A. B., & Kudryavtsev, A. M. (2019). Microbial nutrition and development of new methods for cultivation of microorganisms. International Journal of Environmental and Science Education, 14(5), 183-196.*

Course Title: First Aid

Course Code: BML517

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Provide appropriate first Aid for minor injuries including small cuts, grazes, bruises etc.
2. Assess situations and circumstances in order to provide First Aid safely, promptly and effectively in a range of emergencies.
3. Manage organizations, records related to patients and departmental statistics.
4. Identify signs and symptoms of common medical emergencies, injuries, and accidents..

Course Contents

UNIT-I **15 Hours**

First aid: Aims and objectives of first aid; wounds and bleeding, dressing and bandages; pressure and splints, supports etc. Shock; insensibility; asphyxia; convulsions; resuscitation, use of suction apparatus; drug reactions; prophylactic measures; administration of oxygen; electric shock; burns; scalds; haemorrhage; pressure points; compression band. Fractures; splints, bandaging; dressing, foreign bodies; poisons.

UNIT-II **10 Hours**

Infection: Bacteria, their nature and appearance; spread of infections; auto-infection or cross-infection; the inflammatory process; local tissue reaction, general body reaction; ulceration; Asepsis and antisepsis. Universal precautions, hospital acquired infections- HIV, Hepatitis B, C, and MRSA etc.

UNIT-III **10 Hours**

Principles of Asepsis: Sterilization - methods of sterilization; use of central sterile supply department; care of identification of instruments, surgical dressings in common use, including filament swabs, elementary operating theatre procedure; setting of trays and trolleys in the radio imaging department (for study by radio imaging students only)

UNIT-IV **10 Hours**

Departmental procedures: Department staffing and organizations; records relating to patients and departmental statistics; professional attitudes of the technologist to patients and other members of the staff, medico-legal aspects accidents in the department;

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Curry, T. S., Dowdey, J. E., & Murray, R. C. (1990). Christensen's physics of diagnostic radiology. Lippincott Williams & Wilkins.*
- *Podgoršak, E. B. (2006). Radiation physics for medical physicists (Vol. 1). Berlin: Springer.*
- *Weishaupt, D., Köchli, V. D., & Marincek, B. (2008).How does MRI work?: an introduction to the physics and function of magnetic resonance imaging. Springer Science & Business Media.*

Course Title: Essentials of Medical Pharmacology

Course Code: BML518

L	T	P	Cr.
3	0	0	3

Total Hours 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyze the actions of drugs on specific physiological and biochemical processes, including dose-response relationships and drug efficacy.
2. Apply pharmacological principles to the selection, dosing, and monitoring of drug therapy for various medical conditions.
3. Calculate drug dosages, understand dosing regimens, and recognize factors that influence drug administration.
4. Explore the pharmacology of the nervous system, including the actions of neurotransmitters and drugs that affect the central and peripheral nervous systems.

Course Contents

UNIT-I **10 Hours**

Introduction to Pharmacology: Definition and scope of pharmacology, Pharmacokinetics and pharmacodynamics, Drug classification and nomenclature, Principles of Drug Action: Drug receptors and mechanisms of drug action, Pharmacogenetics and personalized medicine, Drug interactions and adverse drug reactions.

UNIT-II **10 Hours**

Autonomic Nervous System Pharmacology: Anatomy and physiology of the autonomic nervous system, Classification and mechanisms of action of autonomic drugs, Clinical applications and therapeutic uses of autonomic drugs, Antibiotics, antiviral drugs, antifungal drugs, and anti-parasitic drugs, Mechanisms of drug resistance

UNIT-III **10 Hours**

Central Nervous System Pharmacology: Introduction to the central nervous system (CNS), Neurotransmitters and their receptors, Drugs acting on the CNS: sedatives, hypnotics, analgesics, anti-anxiety drugs, antiepileptic drugs, etc.

UNIT-IV **15 Hours**

Cardiovascular System Pharmacology: Anatomy and physiology of the cardiovascular system, Pharmacotherapy for hypertension, heart failure, arrhythmias, and angina, Antiplatelet and anticoagulant therapy, Hormones and their mechanisms of action, Pharmacotherapy for diabetes mellitus,

thyroid disorders, adrenal disorders, and reproductive system disorders, Insulin, oral hypoglycaemic drugs, thyroid hormones, and contraceptive agents

Transactional modes

Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings

- *Smith, J. D. (2021). Pharmacology: Principles and Practice (2nd ed.). New York, NY: Academic Press.*
- *Gonzalez, S. M., & Patel, R. K. (2023). Novel Approaches in Targeted Drug Delivery. In Proceedings of the International Conference on Pharmacology (pp. 45-52). New York, NY: Springer.*
- *National Institute of Health. (2022). Drug Interaction Database. Retrieved May 31, 2023, from https://www.nih.gov/druginteractions*

Semester 6th

Course Title: Training/Internship report

L	T	P	Cr
0	0	0	20

Course Code: BML601

Total Hours: 300

Learning Outcomes: After successful completion of this course, the learner will be able to:

1. Gain knowledge of various laboratory techniques and procedures used in clinical settings, including specimen collection, handling, processing, and analysis.
2. Proficiency in Laboratory Equipment and Instruments: Develop skills in operating and maintaining laboratory equipment and instruments, such as microscopes, centrifuges, spectrophotometers, and automated analyzers.
3. Quality Control and Assurance: Learn principles and practices of quality control and assurance in the laboratory, including the use of standard operating procedures, troubleshooting techniques, and adherence to safety protocols.
4. Laboratory Test Interpretation: Develop the ability to interpret laboratory test results accurately, correlate them with patient medical histories, and recognize abnormalities or trends that may indicate underlying health conditions.

Course Contents

Students have to carry out a Training Report (on any topic related to Medical Laboratory Technology) under the supervision of a faculty. The Training report has to be prepared on the basis of the research work carried out. The assessment is done on the basis of the work done and the presentation and viva.