

GURU KASHI UNIVERSITY



Bachelor of Science in Medical Laboratory Technology (BMLT)

Interdisciplinary (Annexure-IV)

Session: 2025-26

Faculty of Health & Allied Sciences

Graduate Attributes of the Programme: - Bachelor of Science in Medical Laboratory Technology (BMLT)

Type of learning outcomes	The Learning Outcomes Descriptors
Graduates should be able to demonstrate the acquisition of:	
Learning outcomes that are specific to disciplinary/inter disciplinary areas of learning	Describe the principle, working, uses and maintenance of different laboratory glassware/equipment, safety, infection control and biomedical waste management protocols.
	Collect, receive/reject and analyse human fluid samples using various techniques and equipment's available in the clinical laboratory for biochemical, pathological, microbiological, haematological and blood bank investigations, interpret, and report the patient results.
	Maintain supplies of laboratory reagents, diagnostic kits, etc, evaluate them for diagnostic suitability and maintain laboratory records as per the standard quality guidelines, perform equipment validations, calibrations, quality controls, STAT or run-by-run assessment, statistical control of observed data, monitor, screen, and troubleshoot analysers and record normal operations to maintain reliability of results.
	Demonstrate knowledge and skill to identify investigations required during emergency, critical alerts and effectively communicate the results to the health care team.
Generic learning outcomes	Complex problem-solving: Identify and resolve common issues and errors that may arise during laboratory testing.
	Critical thinking: Apply critical thinking and problem-solving skills to evaluate laboratory data, troubleshoot problems, and make informed decisions.
	Creativity: The graduates should be able to demonstrate the ability to: view a problem or a situation from multiple perspectives,
	Communication Skills: Communicate effectively with healthcare professionals, patients, and colleagues, both orally and in writing.
	Analytical reasoning/thinking: Analyze and interpret laboratory test results accurately and efficiently as well

	as correlate laboratory findings with clinical manifestations and patient history.
	Research-related skills: Apply research methodologies to investigate laboratory-related issues.
	Coordinating/collaborating with others: Collaborate effectively with members of the healthcare team to provide comprehensive patient care.
	Leadership readiness/qualities: Communicate effectively with healthcare professionals, patients, and colleagues, both orally and in writing.
	'Learning how to learn' skills: Recognize the importance of continuous learning and professional development.
	Digital and technological skills: Demonstrate the capability to use appropriate software for analysis of investigations.
	Value inculcation: Comprehend the pathophysiology of diseases and the role of laboratory investigations in their diagnosis, prognosis, and management.
	Autonomy, responsibility, and accountability: Perform a wide range of laboratory tests and procedures accurately and efficiently, including sample collection, processing, analysis, and interpretation of results.
	Environmental awareness and action: Adhere to safety regulations and ethical guidelines in laboratory practice, including handling of biological samples, hazardous materials, and patient information.
	Community engagement and service: The graduates should be able to demonstrate the capability to participate in community-engaged services/ activities for promoting the well-being of society.
	Empathy: The graduates should be able to demonstrate the ability to Demonstrate professional and ethical conduct in all aspects of laboratory practice, including respect for patient confidentiality and privacy.

Programme learning outcomes: An Undergraduate Certificate is awarded to students who have demonstrated the achievement of the outcomes located at level 4.5:

Element of the Descriptor	Programme learning out comes relating to Undergraduate Certificate
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	Basic Sciences: Demonstrate foundational knowledge of human anatomy, physiology, biochemistry, microbiology, and immunology relevant to medical laboratory testing.
	Laboratory Procedures: Understand the principles and procedures of common laboratory tests performed in hematology, clinical chemistry, microbiology, and other relevant areas.
	Quality Control: Understand the importance of quality control and quality assurance in the laboratory and basic QC procedures.
	Safety: Understand and adhere to laboratory safety protocols, including handling of biological specimens, chemicals, and equipment.
General, technical and professional skills required to perform and accomplish tasks	Technical Skills: Perform basic laboratory tests accurately and efficiently
	Equipment Handling: Operate and maintain common laboratory equipment
	Record Keeping: Maintain accurate and legible records of tests performed
	Communication: Communicate effectively with colleagues and other healthcare professionals
Application of knowledge and skills	Apply learned knowledge and skills to perform routine laboratory tests, following standard operating procedures. Recognize and report abnormal test results to the appropriate personnel. Participate in quality control activities to ensure accurate and reliable test results. Troubleshoot basic problems that may arise during laboratory testing.
Generic learning outcomes	Critical Thinking: Apply basic critical thinking skills to interpret test results and identify potential errors. Problem-Solving: Solve basic problems related to laboratory testing and equipment. Teamwork: Work effectively as part of a laboratory team. Professionalism: Demonstrate professional behavior, including

	punctuality, respect for colleagues and patients, and adherence to ethical guidelines.
Constitutional, humanistic, ethical, and moral values	Adhere to ethical principles in laboratory practice, including patient confidentiality and data integrity. Respect patient rights and dignity. Understand the importance of accurate and reliable laboratory testing for patient care.
Employability and job-ready skills, and entrepreneurs hip skills and capabilities/qualities and mindset	Demonstrate basic job-ready skills, such as punctuality, attendance, and work ethic. Understand the role of the medical laboratory technician in the healthcare system. Gain basic awareness of laboratory management and quality systems (a foundation for future growth, not full entrepreneurship at this level).
Credit requirements	The successful completion of the first year (two semesters) of the undergraduate programme of 48 credit hours followed by an exit 4-credit of internship (Total 52 Credits)
Entry requirements	10+2 Medical/Non-Medical with at least 45% in the aggregate.

** Minimum Credits required to get Certificate Course in Medical lab technology= $48 + 4 = 52$

Program Structure

SEMESTER: 1st									
Course Code	Course Title	Type of Courses	L	T	P	No . of Credits	Int.	Ext.	Total Marks
BML1100	General Anatomy	Core Course	3	0	0	3	30	70	100
BML1101	General Physiology	Core Course	3	0	0	3	30	70	100
BML1102	Basic Haematology & Haematological Techniques - I	Core Course	3	0	0	3	30	70	100
BML1103	Cell Biology and Genetics	Minor Course	2	0	0	2	30	70	100
BML1104	Introduction to Quality and Patient Safety	Skill Enhancement Course	3	0	0	3	30	70	100
BML1105	Human Rights and Duties	Multidisciplinary Course	3	0	0	3	30	70	100
BML1106	General Anatomy (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML1107	General Physiology (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML1108	Basic Haematology & Haematological Techniques - I (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML1109	English for Professionals	Ability Enhancement Course	2	0	0	2	30	70	100
VAC0001	Environment Education	Value Added Course	2	0	0	2	30	70	100
Total			21	00	06	24	330	770	1100

SEMESTER: 2nd									
Course Code	Course Title	Type of Courses	L	T	P	No . of Credits	Int.	Ext.	Total Marks
BML2150	General Microbiology	Core Course	3	0	0	3	30	70	100
BML2151	Basics of Biochemistry	Core Course	3	0	0	3	30	70	100
BML2152	Basic Haematological Techniques – II	Core Course	3	0	0	3	30	70	100
BML2153	Systematic Bacteriology	Minor Course	2	0	0	2	30	70	100
BML2154	Computer Applications	Skill Enhancement Course	3	0	0	3	30	70	100
BML2155	Nutrition	Multidisciplinary Course	3	0	0	3	30	70	100
BML2156	General Microbiology (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML2157	Basics of Biochemistry (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML2158	Basic Haematological Techniques – II (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML2159	Communication and Presentation Skills	Ability Enhancement Course	2	0	0	2	30	70	100
VAC0002	Human Values and Professional Ethics	Value Added Course	2	0	0	2	30	70	100
Total			21	00	06	24	330	770	1100

Programme learning outcomes: An Undergraduate Diploma is awarded to students who have demonstrated the achievement of the outcomes located at level 5:

Element of the Descriptor	Programme learning outcomes relating to Undergraduate Diploma
The graduates should be able to demonstrate the acquisition of:	
Knowledge and Understanding	Sciences: Demonstrate a solid understanding of human anatomy, physiology, biochemistry, microbiology, immunology, hematology, and pathology as they relate to laboratory testing.
	Laboratory Procedures: Understand the principles, procedures, and quality control measures for a broader range of laboratory tests, including those in clinical chemistry, hematology, microbiology, immunology, and other specialized areas.
	Instrumentation: Understand the principles of operation, maintenance, and troubleshooting of various laboratory instruments and equipment.
	Quality Management: Understand the principles of quality assurance and quality management systems in a medical laboratory.
	Safety and Biohazards: Demonstrate a thorough understanding of laboratory safety protocols, including handling of biological specimens, chemicals, and hazardous materials.
Skills required to perform and accomplish tasks	Technical Skills: Perform a wider range of laboratory tests accurately and efficiently, following standard operating procedures. This includes various sample collection techniques, preparation, analysis, and quality control procedures.
	Instrumentation: Operate, maintain, and troubleshoot a broader range of laboratory equipment and instruments.
	Data Analysis: Analyze and interpret laboratory data, identify trends, recognize abnormal values, and perform basic statistical calculations.
	Problem-Solving: Troubleshoot problems that may arise during laboratory testing and equipment operation.
	Record Keeping: Maintain accurate, legible, and detailed records of tests performed, results, quality control data, and equipment maintenance.
	Communication: Communicate effectively with colleagues,

	healthcare professionals, and sometimes patients, both verbally and in writing.
Application of knowledge and skills	Apply learned knowledge and skills to perform a variety of laboratory tests and procedures.
	Correlate laboratory findings with patient history and clinical manifestations (under supervision).
	Participate actively in quality control and quality assurance activities.
	Adapt to new technologies and advancements in medical laboratory testing.
Generic learning outcomes	Critical Thinking: Apply critical thinking and problem-solving skills to analyze laboratory data, interpret results, and troubleshoot problems.
	Information Literacy: Access, evaluate, and utilize scientific literature and research findings related to medical laboratory technology.
	Teamwork: Collaborate effectively with members of the laboratory team and other healthcare professionals.
	Professionalism: Demonstrate professional behavior, including punctuality, attendance, respect for colleagues and patients, adherence to ethical guidelines, and commitment to lifelong learning.
Constitutional, humanistic, ethical, and moral values	Adhere to ethical principles in laboratory practice, including patient confidentiality, data integrity, and respect for patient rights.
	Understand the importance of accurate and reliable laboratory testing for patient care and the potential consequences of errors.
	Demonstrate sensitivity to cultural and social factors that may influence patient care.
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	Demonstrate job-ready skills, such as effective communication, teamwork, problem-solving, and adaptability.
	Understand the role of the medical laboratory technician in the healthcare system and the importance of their contribution to patient care.
	Gain basic awareness of laboratory management, quality systems, and regulatory requirements. Exposure to basic business principles related to lab operations may be included.
Credit requirements	The successful completion of the 2 nd year (four semesters) of the undergraduate programme of 96 credit hours followed

	by an exit 4-credit of internship (Total 100 Credits)
Entry requirements	Passed UG Certificate course in the BSc. MLT with 48 credits hours followed by a 4-credit of internship. Or 3 years DMLT after metric or Passed 2 years DMLT after 10+2 with at least 45%o in the aggregate.

SEMESTER: 3rd									
Course Code	Course Title	Type of Courses	L	T	P	No . of Credits	Int.	Ext.	Total Marks
BML3200	Applied Bacteriology	Core Course	3	0	0	3	30	70	100
BML3201	Biochemical Metabolism	Core Course	4	0	0	4	30	70	100
BML3202	Immunology and Serology	Core Course	3	0	0	3	30	70	100
BML3203	Basic Cellular Pathology	Minor Course	2	0	0	2	30	70	100
BML3204	First Aid	Skill Enhancement Course	3	0	0	3	30	70	100
BML3205	Disaster Management	Multidisciplinary Course	3	0	0	3	30	70	100
BML3206	Applied Bacteriology (Lab)	Core Course (Practical)	0	0	2	1	30	70	100
BML3207	Immunology and Serology (Lab)	Core Course (Practical)	0	0	2	1	30	70	100
BML3208	English for Clinical Language	Ability Enhancement Course	2	0	0	2	30	70	100
Total			20	00	04	22	270	630	900

SEMESTER: 4th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BML4250	Parasitology & Mycology	Core Course	3	0	0	3	30	70	100
BML4251	Applied Haematology I	Core Course	3	0	0	3	30	70	100
BML4252	Analytical Biochemistry	Core Course	3	0	0	3	30	70	100
BML4253	Histopathology & Histopathological Techniques	Core Course	3	0	0	3	30	70	100
BML4254	Clinical Endocrinology	Minor Course	2	0	0	2	30	70	100
BML4255	Parasitology & Mycology (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML4256	Applied Haematology I (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML4257	Analytical Biochemistry (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML4258	Histopathology & Histopathological Techniques (Lab)	Core Course Practical	0	0	2	1	30	70	100
BML4259	English for Research Writing	Ability Enhancement Course	2	0	0	2	30	70	100
IKS0002	Indian Education	Value added	2	0	0	2	30	70	100

		course							
BML4260	Industrial Training (IT)*	Skill Based	0	0	0	4	30	70	100
Total			18	00	8	26	360	840	1200

Programme learning outcomes: The Bachelor's degree is awarded to students who have demonstrated the achievement of the outcomes located at level 5.5:

Element of the Descriptor	Programme learning outcomes relating to Bachelor Degree
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	Advanced Sciences: Demonstrate a comprehensive and in-depth understanding of human anatomy
	Clinical Laboratory Science: Possess a thorough understanding of the principles
	Laboratory Management: Understand the principles of laboratory management
	Research and Evidence-Based Practice: Understand the principles of research methodology
General, technical and professional skills required to perform and accomplish tasks	Advanced Technical Skills: Perform complex and specialized laboratory tests and procedures accurately and efficiently
	Data Analysis and Interpretation: Analyze and interpret complex laboratory data
	Problem-Solving and Critical Thinking: Apply advanced problem-solving and critical thinking skills to analyze complex laboratory data
	Communication and Collaboration: Communicate effectively with colleagues
	Laboratory Management Skills: Demonstrate basic skills in laboratory management
Application of knowledge and skills	Apply learned knowledge and skills to perform a wide range of complex laboratory tests and procedures.
	Correlate laboratory findings with patient history, clinical manifestations, and other diagnostic data.
	Participate actively in quality control and quality assurance programs.
	Evaluate and implement new laboratory technologies and methodologies.
	Contribute to research projects related to medical laboratory science.
Generic learning outcomes	Critical Thinking and Problem-Solving: Apply advanced critical thinking and problem-solving skills to analyze complex data, interpret results, troubleshoot problems, and make informed decisions.
	Information Literacy and Research Skills: Access, evaluate, and utilize scientific literature and research findings related

	to medical laboratory technology. Conduct basic research studies.
	Communication and Teamwork: Communicate effectively with diverse audiences, both orally and in writing. Collaborate effectively as part of interprofessional teams.
	Lifelong Learning and Professional Development: Recognize the importance of continuous learning and professional development in the rapidly evolving field of medical laboratory technology.
Constitutional, humanistic, ethical, and moral values	Adhere to the highest ethical principles in laboratory practice, including patient confidentiality, data integrity, respect for patient rights, and professional conduct.
	Understand the social and ethical implications of medical laboratory testing.
	Demonstrate cultural sensitivity and respect for diversity in patient care.
Employability and job-ready skills, and entrepreneurial skills and capabilities/qualities and mindset	Demonstrate strong job-ready skills, including effective communication, teamwork, problem-solving, adaptability, and leadership.
	Understand the role of the medical laboratory scientist in the healthcare system and their contribution to patient care.
	Possess a deeper understanding of laboratory management, quality systems, regulatory requirements, and accreditation processes. May be exposed to entrepreneurship concepts related to lab services.
Credit requirements	The successful completion of the 3rd year (six semesters) of the undergraduate programme of 148 credit hours followed by an exit 4-credit of internship (Total 152 Credits)
Entry requirements	Passed UG Diploma in the BSc. MLT with 96 credits hours followed by a 4-credit of internship. (Total 100)

SEMESTER: 5th									
Course Code	Course Title	Type of Courses	L	T	P	N o. of Credits	Int.	Ext.	Total Marks
BML5300	Virology	Core Course	3	0	0	3	30	70	100
BML5301	Blood Banking	Core Course	3	0	0	3	30	70	100
BML5302	Clinical Biochemistry - 1	Core Course	3	0	0	3	30	70	100
BML5303	Hospital Administration	Core Course	3	1	0	4	30	70	100
BML5304	Research Methodology & Biostatistics	Core Course	4	0	0	4	30	70	100
BML5305	Cytology & Cytotechnology	Core Course	3	0	0	3	30	70	100
BML5306	Clinical Enzymology and Automation	Minor Course	2	0	0	2	30	70	100
BML5307	Virology (Practical)	Core Course	0	0	2	1	30	70	100
BML5308	Blood Banking (Practical)	Core Course	0	0	2	1	30	70	100
BML5309	Clinical Biochemistry – 1 (Practical)	Core Course	0	0	2	1	30	70	100
BML5310	Cytology & Cytotechnology (Lab)	Core Course (Practical)	0	0	2	1	30	70	100
Total			21	01	8	26	330	770	1100

SEMESTER: 6th									
Course Code	Course Title	Type of Courses	L	T	P	No . of Credits	Int.	Ext.	Total Marks
BML6350	Diagnostic Molecular Biology	Core Course	3	0	0	3	30	70	100
BML6351	Advanced Diagnostic Techniques	Core Course	3	0	0	3	30	70	100
BML6352	Applied Haematology II	Core Course	3	0	0	3	30	70	100
BML6353	Clinical Biochemistry – II	Core Course	3	0	0	3	30	70	100
BML6354	Basics of Hospital Skill Learning	Minor Course	2	0	0	2	30	70	100
BML6355	Diagnostic Molecular Biology (Practical)	Core Course	0	0	2	1	30	70	100
BML6356	Advanced Diagnostic Techniques (Practical)	Core Course	0	0	2	1	30	70	100
BML6357	Applied Haematology II (Practical)	Core Course	0	0	2	1	30	70	100
BML6358	Clinical Biochemistry – II (Practical)	Core Course	0	0	2	1	30	70	100
IKS0006	Indian Health Sciences	Value added course	2	0	0	2	30	70	100
BML6359	Research Publication	Ability Enhancem	2	0	0	2	30	70	100

	Ethics and IPR	ent Course							
BML6360	Industrial Training (IT)*	Internship	0	0	0	4	30	70	100
Total			18	00	8	26	360	840	1200

*Industrial Training of 4 weeks in a hospital before commencing the classes of 6th Semester during the break after competing 5th semester examination. Training report by the student to be submitted within one week of start of 6th Semester. Viva-Voce examination to be held within 3 weeks of the start of 6th semester.

#Exit 3: Bachelor's Degree Course-Student can exit after completion of 3rd year having secured 148 Credits and provided 4 Credits of internship of 8 weeks duration as per scheme of the programme, will be awarded a Bachelor's Degree in Medical Laboratory Technology.

Programme learning outcomes: The Bachelor's degree (Honors with Research) or the Post-Graduate Diploma is awarded to students who have demonstrated the achievement of the outcomes located at level 6:

Element of the Descriptor	Programme learning outcomes relating to Bachelor Degree (Honors/Honors with Research)
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	Advanced and Specialized Knowledge: Possess deep and comprehensive knowledge of core disciplines (anatomy, physiology, biochemistry, microbiology, immunology, hematology, pathology, genetics) and specialized areas within medical laboratory science.
	Research Methodology (Research-focused programs): Demonstrate a strong understanding of research methodologies, experimental design, data analysis, and scientific writing.
	Evidence-Based Practice: Critically evaluate scientific literature and apply evidence-based principles to laboratory practice.
	Laboratory Management and Quality Systems: Understand advanced laboratory management principles, quality management systems (ISO 15189), regulatory compliance, accreditation processes, and resource management.
General, technical and professional skills required to perform and accomplish tasks	Advanced Technical Skills: Perform and interpret a wide range of complex and specialized laboratory tests and procedures with a high degree of accuracy and precision.
	Instrumentation and Technology: Operate, maintain, troubleshoot, and calibrate sophisticated laboratory equipment and instruments, including advanced diagnostic technologies.
	Data Analysis and Interpretation: Analyze and interpret complex laboratory data, including statistical analysis, data mining, and bioinformatics. Correlate lab findings with clinical information.
	Critical Thinking and Problem-Solving: Apply advanced critical thinking and problem-solving skills to analyze complex cases, troubleshoot laboratory problems, and make informed decisions.
	Communication and Collaboration: Communicate effectively with diverse audiences, including healthcare professionals, patients, and the public. Collaborate effectively within interprofessional teams.

	Research Skills (Research-focused programs): Design, conduct, and analyze research projects related to medical laboratory science. Present research findings effectively.
	Leadership and Management Skills: Demonstrate leadership potential and basic skills in laboratory management.
Application of knowledge and skills	Apply knowledge and skills to perform advanced laboratory tests, interpret complex results, and contribute to patient diagnosis and management.
	Critically evaluate and implement new laboratory technologies and methodologies.
	Contribute to research projects and advance knowledge in medical laboratory science (Research-focused programs).
	Participate in quality improvement initiatives and ensure the accuracy and reliability of laboratory testing.
Generic learning Outcomes	Critical Thinking and Analytical Skills: Demonstrate advanced critical thinking, analytical, and problem-solving skills.
	Information Literacy and Research Skills: Access, evaluate, and synthesize scientific literature and research findings. Conduct independent research (Research-focused programs).
	Communication and Teamwork: Communicate effectively with diverse audiences, both orally and in writing. Work effectively in teams and demonstrate leadership skills.
	Lifelong Learning and Professional Development: Demonstrate a commitment to lifelong learning and professional development in the rapidly evolving field.
Constitutional, humanistic, ethical, and moral values	Adhere to the highest ethical principles in laboratory practice, including patient confidentiality, data integrity, respect for patient rights, and professional conduct.
	Understand the social, ethical, and legal implications of medical laboratory testing.
	Demonstrate cultural sensitivity and respect for diversity in patient care.
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	Possess strong job-ready skills
	Be prepared for leadership roles in clinical laboratories
	Demonstrate an understanding of laboratory management

Credit requirements	The successful completion of the 4 th year (eight semesters) of the undergraduate programme of 196 credit hours.
Entry requirements	Bachelor's Degree with 148 credits hours followed by a 4-credit of internship. After completing the requirement of a 3 years bachelor's degree, candidates who meet a minimum 75% marks or its equivalent grade will be allowed to continue studies in the 4th year of the Under Graduate programme leading to the Bachelor's Degree with Research.

*The 7th and 8th semester of the Bachelor of Science in Medical Laboratory Technology (BSc.MLT) program focuses on preparing students for professional practice through internships and research work. This semester is crucial as it marks the transition from academic learning to practical application in real-world settings.

Internship and Research Overview:

- During the 7th & 8th semester, medical laboratory students engage in both internship and research activities. This period provides students with the opportunity to apply their academic knowledge in clinical settings, interact with patients, and gain hands-on experience. In parallel, students are expected to undertake a research project, contributing to the body of knowledge in the field of laboratory technology.
- In 7th semester the student will present 1 seminar and submit 1 case study which would be related to his/her topic of research and submission of Synopsis proceed to 8th sem. Dissertation I will include Synopsis approval from Doctoral Advisory Committee (DAC) will be taken by the student and after that it will send to Institutional Research Committee (IRC), followed by Institutional Ethical Committee (IEC) for approval.
- In 8th semester as a part of dissertation phase II, dissertation will be evaluated for **300 marks** on the parameter laid down in the proforma for the evaluation in which the students will give a presentation on the dissertation and an open viva-exam examination will be conducted by the external examiner. Student will submit three hard copies of her/his dissertation along with soft copy as PDF file to the Department and 1 Review & Research paper based on his/her research work.
- The Anti-plagiarism policy of the university is to be strictly followed by the candidate and the supervisor.

SEMESTER: 7th

Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BML7400	Internship (Six months)	Skill Based	0	0	0	8	30	70	100
BML7401	Dissertation (Phase I)	Skill Based	0	0	0	12	30	70	100
BML7402	Seminar	Skill Based	0	0	8	4	30	70	100
BML7403	Self-Development Report	Ability Enhancement Course	0	0	4	2	30	70	100
Total			0	0	12	26	120	280	400

Dissertation (Phase) I will include Synopsis approval from Doctoral Advisory Committee (DAC) will be taken by the student and after that it will send to Institutional Research Committee (IRC), followed by Institutional Ethical Committee (IEC) for final approval.

Self-Development Report will include submission of one case study.

SEMESTER: 8th									
Course Code	Course Title	Type of Course	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BML8450	Internship (Six months)	Skill Based	0	0	0	8	30	70	100
BML8451	Dissertation (Phase II)	Skill Based	0	0	0	12	30	70	100
BML8452	Self-Development Report	Ability Enhancement Course	0	0	4	2	30	70	100
Total			0	0	4	22	90	210	300
Grand Total			119	01	48	196			

Self-Development Report- Student will present progress report of research work in the third month of 8th semester.

Dissertation (Phase) II - Dissertation will be evaluated for **300 marks** on the parameter laid down in the proforma for the evaluation in which the students will give a presentation on the dissertation and an open viva-exam examination will be conducted by the external examiner. Student will submit three hard copies of her/his dissertation along with soft copy as PDF file to the Department and 1 Review & Research paper based on his/her research work.

Semester – 1st

Course Title: General Anatomy	L	T	P	Cr.
Course Code: BML1100	3	0	0	3

Total Hours: 45

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

- 1.** Identify and locate major anatomical structures.
- 2.** Describe the organization of human body systems.
- 3.** Correlate anatomical structures with physiological functions.
- 4.** Apply anatomical knowledge to clinical laboratory procedures.
- 5.** Demonstrate the various disabilities of body of parts and their consequences.

Course Content**UNIT I****10 Hours**

- Basic unit of body - Cell The anatomical organization of body cells, tissues, organs, organ systems, Membranes and glands in human body.
- Introduction to different types of tissues: Epithelial Tissue, Muscular Tissue, Nervous Tissue
- Different types of organ systems. Brief Introduction of different types of body fluids, secretions and excretions
- Skeletal system: bones, joints and muscles.

UNIT II**8 Hours**

- Digestive Organs:
 - Tongue
 - Teeth
 - Oral cavity
 - Pharynx
 - Oesophagus
 - Stomach
 - Small intestine
 - Large intestine
 - Liver, Pancreas and Spleen

UNIT III**12 Hours**

- Respiratory Organs:
 - Nasopharynx
 - Oropharynx
 - Larynx
 - Trachea

- Bronchi
- Lungs
- Thoracic cavity
- Pleura and Pleural cavity
- Circulation System: Structure of Heart and Brief introduction of main blood vessels.

UNIT IV**15 Hours**

- Reproductive Organs Male and Female Gonads
- Nervous system and Sense organs: Brief Introduction of Central Nervous System and Peripheral Nervous System
- Anatomy of Brain, Spinal Cord, Nerves, Eye, Ear, Olfactory Receptors, Gustatory Receptors
- Excretory Organs:
 - Cortex and medulla of Kidney
 - Ureter
 - Urinary Bladder Urethra (male and female)

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Anatomy & Physiology: Ross and Wilson*
- *Anatomy and Physiology: N Murgesh*
- *Anatomy and Physiology for nurses: Evelyn Pearce*
- *Anatomy and Physiology for nurses: Sears*
- *Anatomy and Physiology for nurses: Pearson*
- *Human Anatomy: Harie R. Berasari*

Course Title: General Physiology	L	T	P	Cr.
Course Code: BML1101	3	0	0	3

Total Hours: 45

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

1. Identify and describe the major organ systems and their functions.
2. Explain the physiological mechanisms that maintain homeostasis.
3. Correlate physiological processes with common clinical laboratory findings.
4. Apply knowledge of physiological principles to understand disease processes.
5. Demonstrate the various disabilities of body of parts and their consequences.

Course Content

UNIT I

7 Hours

- Nutrition- Different types of Nutrients and Vitamins
- Integumentary system: Structure of Skin and its functions.
- Digestive system: Physiology of digestion of food and its absorption.

UNIT II

15 Hours

- Lymphatic system: Different types of body fluids and their functions Spleen, lymph node and R.E. system
- Excretory System: Urine formation, osmoregulation and counter current mechanism.
- Cardiovascular system: Origin and regulation of heart beat, cardiac cycle, electrocardiogram, cardiac output, blood pressure and micro-circulation.

UNIT III

15 Hours

- Respiratory system- Transport of O₂ and CO₂, Oxygen dissociation curve of haemoglobin, Bohr effect, chloride (-) shift, Haldane effect
- Muscular System: Ultra structure and physiological basis of skeletal muscle contractions.
- Reproductive System- Brief Introduction to Female Reproductive System and Male Reproductive System Fertilization and Gametogenesis.

UNIT IV

8 Hours

- Neural Physiology- Structure of neuron, resting membrane potential, origin and propagation of impulse along the axon, synapse and myoneural junction.

- Endocrine System- Structure, and functions of hormones of thyroid, parathyroid, adrenal, pineal, hypothalamus, pituitary, pancreas, gonads, thymus.
- Hormones of alimentary canal and kidney.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Textbook of Medical Physiology Guyton and Hall*
- *Anatomy & Physiology Ross and Wilson*
- *Anatomy and Physiology N Murgesh*
- *Anatomy and Physiology for nurses Evelyn Pearce*
- *Anatomy and Physiology for nurses Sears*
- *Anatomy and Physiology for nurses Pearson*
- *Anatomy and Physiology: Understanding the Human Body Clark*
- *Physiology & Health Education Gandhi & Goel*
- *Endocrinology Headley*
- *Human Physiology Andrew Davis*
- *Manual of Endocrinology and Metabolism Norman Levin*

Course Title: Basic Haematology & Haematological Techniques - I	L	T	P	Cr.
Course Code: BML1102	3	0	0	3

Total Hours: 45

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

1. Learn blood cells morphology and diseases related to cells abnormalities.
2. Identify common hematological abnormalities.
3. Apply appropriate techniques for blood sample collection and processing.
4. Understand the principles of basic coagulation testing.
5. Use of appropriate anticoagulants and their merits and demerits.

Course Content

UNIT-I 10 Hours

- Introduction to Hematology: Definition, Importance, Important Equipment Used, Lab safety and Instrumentation, Blood, its Components Formation (Erythropoiesis, Leucopoiesis, Thrombopoiesis), Composition, Function.

UNIT-II 9 Hours

- Anticoagulants, Preservation of Blood: Various Anticoagulants, Their Uses, Mode of Action, Their Merits and Demerits, Collection and Preservation of Blood for Various Hematological Investigations.

UNIT-III 15 Hours

- Hematological Instrumentations: Clinical Significance, Errors involved in the Haemoglobinometry, Haemocytometry, Procedures for Cell Counts I.E. TLC, DLC, ESR, PCV/Haematocrit Value, Red Cell Indices (RCI), Absolute Eosinophil Count, Reticulocyte Count Platelet Counts (Visual as well as Electronic).

UNIT-IV 11 Hours

- Blood Morphology & Staining's: Morphology of Normal Blood Cells and Their Identifications, Romanowsky's Dyes (Giemsa, Leishman, Wright's, Field's, Jsb)- Principle, Composition, Preparation and Procedure, Preparation of Blood Films- Types, Methods of Preparation), Thick and Thin Smear.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based

Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *K.L. Mukherjee, 'Med. Lab. Technology', Volume-I.*
- *Paraful B. Godkar, 'Med. Lab. Technology'.*
- *Ramnik Sood, 'Med. Lab. Technology Methods and Interpretation', 5th Edn.*
- *Christopher A. Ludlam, 'Clinical Hematology'.*

Course Title: Cell Biology and Genetics	L	T	P	Cr.
Course Code: BML1103	2	0	0	2

Total Hours: 30

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

1. Identify and differentiate cellular components and their functions.
2. Explain the principles of Mendelian and molecular genetics & apply knowledge of genetic inheritance to understand disease transmission.
3. Perform and interpret basic laboratory techniques related to cell biology and genetics.
4. Demonstrate understanding of the role of genetics in health and disease.
5. Apply the knowledge while evaluating blood parameters.

Course Content

UNIT-I

5 Hours

- Introduction Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homeostasis, growth and reproduction, adaptation, survival, death).
- Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Speciation and Isolation (geographical and reproductive); Origin of species.

UNIT-II

5 Hours

- Ecology and Environment Atmosphere; Hydrosphere; Lithosphere; Abiotic and Biotic components of Ecosystem; Biogeochemical cycles of Carbon, Nitrogen and Oxygen; Food Chain and Food web.
- Diversity of Life Diversity of living organisms, Systematic; Need, history and types of classification (artificial, natural, polygenetic); biosystematics; binomial nomenclature; Two kingdom system, Five kingdom System, their merits and demerits, status of bacteria and virus; Morphology of animals - salient features of pathogenic microbes, protozoan, helminthes and insects structure and function of tissues - epithelial, connective, muscular and nervous.

UNIT-III

5 Hours

- Cell and Cell Division Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell;

unicellular and multicellular organisms; Ultrastructure of prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (FluidMosaic model); membrane transport; cellular movement (exocytosis, endocytosis); cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes.

- Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, nucleotides, nucleic acids (DNA and RNA); Enzymes (Properties, chemical nature and mechanism of action); vitamins, hormones and steroids.

Unit IV

5 Hours

- Genetics Continuity of life - heredity, variation; Mendel's laws of inheritance, chromosomal basis of inheritance; other patterns of inheritance - incomplete dominance, multiple allelism, quantitative inheritance.
- Chromosomes - bacterial cell and eukaryotic cell; parallelism between genes and chromosomes; genome, linkage and crossing over; gene mapping; recombination; DNA as a genetic material - its structure and replication; structure of RNA and its role in protein synthesis

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *The Cell – A Molecular Approach*, Cooper & Hausman, ASM Press, 2004.
- *Cell and molecular biology*, EDP De Robertis, EMF De Robertis, Lea & Febiger Intl. ed. 1991.
- *Molecular Biology of the Cell*, B. Alberts, et al., Garland Science, 4th ed. 2002.
- *Molecular Cell Biology Hardcover*, James E. Darnell, Harvey Lodish, David Baltimore, 1999

Course Title: Introduction to Quality and Patient Safety	L	T	P	Cr.
Course Code: BML1104	3	0	0	3

Total Hours: 45

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

1. To understand the basics of emergency care and life support skills and to Manage an emergency including moving a patient
2. To help prevent harm to workers, property, the environment and the general public.
3. To provide a broad understanding of the core subject areas of infection prevention and control.
4. To provide knowledge on the principles of on-site disaster management.
5. To maintain the quality in patient care.

Course Content

UNIT I

10 Hours

- Quality assurance and management – Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Introduction to NABH guidelines
- Basics of emergency care and life support skills - Basic life support (BLS), Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One and Two-rescuer CPR

UNIT II

10 Hours

- Bio medical waste management and environment safety -Definition of Biomedical Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including color coding), Liquid BMW, Radioactive waste, Metals/ Chemicals / Drug waste, BMW Management & methods of disinfection, Modern technology for handling BMW, Use of Personal protective equipment (PPE), Monitoring & controlling of cross infection (Protective devices)

UNIT III

12 Hours

- Infection prevention and control - Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)], Prevention & control of common healthcare associated infections, Components of an effective infection control program, Guidelines (NABH and JCI) for Hospital Infection Control

UNIT IV**13 Hours**

- Antibiotic Resistance - History of Antibiotics, How Resistance Happens and Spreads, Types of resistance- Intrinsic, Acquired, Passive, Trends in Drug Resistance, Actions to Fight Resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance
- Disaster preparedness and management - Fundamentals of emergency management, psychological impact management, Resource management, Preparedness and risk reduction, information management, incident command and institutional mechanisms.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Washington Manual of Patient Safety and Quality Improvement Paperback – 2016 by Fondahn (Author)*
- *Understanding Patient Safety, Second Edition by Robert Wachter (Author)*
- *Handbook of Healthcare Quality & Patient Safety Author : Girdhar J Gyani, Alexander Thomas*
- *Researching Patient Safety and Quality in Healthcare: A Nordic Perspective Karina Aase, Lene Schibevaag*
- *Old) Handbook Of Healthcare Quality & Patient Safety by Gyani Girdhar J (Author)*
- *Handbook of Healthcare Quality & Patient Safety by .Gyani G J/Thomas A*

Course Title: Human Rights and Duties	L	T	P	Cr.
Course Code: BML1105	3	0	0	3

Total Hours: 45

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

1. Identify and respect the ethical principles related to patient confidentiality and informed consent.
2. Demonstrate awareness of legal frameworks governing medical laboratory practice and blood banking.
3. Recognize and uphold the fundamental human rights of all individuals, regardless of background.
4. Apply principles of non-discrimination and equality in healthcare delivery.
5. Understand and fulfill the professional duties and responsibilities associated with medical laboratory technology.

Course Content

UNIT-I

15 Hours

Introduction to Human Rights, Definition and historical evolution of human rights, Universal Declaration of Human Rights (UDHR) and its significance, Cultural relativism vs. universalism in human rights discourse, Theories of natural law, social contract, and human dignity, Debates on the universality and cultural specificity of human rights, Relationship between rights and moral duties.

UNIT-II

10 Hours

International human rights law: treaties, conventions, and customary law, Regional human rights systems (e.g., European Convention on Human Rights, African Charter on Human and Peoples' Rights), National constitutions and domestic protection of human rights, right to life, liberty, and security, Freedom of expression, assembly, and association, right to a fair trial and due process.

UNIT-III

10 Hours

Right to education, healthcare, and social security, right to work, just and favorable conditions of work, and adequate standard of living, Challenges in realizing economic and social rights, Rights of indigenous peoples, Rights of minorities and marginalized groups, Intersectionality and multiple forms of discrimination.

UNIT-IV**10 Hours**

Human rights violations in armed conflicts and humanitarian crises, Gender equality and women's rights, Rights of refugees, migrants, and stateless persons, Strategies for promoting and defending human rights, Role of civil society organizations, NGOs, and grassroots movements, Ethical dilemmas and challenges in human rights advocacy

Transactional modes: Video based teaching, Collaborative teaching, Case based teaching, Question-Answer

Suggested readings

- *"The Idea of Human Rights" by Charles R. Beitz*
- *"Just and Unjust Wars" by Michael Walzer*
- *"The Ethics of Authenticity" by Charles Taylor*
- *"Global Justice: A Cosmopolitan Account" by Gillian Brock*

Course Title: General Anatomy (Lab.)	L	T	P	Cr.
Course Code: BML1106	0	0	2	1

Total Hours: 30

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

- 1.** Identify and locate major anatomical structures.
- 2.** Describe the organization of human body systems.
- 3.** Correlate anatomical structures with physiological functions.
- 4.** Apply anatomical knowledge to clinical laboratory procedures.
- 5.** Demonstrate the disorders due to disability in anatomy of body.

Course Content

List of Practical's / Experiments:

1. Demonstration of anatomical position, anatomical planes, levels of organization in the body, organ systems, skeleton, cavities of the body.
2. Demonstration of various tissues from permanent slides. (i) Epithelial tissue (ii) Connective tissue. (iii) Muscular tissue (iv) Nervous tissue
3. Demonstration of individual bone.
4. Demonstration of respiratory system from chart.
5. Demonstration of cardiovascular system from chart.
6. To study digestive system from charts and TS of liver, spleen and pancreas from permanent slides.
7. Study of Urinary system (charts)
8. Study of Genital system (male & female) from charts and TS of testis and ovary from permanent slides.
9. To study nervous system (From models / charts)
10. Demonstration of eye, nose, ear and tongue from model and charts.

Course Title: General Physiology (Lab.)	L	T	P	Cr.
Course Code: BML1107	0	0	2	1

Total Hours: 30

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

1. Identify and describe the major organ systems and their functions.
2. Explain the physiological mechanisms that maintain homeostasis.
3. Correlate physiological processes with common clinical laboratory findings.
4. Apply knowledge of physiological principles to understand disease processes.
5. Demonstrate the disorders related to various body parts.

Course Content

List of Practical's / Experiments:

1. Introduction to Basic physiological terminology,
2. Determination of heart rate and pulse rate.
3. Measurement of Blood pressure with sphygmomanometer.
4. To study different cell types.
5. Electro cardio gram (ECG)
6. To study circulatory system from charts and TS of artery and vein from permanent slides.
7. Demonstration of cell division i.e., mitosis and Meiosis from permanent mounted slides.
8. To study various body fluids.
9. Peak expiratory flow rate (PEFR)
10. Determination of blood group.

Course Title: Basic Haematology & Haematological Techniques-I (Lab.)	L	T	P	Cr.
Course Code: BML1108	0	0	2	1

Total Hours: 30

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

1. Perform accurate blood cell counts and differentials.
2. Identify common hematological abnormalities.
3. Apply appropriate techniques for blood sample collection and processing.
4. Understand the principles of basic coagulation testing.
5. Use of safety precautions while working in laboratory.

Course Content

List of Practical's / Experiments:

1. Demonstration of equipment used in clinical field: Microscope, Blood cell, counter, Sahil's apparatus, calorimeter.
2. Hb Estimation: Sahil's methods, Cyanmethaemoglobin, Oxyhaemoglobin methods.
3. TLC, DLC, platelet and Reticulocyte, Absolute Eosinophil counts.
4. Preparation of smear and staining with Giemsa and Leishman stain.
5. Calculation of Red Cell Indices (RCI).
6. Packed cell volume (Macro and Micro methods).
7. ESR (Wintrobe and Westergren methods).

Course Title: English for Professionals	L	T	P	Cr.
Course Code: BML1109	2	0	0	2

Total Hours: 30

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

1. Demonstrate effective patient communication.
2. Produce clear and concise medical documentation.
3. Interpret and analyze medical texts and research.
4. Participate confidently in professional discussions and presentations.
5. Use the skills to communicate to patients as well as doctors.

Course Content

UNIT I

7 Hours

- Etiquette – Telephone, Table (Different ways of enhancing oneself)
 - Parts of Speech Tens Vocabulary.
 - Synonyms.
 - Antonyms.
 - One word substitute.
 - Homophones.
 - Homonyms.

UNIT II

7 Hours

- Composition
 - Orientation to different types of letter – (Social, business letter, applying for a job, for higher studies, Preparing curriculum vitae, subscribing to a journal, letters to the Editor).
 - Essay writing – Descriptive, Narrative and Reflective.
 - Précis or Summary writing
 - Report writing (with special stress on scientific/technical reports, preparing field/observation report).

UNIT III

7 Hours

- Practical/ Spoken English
- Front Desk management, Fixing appointments, getting information – Managing medical representatives, able to answer FAQs, lab reports writing, telephoning in a hospital: the object is to practice fluent conversation
 - JAM session.
 - Conversation.

- Group discussion.
- Role-plays.
- Conversation. Group discussion.
- Presentation.
- Role plays.

UNIT IV

9 Hours

- Grammar
 - Narration.
 - Voice change (Use of passive voice particularly in scientific and official writing).
 - Use of articles and preposition.
 - Figures of speech.
 - Vocabulary
 - The language of Doctor and Patient.
 - General description and Medical description.
 - Medical terminology – roots.
 - Prefixes and suffixes.
 - Medical abbreviations.
 - Punctuation.
 - Common errors in English.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Loveleen Kaur, 'Communication Skills' Satya Prakashan Publication.
- Narinder Kumar Bodhraj, 'Business Communication', Kalyani Publishers, 2011.
- S.P. Dhanavel, 'English & communication Skills for the Students of Science & Engineering' Orient blackswan publication, 2009.
- Indrajit Bhattacharya, 'An Approach to Communication Skills'.
- Chissie Wright, 'Handbook of Practical Communication Skills'.

Course Title: Environment Education	L	T	P	Cr.
Course Code: VAC0001	2	0	0	2

Total Hours: 30

Course Learning Outcomes: After completing all the units, students will learn:

1. The concept of Environmental Science, its components, types of natural resources, their distribution, and usage, with a focus on India.
2. The factors impacting biodiversity loss and ecosystem degradation in India and the world.
3. Understand environmental laws for monitoring pollution.
4. Principles guiding human responsibility toward the environment.
5. Understand basic concepts related to ecosystems, biodiversity, climate change, pollution, natural resources, and sustainability.

Course Content

Unit-I

6 Hours

Human – Environment Interaction, Natural Resources, and Sustainable Development

The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowledge and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. Environmental Ethics and emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and Rio Summit. Natural resources: Definition and Classification. Microbes as a resource; Status and challenges. Environmental impact of over-exploitation, issues and challenges; Water scarcity and Conflicts over water. Mineral resources and their exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation. Energy resources: Sources and their classification. Implications of energy use on the environment. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.

Unit-I

6 Hours

Biodiversity Conservation and Environmental Issues

Biodiversity as a natural resource; Levels and types. Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories. Major ecosystem types in India, their services, classification, significance and characteristics of forests, wetlands, grasslands, agriculture, coastal and marine; Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change. Major conservation policies: in-situ and ex-situ approaches; National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation. Environmental issues and scales: micro-, meso-, synoptic and planetary scales; Temporal and spatial extents of local, regional, and global phenomena. Pollution: Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog. Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact. Global change: Ozone layer depletion; Natural Disasters – Natural and Man-made (Anthropogenic).

Unit-III

8 Hours

Environmental Pollution, Health, Climate Change: Impacts, Adaptation and Mitigation

Definition of pollution; Point and non-point sources. Air pollution: sources, Impacts, Primary and Secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); Indoor air pollution; National Ambient Air Quality Standards. Water pollution: Sources; River, lake and marine pollution, groundwater pollution, impacts; Water quality parameters and standards. Soil pollution: sources and pollutants. Solid and hazardous waste, its impacts. Noise pollution: Definition, Unit of measurement, sources, noise standards; adverse impacts. Thermal and Radioactive pollution: Sources and impacts. Climate change: natural variations in climate due to greenhouse gas emission- past, present & future. Structure of atmosphere. Projections of global climate change with special reference to temperature, rainfall, climate variability and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent. Impacts, vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests, natural ecosystems, animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change.

Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity and carbon neutrality; National and international policy instruments for mitigation, decarbonizing pathways and net zero targets for the future; Energy efficiency measures; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice.

Unit-IV

10 Hours

Environment Management, Treaties and Legislation

Introduction to environmental laws and regulation: Article 48A, Article 51A (g) and other environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis Environmental audit and impact assessment; Environmental risk assessment Pollution control and management; Waste Management-Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme. Bilateral and multilateral agreements on international co-operation of instruments; conventions and protocols; binding and nonbinding measures; Conference of the Parties (COP) Major International Environmental Agreements:- Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; United Nations Convention to Combat Desertification (UNCCD); Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention, Minamata Convention, United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions Major Indian Environmental Legislations: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules; Ramsar sites; Biosphere reserves; Protected Areas; Ecologically Sensitive Areas; Coastal Regulation Zone; Production and consumption of Ozone Depleting substances, Green Tribunal; Some landmark Supreme Court judgements Major International

organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Chahal, M. K. (2024). *Environmental Science and Hazards Management (Ecology and Risk Management)*, ISBN:978-93-6440-586-7.
- Baskar, S. and Baskar, R. (2009). *Natural Disasters (Earth's Processes & Geological Hazards)*, ISBN: 978-81-7806-168-9.
- Tiefenbacher, J (ed.) (2022), *Environmental Management - Pollution, Habitat, Ecology, and Sustainability*, Intech Open, London. 10.5772/
- KanchiKohli and Manju Menon (2021) *Development of Environment Laws in India*, Cambridge University Press.
- Bhagwat, Shonil (Editor) (2018) *Conservation and Development in India: Reimagining Wilderness*, Earthscan Conservation and Development, Routledge.
- Manahan, S.E. (2022). *Environmental Chemistry (11th ed.)*. CRC Press. <https://doi.org/10.1201/9781003096238>.
- William P.Cunningham and Mary A. (2015) *Cunningham Environmental Science: A Global Concern*, Publisher (Mc-Graw Hill, USA)
- Central Pollution Control Board Web page for various pollution standards. <https://cpcb.nic.in/standards/>
- Theodore, M. K. and Theodore, Louis (2021) *Introduction to Environmental Management*, 2nd Edition. CRC Press.
- Ministry of Environment, Forest and Climate Change (2019) *A Handbook on International Environment Conventions & Programmes*. <https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf>

Semester 2nd

Course Title: General Microbiology	L	T	P	Cr.
Course Code: BML2150	3	0	0	3

Total Hours: 45

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

1. Identify and differentiate common pathogenic microorganisms.
2. Perform and interpret basic microbiological tests.
3. Apply principles of infection control and biosafety.
4. Understand the role of microorganisms in disease.
5. Demonstrate knowledge of antimicrobial susceptibility testing.

Course Content**UNIT-I****13 Hours**

Introduction to Microbiology & Microscopy: Brief History of Microbiology- Louis Pasteur, Robert Koch, Joseph Lister, Edward Jenner, Characteristics of Bacteria and Fungi, Bright Field, Dark Field, Phase Contrast and Fluorescence and Electron Microscope, Gram, Negative, Spore and Acid- Fast Staining.

UNIT-II**11 Hours**

Nutrition and Growth of Bacteria: Types of Nutritional Requirements, Types and Preparation of Culture Media, Bacteria Cell Division, Growth Phase, Batch and Continuous Culture, Growth of Aerobic and Anaerobic Bacteria.

UNIT-III**12 Hours**

Principles and Method of Sterilization: Physical (Heat, Temperature, Radiation, Filtration) and Chemical Agents (Alcohol, Aldehyde, Halogens, Phenols, Gases) to Control Growth of Microbes.

UNIT-IV**9 Hours**

Collection and Transportation of Specimens, Disposal of Laboratory/ Hospital Waste: General Principles, Collection, Transportation (Urine, Faeces, Sputum, Pus, Body Fluids, Swab and Blood), Non- Infectious Waste, Infected Sharp Waste Disposal, Infected Non- Sharp Waste Disposal.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- M.J. Jr., Pelczar, E.C.S., Chan and R. Krieg, 'Microbiology', McGraw Hill.

- *G.J. Tortora, B.R. Funke and C.L. Case, 'Microbiology-An Introduction', Benjamin Cummings.*
- *B.D. Davis, R. Dulbecco, H.N. Eisen and H.S. Ginsber, 'Microbiology', Harper & Row, Publishers.*
- *R.Y. Stainer, J.L. Ingraham, M.L. Wheelis and P.R. Palmer, 'General Microbiology', MacMilan Press Ltd*

Course Title: Basics of Biochemistry	L	T	P	Cr.
Course Code: BML2151	3	0	0	3

Total Hours: 45

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

1. Identify and describe the basic chemical components of blood and other bodily fluids.
2. Explain the ethics in clinical works.
3. Understand the genetic basis of common blood disorders.
4. Apply knowledge of safety while practices.
5. Perform basic biochemical tests relevant to blood analysis.

Course Content

Unit-I

6 Hours

Introduction to Medical lab Technology:

- (a) Role of Medical lab Technologist
- (b) Ethics, Responsibility
- (c) Safety measures
- (d) First aid.

Cleaning and care of general laboratory glass ware and equipments:

- (a) Steps involved in cleaning soda lime glass
- (b) Steps involved in cleaning borosil glass
- (c) Preparation of chromic acid solution (d) Storage

Unit-II

13 Hours

Distilled water:

- (a) Method of preparation of distilled water
- (b) Types of water distillation plants
- (c) Storage of distilled water

Units of Measurement:

- (a) S.I unit and CGS units
- (b) Conversion of units
- (c) Strength, molecular weight, equivalent weight
- (d) Normality, Molarity, Molality
- (e) Numericals.

Unit-III

13 Hours

Calibration of volumetric apparatus:

- (a) Flask
- (b) Pipettes
- (c) Burettes
- (d) Cylinders.

Analytical Balance:

- (a) Principle
- (b) Working
- (c) Maintenance

Concept of pH:

- (a) Definition
- (b) Henderson Hasselbatch equation
- (c) Pka value
- (d) pH indicator
- (e) Methods of measurement of pH
 - (i) pH paper
 - (ii) pH meter
 - (iii) Principle, working, maintenance and calibration of pH meter.

Unit-IV

13 Hours

Volumetric analysis:

- (a) Normal and molar solutions
- (b) Standard solutions
- (c) Preparation of reagents
- (d) Storage of chemicals

Osmosis:

- (a) Definition
- (b) Types of osmosis
- (c) Factors affecting osmotic pressure
- (d) Vant Hoff's equation
- (e) Applications of osmosis
- (f) Dialysis

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Readings:

- *Text book of Medical Laboratory Technology by P. B. Godker*
- *Medical Laboratory Technology by KL Mukherjee volume III*
- *Practical Clinical Biochemistry by Harold Varley*
- *Principal of Biochemistry by M. A. Siddiqi*
- *Instrumental Analysis by Chatwal Anand*
- *Text book of Medical Biochemistry by ChaterjeeShinde*
- *Principal of Biochemistry by Lehninger*
- *Biochemistry by Voet & Voet*
- *Biochemistry by Stryer*

Course Title: Basic Haematological Techniques – II	L	T	P	Cr.
Course Code: BML2152	3	0	0	3

Total Hours: 45

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

1. Perform advanced manual blood cell counts.
2. Operate and maintain automated hematology analyzers.
3. Prepare and interpret blood film morphology.
4. Conduct specialized coagulation tests.
5. Apply quality control procedures in hematology laboratories.

Course Content

UNIT-I

6 Hours

Blood Group Systems: History and discovery of blood group system; ABO and Rhesus blood group system; Compatibility tests in blood transfusion, complications and hazards of blood transfusion.

UNIT-II

8 Hours

Hemoglobin Studies: Hemoglobin, its synthesis, functions and degradation; Hemoglobin, pigments and their measurements; Abnormal hemoglobin's, their identification and estimation.

UNIT-III

10 Hours

Blood Coagulation: Hemostatic mechanism and theories of blood coagulation; Classification and physio- chemical properties of coagulation factors.

UNIT-IV

12 Hours

Blood Coagulation Reagents and Procedures: Preparation and standardization of various coagulation; Screening coagulation procedures such as Bleeding and clotting time, Hess test, prothrombin time (PT) and Activated Partial Thromboplastin time (APTT).

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Readings:

- Paraful B. Godkur, 'Text Book of Med. Lab. Technology'.
- V.H. Talib, 'Hand Book of Med. Lab. Technology', 2nd Edn.
- J.B. Dacie, 'Med. Lab. Tech. Methods and Interpretation, Practical Hematology'.
- Christopher A. Ludlam, 'Clinical Haematology'.
- G.A. McDonald, 'Atlas of Hematology'.

- *Stephen M. Robinson, Hematology (Pathophysiological basis for clinical practice 3rd Edn.).*

Course Title: Systematic Bacteriology	L	T	P	Cr.
Course Code: BML2153	2	0	0	2

Total Hours: 30

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

1. Identify and classify clinically significant bacteria.
2. Apply appropriate laboratory techniques for bacterial identification.
3. Interpret bacterial culture results and antimicrobial susceptibility testing.
4. Understand the pathogenesis and epidemiology of bacterial infections.
5. Correlate bacterial characteristics with clinical manifestations of disease.

Course Content

UNIT-I

5 Hours

Staining Techniques in Bacteriology: Principle, Procedures and Interpretation: Simple, Negative, Gram, Albert's, Ziehl-Nelsen, Capsule, Flagella and Spore stainings.

UNIT-II

5 Hours

Biochemical Tests for the Identification of Different Bacteria: Catalase, Coagulase, Indole, Methyl Red, Voges Proskauer, Urease, Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation, H₂S production, Decarboxylases, CAMP.

UNIT-III

5 Hours

Morphology, Culture Characteristics, Pathogenesis and Laboratory Diagnosis of the Gram-Positive Bacteria: Staphylococci, Streptococci, Corynebacteria, Mycobacteria, Clostridium.

UNIT-IV

5 Hours

Morphology, Culture Characteristics, Pathogenesis and Laboratory Diagnosis of the Gram-Negative Bacteria: Pseudomonas, Enterobacteriaceae: Escherichia, Klebsiella, Citrobacter, Enterobacter, Proteus, Salmonella, Shigella, Yersinia; Neisseria, Vibrio, Mycoplasma, Rickettsia & Chlamydia.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- James G. Cappuccino and Natalie Sherman, 'Microbiology: A

Laboratory Manual, Benjamin Cummings.

- K.R. Aneja, *'Experiments in Microbiology, Plant Pathology and Biotechnology'*, New Age Publishers.
- M. Cheesbrough, *'District Laboratory Practice in Tropical Countries'*, Cambridge University Press.
- R. Ananthanarayan, C.K.J. Panikar, *'Textbook of Microbiology'*, 6th Edn., Orient Longman Private Limited.

Course Title: Computer Application	L	T	P	Cr.
Course Code: BML2154	3	0	0	3

Total Hours: 45

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

1. Demonstrate proficiency in utilizing computer software for laboratory data management.
2. Apply computer skills to analyze and interpret laboratory results.
3. Utilize electronic resources for accessing and managing medical information.
4. Implement cyber security best practices in a laboratory setting.
5. Effectively communicate laboratory data using computer-generated reports.

Course content

Unit-I

14 Hours

Introduction to Various Computer Parts: Input output devices: input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices); output devices (monitors, pointers, plotters, screen image projector, voice response systems). Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit-II

12 Hours

MS- Word, Excel, Power Point: Components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge; worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs; creation and manipulation presentation, formatting and enhancing text, slide with graphs.

Unit-III

10 Hours

Introduction of Windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Unit-IV

9 Hours

Application of Computers in Various Fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Sunita Goel, 'Computer Fundamentals', Pearson Publication.*
- *Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.*

Course Title: Nutrition	L	T	P	Cr.
Course Code: BML2155	3	0	0	3

Total Hours: 45

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

1. Understand the basic principles of nutrition and their relevance to health.
2. Identify essential nutrients and their functions.
3. Apply dietary guidelines to promote health and prevent disease.
4. Recognize the role of nutrition in various health conditions.
5. Provide basic nutritional counseling and education.

Course Content

Unit I

10 Hours

Fundamentals of Nutrition

- Introduction to nutrition: Definition, scope, and importance.
- Essential nutrients: Macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins, minerals).
- Digestion, absorption, and metabolism of nutrients.
- Energy balance and requirements.
- Food groups and dietary guidelines.

Unit II

10 Hours

Nutritional Assessment and Planning

- Methods of nutritional assessment: Anthropometric measurements, biochemical assessments, clinical assessments, and dietary assessments.
- Dietary planning and meal preparation.
- Nutritional needs across the lifespan: Infants, children, adolescents, adults, and elderly.
- Special dietary considerations: Vegetarian, vegan, and cultural diets.

Unit III

12 Hours

Nutrition in Health and Disease

- Role of nutrition in disease prevention and management.
- Nutrition-related disorders: Obesity, malnutrition, diabetes, cardiovascular diseases, and cancer.
- Enteral and parenteral nutrition.
- Food safety and hygiene.
- Food allergies and intolerances.

Unit IV**13 Hours**

Nutritional Counseling and Education

- Principles of nutritional counseling.
- Effective communication and patient education.
- Promoting healthy eating habits.
- Addressing common nutritional misconceptions.
- Community nutrition and public health.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Whitney, E., & Rolfes, S. R. (2019). *Understanding nutrition*. Cengage Learning.
- Srilakshmi, B. (2014). *Dietetics*. New Age International.
- Wardlaw, G. M., & Smith, A. M. (2018). *Contemporary nutrition*. McGraw-Hill Education.

Course Title: General Microbiology (Lab.)	L	T	P	Cr.
Course Code: BML2156	0	0	2	1

Total Hours: 30

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

1. Apply safe laboratory practices and handle various laboratory instruments effectively.
2. Demonstrate proficiency in the operation and handling of a compound microscope.
3. Perform proper washing, cleaning, and sterilization of laboratory glassware.
4. Prepare and sterilize microbiological media according to standard procedures.
5. Demonstrate the ability to perform aerobic and anaerobic bacterial culture techniques.

Course Content

List of Practical's / Experiments:

1. Introduction to Use of Different Laboratory Instruments and Their Safety Precautions.
2. To Demonstrate the Working & Handling of Compound Microscope.
3. Washing, Cleaning and Sterilization Glassware.
4. Media Preparation and Sterilization.
5. To Prepare Working Dilution of Commonly Used Disinfectants.
6. To Demonstrate Aerobic Culture.
7. To Demonstrate of Anaerobic Culture.

Course Title: Basics of Biochemistry (Lab.)	L	T	P	Cr.
Course Code: BML2157	0	0	2	1

Total Hours: 30

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

1. Demonstrate proficiency in the proper cleaning and sterilization of laboratory glassware.
2. Produce distilled water of appropriate purity for laboratory use.
3. Understand the principles of pH measurement and operate and maintain a pH meter accurately.
4. Prepare standard solutions of specified normality and molarity (NaOH, HCl, H₂SO₄, and Sodium Carbonate).
5. Explain and demonstrate the processes of osmosis and dialysis.

Course Content

List of Practical's / Experiments:

1. Cleaning of the laboratory glass ware.
2. Preparation of distilled water
3. Principle, working and maintenance of pH meter.
4. To prepare 0.1 N NaOH solution.
5. To prepare 0.2N HCl solution.
6. To prepare 0.1 molar H₂SO₄
7. To prepare 0.2 Molar Sodium carbonate solution.
8. Demonstration of osmosis and dialysis.

Course Title: Basic Haematological Techniques – II (Lab.)	L	T	P	Cr.
Course Code: BML2158	0	0	2	1

Total Hours: 30

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

1. Perform laboratory assays to quantify Methemoglobin, Carboxyhemoglobin, and Sulphemoglobin.
2. Accurately determine Prothrombin Time (PT), Prothrombin Time Index (PTI), International Normalized Ratio (INR).
3. Accurately determine Activated Partial Thromboplastin Time (APTT).
4. Execute platelet counts using a phase contrast microscope.
5. Prepare essential laboratory reagents, including Thromboplastin, Cephalin, Thrombin, Calcium Chloride (M/uo Calc2), and Kaolin solution.

Course Content

List of Practical's / Experiments:

1. To measure the levels of Met, Carboxy and Sulpha-haemoglobin
To determine PT, PTI, INR and APTT of the given sample
3. To determine platelet, count of the given sample using phase contrast microscope
4. To prepare the following in lab:
Thromboplastin,
Cephalin,
Thrombin,
M/uo Calc2 and Kaolin solution.

Course Title: Communication and Presentation skills	L	T	P	Cr.
Course Code: BML2159	2	0	0	2

Hours: 30

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

1. Demonstrate clear and effective verbal and non-verbal communication.
2. Construct and deliver organized and engaging presentations.
3. Apply active listening and interpersonal skills in professional settings.
4. Produce accurate and professional written communication.
5. Conduct and lead group activities.

Course Content

UNIT I

7 Hours

- 1) Communication: Definition, meaning.
- 2) Importance of Communication in Health
- 3) Functions of Communication.

UNIT II

7 Hours

- 1) Communication channels - Definition dimension and classification, selection of communication channels.
- 2) Feedback in communication – Feedback process, effect of feed back in health communication.
- 3) Problems in communication - various types of problems.

UNIT III

7 Hours

- 1) Mass communication e.g. Radio, television, traditional systems like nukkad natak, drama, puppet show
- 2) Inter personal communication: Lecture method (IPC).

UNIT IV

9 Hours

- 1) Intrapersonal communication like demonstration, group discussions, seminars symposium, workshop, conference, CME, communication network
- 2) Various ways of creating awareness about health-related issues
- 3) Counseling, pretest counseling, posttest counseling.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Loveleen Kaur, 'Communication Skills' Satya Prakashan Publication.
- Narinder Kumar Bodhraj, 'Business Communication', Kalyani

Publishers, 2011.

- *S.P. Dhanavel, 'English & communication Skills for the Students of Science & Engineering' Orient blackswan publication, 2009.*
- *Indrajit Bhattacharya, 'An Approach to Communication Skills'.*

Course Title: Human Values and Professional Ethics	L	T	P	Cr.
Course Code: VAC0002	2	0	0	2

Hours: 30

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

1. Demonstrate ethical decision-making in professional contexts.
2. Cultivate effective interpersonal communication and teamwork skills.
3. Apply principles of self-awareness and emotional intelligence.
4. Develop a strong sense of social responsibility and civic engagement.
5. Integrate personal values with professional conduct.

Course Content

Unit-I

7 Hours

Introduction to Indian Ethos

Meaning of ethos and cultural essence of India, Scriptures as the base of the Indian Knowledge System (IKS), Integrating the two methodologies: interiorization process for self-exploration and exterior scientific pursuit for the prosperity of world, The Law of Karma and Nishkama Karma (The Law of action and selfless action), Practical: Five hours of Yoga practice per week, Ethics through Music and Indian Poetry, Community Engagement

Unit-II

8 Hours

Human Values and Ethics

Knowing the Self and the universal values that we stand for. This is self-enquiry & self-discovery, Background conversations and deep listening, recognizing the assumptions that we make, the biases we have and the implications for ethical action. Self-identity: distinguishing and embracing oneself (and others) four profiles (inner potential, social, professional, personality), Distinguish ideology, perspectives beliefs from embodying values. Practical: Self discovery, self enquiry and Mindfulness, Yama & Niyama of Ashthang Yoga

Unit-III

7 Hours

Constitutional Values, Global Responsibility & Skills for Youth

Values embedded in the Preamble of the Indian Constitution, Integration of Human Rights and duties. Principles and responsibilities: as citizens of India, towards global environment, Loksangraha and Vasudhaiva Kutumbakam, Conscious Full Spectrum Response model. Distinguishing judgement from discernment, Practical: Development of concentration among students through music, fine arts, mathematics, sports, yoga and mindfulness

Unit-IV**8 Hours****Integrated Personality and Well-being**

The three gunas (qualities of sattva—purity and harmony, rajas —activity and passion, tamas —darkness and chaos), the four antah-karanas (inner instruments) and panch kosha (five sheaths), Stress management, Oneness, non-duality and equanimity, Physical, mental, social and spiritual well-being. Practical: Talks on importance of the Ayurvedic concept of well-being and nutrition, sports activities.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Mahadevan, B., Bhat, V.R. and Nagendra, P.R.N. 2022. *Introduction to Indian Knowledge System*. Delhi: PHI.
- *Human Values and Professional Ethics* by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
- Kashyap, Subhash C. 2019. *Constitution of India. A handbook for students*. New Delhi: National Book Trust.
- Dr. Awadesh Pradhan, *MahamanakeVichara*". (B.H.U., Vanarasi 2007)
- Harold Koontz & Heinz Weihrich, *Essentials of Management*, Tata McGraw Hill.
- Lama, D. 2012. *Beyond Religion: Ethics for a Whole World*. India: Harper Collins.
- *Shrimad Bhagavad-Gita (Part of the Mahabharata)*. 1994. Gorakhpur: Gita Press. Swami Harshananda. 2000. *The Birds' Eye View of the Vedas*. Bangalore: Ramakrishna Math.
- Fontaine, D. K., Rushton, C. H. and Sharma, M. 2013. *Cultivating Compassion and Empathy*. In: M. Plews-Ogan and G. Beyt (Eds.), *Wisdom Leadership in academic Health Science Centers- Leading Positive Change*. London: Radcliffe Publishing.
- Blanchard, Kenneth and Peale, Norman Vincent. 1988. *The Power of Ethical Management*. New York: William Morrow and Company, Inc.
- Gandhi, Mohandas Karamchand. 1971. *Pathway to God* compiled by MS Deshpande. Ahmedabad: NavajivanMudranalaya, Navjivan Trust.
- Gardner, H. 2006. *Five Minds for the Future*. Boston: Harvard Business School Press.
- Rodriguez, S. and Juvva, S. 2018. *Embodying Universal Values and Ethical Leadership in Higher Education: Creating Change Agents for Social Transformation*. In B. Chatterjee, A. Banerji and P. Arya (Eds.). *Resolution to Resolve: Sustainability Practices in Industry and Education*. New Delhi: Bloomsbury

- *[ISBN: 978-938-74-7168-9]*
- *Sharma, M. 2017. Radical Transformational Leadership: Strategic Action for Change Agents. Berkeley, US: North Atlantic Books.*

Semester 3rd

Course Title: Applied Bacteriology	L	T	P	Cr.
Course Code: BML3200	3	0	0	3

Total Hours: 45

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

1. Apply appropriate techniques for collecting, transporting, and processing microbiological samples from various clinical sources.
2. Conduct microbiological analyses of water, milk, and food products to assess their bacteriological quality and identify potential foodborne pathogens.
3. Evaluate air quality in healthcare settings using appropriate sampling methods and understand the role of the microbiology laboratory in nosocomial infection control.
4. Utilize serotyping and phage typing methods for epidemiological investigations.
5. Perform and interpret antibiotic susceptibility testing, including MIC, MBC, Stokes method, Kirby-Bauer method, and β -lactamase testing, and understand the principles of microbial preservation.

Course Content**UNIT- I****12 Hours**

Sample Collection, Transportation and Processing: Upper and lower respiratory tract; gastro intestinal tract infections; urinary tract infections; genital tract infections; Septicemia and bacteraemia.

UNIT- II**9 Hours**

Examination of Water, Milk & Food Product: Presumptive coliform count (Eijkman test), Membrane filtration tests of water; various tests for Bacteriological quality of milk and its product; classification of food like frozen food, canned food, raw food, cooked food, Bacteriological examination with special reference to food poisoning bacteria.

UNIT III**10 Hours**

Examination of Air, Nosocomial Infection & Epidemiological Markers: Significance of air bacteriology in healthcare facilities, types of air sampling methods, collection processing and reporting of an air sample; sources and types of nosocomial infections, Role of microbiology laboratory in control of nosocomial infections; Serotyping and phage typing.

UNIT IV**14 Hours**

Microbial Preservation & Antibiotic Susceptibility Testing: Basic concepts of preservation of microbes, Principle and procedures of various preservation methods with special reference to lyophilization; Definition of antibiotics, Preparation and standardization of inoculums, Choice of antibiotics, MIC and MBC determination, Stokes method and Kirby-Bauer method; test for production of β -lactamase.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Mackie & Mac Cartney, 'Practical Medical Microbiology', Vol. 1 and 2.
- Ananthanereyan, 'Text book of Microbiology'.
- Paniker & Satish Gupte, 'Medical Microbiology'.
- Mukherjee, 'Medical Laboratory Technology', Vol. I, II, III.
- Monia Cheesbrough, 'Medical Laboratory Manual for Tropical Countries', Vol. II.
- V. Muralidhar, 'Hospital Acquired Infections'.

Course Title: Biochemical Metabolism	L	T	P	Cr.
Course Code: BML3201	3	1	0	4

Total Hours: 60

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

1. Articulate the core concepts that underpin all metabolic processes.
2. Name and outline the key pathways involved in the catabolism (breakdown) and anabolism (synthesis) of carbohydrates, lipids, proteins, and nucleic acids.
3. Describe how different metabolic pathways interact and are coordinated to maintain cellular homeostasis.
4. Predict and explain the biochemical basis of various metabolic disorders resulting from enzyme deficiencies or genetic mutations.
5. Explain broader biological processes, such as cell growth and division, signal transduction, muscle contraction, and nerve impulse transmission.

Course Content

UNIT-I

15 Hours

Carbohydrates: Outline of Glycolysis, TCA, and Gluconeogenesis, Glycogen metabolism (glycogenesis, glycogenolysis, glycogen storage diseases, and hormone regulation), biomedical importance of HMP, GTT and its regulation.

UNIT-II

15 Hours

Lipids: β fatty acid oxidation along with inborn errors, fatty acid synthesis, Cholesterol synthesis, catabolism & regulation, brief about atherosclerosis, Lipoproteins, ketosis, lipid peroxidation and role of antioxidants.

UNIT-III

15 Hours

Amino Acids: Oxidative and nonoxidative deamination, transamination and decarboxylation, transamination, transport and function of ammonia, urea cycle, metabolism of specialized products like glycine, phenylalanine, tyrosine, tryptophan, methionine, cysteine, histidine and branched chain amino acids, creatine metabolism.

UNIT-IV

15 Hours

Nucleic acids, Enzymes and Vitamins: Types of nucleic acids, functions, importance of nucleosides and nucleotides, properties and classification of enzymes, Factor affecting the enzymes activity, applications of enzymes, concept of water soluble & fat soluble vitamins.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *U. Satyanaryana, U. Chkrapani, 'Biochemistry', 4th Edn., Elsevier.*
- *D.L. Nelson, L.A. Lininger, M. Cox, M., Lehninger, 'Principles of Biochemistry', 5th Edn., W.H. Freeman.*
- *J.M. Berg, J.L. Tymoczko, L. Stryer, 'Biochemistry', 5th Edn., W.H. Freeman.*
- *D. Voet, J.G. Voet, 'Biochemistry', 4th Edn., John Wiley & Sons.*

Course Title: Immunology and Serology	L	T	P	Cr.
Course Code: BML3202	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After 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.
5. Understand immune response mechanisms to different pathogens, including viruses.

Course Contents

Unit I 10 Hours

Introduction to Immunology Overview of the immune system, Cells and tissues of the immune system, Innate immunity and adaptive immunity, Organs involved in immune system. Antigens, Major histocompatibility complex (MHC), Antibodies, Complement system and Hybridoma technology.

Unit II 10 Hours

Immune Response, Humoral immune response, Cell-mediated immune response, Immunological memory, Hypersensitivity reactions. Autoimmunity and autoimmune disorders.

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 10 Hours

Immunological Disorders, Autoimmune diseases and serological

markers, Allergic reactions and immunoglobulin measurements, Serological markers in immuno deficiency disorders, Serological Techniques and Instrumentation: Enzyme-Linked Immuno sorbent Assay (ELISA), Western blotting Immuno fluorescence assays.

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: Basic Cellular Pathology	L	T	P	Cr.
Course Code: BML3203	2	0	0	2

Total Hours: 30

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

1. Identify and describe the fundamental pathological processes.
2. Correlate pathological changes with clinical manifestations.
3. Apply knowledge of pathology to laboratory testing procedures.
4. Recognize and understand the etiology of common diseases.
5. Demonstrate proficiency in basic pathological terminology.

Content Course

UNIT I 5 Hours

Digestive & Accessory System Complications: Diseases: mouth, oesophagus, gastritis, peptic ulceration, intestinal abstrictions; Microbial complications: Food poisoning, malabsorption, hepatitis, appendicitis; liver cirrhosis, pancreatitis, jaundice.

UNIT- II 5 Hours

Respiratory System Problems: Upper respiratory tract infections: Bronchi, Asthma; Lower respiratory Infections: Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.

UNIT- III 5 Hours

Urinary & Reproductive System Problems: Glomerulonephritis, Nephrotic syndrome, Renal failure, Renal calculi, Urinary obstruction, Urinary tract infection; Sexually transmitted diseases, Disease of ovaries, ectopic pregnancy, prostatitis, Infertility.

UNIT IV 5 Hours

Circulatory System Complications: Disease of the blood vessels: Atheroma, Arteriosclerosis, heart block; blood pressure: hyper and hypotension.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Ross and Wilson, 'Anatomy & Physiology'.*
- *Pearce, 'Human Anatomy and Physiology'.*
- *Di Fiore, 'Atlas of Histology'.*
- *'Medical Laboratory Technology' Vol. III.*
- *'Color Atlas of Basic Histopathology'.*

Course Title: First Aid	L	T	P	Cr.
Course Code: BML3204	3	0	0	3

Total Hours: 45

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

1. Demonstrate the ability to assess and prioritize emergency situations.
2. Perform appropriate first aid procedures for common injuries and illnesses.
3. Apply principles of basic life support, including CPR and AED usage.
4. Understand and manage shock and other life-threatening conditions.
5. Effectively communicate with emergency services and provide accurate information.

Course Content

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 15 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: Disaster Management	L	T	P	Cr.
Course Code: BML3206	3	0	0	3

Total Hours: 45

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

1. Understand the principles of disaster management.
2. Identify and classify different types of disasters.
3. Apply emergency medical response protocols in disaster situations.
4. Participate in disaster preparedness and mitigation activities.
5. Communicate effectively during disaster response.

Course Content

Unit I

10 Hours

- Introduction to Disaster Management
- Definitions and concepts of disaster, hazard, risk, and vulnerability.
- Types of disasters: Natural (earthquakes, floods, cyclones) and man-made (chemical spills, industrial accidents).
- The disaster management cycle: Mitigation, preparedness, response, and recovery.
- National and international disaster management frameworks.
- Role of paramedical professionals in disaster management.

Unit II

10 Hours

- Disaster Preparedness and Mitigation
- Risk assessment and vulnerability analysis.
- Developing disaster management plans.
- Early warning systems and communication strategies.
- Community-based disaster preparedness.
- First aid and basic life support training.
- Resource management and logistics.

Unit III

10 Hours

- Emergency Medical Response in Disasters
- Triage and casualty management.
- Management of trauma and injuries.
- Infection control and sanitation.
- Psychological first aid.
- Mass casualty incidents and field hospitals.
- Transportation of injured people.

Unit IV**15 Hours**

- Post-Disaster Recovery and Rehabilitation
- Needs assessment and damage evaluation.
- Rehabilitation and reconstruction.
- Mental health and psychosocial support.
- Disease surveillance and prevention.
- Ethical considerations in disaster management.
- Legal aspects of disaster management.

Transactional modes: Video based teaching, Collaborative teaching, Case based teaching, Question Answer

Suggested Readings:

- *Alexander, D. (2016). Natural disasters. Routledge.*
- *Haddow, G. D., Bullock, J. A., & Coppola, D. P. (2017). Introduction to emergency management. Butterworth-Heinemann.*
- *Carter, W.N. (1991). Disaster Management: A Disaster Manager's Handbook. Asian Development Bank.*
- *WHO, (Various publications) World Health Organization emergency and disaster related publications.*

Course Title: Applied Bacteriology (Lab.)	L	T	P	Cr.
Course Code: BML3206	0	0	2	1

Total Hours: 30

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

1. Demonstrate the ability to assess and prioritize emergency situations.
2. Perform appropriate first aid procedures for common injuries and illnesses.
3. Apply principles of basic life support, including CPR and AED usage.
4. Understand and manage shock and other life-threatening conditions.
5. Effectively communicate with emergency services and provide accurate information.

Course Content

- Isolation of pure cultures by spread plate, pour plate and streak plate method.
- Culturing of blood, urine, throat swab, csf and other body fluids.
- Microbiological examination of water by MPN
- Microbiological examination of milk by MBRT.
- To perform antibiotic susceptibility testing of clinical isolates by using Stokes and Kirby- Bauer method.
- β - lactamase production test.

Course Title: Immunology and Serology (Lab.)	L	T	P	Cr.
Course Code: BML3207	0	0	2	1

Total Hours: 30

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

1. Promote effective communication and team work skills through laboratory activities.
2. Introduce students to the basic principle sand 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.
5. Learn communication and team work skills through laboratory activities

Course Content

- Determination of ABO and Rh blood group of a blood sample.
- Demonstration of electrophoresis.
- Measurement of CRP levels as an indicator of Inflammation.
- Demonstration of ELISA for detection and quantification of specific antigens and antibodies.
- Demonstration of Hemagglutination inhibition assay.
- Diagnostic Virology: Laboratory diagnosis of viral infections.
- Serological tests for viral antibodies,
- Demonstration of PCR forviral detection.

Course Title: English for Clinical Languages	L	T	P	Cr.
Course Code: BMLT3208	2	0	0	2

Total Hours: 30**Course Objectives:** Upon completion of this course, students will be able to:

1. Understand and utilize medical terminology accurately.
2. Communicate effectively with patients and healthcare professionals.
3. Write clear and concise medical reports and documentation.
4. Demonstrate professional communication skills in healthcare settings.
5. Use the English skills to write research paper.

Course Content**UNIT I****7 Hours****Foundations of Medical Terminology**

- Introduction to medical terminology: Roots, prefixes, suffixes.
- Anatomical and physiological terms.
- Terms related to common diseases and conditions.
- Understanding and using medical abbreviations.
- Pronunciation and spelling of medical terms.

UNIT II**7 Hours****Patient Communication and Interaction**

- Effective communication techniques with patients.
- Taking patient history and conducting interviews.
- Explaining medical procedures and treatments.
- Handling difficult or sensitive conversations.
- Cultural sensitivity in patient communication.

UNIT III**7 Hours****Medical Documentation and Report Writing**

- Principles of medical documentation.
- Writing patient reports and case studies.
- Documenting medical procedures and observations.
- Using medical charts and electronic health records (EHR).
- Grammar and style for medical writing.

UNIT IV**9 Hours****Professional Communication in Healthcare**

- Communication with other healthcare professionals.
- Presenting medical information in meetings and conferences.
- Using professional email and correspondence.
- Ethical considerations in medical communication.

- Developing presentation skills.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Young, B. A. (2018). *Medical terminology: An illustrated guide*. F.A. Davis.
- Rice, R. (2017). *Medical terminology with human anatomy*. Pearson.
- Boothman, R. C. (2013). *How to Connect in Business in 90 Seconds or Less*. Pearson.
- Geffner, D. (2018). *The Skilled Helper: A Problem-Management and Opportunity-Development Approach to Helping*. Cengage Learning.

Semester 4th

Course Title: Parasitology and Mycology	L	T	P	Cr.
Course Code: BML4250	3	0	0	3

Total Hours: 45**Course Objectives:** Upon completion of this course, students will be able to:

1. Demonstrate the ability to assess and prioritize emergency situations.
2. Perform appropriate first aid procedures for common injuries and illnesses.
3. Apply principles of basic life support, including CPR and AED usage.
4. Understand and manage shock and other life-threatening conditions.
5. Effectively communicate with emergency services and provide accurate information.

Course Content**UNIT I****9 Hours**

- Introduction to Medical Parasitology
- Definition- Parasitism, host, vectors; Study of the types of animal association's parasitism commensalisms and symbiosis; Types of parasites; Classification of protozoan & Helminthes; Collection, transport, processing and preservation of samples for routine parasitological investigations.

UNIT II**14 Hours**

- Morphology, Life cycle and Lab Diagnosis of Protozoa, Nematodes and Platyhelminths
- Intestinal Amoebae- Entamoeba histolytica, Entamoeba coli; Flagellates of intestine/genitalia- Giardia lamblia; Trichomonas vaginalis; Malarial Parasite- Plasmodium vivax; Intestinal Nematodes- Ascaris, Ancylostoma duodenale; Taenia solium.

UNIT III**9 Hours**

- Introduction to Medical Mycology: Basic concepts about superficial and deep Mycoses, Taxonomy and classification and general characteristics of various medically important fungi, Normal fungal flora.

UNIT IV**14 Hours**

- Laboratory Procedures: Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids; Direct microscopy; Culture media used in mycology; Techniques used for isolation and identification of medically important fungi; Use

of laboratory animal for diagnosis of fungal infections; Preservation of fungal cultures.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Dr Jagdish Chander, 'Medical Mycology'.
- Paniker & Satish Gupte, 'Medical Microbiology'.
- Mackie & MacCartney, 'Practical Medical Microbiology' Vol. 1 and 2.

Course Title: Applied Haematology - I	L	T	P	Cr.
Course Code: BML4251	3	0	0	3

Total Hours: 45**Course Objectives:** Upon completion of this course, students will be able to:

1. Implement and interpret internal and external quality control procedures.
2. Proficiency in the procedures for bone marrow aspiration and trephine biopsy.
3. Identify and describe the morphological changes in red blood and white blood cells.
4. Perform and interpret routine examinations of urine, seminal fluid, cerebrospinal fluid (CSF), and other body fluids.
5. Classify and segregate biomedical waste according to established.

Course Content**UNIT I****12 Hours**

Quality Assurance & Safety Precautions in Haematology: Internal and external quality control, routine quality assurance protocol; statistical analysis: Standard deviation, Co-efficient variation, accuracy and precision; standard guidelines related to safety precautions.

UNIT II**10 Hours**

Bone Marrow Examination: Composition and function of bone marrow; aspiration procedure and processing of bone marrow; processing and staining of trephine biopsy specimens.

UNIT III**10 Hours**

Blood Cells Anomalies: Red Blood Cells: Morphological changes such as variation in size shape & staining character; Leucocytes: Abnormal morphology i.e. shift to left & shift to right.

UNIT IV**13 Hours**

Biomedical Examinations & Biomedical Waste Management: Routine examination of Urine, seminal fluid, CSF and other body fluids; biomedical waste classification and segregation; treatment procedure.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Paraful B. Godkar, 'Text book of Medical Laboratory Technology'.

- J. B. Dacie, 'Practical Haematology'
- V.H. Talib, 'Hand book of Medical Laboratory Technology'.
- Emmanuel C.Besa, 'Haematology' (International Edition) Harwal Publisher.

Course Title: Analytical Biochemistry	L	T	P	Cr.
Course Code: BML4252	3	0	0	3

Total Hours: 45**Course Objectives:** Upon completion of this course, students will be able to:

1. Explain the theoretical basis of spectrophotometry and colorimetry, including Lambert's Law and Beer's Law.
2. Assess the clinical utility and limitations of flame photometry in analyzing biological samples.
3. Describe the working mechanisms of each chromatographic technique and identify their specific applications in separating and analyzing biological molecules.
4. Describe the procedure, and uses of paper and gel electrophoresis and be able to describe the clinical applications of electrophoresis.
5. Compare and contrast the principles, instrumentation, and clinical applications of spectrophotometry, colorimetry, flame photometry, chromatography, and electrophoresis.

Course Content**UNIT I****12 Hours**

Spectrophotometry & Colorimetry: Theories of spectrophotometry and colorimetry; Lambert's law and Beer's law; Construction and working of spectrophotometry and colorimetry and their clinical applications.

UNIT II**9 Hours**

Photometry: Introduction, Principle of Flame photometry; body construction, working; clinical applications and limitations.

UNIT III**14 Hours**

Chromatography: Types of chromatography: Paper, Thin Layer, Column, Gas, Ion exchange, Gel; their principles, working and applications.

UNIT IV**10 Hours**

Electrophoresis: Introduction, principle, Instrumentation; types of electrophoresis: paper and gel electrophoresis and their applications.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Harold Varley, 'Practical Clinical Biochemistry'.
- K. Wilson and J. Walker, 'Principles and Techniques of Biochemistry and

Molecular Biology', Cambridge University Press.

- *P.B. Godker, 'Text book of Medical Laboratory Technology'.*
- *Mukherjee, 'Medical Laboratory Technology'.*
- *Chatwal Anand, 'Instrumental Analysis'.*

Course Title: Histopathology & Histopathological Techniques	L	T	P	Cr.
Course Code: BML4253	3	0	0	3

Total Hours: 45**Course Objectives:** Upon completion of this course, students will be able to:

1. Understand the core terminology: histology, histopathology, and the techniques used in histopathological analysis.
2. Students will learn the essential steps of tissue processing, from initial fixation to final mounting.
3. Understand the principles of staining and learn to perform basic and special staining techniques used in histopathology.
4. Introduced to specialized techniques like frozen sections and immunohistochemistry, understanding their principles, methods, and applications in diagnostic pathology
5. Develop practical skills in using laboratory equipment, including microtomes and automatic tissue processors.

Course Content**UNIT I****11 Hours**

General understanding of the terms –Histology, histopathology and histopathological techniques.

General organization of histopathological laboratory and basic requirements of histopathology laboratory. (Glass wares, chemical and Reagent, Equipment and Instruments). Responsibilities of a histotechnologist.

UNIT II**11 Hours**

General introduction to processing of tissues. cell nucleus, cyto. Membrane, cytoplasm, cell division).

Basic steps in tissue processing fixation, embedding, microtomy, staining, mounting.

Fixation and fixatives- Aim of fixation, classification of fixation, classification of fixatives, Different fixatives used, its advantages and disadvantages.

Decalcification- Aim of decalcification, selection of tissue, fixation, decalcifying agents used, Decalcification techniques.

UNIT III**12 Hours**

Tissue processing- Technique of dehydration, clearing (Aim of cleaning, different cleaning agents), Impregnation, techniques of casting Blocking, section cutting.

Principles, operation, parts and use of automatic tissue processors.

Different types of microtomes, microtome knives.

Staining- Principles of staining Basic staining techniques, special stains in histopathological studies.

UNIT IV

11 Hours

Mounting- Different mounting media and mounting techniques.

Museum techniques- General introduction, organization of museum, mounting of museum specimens.

Frozen sections- Principles, methods used, freezing micro sections, staining of frozen sections and application of frozen sections.

Immunohistochemistry

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Sunita Goel, 'Computer Fundamentals', Pearson Publication.
- Anupam Jain and Avneet Mehra, 'Computer Fundamental MS Office: Including Internet & Web Technology'.
- Culling Histopathology techniques.
- Bancroft Histopathology techniques.

Course Title: Clinical Endocrinology and Toxicology	L	T	P	Cr.
Course Code: BML4254	2	0	0	2

Total Hours: 30

Course Objectives: Upon successful completion of this course, students 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.
5. Develop practical skills in using laboratory equipment.

Course Content

Unit I

5 Hours

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action

Unit II

5 Hours

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T3, T4, TSH, FT3, FT4, TBG, Disorder associated with thyroid dysfunction.

Unit III

5 Hours

Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion

Unit IV

5 Hours

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs

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 (6thed.). Elsevier Saunders.*
- *Gardner, D. G., & Shoback, D. M. (Eds.). (2016). Greenspan's*

Course Title: Parasitology and Mycology (Lab.)	L	T	P	Cr.
Course Code: BML4255	0	0	2	1

Total Hours: 30**Course Objectives:** Upon completion of this course, students will be able to:

1. Perform and interpret routine stool examinations using various concentration methods to detect intestinal parasites.
2. Identify common adult intestinal worms from models or slides, demonstrating knowledge of their morphological characteristics.
3. Prepare, stain, and interpret thin and thick blood smears for the detection and identification of various life cycle stages of malarial parasites.
4. Prepare culture media commonly used in the laboratory diagnosis of fungal infections.
5. Perform and interpret staining techniques used for the identification of fungi and process clinical samples (skin, nail, hair) for fungal diagnosis.

Course Content

- Routine stool examination for detection of intestinal parasites with concentration methods: Saline preparation, Iodine preparation, Flootation method, Centrifugation method, Formal ether method, Zinc sulphate method.
- Identification of adult worms from models/slides: Tapeworm, Ascaris, Hookworms.
- Malarial parasite: Preparation of thin and thick smears, Staining of smears, Demonstration of various stages of life cycle of malarial parasites from stained slides.
- To prepare culture media used routinely in mycology.
- To perform the staining techniques for identification of fungi.
- To process clinical samples for laboratory diagnosis of fungal infections i.e. skin, nail hair.

Course Title: Applied Haematology I (Lab.)	L	T	P	Cr.
Course Code: BML4256	0	0	2	1

Total Hours: 30**Course Objectives:** Upon completion of this course, students will be able to:

1. Prepare and stain bone marrow smears using Leishman's, May-Grünwald-Giemsa, and Perl's stains, enabling the identification of cellular components and abnormalities.
2. Recognize and classify abnormal red blood cell (RBC) morphologies, contributing to the diagnosis of hematological disorders.
3. Competence in performing physical, chemical, and microscopic examinations of urine, essential for assessing renal and systemic health.
4. To perform cytological examination of cerebrospinal fluid (CSF) and other body fluids, aiding in the diagnosis of infections, inflammation, and malignancies.
5. Conduct physical and microscopic examinations of seminal fluid, including sperm count, crucial for evaluating male fertility.

Course Content

- To prepare a bone marrow smear and stain by Leishman's, May Grünwald Giesma and Perl's stain.
- To study the RBCs abnormal morphological forms.
- Physical, Chemical and Microscopic examination of urine.
- Cytological examination of CSF and other body fluids.
- Physical and Microscopic examination of seminal fluid including sperm Count.

Course Title: Analytical Biochemistry (Lab.)	L	T	P	Cr.
Course Code: BML4257	0	0	2	1

Total Hours: 30**Course Objectives:** Upon completion of this course, students will be able to:

1. Explain the principles of operation and perform basic maintenance for spectrophotometers, colorimeters, and flame photometers.
2. Perform and explain the principles behind paper chromatography, gas chromatography, thin-layer chromatography (TLC), and column chromatography.
3. Demonstrate the procedure for electrophoresis and understand its application in separating DNA samples.
4. Hands-on experience in using analytical instruments and techniques for quantitative and qualitative analysis.
5. Learn basic maintenance procedures and identify common issues related to the operation of these analytical instruments.

Course Content

- Working & maintenance of spectrophotometer.
- To demonstrate the working & maintenance of colorimeter.
- To demonstrate the working & maintenance of flame photometer.
- To demonstrate the procedure of paper chromatography.
- To demonstrate the procedure of Gas chromatography.
- Demonstration of TLC.
- To demonstrate the procedure of column chromatography.
- Electrophoresis of the given DNA sample.

Course Title: Histopathology and Histopathological Techniques (Lab.)	L	T	P	Cr.
Course Code: BML4258	0	0	2	1

Total Hours: 30**Course Objectives:** Upon completion of this course, students will be able to:

1. Perform sequence of steps (fixation, embedding, microtomy, staining, mounting) required to transform biological tissue into microscope-ready slides.
2. Learn and compare different tissue processing methods, including paraffin embedding, celloidin embedding, and frozen sectioning, and understand their respective applications.
3. Gain practical skills in preparing fixatives, performing decalcification, and executing both manual and automated tissue processing procedures.
4. Develop competence in section cutting using a microtome, including the proper handling and sharpening of microtome knives.
5. Learn how staining and mounting contribute to clear and accurate microscopic visualization of tissue structures.

Course Content

Basic steps of tissue processing.

- Preparation of fixatives and fixation.
- Embedding.
- Microtomy.
- Staining.
- Mounting.
- Various methods of preparation of tissue sections.
- Paraffin section, celloidin embedding, frozen section.
- Decalcification.
- Tissue processing (Manual / Automatic).
- Section cutting and sharpening of microtome knife.

Course Title: English for Research Writing	L	T	P	Cr.
Course Code: BML4259	2	0	0	2

Hours: 30

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

1. Understand the structure and conventions of academic research writing and use appropriate academic vocabulary.
2. Critically analyze and synthesize information from research articles.
3. Write different sections of a research paper, including abstracts, introductions, methods, results, and discussions.
4. Format and cite sources accurately using recognized citation styles (e.g., APA, Vancouver).
5. Learn the process of research presentation.

Course Content

Unit I

7 Hours

- Foundations of Academic Writing and Reading
- Introduction to academic writing: purpose, audience, and style.
- Understanding the structure of a research article.
- Developing critical reading skills: skimming, scanning, and in-depth analysis.
- Identifying and evaluating sources of information.
- Introduction to academic integrity and plagiarism.

Unit II

7 Hours

- Grammar and Vocabulary for Scientific Communication
- Review of essential grammar: verb tenses, subject-verb agreement, and sentence structure.
- Use of passive voice and nominalization in scientific writing.
- Building academic vocabulary: roots, prefixes, and suffixes.
- Medical terminology: definitions and usage.
- Hedging and boosting: expressing certainty and uncertainty.

Unit III

7 Hours

- Writing the Research Paper
- Writing abstracts: summarizing key findings.
- Writing introductions: establishing the research context and purpose.
- Writing methods: describing the research design and procedures.
- Writing results: presenting data and findings.
- Writing discussions: interpreting and analyzing results.
- Writing case reports.

Unit IV**9 Hours**

- Referencing and Presentation
- Introduction to citation styles: APA and Vancouver.
- Creating and formatting references and bibliographies.
- Designing effective tables and figures.
- Revision and editing techniques.
- Introduction to the publication process.
- Basics of research presentation.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills*. University of Michigan Press.
- Day, R. A., & Gastel, B. (2011). *How to write and publish a scientific paper*. Cambridge University Press.
- Pechenik, J. A. (2016). *A short guide to writing about biology*. Pearson.
- American Psychological Association. (2020). *Publication manual of the American Psychological Association* (7th ed.).
- International Committee of Medical Journal Editors. (ICMJE). (Various years). Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. Available at: www.icmje.org
- O'Connor, M. (1991). *Writing successfully in science*. HarperCollins Academic.
- Jordan, R.R. (1997). *English for Academic Purposes: A guide and resource book for teachers*. Cambridge University Press.

Course Title: Indian Education	L	T	P	Cr.
Course Code: IKS0002	2	0	0	2

Total Hours: 30

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Understand the Indian Education Pre-Vedic and Post Vedic Period
2. Critically analyse the Paravidhya and Apravidhya in Indian education
3. Examine the methods of Vedas, Jainism and Bhodhsim Education
4. Development the curriculum according to Vedas, Jainism and Bhodhsim

Course Content

Unit-I

7 Hours

Religion and Philosophy in India: Ancient Period: Pre-Vedic and Vedic Religion, Buddhism and Jainism, Indian philosophy – Vedanta and Mimansa school of Philosophy

Unit-II

7 Hours

Paravidya: Relation between God and Self and Aparavidya: Vedas, Vedangas, Rituals, Astronomy, Ithihasas, Puranas, Ethics and Military sciences etc.

Unit-III

8 Hours

Methods of teaching: Vedic Education: - Saravana, Manana, Nididhyasana and Intuition/revelation Jainism – Matigyan, sarutiGyan, Avvidhiyagyan, Man: Paryav, Kaveleye
Bhodhsim- Direct and application Method, Lecture Method, Practice Method, Knowledge through conversation, Questioner answer Method

Unit-IV

8 Hours

Vedas- Mantel Development, Physical Development and Seprulity development, Jainism- Dravye, Astikay and Anistakay
Bhodhsim- four Arya Truth (ShabadVidhya, ChikitasyaVidhya and ShilpasanaVidhya, HetuVidhya and AdhyatamVidhya

Transactional Mode: Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment

Suggested Readings

- Chaudhuri, Kirti N.: *Trade and Civilisation in the Indian Ocean*, CUP, Cambridge, 1985.
- Malekandathil, Pius: *Maritime India: Trade, Religion and Polity in the*

Indian Ocean, Primus

- *Books, Delhi, 2010.*
- *McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian*
- *Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75.*
- *Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV*
- *Christie, J.W., 1999, The Banigrama in the Indian Ocean and the Java sea during the early*
- *Asian trade boom, Communarute'smaritimes de l'oceanindien, Brepols*
- *De Casparis, J.G., 1983, India and Maritime Southeast Asia: A lasting Relationship, Third*
- *Sri Lanka Endowment Fund Lecture.*
- *Hall, K.R., 1985, Maritime Trade and State development in early Southeast Asia,*
- *Honolulu. Walters, O.W., 1967, Early Indonesian Commerce, Ithaca.*
- *BaladevUpadhyaya, SamskrtaŚāstromkaItihās, Chowkhambha, Varanasi, 2010.*
- *D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., A Concise History of Science in India, 2nd Ed., Universities Press, Hyderabad, 2010.*
- *Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): The Trading World of the Indian Ocean, 1500-1800 (History of Science, Philosophy and Culture in Indian Civilization, ed. by D.P. Chattopadhyaya, vol. III, 7), Pearson, Delhi, 2012*

Semester 5th

Course Title: Virology	L	T	P	Cr.
Course Code: BML5300	3	0	0	3

Total Hours: 45

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

1. Understand the basic principles of virology, including viral structure, replication, and genetics.
2. Describe the pathogenesis of major viral infections.
3. Apply laboratory techniques for the detection and identification of viruses.
4. Explain the principles of antiviral therapy and prevention.
5. Discuss the role of virology in public health.

Course Content**Unit I****10 Hours**

Nature and Properties of Viruses Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses

Unit II**10 Hours**

Isolation, purification and cultivation of viruses Viral taxonomy: Classification and nomenclature of different groups of viruses, Modes of viral transmission: Persistent, non-persistent, vertical and horizontal Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions

Unit- III**12 Hours**

Poxviruses, Herpesviruses, hepatitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxoviruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis, Covid 19

Unit IV**13 Hours**

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Basic Virology* by Edward K. Wagner, Martinez J. Hewlett, David C. Bloom, David Camerini.
- *Fields Virology* by David M. Knipe, Peter M. Howley.
- *Medical Virology* by David O. White, Frank Fenner.
- *Principles of Virology* by S.J. Flint, Lynn W. Enquist, Vincent R. Racaniello, Anna Marie Skalka.
- *Jawetz, Melnick, & Adelberg's Medical Microbiology* (relevant chapters on virology).
- *Virology: Principles and Applications* by John Carter, Venetia Saunders.
- *Diagnostic Virology Protocols* by John M. Best.

Course Title: Blood Banking	L	T	P	Cr.
Course Code: BML5301	3	0	0	3

Total Hours: 45

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

1. Different blood grouping aspects.
2. To understand the blood transfusion and donation processes.
3. To learn the blood collection and testing approaches.
4. Explain the blood storage, transport and maintenance.
5. Learn cross matching procedures.

Course Content

UNIT I

12 Hours

Blood Grouping

Human Blood Group system: ABO Subgroups, Red Cell Antigen, Natural Antibodies, Rh Antigens; Principal of Blood grouping, antigen-antibody reaction; Blood grouping techniques: Cell grouping, Serum grouping; Difficulties in ABO grouping; Inheritance of the Blood groups.

UNIT II

14 Hours

Blood Transfusion & Blood Donation

Principal & Practice of blood Transfusion; Guide lines for the use of Blood, Appropriate use of Blood, Quality Assurance; Objectives of Quality Assurance in Blood Transfusion services, Standard operating procedures for usage, donation & storage of blood, screening of donor, compatibility testing, safety, procurement of supplies; Blood donor requirements; Criteria for selection & rejection.

UNIT III

9 Hours

Blood Collection & Testing Donor Blood

Blood collection packs; Anticoagulants; Adverse donor reaction; Screening donor's blood for infectious agents - HIV, HCV, HBV, Trepanoma palladium, Plasmodium, HTLV.

UNIT IV

10 Hours

Storage, Transport of Blood and Maintenance of Blood Bank Records

Changes in blood after storage; Gas refrigerator; Lay out of a blood bank refrigerator; Transportation approaches: Blood bank temperature and stock sheet, transfusion request form.

Transactional Mode:

Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Haufbrand, 'Essentials of Hematology'.*
- *J.V. Dacie, 'Practicals in Hematology'.*
- *Lynch, 'Medical Laboratory Technology'.*
- *'Wintrobe's Clinical Hematology'.*

Course Title: Clinical Biochemistry - I	L	T	P	Cr.
Course Code: BML5302	3	0	0	3

Total Hours: 45

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

1. Apply safety measures in a clinical biochemistry laboratory, and implement quality control and assurance procedures.
2. Master the principles and procedures for estimating key biochemical components in blood, serum, plasma, and urine.
3. Learn the principles and procedures for estimating electrolytes and minerals in biological samples.
4. Gain knowledge of screening procedures for detecting drugs, including drugs of abuse, and understand the toxicity and evaluation of toxic metals.
5. Learn about instrumentation used in clinical biochemistry.

Course Content

UNIT I

9 Hours

Introduction to Clinical Biochemistry: Hazards & safety measures in clinical Biochemistry laboratory; Quality control and quality assurance; management and maintenance of records; principles of assay procedure for the estimation of glucose, protein, urea, uric acid, creatinine, bilirubin, lipids in the blood, serum, plasma and urine and their normal range.

UNIT II

14 Hours

Principles, procedures for the estimation of the various biochemical components: Sodium, Potassium, Chloride, Iodine, Calcium, Phosphorus and Phosphates.

UNIT- III

12 Hours

Clinical Toxicology: Screening procedures for detection of drugs. Drugs of abuse and their evaluation. Toxic metals – Lead, Mercury, Arsenic, Cadmium and Chromium – Toxicity and their evaluation.

UNIT IV

10 Hours

Instrumentations: Detection of radioactivity; applications of radioisotopes in clinical biochemistry; Immunodiffusion Techniques, Radioimmunoassay & ELISA; Autoanalysers.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *P.B. Godkar, 'Text book of Medical Laboratory Technology'.*
- *Kolhatkar, 'Medical Laboratory Sciences, Theory & Practical'.*
- *Harold Varley, 'Practical Clinical Biochemistry'.*
- *U. Satyanarayan. & U. Chakrapani, 'Biochemistry'.*
- *Chaterjee & Shinde, 'Text book of Medical Biochemistry'.*

Course Title: Hospital Administration	L	T	P	Cr.
Course Code: BML5303	3	1	0	4

Hours: 60

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

1. Understand the structure and functions of a modern hospital.
2. Apply basic management principles to healthcare operations.
3. Recognize and adhere to legal and ethical standards in healthcare.
4. Contribute to quality improvement initiatives within a hospital.
5. Understand the importance of effective communication and teamwork in a hospital setting.

Course Content

Unit I

15 Hours

Introduction to Hospital Organization and Management

- Overview of the healthcare system.
- Types of hospitals and healthcare facilities.
- Hospital organizational structure and departments.
- Roles and responsibilities of hospital personnel.
- Basic management principles (planning, organizing, staffing, directing, controlling).
- Hospital information systems.

Unit II

15 Hours

Legal and Ethical Aspects of Hospital Administration

- Medical ethics and professional conduct.
- Legal aspects of healthcare (consent, confidentiality, medical records).
- Patient rights and responsibilities.
- Medical malpractice and liability.
- Healthcare regulations and compliance.
- HIPAA and data security.

Unit III

15 Hours

Quality Management and Patient Safety

- Principles of quality management in healthcare.
- Patient safety protocols and procedures.
- Risk management and infection control.
- Accreditation and quality standards (NABH, JCI).
- Performance measurement and quality improvement.
- Incident reporting and analysis.

Unit IV**15 Hours**

Communication, Teamwork, and Resource Management

- Effective communication in healthcare.
- Interprofessional teamwork and collaboration.
- Human resource management in hospitals.
- Inventory management and supply chain.
- Basic financial management in hospitals.
- Stress management for healthcare workers.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Hospital Administration: Text and Cases" by Francis C. Coleman.*
- *Principles of Hospital Administration and Planning" by B.L. Sherikar.*
- *Healthcare Management: Principles and Practice" by Steven Jonas and Raymond L. Goldsteen.*
- *Medical Law and Ethics" by Bonnie F. Fremgen.*
- *Quality Management in Healthcare" by Patricia Shaw Shaughnessy.*
- *The Patient Will See You Now: The Future of Medicine Is in Your Hands" by Eric Topol.*
- *Health Care Administration: Managing Organized Delivery Systems" by Stephen Shortell and Thomas Rundall.*
- *Hospital Administration" by S.L. Goel.*
- *Hospital Planning, Design, and Management" by G.D. Kunders.*

Course Title: Research Methodology and Biostatistics	L	T	P	Cr.
Course Code: BML5304	4	0	0	4

Hours: 60

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

1. Differentiating between various research types and methods.
2. Learn how to design effective research studies, including selecting appropriate populations, applying experimental design principles, and choosing suitable sampling methods.
3. Enables you to organize, analyze, and interpret data effectively.
4. Apply advanced statistical techniques, such as chi-square tests, ANOVA, and regression analysis, to analyze complex datasets.
5. Learn the basics of biostatistics as it applies to clinical trials, including randomization techniques, statistical monitoring, and regulatory considerations.

Course Content

UNIT I

15 Hours

Introduction to Research: Definition of Research, Types & Methods of research Applied versus Fundamental research, exploratory research, Observational research, Inductive and Deductive approaches; Designing Research protocol: Research Protocol Development, Literature search, Identification of Research problem, Research gap, Research question, Research Hypothesis, Null and Alternative Hypothesis, Study Objectives; Data and types: Types of Data, Primary and Secondary data, Scales of measurement of data- Nominal data, Ordinal, Interval and Ratio scale, Variables and Confounders, Dependent and Independent Variables, Extraneous variable, Control variable.

UNIT II

15 Hours

Literature Review: Importance of literature review, Sources of literature: Journals, books, and online databases, Organizing and synthesizing research findings; Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Different Research Designs, Basic Principles of Experimental Designs; Study population: Selecting Cases and Control, Comparison Group, Target population, Matching, Case Definition, Inclusion and Exclusion Criteria; Qualitative vs. Quantitative research methods; Data Collection and analysis : Types and sources of data – Primary and secondary, Methods of collecting data, Concept of sampling and sampling methods – sampling frame, sample, characteristics of good sample, simple

random sampling, purposive sampling, convenience sampling, snowball sampling.

Unit III

15 Hours

Statistics: Measures of central tendency: Mean, median, and mode, Measures of dispersion: Range, variance, and standard deviation, Frequency distributions and histograms, Data visualization: Bar charts, pie charts, and box plots; Probability and Probability Distributions: Basic probability concepts, Probability distributions: Normal distribution, binomial distribution, and Poisson distribution, Law of large numbers and central limit theorem.

Unit IV

15 Hours

Chi-square test for independence and goodness of fit, One-way and two-way analysis of variance (ANOVA), Post-hoc tests following ANOVA; Regression Analysis: Simple linear regression, Multiple linear regression, Model assumptions and diagnostics, Logistic regression (binary outcomes), Poisson regression (count data); Biostatistics for Clinical Trials: Design and analysis of clinical trials, Randomization techniques, Statistical monitoring of trials, Regulatory considerations (e.g., FDA guidelines).

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar: This is a widely used and accessible text.
- Business Research Methods" by William G. Zikmund, Barry J. Babin, Jon C. Carr, and Mitch Griffin: While titled for business, it covers general research methodology principles.
- Biostatistics: The Bare Essentials" by Geoffrey R. Norman and David L. Streiner: This is known for its clear and concise explanations.
- Biostatistics: A Methodology for the Health Sciences" by Gerald van Belle, Lloyd D. Fisher, Patrick J. Heagerty, and Thomas Lumley: This is a more comprehensive and advanced text.

Course Title: Cytology & Cytotechnology	L	T	P	Cr.
Course Code: BML5305	3	0	0	3

Total Hours: 45

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

1. Describe and differentiate the various types of tissues and their specialized functions.
2. Identify and categorize cellular components observed in cytological preparations of diverse body fluids.
3. Analyze and interpret cytological changes associated with physiological and pathological conditions of the female genital tract.
4. Recognize and differentiate between normal and abnormal cellular morphology in respiratory and urinary tract specimens.
5. Perform and understand the principles of various cytological collection and preparation techniques, including FNAC Cytology.

Course Content

UNIT I

10 Hours

Cell morphology and physiology, Cell structure and functions – lining membrane epithelia, stratified squamous epithelia, columnar epithelia, epithelia serving reproductive function and miscellaneous epithelia, Various cells seen in cytological preparations

Body fluids: method of collection transport and macroscopic and microscopic of Ascitic fluid, pleural fluid, and synovial fluid with special reference to cytology.

UNIT II

10 Hours

Genitourinary cytology (including normal and abnormal) Histology and cytology of epithelia of female genital tract during the child bearing age. Cells originating from the normal squamous epithelium of cervix vagina. Squamocolumnar junction.

Endocervical epithelium ciliary tuft. Cells originating from normal Endometrial. Endometrial smears in women wearing intra uterine devices, cells other than epithelia in normal smears, normal vaginal floras. Cyclic changes in vaginal smears.

Basic cytologic pattern of menopause, early, crowded and Atrophic menopause. Importance of physiologic cytology of prepubertal females. Vaginal smear at ovulation time.

UNIT III**15 Hours**

Excretory system: Cytology in the absence of cancer, cytology of normal urinevoided urine and catheterized urine. Inflammatory process with in the lower urinary tract. Bacterial fungal (Monilia) and viral infections and associated changes. Cytologic changes in bladder epithelium due to therapy, cytology of urinary tract in inflammantion and malignancy.

Respiratory Tract: Cytology in the absence of cancer. The squamous epithelium and Respiratory epithelium and their cytology, Non – epithelial cells of respiratory tract. Foreign materials in sputum. Benign abnormalities of respiratory epithelium, squamous epithelium and Squamous metaplasia cytology in malignant condition.

Cancer cells: Morphologic characters of cancer cells. Morphologic difference between normal cells and cancer cells.

UNIT IV**10 Hours**

Fine Needle Aspiration Cytology (FNAC).

Clinical procedures: Preparation and fixation of smears and fluid specimens. Collection, fixation and transport of cervical smears and vaginal smears for hormonal studies. Standards of adequacy of cytology examination of female genital tract.

Collection of urine, bladder irrigation, urine collection after prostatic massage, screening of urinary sediment, GIT Brushing and lavage, Cytological sampling from oesophagus, stomach and duode-num. occult blood in stool. Collection of body fluids and anticoagulants used.

Transactional Mode:

Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- Ross and Wilson, 'Anatomy & Physiology'.
- Pearce, 'Human Anatomy and Physiology'.
- Di Fiore, 'Atlas of Histology'.
- 'Medical Laboratory Technology' Vol. III.
- 'Color Atlas of Basic Histopathology'.

Course Title: Clinical Enzymology and Automation	L	T	P	Cr.
Course Code: BML5306	2	0	0	2

Total Hours: 30

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

1. Describe and differentiate the various types of tissues and their specialized functions.
2. Identify and categorize cellular components observed in cytological preparations of diverse body fluids.
3. Analyze and interpret cytological changes associated with physiological and pathological conditions of the female genital tract.
4. Recognize and differentiate between normal and abnormal cellular morphology in respiratory and urinary tract specimens.
5. Perform and understand the principles of various cytological collection and preparation techniques, including FNAC Cytology.

Course Content

Unit I

2 Hours

Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity

Unit-II

5 Hours

Coenzyme: Classification, various types and function, structure of NAD⁺, NADP⁺, FAD and FMN, PPP. Units for measuring enzyme activity, factors affecting enzyme level in serum/ plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes

Unit-III

5 Hours

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme

Unit-IV

8 Hours

Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK-MB, LDH, Troponin, Myoglobin, Amylase, Lipase, ACP, Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
- M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
- Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
- Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
- U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
- Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
- Bishop(2013),Clinical Chemistry,7th edition, WileyPublications

Course Title: Virology (Lab.)	L	T	P	Cr.
Course Code: BML5307	0	0	2	2

Total Hours: 30

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

1. Proficiency in Embryonated Egg Techniques.
2. Competence in Viral Diagnostic Procedures.
3. Ability to Perform Rapid Diagnostic Assays.
4. Mastery of ELISA-Based Viral Detection.
5. Understanding of Molecular Diagnostic Principles.

Course Content

1. Demonstration of fertilized hen egg.
2. Demonstration of virus inoculation routes in fertilized hen egg.
3. Lab Diagnosis of Viral Infections, with Special reference to COVID 19 - Collection of Specimen Diagnostic Tests Demonstration of Doffing and Donning
4. To perform HBsAg/ Australia Ag by rapid method
5. To perform HBsAg by ELISA
6. To perform HIV Tridot method.
7. To perform HIV by ELISA
8. To perform Dengue IgG/IgM
9. To perform TORCH profile
10. Demonstration of PCR HIV Viral load

Course Title: Blood Banking (Lab.)	L	T	P	Cr.
Course Code: BML5308	0	0	2	1

Total Hours: 30

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

1. Blood Donor Screening and Blood Preservation:
2. Blood Grouping and Compatibility Testing
3. Perform Direct and Indirect Coombs' tests.
4. Screen blood for transfusion-transmissible infections, and TORCH profile.
5. Understand advanced molecular diagnostic techniques which is important for monitoring viral levels in infected individuals.

Course Content

1. Screening of blood donor: physical examination including medical history of the Donor.
2. To prepare Acid Citrate Dextrose (ACD) and Citrate Phosphate Dextrose (CPD) Solutions.
3. Collection and preservation of blood for transfusion purpose.
4. Screening of blood for Malaria, Microfilaria, HBsAg, syphilis and HIV.
5. To determine the ABO & Rh grouping.
6. To perform Direct and Indirect Coomb's test.
7. To perform cross matching.

Course Title: Clinical Biochemistry - I (Lab.)	L	T	P	Cr.
Course Code: BML5309	0	0	2	1

Hours: 30

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

1. Perform core biochemical analyses of blood and urine, including the estimation of glucose, protein, urea, and uric acid.
2. Learn how to accurately measure components of a lipid profile which are crucial for assessing cardiovascular risk.
3. Develop expertise in estimating creatinine and urea levels, providing insights into renal (kidney) function.
4. Learn to estimate serum bilirubin, which is essential for assessing liver function and diagnosing related disorders.
5. Gain proficiency in measuring serum calcium and electrolytes which are vital for understanding and maintaining electrolyte and mineral balance within the body.

Course Content

1. Estimation of Glucose in Urine and in Blood.
2. Estimation of Protein in Urine and Blood.
3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum bilirubin.
6. Estimation of Total Cholesterol in blood.
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol.
9. Estimation of TG.
10. Estimation of Creatinine in Blood.
11. Estimation of serum calcium.
12. To measure electrolytes Sodium, Potassium & Chloride.

Course Title: Cytology and Cytotechnology (Lab.)	L	T	P	Cr.
Course Code: BML5310	0	0	2	1

Total Hours: 30

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

1. Describe and differentiate the various types of tissues and their specialized functions.
2. Identify and categorize cellular components observed in cytological preparations of diverse body fluids.
3. Analyze and interpret cytological changes associated with physiological and pathological conditions of the female genital tract.
4. Recognize and differentiate between normal and abnormal cellular morphology in respiratory and urinary tract specimens.
5. Perform and understand the principles of various cytological collection and preparation techniques, including FNAC Cytology

Course Content

1. Collection of samples and processing.
2. Cytological fixatives and fixation.
3. Collection and preparation of fluid sediment for cytological examination.
4. Preparation and fixation of sputum smears for cytology and preparation.
5. Preparation and fixation of vaginal and cervical smears for cytology.
6. Hormonal evaluation of vaginal smears.
7. Papanicolaou staining-principles and staining procedures.
8. Maygrunwald staining-principles and staining procedures.
9. Identification of cells.
10. Differentiation between malignant and benign cells.

Semester 6th

Course Title: Diagnostic Molecular Biology	L	T	P	Cr.
Course Code: BML6350	3	0	0	3

Hours: 45

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

1. Gain a comprehensive understanding of nucleic acids (DNA and RNA), including their composition, structure, types, and the processes of DNA denaturation
2. Learn the detailed mechanisms of transcription in both prokaryotes and eukaryotes.
3. Develop knowledge of nucleic acid amplification testing, particularly PCR, its principles, types (RT-PCR, nested PCR), applications, and the use of thermal cyclers.
4. Learn about Southern and Western blotting techniques, and gain an understanding of chromosome.
5. Applications of radioisotopes in blood volume measurement and cell lifespan determination, understand radiation hazards and safety.

Course Content**Unit I****11 Hours**

Nucleic Acids, DNA, RNA, composition, structure, types, denaturation and renaturation of DNA, chemistry of DNA synthesis, general principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins

Unit II**11 Hours**

Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors Introduction of translation

Unit III**11 Hours**

Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RTPCR, reverse transcriptase PCR, Nested PCR

Unit-IV Blotting techniques, southern blotting and Western blotting
Introduction to chromosomes, its structure and disorder, Karyotyping, Chromosomal studies in hematological disorders (PBL and Bone marrow), FISH

Unit IV**12 Hours**

Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of radioactive material Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications*
- *Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition,Elsevier*
- *Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science*
- *Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman*

Course Title: Advanced Diagnostic Techniques	L	T	P	Cr.
Course Code: BML6351	3	0	0	3

Hours: 45

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

1. Learn the principles, types (paper, TLC, HPLC, GLC, ion exchange), and diagnostic applications of chromatography.
2. Learn the basic principles and various types of electrophoresis (paper, gel, PAGE, SDS-PAGE, agarose), understanding their use.
3. Gain knowledge of centrifugation principles, including rotor types, RCF, sedimentation coefficient, and different centrifugation techniques.
4. Understand and apply various immunoassay techniques, such as ELISA, RIA, FIA, and FACS, to detect and quantify analytes for clinical diagnosis.
5. Learn about radioisotopes, radioactivity measurement, and their applications.

Course Content

Unit I

10 Hours

Chromatography, its principle, types and applications. Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.

Unit II

15 Hours

Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.

Unit III

10 Hours

Centrifugation, fixed angle and swinging bucket rotors, RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultracentrifugation.

Unit IV

10 Hours

Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications*
- *Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition,Elsevier*
- *Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science*
- *Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman*
- *Wilson & Walker, Practical Biochemistry,2nd Edition*

Course Title: APPLIED HAEMATOLOGY- II	L	T	P	Cr.
Course Code: BML6352	3	0	0	3

Total Hours: 45

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

1. Gain a comprehensive understanding of the different classifications of anemia
2. Learn to classify various types of leukemia, recognize their signs and symptoms, laboratory diagnostic procedures.
3. Develop a strong understanding of normal blood clotting mechanism.
4. Learn about the radioactive isotopes in medical and research settings, radiation hazards, prevention measures, and the safe disposal of radioactive materials.
5. gain a deeper understanding of the underlying disease mechanisms of anemia, leukemia, and coagulation disorders.

Course Content

UNIT I

9 Hours

Anemia Disorder: Classification of Anemia: Morphological & etiological; Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency; Megaloblastic Anemia; Hemolytic Anemia.

UNIT II

10 Hours

Leukemia: Classification: general, specific; signs and symptoms; causes: radiation, genetic conditions; laboratory diagnosis; treatment: Acute lymphoblastic, chronic lymphocytic, acute myelogenous, hairy cells.

UNIT III

14 Hours

Blood Disorders: Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis; intravascular coagulation, hemophilia, idiopathic thrombocytopenic purpura their mechanisms and laboratory identification; platelet function test; measurement of blood volume, red cell volume.

UNIT IV

12 Hours

Radioactive Isotopes Their Uses and Management: Source, half life and their applications; various apparatus used for measurement of radiation; radiation hazards its prevention; disposal of radioactive materials.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Paraful B. Godkar, 'Text book of Medical Laboratory Technology'.*
- *J.B. Dacie, 'Practical Haematology'*
- *V.H. Talib, 'Hand book of Medical Laboratory Technology'.*
- *Emmanuel C. Besa, 'Haematology' Harwal Publisher.*
- *Sir John, 'Practical Haematology'.*

Course Title: Clinical Biochemistry II	L	T	P	Cr.
Course Code: BML6353	3	0	0	3

Total Hours: 45

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

1. To know the metabolic disorders due the deficiencies of various bio-molecules.
2. Concepts of Inborn metabolic problems.
3. Various liver and kidney complications.
4. To understand the clinical automation.
5. Learn the procedure of automation.

Course Content

UNIT I

12 Hours

Disorders of Metabolism

Disorders of Carbohydrate Metabolism: Diabetes mellitus, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, galactose tolerance tests; Analysis of T3, T4 and TSH, and their significance in diagnosis of metabolic disorders; Disorders of Lipid metabolism: Plasma lipoproteins, cholesterol, triglycerides & phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemias, and ketone bodies; Digestive diseases- Gastric analysis and its importance.

UNIT II

10 Hours

Inborn Errors of Metabolism

Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Lesch-Nyhan syndrome, sickle cell anemia, Histidinemia.

UNIT III

14 Hours

Disorders of liver and kidney

Normal and abnormal functions of liver and kidney. Jaundice, fatty liver, acute and chronic renal failure; Clearance tests for renal function. Diagnostic Enzymes clinical significance of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine transaminase and Creatine phosphokinase. Qualitative and quantitative analysis of renal calculi and its significance.

UNIT IV

9 Hours

Clinical Automation

History of Automaton, purpose; types of machines used in the routine laboratory practices their principles, construction and working.

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *M.N. Chatterjea and Rana Shinde, 'Textbook of Medical Biochemistry', Jaypee Brothers.*
- *John W. Baynes and Marek Dominiczak, 'Medical Biochemistry (Paperback)', Mosby.*
- *Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd, 'Clinical Biochemistry: An Illustrated Colour Text (Paperback)', 3rd Edn.,. Churchill Livingstone.*
- *G. Beckett, S. walker, P. Rae, P. Ashby, 'Clinical Biochemistry', 7th Edn., Blackwell Publishing.*

Course Title: Basics of Hospital Skill Learning	L	T	P	Cr.
Course Code: BML6354	2	0	0	2

Total Hours: 30

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

1. Understand the basic ideas on how to check for Vital Signs of the Patient
2. Learn how to handle the patients and their positioning
3. Learn on the Basics of Nasal-Gastric Tube
4. Learn on Administration of IV, IV and Medication
5. Know about Cleanliness in the Asepsis

Course Content

UNIT I

5 Hours

MEASURING VITAL SIGNS: Temperature: Axillaries Temperature, Pulse: Sites of pulse, Measurement, Respiratory, Blood Pressure, Pain: Pain Scale

PHYSICAL EXAMINATION: Observation, Auscultation (Chest), Palpation, Percussion, History Taking

UNIT II

5 Hours

FEEDING: ENTRAL FEEDING, NG TUBE: Measurement, Procedure, Care, Removal of Nasal-Gastric Tube, Nasal-Gastric Tube Feeding, and Parenteral Nutrition.

MOBILITY AND SUPPORT: Moving and Positioning, range of Motion exercises (Active & Passive) Assisting for Transfer, Application of Restraints

UNIT III

5 Hours

ADMINISTRATIONS: Oral, Intravenous, Intramuscular, Subcutaneous, Recapping of Syringe, Loading of Drugs, Calculation of Drugs, Venipuncture, IV Infusion, Cannula, Attachment of IV infusion Set, Fluid Collection, Heparin Lock, Maintenance of IV set, Performing Nebulizer Therapy, Inhaler, Oxygen Therapy (Nasal, prongs, nasal Catheter, Venturi Mask, face mask)

UNIT IV

5 Hours

ASEPSIS: Hand wash Techniques, (Medical, Surgical) Universal Precaution, Protecting Equipments: Using Sterile Gloves, Opening a Sterile package and Establishing a Sterile Field, Sterile Dressing Changes, Surgical Attire, Wound Dressing, Suture Removal, Cleaning and Application of Sterile Dressing, Wearing and Removal of personal protective Equipment

Transactional Mode: Video Based Teaching, Panel Discussion, Case Based Teaching, Brain Storming, Demonstration, Peer Teaching.

Suggested Reading:

- *Ross and Wilson, 'Anatomy & Physiology'.*
- *Pearce, 'Human Anatomy and Physiology'.*
- *Di Fiore, 'Atlas of Histology'.*
- *'Medical Laboratory Technology' Vol. III.*
- *'Color Atlas of Basic Histopathology'.*

Course Title: Diagnostic Molecular Biology (Lab.)	L	T	P	Cr.
Course Code: BML6355	0	0	2	1

Total Hours: 30

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

1. Gain practical skills in isolating DNA and analyzing it through agarose gel electrophoresis.
2. Learn about the operation of a thermal cycler and understand the principles and applications of PCR.
3. Understand and observe the Western blotting technique for HIV testing.
4. Learn how to perform karyotyping, a technique used to analyze chromosomes and identify chromosomal abnormalities.
5. Gain exposure to the application of PCR in the diagnosis of infectious diseases and in the detection of specific genetic markers.

Course Content

1. Isolation of DNA
2. Separation of DNA by Agarose gelelectrophoresis
3. Demonstration of thermal cycler and PCR.
4. HIV test by Western Blotting
5. To perform karyotyping
6. Demonstration of PCR HLA B-27
7. Demonstration of PCR HIV
8. Demonstration of PCR MTB

Course Title: Advanced Diagnostic Techniques (Lab.)	L	T	P	Cr.
Course Code: BML6356	0	0	2	1

Total Hours: 30

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

1. Know the separation of amino acids using both paper chromatography and thin-layer chromatography (TLC).
2. Learn how to separate DNA fragments using agarose gel electrophoresis.
3. Acquire practical skills in separating proteins using polyacrylamide gel electrophoresis (PAGE).
4. Gain experience in separating proteins through paper electrophoresis, which will help you understand the protein separation based on electrical charge.
5. Learn techniques to separate different types of hemoglobin, which is vital for diagnosing hemoglobinopathies.

Course Content

1. To perform separation of amino acids by paper chromatography
2. To perform separation of amino acids by thin layer chromatography
3. To perform separation of DNA by Agarose gel electrophoresis.
4. Separation of protein byPAGE
5. Separation of protein bypaper electrophoresis
6. Separation of haemoglobin

Course Title: APPLIED HAEMATOLOGY- II (Lab.)	L	T	P	Cr.
Course Code: BML6357	0	0	2	1

Total Hours: 30

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

1. Develop proficiency in assessing iron status and analyzing various hemoglobin components.
2. Learn to detect G6PD deficiency.
3. Cytochemical staining techniques to differentiate various blood cell types
4. Gain expertise in evaluating coagulation leading to an understanding of clotting disorders.
5. Learn to perform various platelet function to diagnose platelet-related bleeding disorders.

Course Content

- To estimate serum iron and total iron binding capacity.
- To detect whether the given specimen is G6PD deficient or normal.
- To estimate Hb-F in a given blood sample.
- To estimate plasma and urine Haemoglobin in the given specimens.
- To demonstrate the presence of Hb-S by Sickling and solubility tests.
- To test the given blood sample for its osmotic red cell fragility.
- Cytochemical staining on the given smears such as PAS, SBB, MPO, LAP and Perl's reaction.
- Estimation of Fibrinogen, Fibrin degradation products (FDPs) and Euglobulin clot lysis test (ELT).
- Urea clot solubility test for factor XIII.
- To perform various platelet function tests such as whole blood clot retraction test, prothrombin consumption index (PCI) Platelet adhesion, aggregation and PF3 availability test.

Course Title: Clinical Biochemistry II (Lab.)	L	T	P	Cr.
Course Code: BML6358	0	0	2	1

Total Hours: 30

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

1. Gain practical experience in performing and interpreting the Glucose Tolerance Test (GTT) and the Insulin Tolerance Test (ITT)
2. Determine uric acid in urine and calculate creatinine and urea clearances.
3. Determine the levels of serum acid phosphatase, alkaline phosphatase, lactate dehydrogenase (LDH), and creatine phosphokinase (CPK).
4. Determine the levels of thyroid hormones (T3 and T4) and thyroid-stimulating hormone (TSH).
5. Gain the ability to relate the results to clinical conditions.

Course Content

1. To perform the Glucose tolerance test of the given sample (GTT).
2. To perform the Insulin tolerance test (ITT).
3. Determination of Uric acid in Urine of the patient.
4. Determination of Creatinine clearance.
5. Determination of Urea clearance.
6. Determination of Serum acid phosphatase.
7. Determination of Serum Alkaline phosphatase.
8. Determination of Serum Lactate dehydrogenase.
9. Determination of Serum CPK
10. Determination of T3, T4 and TSH.

Course Title: Indian Health Sciences	L	T	P	Cr.
Course Code: IKS0006	2	0	0	2

Total Hours: 30

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Understand knowledge of India's traditional health systems
2. Critically analyse India's healthcare policies
3. Understand the patterns, causes, and effects of diseases in India and strategies for prevention and control.
4. Learn about nutrition, sanitation, mental health, and lifestyle diseases like diabetes and cardiovascular disorders, along with preventive healthcare measures.

Course Content

Unit – I:

7 Hours

Introduction, Vedic foundations of Ayurveda. Ayurveda is concerned both with maintenance of good health and treatment of diseases.

Unit – II:

8 Hours

Basic concepts of Ayurveda. The three Gunas and Three Doshas, Pancha-mahabhuta and Sapta-dhatu.

The importance of Agni (digestion). Six Rasas and their relation to Doshas. Ayurvedic view of the cause of diseases.

Unit – III:

8 Hours

Dinacharya or daily regimen for the maintenance of good health. Ritucharya or seasonal regimen. Important Texts of Ayurveda. Selected extracts from *Astāngahrdaya* (selections from *Sūtrasthāna*) and *Suśruta-Samhitā* (sections on plastic surgery, cataract surgery and anal fistula). The large pharmacopeia of Ayurveda.

Unit – IV:

7 Hours

Charaka and Sushruta on the qualities of a Vaidya. The whole world is a teacher of the good Vaidya.

Charaka's description of a hospital. Hospitals in ancient and medieval India.

Transactional Mode: Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment.

Suggested Readings

- Park's Textbook of Preventive and Social Medicine – K. Park

- Ayurveda: The Science of Self-Healing – Dr. Vasant Lad
- Health Sector in India: A Policy Perspective – P. K. Pandey
- Essential Readings in Health Policy and Law – Joel B. Teitelbaum & Sara E. Wilensky

Course Title: Research Publication Ethics and Intellectual Property Right	L	T	P	Cr.
Course Code: BML6359	2	0	0	2

Total Hours: 30

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Understand and apply principles of ethical conduct in research and publication.
2. Identify and prevent instances of research misconduct, including plagiarism, fabrication, and falsification.
3. Comprehend the fundamentals of intellectual property rights, including copyright, patents, and trademarks.
4. Navigate the legal and ethical considerations related to authorship, data ownership, and responsible data management.

Course Content

Unit I

7 Hours

Scientific Writing: Structure of a scientific paper (Title, abstract, introduction, methodology, results, discussion, conclusion); Writing a research proposal: Objectives, methodology, expected outcomes, Academic writing style and language (Clarity, conciseness, and logical flow), Citation and referencing: Understanding various citation styles (APA, MLA, Chicago, etc.), Reference management tools.

Unit II

7 Hours

Plagiarism: Types, plagiarism detection software, Publication misconduct and Publication Ethics, Plagiarism avoiding techniques, regulation of plagiarism in India; Publication Ethics: Integrity and Ethics, Best Practices, Intellectual Honesty & Research Integrity: Scientific Misconducts & Redundant Publications, Conflict of Interest, Publication Misconduct, Violation of Publication Ethics, Authorship and Contributorship; Identification of Publication Misconduct: Fabrication, Falsification and Plagiarism (FFP), Predatory Publishers & Journals.

Unit III

7 Hours

Open Access Publishing: Concept of OER, Concept of open license, Open access publishing, Open access content management; Database and Research Metrics: Indexing Databases, Citation Databases: Web of Science, Scopus, Google Scholar, Metrics: h-index, g-ind, i10 index, Understanding Citation Metrics for Quality Research: Impact & Visualization Analysis; Peer Review and Journal Selection: Understanding the peer-review process, Types of journals: Open access vs. subscription-based journals, How to select a

journal for publication, Writing a cover letter and responding to reviewer comments.

Unit IV

9 Hours

Intellectual Property Rights (IPR): Definition and types of intellectual property (IP): Copyright, patents, trademarks, and trade secrets; The importance of IP in research and innovation, Historical development and international IP laws (e.g., the role of WIPO, TRIPS Agreement); Key IP terms: Patentable inventions, originality, novelty, and industrial applicability; Patents: Overview of the patent system: Types of patents, Steps involved in obtaining a patent: Application, examination, and grant, Patentability requirements: Novelty, non-obviousness, and usefulness, Patent infringement and enforcement; Licensing and Commercialization of IP: Types of IP licenses: Exclusive vs. non-exclusive licenses, Licensing agreements and revenue sharing, Commercialization of research findings: Startups, spin-offs, and patent exploitation, Technology transfer offices: Role in university-based IP commercialization; Patent issues in academic research: Balancing public knowledge with commercial interests, Ethical concerns in patenting research outcomes, Impact of IP laws on collaborative research, IP in publicly funded research.

Transactional Mode: Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment

Suggested Readings

- *Scientific Integrity: Text and Cases in Responsible Conduct of Research" by Francis L. Macrina*
- *Intellectual Property: Law & Policy" by Robert P. Merges, Peter S. Menell, Mark A. Lemley, and Shyamkrishna Balganesh*
- *Research Ethics: Cases and Materials" by Robin Levin Penslar*
- *Copyright Law" by Robert Brauneis and Roger E. Schechter*
- *Understanding Copyright Law" by Marshall Leaffer: A more concise guide to copyright, useful for beginners.*
- *Patent Law" by Janice Mueller*
- *The Chicago Guide to Your Academic Career*
- *Doing Integrity in Research & Scholarly Publication" by Carole McCartney*