

SCHEME & SYLLABUS

Bachelor of Medical Laboratory Science

As per NCAHP
Program Code:UG074



Department of Allied Health Sciences
University Institute of Allied Health Science (UIAHS)
Sant Baba Bhag Singh University

2026

ABOUT THE DEPARTMENT

The Department of Allied Health Sciences, formerly the Department of Natural Science, was established in 2015. Over the years, the department has flourished and now offers programs at the graduate, postgraduate, and doctoral levels in Medical Laboratory Sciences (MLS), Medical Radiology & Imaging Technology (MRIT), and Anaesthesia & Operation Theatre Technology (AOTT). With modern laboratories, experienced faculty, and strong clinical collaborations, the Institute integrates scientific knowledge, practical skills, and ethical values to prepare competent healthcare professionals aligned with national and global healthcare standards.

ABOUT THE PROGRAMME

The programme in Medical Laboratory Sciences is designed to develop skilled laboratory professionals proficient in diagnostic testing, clinical analysis, and quality assurance practices. It provides comprehensive training in biochemistry, microbiology, hematology, pathology, molecular diagnostics, and emerging laboratory technologies. Through advanced laboratory exposure and research orientation, students gain the competence required to support accurate diagnosis, disease monitoring, and evidence-based clinical decision-making.

SALIENT FEATURES OF THE DEPARTMENT

- Strong academic framework aligned with **NCAHP guidelines** and national regulatory standards.
- Well-equipped, modern laboratories with advanced diagnostic and clinical equipment.
- Experienced and research-oriented faculty with strong academic and clinical expertise.
- Extensive hands-on training through hospital tie-ups and healthcare collaborations.
- Career-oriented programmes with strong employability prospects in the healthcare sector.
- Supportive learning environment with mentorship and academic guidance.

BMLS (Bachelor of Medical Laboratory Science)

Bachelor of Medical Laboratory Science (BMLS) is an undergraduate degree program designed to prepare students for a professional career in clinical laboratory science, which plays a critical role in diagnosing, treating, and monitoring diseases. The course is designed to be of 4 years duration (including one year compulsory internship).

ELIGIBILITY CRITERIA

- ◆ Candidate must have passed Senior Secondary (10+2) or equivalent with Physics, Chemistry and Biology (Botany & Zoology) subjects.
- ◆ Admission on the basis of merit of Senior Secondary (10+2).
- ◆ He/she has completed 17 years of age at the time of admission or will complete that age on or before 31 December of the year of his/her admission to the first year of the Undergraduate Allied and Healthcare Course.
- ◆ Lateral Entry to the candidates in second year (3rd semester) who have passed Diploma in Medical Laboratory Technology (D.MLT) with 50% Marks.
- ◆ Medical fitness certificate is mandatory to submit and it is to be endorsed by Government medical officer.
- ◆ Reservation policy for admission in under graduate programs shall be as per the State/Centre Government norms.

DURATION

It is recommended that any programme developed from this curriculum should have the following minimum duration for students to qualify as entry level professionals in laboratory Science –

- 4-year program (including 1 year of compulsory internship (Laboratory rotation /Research dissertation)- Bachelor's degree level

Total number of hours: 4125

Total Credits : 160

4-year program including 12 months of Internship - Bachelor's degree level

Degree Awarded: Bachelor's of Medical Laboratory Science (BMLS)

Medium of instruction: English

PROGRAMME OBJECTIVES:

- Equip students with knowledge of laboratory procedures across haematology, clinical biochemistry, microbiology, immunology, histopathology, and molecular diagnostics.
- Train students to operate, maintain, and troubleshoot modern diagnostic equipment.
- Emphasize quality control, laboratory safety, and ethical practice.
- Develop critical thinking and diagnostic interpretation skills.

Core Subjects included in the curriculum are:

1. Human Anatomy & Physiology
2. Biochemistry
3. Pathology
4. Microbiology
5. Hematology
6. Immunology & Serology
7. Blood Banking & Transfusion Science
8. Clinical Biochemistry
9. Histopathology & Cytology
10. Molecular Biology & Genetics
11. Laboratory Management & Quality Assurance
12. Research Methodology

The course curriculum is designed to provide special emphasis on hands-on lab sessions in hospital or diagnostic laboratories, Internships in clinical settings, and in the final year.

CAREER OPPORTUNITIES

Upon successful completion of the course, post-graduates can have the following career opportunities:

- Medical Laboratory Technologists
- Clinical Research Assistants
- Clinical Lab Managers
- Quality Control Officers
- Molecular Lab Technologists

In Hospitals, Diagnostic labs, Blood banks, pharmaceutical companies, public health organizations, Research institutions.

Students also have higher studies options including, Master of Medical Laboratory Science, M.Sc. in disciplines like Microbiology, Biochemistry, or Biotechnology, MBA in Hospital or Healthcare Management.

LEARNING OBJECTIVES:

Upon successful completion of the Bachelor's program, students will

1. Foundational Knowledge

- Understand the normal structure and function of the human body.
- Explain the pathophysiological basis of disease and how laboratory tests aid diagnosis.
- Apply knowledge of microbiology, hematology, biochemistry, immunology, and molecular biology to clinical scenarios.

2. Laboratory Skills

- Perform routine and specialized laboratory tests accurately in various disciplines (e.g., hematology, microbiology, clinical chemistry, histopathology).
- Operate, calibrate, and maintain laboratory instruments and equipment.
- Collect, handle, and process biological specimens following safety and quality standards.

3. Quality Assurance & Safety

- Implement quality control procedures to ensure accuracy and reliability of test results.
- Adhere to biosafety and infection control guidelines in all laboratory practices.
- Identify and troubleshoot pre-analytical, analytical, and post-analytical errors.

4. Critical Thinking & Problem Solving

- Analyze and interpret laboratory data for clinical relevance.
- Recognize abnormal results and understand their diagnostic implications.
- Apply logical reasoning to solve technical problems and improve procedures.

5. Communication & Collaboration

- Communicate effectively with healthcare professionals, patients, and laboratory teams.
- Maintain clear and accurate laboratory records and reports.
- Demonstrate professional and ethical behavior in a clinical setting.

6. Research & Lifelong Learning

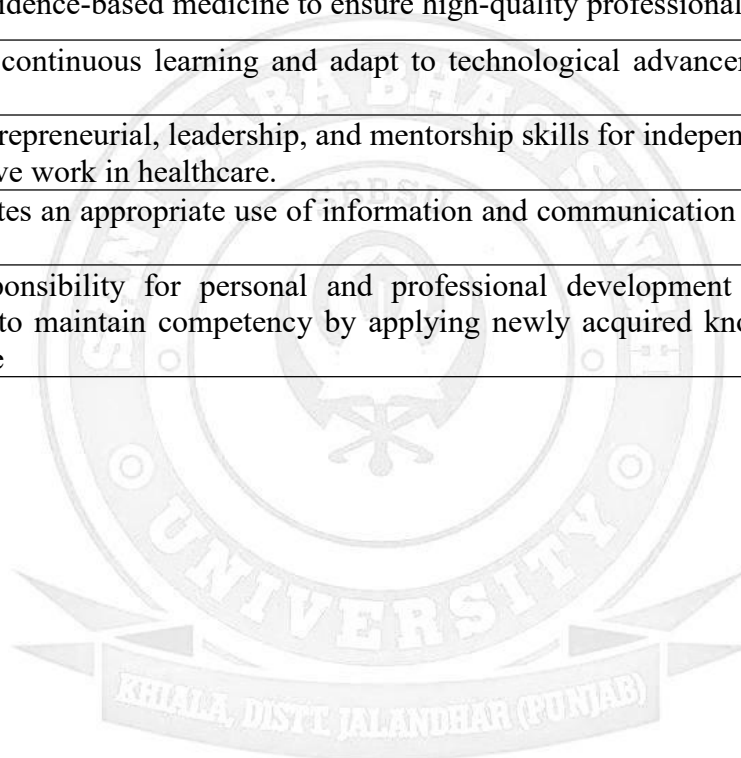
- Understand the principles of scientific research and evidence-based practice
- Participate in small-scale research or projects related to laboratory science.
- Stay updated with current advances in laboratory medicine and emerging technologies.

7. Professional Development

- Demonstrate responsibility, initiative, and time management in professional duties.
- Understand legal and ethical issues in laboratory practice.
- Prepare for national certification or licensing exams, if applicable.

PROGRAMME OUTCOMES (PO):

POs	Outcome
PO1	Apply scientific knowledge in professional healthcare practice.
PO2	Demonstrate clinical and technical skills to deliver quality healthcare services.
PO3	Collaborate effectively in teams within an interdisciplinary healthcare setting to improve societal health.
PO4	Uphold ethical values and professionalism within the legal framework of society.
PO5	Communicate effectively with healthcare teams and the community.
PO6	Practice evidence-based medicine to ensure high-quality professional performance.
PO7	Engage in continuous learning and adapt to technological advancements for professional growth.
PO8	Exhibit entrepreneurial, leadership, and mentorship skills for independent practice and collaborative work in healthcare.
PO9	Demonstrates an appropriate use of information and communication technology relevant to their field.
PO10	Takes responsibility for personal and professional development and demonstrates an obligation to maintain competency by applying newly acquired knowledge or abilities to patient care



INDEX

S.No	SubjectCode	SubjectName	Page No.	Semester
1		AllCourseScheme	I-VIII	
2		Marks Distribution	IX- XII	
3	BMLS101	Human Anatomy	1-2	1
4	BMLS 105	Human Physiology	3-4	1
5	BMLS109	Fundamentals of the Healthcare System and Medical Laboratory Science (MLS)	5-6	1
6	BMLS111	Basic Emergency care and First aid	7	1
7	BMLS113	Communication and Professionalism	8-9	1
8	BMLS115	Basics of Computer Application	10-11	1
9	BMLS103	Human Anatomy practical	12	1
10	BMLS107	Human Physiology practical	13	1
11	BMLS102	Fundamentals of Microbiology	14-16	2
12	BMLS106	Basics of Biochemistry	17-18	2
13	BMLS110	Fundamentals of Haematology	19-20	2
14	BMLS114	Preventive and Social Medicine	21-22	2
15	EVS200	Environment Education	23-24	2
16	BMLS104	Fundamentals of Microbiology Practical	25	2
17	BMLS108	Basics of Biochemistry Practical	26	2
18	BMLS112	Fundamentals of Haematology Practical	27-28	2
19	BMLS201	Bacteriology	29-30	3
20	BMLS205	Intermediary Metabolism and Endocrinology	31-32	3
21	BMLS209	Clinical Haematology	33-34	3
22	BMLS213	Basics of Pharmacology	35-36	3
23	BMLS203	Bacteriology Practical	37	3
24	BMLS207	Intermediary Metabolism and Endocrinology Practical	38	3
25	BMLS211	Clinical Haematology-Practical	39-40	3
26	BMLS202	Virology and Immunology	41-42	4
27	BMLS206	Genetics and Molecular Biology	43-44	4
28	BMLS210	Clinical Pathology	45-46	4
29	BMLS214	Medical Laboratory Management and Quality Control	47-48	4
30	BMLS204	Virology and Immunology Practical	46-50	4
31	BMLS208	Genetics and Molecular Biology Practical	51	4
32	BMLS212	Clinical Pathology Practical	52	4
33	BMLS301	Mycology & Parasitology	53-55	5
34	BMLS305	Analytical Biochemistry	56-57	5
35	BMLS309	Immuno hematology and Transfusion Medicine	58-59	5

36	BMLS313	Medical Law and Ethics	60-61	5
37	BMLS303	Mycology & Parasitology Practical	62	5
38	BMLS307	Analytical Biochemistry Practical	63	5
39	BMLS311	Immuno hematology and Transfusion Medicine Practical	64	5
40	BMLS302	Applied Pathobiology	65-66	6
41	BMLS306	Cytology and Histopathology	67-69	6
42	BMLS310	Clinical Biochemistry	70-71	6
43	BMLS 314	Biostatistics and Research Methodology	72-73	6
44	BMLS304	Applied Pathobiology Practical	74	6
66	BMLS308	Cytology and Histopathology Practical	75-76	6
67	BMLS312	Clinical Biochemistry Practical	77-78	6
68	BMLS401	Lab Posting/ Research Dissertation (Logbook and Viva)	79-80	7
69	BMLS402	Lab Posting/ Research Dissertation (Logbook and Viva)	79-80	8



SEMESTER-I

S.No	Sub Code	Subject Name	Lecture	Tutorial	Practical	Credits	Contact Hours
1	BMLS101	Human Anatomy	3	1	0	4	60
2	BMLS 105	Human Physiology	3	1	0	4	60
3	BMLS109	Fundamentals of the Healthcare System and Medical Laboratory Science (MLS)	2	0	0	2	30
4	BMLS111	Basic Emergency care and First aid	1	1	0	2	30
5	BMLS113	Communication and Professionalism	2	0	0	2	30
6	BMLS115	Basics of Computer Application	1	0	1	2	45
7	BMLS103	Human Anatomy practical	0	0	4	2	60
8	BMLS107	Human Physiology practical	0	0	4	2	60
9	PT 161/ 163/ 165	Physical Training- 1 (NSO/NCC/NSS)	0	0	2	NC	
Total			12	3	11	20	375

Total Contact hrs: 26**Total Credit Hours:20**

SEMESTER-II

S.No	Sub Code	Subject Name	Lecture	Tutorial	Practical	Credits	Contact Hours
1	BMLS102	Fundamentals of Microbiology	4	0	0	4	60
2	BMLS106	Basics of Biochemistry	4	0	0	4	60
3	BMLS110	Fundamentals of Haematology	4	0	0	4	60
4	BMLS114	Preventive and Social Medicine	2	0	0	2	30
5	BMLS104	Fundamentals of Microbiology Practical	0	0	4	2	60
6	BMLS108	Basics of Biochemistry Practical	0	0	4	2	60
7	BMLS112	Fundamentals of Haematology Practical	0	0	4	2	60
8	EVS200	Environment Education	4	0	0	NC	60
9	PT 161/ 163/ 165	Physical Training- 1 (NSO/NCC/NSS)	0	0	2	NC	
Total			18	0	14	20	450

Total Contact hrs: 32
Total Credit Hours: 20

SEMESTER-III

S.No	Sub Code	Subject Name	Lecture	Tutorial	Practical	Credits	Contact Hours
1	BMLS201	Bacteriology	4	0	0	4	60
2	BMLS205	Intermediary Metabolism and Endocrinology	4	0	0	4	60
3	BMLS209	Clinical Haematology	4	0	0	4	60
4	BMLS213	Basics of Pharmacology	2	0	0	2	30
5	BMLS203	Bacteriology Practical	0	0	4	2	60
6	BMLS207	Intermediary Metabolism and Endocrinology Practical	0	0	4	2	60
7	BMLS211	Clinical Haematology- Practical	0	0	4	2	60
8	PT 261/ 263/ 265	Physical Training- 1 (NSO/NCC/NSS)	0	0	2	NC	
Total			14	0	14	20	390

Total Contact hrs: 28**Total Credit Hours: 20**

SEMESTER-IV

S.No	Sub Code	Subject Name	Lecture	Tutorial	Practical	Credits	Contact Hours
1	BMLS202	Virology and Immunology	4	0	0	4	60
2	BMLS206	Genetics and Molecular Biology	4	0	0	4	60
3	BMLS210	Clinical Pathology	4	0	0	4	60
4	BMLS214	Medical Laboratory Management and Quality Control	2	0	0	2	30
5	BMLS204	Virology and Immunology Practical	0	0	4	2	60
6	BMLS208	Genetics and Molecular Biology Practical	0	0	4	2	60
7	BMLS212	Clinical Pathology Practical	0	0	4	2	60
8	PT262/264/266	Physical Training- 4 (NSO/NCC/NSS)	0	0	2	NC	
Total			14	0	14	20	390

Total Contact hrs: 28**Total Credit Hours: 20**

SEMESTER-V

S.No	Sub Code	Subject Name	Lecture	Tutorial	Practical	Credits	Contact Hours
1	BMLS301	Mycology & Parasitology	4	0	0	4	60
2	BMLS305	Analytical Biochemistry	4	0	0	4	60
3	BMLS309	Immunohematology and Transfusion Medicine	4	0	0	4	60
4	BMLS313	Medical Law and Ethics	2	0	0	2	30
5	BMLS303	Mycology & Parasitology Practical	0	0	4	2	60
6	BMLS307	Analytical Biochemistry Practical	0	0	4	2	60
7	BMLS311	Immunohematology and Transfusion Medicine Practical	0	0	4	2	60
Total			14	0	12	20	390

Total Contact hrs: 26**Total Credit Hours: 20**

SEMESTER-VI

S.No	Sub Code	Subject Name	Lecture	Tutorial	Practical	Credits	Contact Hours
1	BMLS302	Applied Pathobiology	4	0	0	4	60
2	BMLS306	Cytology and Histopathology	4	0	0	4	60
3	BMLS310	Clinical Biochemistry	4	0	0	4	60
4	BMLS 314	Biostatistics and Research Methodology	2	0	0	2	30
5	BMLS304	Applied Pathobiology Practical	0	0	4	2	60
6	BMLS308	Cytology and Histopathology Practical	0	0	4	2	60
7	BMLS312	Clinical Biochemistry Practical	0	0	4	2	60
Total			14	0	12	20	390

Total Contact hrs: 26**Total Credit Hours: 20**

SEMESTER-VII

Sr. No.	Subject Code	Subject Name	L:T:P	Credit hours	Total Contact Hours	Total Credits Hours
1	BMLS401	Internship (Clinical Lab Posting/ Research Dissertation)	0:0:0	0:0:0	(6 months) 900 hrs	20

SEMESTER-VIII

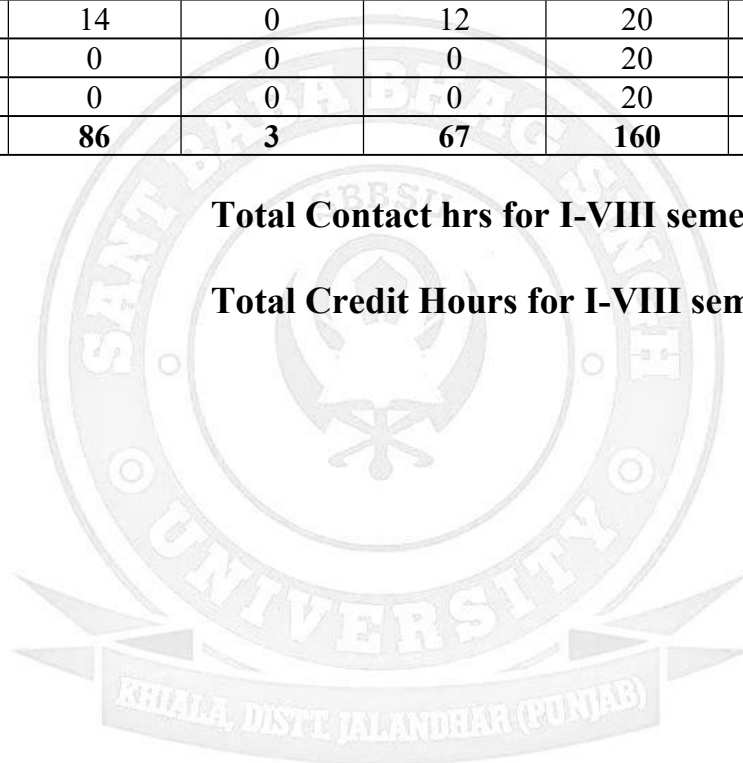
Sr. No.	Subject Code	Subject Name	L:T:P	Credit hours	Total Contact Hours	Total Credits Hours
1	BMLS402	Internship (Clinical Lab Posting/ Research Dissertation)	0:0:0	0:0:0	(6 months) 900 hrs	20

COURSE SCHEME SUMMARY

Semester	L	T	P	Total Credits	Total Contact hours
1	12	3	11	20	375
2	18	0	14	20	450
3	14	0	14	20	390
4	14	0	14	20	390
5	14	0	12	20	390
6	14	0	12	20	390
7	0	0	0	20	900
8	0	0	0	20	900
TOTAL	86	3	67	160	4185

Total Contact hrs for I-VIII semester: 4185

Total Credit Hours for I-VIII semester: 160



MARKS DISTRIBUTION***BMLS FIRST SEMESTER***

COURSE NAME	Continuous assessment	End Semester Examination	Total
Human Anatomy	30	70	100
Human Physiology	30	70	100
Fundamentals of the Healthcare System and Medical Laboratory Science (MLS)	15	35	50
Communication and Professionalism	15	35	50
Basic Emergency care and First aid	30	70	100
Basics of Computer Application	30	70	100
Human Anatomy practical	30	70	100
Human Physiology practical	30	70	100
Total			700

BMLS SECOND SEMESTER

COURSE NAME	Continuous assessment	End Semester Examination	Total
Fundamentals of Microbiology	30	70	100
Basics of Biochemistry	30	70	100
Fundamentals of Haematology	30	70	100
Preventive and Social Medicine	30	70	100
Fundamentals of Microbiology Practical	30	70	100
Basics of Biochemistry Practical	30	70	100
Fundamentals of Haematology Practical	30	70	100
Environment Education	--	--	--
Total			700

BMLS THIRD SEMESTER

COURSE NAME	Continuous assessment	End Semester Examination	Total
Bacteriology	30	70	100
Intermediary Metabolism and Endocrinology	30	70	100
Clinical Haematology	30	70	100
Basics of Pharmacology	30	70	100
Bacteriology Practical	30	70	100
Intermediary Metabolism and Endocrinology Practical	30	70	100
Clinical Haematology- Practical	30	70	100
Total			700

BMLS FOURTH SEMESTER

COURSE NAME	Continuous assessment	End Semester Examination	Total
Virology and Immunology	30	70	100
Genetics and Molecular Biology	30	70	100
Clinical Pathology	30	70	100
Medical Laboratory Management and Quality Control	30	70	100
Virology and Immunology Practical	30	70	100
Genetics and Molecular Biology Practical	30	70	100
Clinical Pathology Practical	30	70	100
Total			700

BMLS FIFTH SEMESTER

COURSE NAME	Continuous assessment	End Semester Examination	Total
Mycology & Parasitology	30	70	100
Analytical Biochemistry	30	70	100
Immunohematology and Transfusion Medicine	30	70	100
Medical Law and Ethics	30	70	100
Mycology & Parasitology Practical	30	70	100
Analytical Biochemistry Practical	30	70	100
Immunohematology and Transfusion Medicine Practical	30	70	100
Total			700

BMLS SIXTH SEMESTER

COURSE NAME	Continuous assessment	End Semester Examination	Total
Applied Pathobiology	30	70	100
Cytology and Histopathology	30	70	100
Clinical Biochemistry	30	70	100
Biostatistics and Research Methodology	30	70	100
Cytology and Histopathology Practical	30	70	100
Clinical Biochemistry Practical	30	70	100
Applied Pathobiology Practical	30	70	100
Total			700

BMLS SEVENTH & EIGHTH SEMESTER

COURSE NAME	Continuous assessment	End Semester Examination	Total
Lab Posting/ Research Dissertation (Logbook and Viva)	90	210	300
Lab Posting/ Research Dissertation (Logbook and Viva)	90	210	300
Total			600

Promotion Criteria to higher semesters:

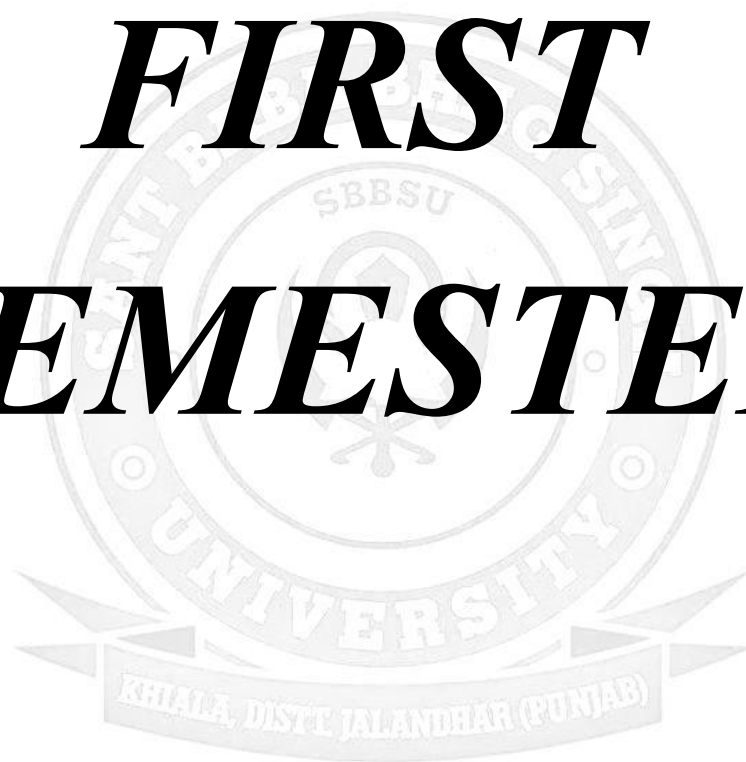
The eligibility for promotion to the next academic year is subject to securing the minimum academic performance as specified below

- First to second year: a minimum of 70% of the credits at the end of the first year (includes first and second semester)
- Second to third year: a cumulative minimum of 80% of the credits at the end of the second year (includes first, second, third and fourth semester)
- Third year to Internship/group project: Students will be eligible for internship (Lab posting/ research dissertation) only after successful completion of the entire coursework, i.e. 100% credits to be accrued by the end of the third year.

The student must complete all the coursework requirements within a maximum of double the program duration. For example, in a 4-year program, all the academic coursework needs to be completed within 8 years. Failure to do so will result in exit from the program.



FIRST SEMESTER



Human Anatomy

Course Code	BMLS101
Course Title	Human Anatomy
Type of course	CC
LTP	3 1 0
Credits	4
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	Students will understand the structure and function of organs and organ systems in the human body.
Course Outcomes (CO)	At the conclusion of the course, the students able to: 1. Comprehend the gross, functional and applied anatomy of various structures in the human body. 2. Identify the microscopic structures of various tissues and organs in the human body and correlate the structure with the functions. 3. Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyse the integrative and regulative functions of the organs and systems.

UNIT-I

General Anatomy: Introduction to Anatomy, terms and terminology. Regions of Body, Cavities and Systems.

Surface anatomy- Musculoskeletal, vascular, cardio-pulmonary system. General Embryology.

UNIT-II

Tissues: Classification and description of the basic tissues of the body.

Histology: Epithelium, compact bone, muscles, connective tissue, nervous tissue, artery, vein and lymphatic tissue. Connective tissue & its modification, tendons, membranes, and special connective tissue

UNIT-III

Musculoskeletal system:

- Bone structure, blood supply, ossification, and classification.
- Muscle classification, structure, types and functional aspects.
- Joints—classification, structures of joints, movements, range, blood supply, nerve supply, dislocations

UNIT-IV

Respiratory system: Structure of the upper and lower respiratory tract.

Thorax: Pleural cavities & pleura, Lungs and respiratory tree, Heart and great vessels, Diaphragm

UNIT-V

Digestive system: Parts/Structure of digestive system, Abdominal cavity - divisions, Muscles of abdominal wall, Liver, Pancreas, Spleen, Alimentary canal, Gall bladder, Intestine (small & large), and accessory organs of digestion.

UNIT-VI

Excretory System: Anatomy of the Kidney. Structure of the kidney, ureter, urinary bladder, male and female urethra. General description of pelvic organs.

Lymphatic system: Lymphatic vessels and lymph, lymph nodes, Spleen. Mediastinum – division and contents

UNIT-VII

Cardiovascular system: Circulatory system – major arteries and veins of the body, structure of blood vessels, Heart structure, positions, chambers, valves, internal & external features, Blood supply to heart, Conductive system of heart

UNIT-VIII

Nervous system: Classification of the nervous system. Nerve – structure, classification, microscopy with examples. Spinal cord- anatomy, structure and features of Meninges, Ventricles of the brain, CSF circulation

UNIT-IX

Sensory system: Structure of the Visual system, Auditory system, Gustatory system, Olfactory system, Somatosensory system, Skin

UNIT-X

Reproductive system: Structure of male and female reproductive organs.

Endocrine system: Pituitary gland, Thyroid, Parathyroid

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Anatomy and Physiology in Health and Illness, 11thEd.	Ross and Wilson	Elsevier
2.	Human Anatomy, 7th Ed	Chaurasia B.D.	CBS Publishers
3.	Atlas of Human Anatomy, 7thEd	FrankH.Netter	Elsevier
4.	Principles of Anatomy and Physiology, 14th Ed	Gerard J. Tortora& Bryan H. Derrickson	Wiley
5.	Fundamentals of Anatomy and Physiology,9th Ed	FredericH.Martini et al	Pearson
6.	Gray's Atlas of Anatomy	Richard Drake,	Elsevier
7.	Simplified Anatomy and Physiology for Paramedical Students,	Manju Chugani & Preysi Chauhan	Jaypee

Human Physiology

Course Code	BMLS105
Course Title	Human Physiology
Type of course	CC
LTP	3 1 0
Credits	4
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	Students will gain knowledge of the organisation of human body cells, tissues, blood and physiological functions of various organ systems of the human body
Course Outcomes (CO)	At the conclusion of the course, the students able to: 1. Understand the functioning of various organ systems of the body and their interactions 2. Elucidate the physiological aspects of normal growth and development.

UNIT-I

General Physiology: Cell: morphology, structure and function of cell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, Homeostasis

UNIT - II

Blood: Introduction, composition & function of blood, WBC, RBC, Platelets formation & functions, Immunity,

Plasma: composition, formation & functions, Plasma Proteins:-types & functions, Blood Groups- types, significance, determination, Haemoglobin, Haemostasis.

UNIT - III

Nervous system and muscle: Organisation of the nervous system. Structure and function of muscle and nerve cells. Functions of the brain, the Spinal cord, the cranial and spinal nerves, and the Motor system. Sensory system, ANS, Synapse, neuromuscular transmission reflex arc, reflex action and reflexes, Cerebrospinal fluid

UNIT – IV

Respiratory System: General organisation, Mechanics of respiration, Regulation of respiration, Gaseous exchange in lungs and tissues, Pulmonary ventilation, volumes and capacities, Effect of exercise on respiration, hypoxia.

UNIT – V

Digestive System: Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation, Functions of Liver, pancreas & stomach, Gastrointestinal tract disorders

UNIT – VI

Renal System: Functions of the kidney, urine formation, Glomerular filtration rate, clearance, Tubular function. Water excretion, concentration of urine-regulation of Na⁺, Cl⁻, K⁺ excretion, Physiology of urinary bladder

UNIT – VII

Lymphatic and immunological system: Lymph glands and circulation of lymph, Spleen structure and function, Immunity – Formation of T-cells and B-cells, Antigen, Antibody and Immune response.

UNIT – VIII

Cardiovascular system: Functions of the heart, organisation of the cardiovascular system, structure and properties of cardiac muscles. Cardiac output, cardiac cycle, and conducting system of the heart. Heart sounds, regulation of heart rate, pulse, blood pressure and its regulation. ECG, cardio respiratory changes during exercise

UNIT – IX

Endocrine system: Physiology of the endocrine glands– Pituitary, Pineal Body, Thyroid, Parathyroid, Adrenal, Gonads, Thymus, Pancreas. Hormones secreted by these glands, their classifications, and their functions.

UNIT –X

Male and female reproductive system: Male: functions of testes & penis, pubertal changes in males, testosterone: action & regulations of secretion, ejaculatory mechanism & dysfunction, Female functions of ovaries and uterus, pubertal changes, menstrual cycle, oestrogens and progesterone action and regulation. Physiological changes during pregnancy, Placenta and placental circulation.

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of Medical Physiology,	Bonnie F Fremgen	Elsevier
2.	Human Physiology,	C.C. Chatterjee	Medical Allied Agency
3.	Essentials of Medical Physiology	K. Sembulingam	Jaypee
4.	Anatomy and Physiology in Health and Illness, 11th Ed	Ross and Wilson	Elsevier
5.	Principles of Anatomy and Physiology, 14th Ed	Gerard J. Tortora & Bryan H. Derrickson	Wiley

Fundamentals of the Healthcare System and Medical Laboratory

Course Code	BMLS109
Course Title	Fundamentals of the Healthcare System and Medical Laboratory
Type of course	CC
LTP	2 0 0
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	This course provides students with a comprehensive understanding of the Indian health care delivery system and the Clinical Laboratory in the health care system. Students will also understand the roles, responsibilities, and regulatory bodies of medical laboratory sciences.
Course Outcomes	At the conclusion of the course, the students able to: 1. Comprehend knowledge of the healthcare delivery system in India 2. Identify the laboratory safety measures and biomedical safety management 3. Understand the organisation, the importance of Clinical labs, Lab professionals and regulatory professional bodies

UNIT-I

Introduction to healthcare delivery system - Healthcare delivery system in India at primary, secondary and tertiary care, classification of hospitals based on system of medicine, Community participation in healthcare delivery system, National Health Mission, National Health Policy, Issues in Health Care Delivery System in India

UNIT-II

Visit to Clinical laboratories, Introduction to clinical Laboratory, Classification of Laboratory, Introduction to various sections/departments in clinical laboratories, Lab space and designing, Knowledge of lab organizational chart, Role of Laboratory in patient care

UNIT-III

Lab safety measures- Infection control, Universal precautions, PPE, Vaccination, Chemical, physical, electrical and fire safety. Biomedical waste management

UNIT-IV

Records and their importance in a hospital, Records maintained in the Laboratory as per ISO15189, importance of records and reports, Data entry and management on an electronic health record system

UNIT-V

Medical terminology - Derivation of medical terms, Basic medical terms, form medical terms utilizing roots, suffixes, prefixes, and combining roots, Interpret basic medical abbreviations/symbols

UNIT-VI

Regulatory Bodies & Professional Organizations: Roles & Responsibilities – MoHFW, NCAHP, State Council, Registration

Text and Reference Books

S. No	Name	Author(S)	Publisher
1.	Text book of Medical laboratory Technology	Mirnali Sant	CBS publishers. 2022
2	Text book of Medical laboratory Technology	Ramnik Sood	Jaypee Publishers, 2006
3.	Text book of Medical laboratory Technology	Godkar PB	Bhalani Publishing House, 2024



Basic Emergency Care and First Aid

Course Code	BMLS111
Course Title	Basic Emergency Care and First Aid
Type of course	SECC
LTP	1 1 0
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course Objective (CO)	Students will be able to perform basic emergency procedures and provide first aid in everyday medical situations.
Course Outcomes	At the conclusion of the course, the students able to: 1. Assess emergencies quickly and accurately to ensure personal and victim safety. 2. Demonstrate basic life-saving techniques, including CPR (Cardiopulmonary Resuscitation) and the recovery position. 3. Provide appropriate first aid for common injuries such as wounds, burns, fractures, sprains, and poisoning.

UNIT-I

First Aid- Introduction, Aims & objectives of first aid, Priorities of first aid, Golden rules of first aid, Qualities & responsibilities of first aider, Simple first aid measures in selected conditions like Food poisoning, Snake bite, Scorpion bite, Dog bite, foreign bodies in various organs, Burns, Haemorrhage

UNIT-II

Shock- Definition, Types of shock, General Features of shock, Investigations of shock, Initial management & first aid of shock

UNIT-III

Poisoning - Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide poisoning

UNIT-IV

Introduction: Chain of survival, team dynamics & multi -rescuer resuscitation. Vital signs of patients - Body temperature, Pulse, Blood Pressure, Respiration

UNIT-V

Basic Life Support (BLS) in adults: Flowchart approach, approach to victim, techniques of CPR, BLS in paediatric

Victims: checking pulse in children, chest compressions techniques, Bag mask ventilation technique

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Manual of first aid, 1 st edition,	Gupta Abhitabh, 2012	Jaypee Publishers
2	Emergency medicine, 5 th edition,	SN hugh, Ashimachugh 202	CBS publishers

Communication Skills and Professionalism

Course Code	BMLS113
Course Title	Communication Skills and Professionalism
Type of course	AECC
LTP	2 0 0
Credits	2
Course prerequisite	+2 in any stream
Course Objective	The course comprises the study and development of the English language, listening, speaking, reading, and writing, which help students communicate well in academic and professional environments
Course Outcomes	At the conclusion of the course, the students able to: 1. Develop good communication skills 2. Trains the students in oral presentations, expository writing, logical organisation and structural support. 3. Develops professionalism, understands professional ethics and values for professional success

UNIT-I

Communication Skills: The Importance of Communication, The Communication Process. Barriers to communication: Physiological, Physical, Cultural, Language, Gender, Interpersonal, Psychological and Emotional barriers

UNIT-II

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective- Past Experiences, Prejudices, Feelings, Environment.

Elements of Communication: Introduction, Face-to-Face Communication, Tone of Voice, Body Language (Non-verbal communication), Verbal Communication.

UNIT- III

Developing personal etiquette: personal appearance, importance of grooming, acknowledging and respecting, maintaining professionalism, cubicle etiquette, time management, attending classes, meetings, seminars, etc, table manners, greeting, Netiquette and Telephonic conversation

UNIT- IV

Developing presentation and career skills: Introduction, Importance of Resume and CV, preparing resume and CV, Interview Skill Tips, FAQ During Interviews, Mock interviews

UNIT- V

Professional values: Integrity, Objectivity, Confidentiality, Professional competence and due care, professional risks, professional responsibility, accountability, professional success

UNIT- VI

Personal Values- Ethical and Moral values, Attitude and behaviour, Personal Hygiene and Mental Health

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Graham Lock, Functional English Grammar: Introduction to Second Language Teachers.	Cambridge University Press,	NewYork,1996
2	Gwen Van Servellen. Communication for Healthcare professionals: Concepts, practice and evidence,	Jones & Bartlett Publications	USA,2009



Basic Computer Applications

Course Code	BMLS115
Course Title	Basic Computer Applications
Type of course	SECC
LTP	1:0:1
Credits	2
Course prerequisite	+2 in any stream
Course Objective (CO)	Students will be familiarized with computer operating systems, using Microsoft Office tools, and internet use in healthcare.
Course Outcomes	At the end of the course, students will be able to: 1. Identify the basic components and functions of computer hardware and software 2. Use word processing software to create, format, and edit professional documents. 3. Created and managed spreadsheets with basic formulas and designed presentations.

UNIT-I

Introduction to Computers: Generations of computers, Applications of computers, Parts of a Computer, I/O devices, computer uses in healthcare

UNIT-II

Basics of Operating System: Introduction to OS, Features of Windows OS, File management, User interface basics.

UNIT-III

Microsoft Word and PowerPoint: Introduction to Word, Typing medical documents, formatting, tables, inserting images, Introduction to powerpoint, slide creation

UNIT-IV

Microsoft Excel, Access: Introduction to Excel and Access, Entering data, basic formulas, formatting cells, simple charts

UNIT-V

Internet & Email: Definition, types of network, using browsers, opening email, attaching reports, basic internet safety

UNIT-VI

Computers in Healthcare: Electronic health record, Hospital Information System basics, digital patient records, lab reporting usage

LIST OF PRACTICALS

1. MS Word – Document Creation- Resume, lab report typing, alignment, save & print.
2. MS Word – Formatting & Tables- Medical charts, tables for patient information.
3. MS Excel – Data Entry- Entering blood test reports and patient data.
4. MS Excel – Basic Formulas- Average, sum, and conditional formatting.
5. PowerPoint – Basic Slides- Creating a 5-slide presentation on hospital safety
6. Internet Browsing & Searching- Using Google for medical topics, downloading forms
7. Email Usage- Create an email, send a lab report with an attachment
8. MS Access database creation- Patient database creation
9. MS Access HTML integration in the database- Patient database creation view HTML webpage
10. Demonstrate use of Artificial Intelligence tools

Text and Reference Books:

SrNo	Author(s)	Title	Publisher
1.	V. Rajaramana,	Computer basics and programming	PHI Learning Pvt. Ltd
2.	Michael Miller,	Computer Basics and Absolute Beginner's Guide,	Que Publishing

Human Anatomy Practical

Course Code	BMLS103
Course Title	Human Anatomy Practical
Type of course	CC
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	Students will be able to identify and demonstrate anatomical structures of various organ systems.
Course Outcomes	At the conclusion of the course, the students able to: 1. Able to identify and label all major bones and joints of the musculo-skeletal system on charts and models. 2. Develop an understanding of blood circulation in the cardiovascular system, including the functions of the heart, arteries, and veins. 3. Analyze the structure and function of the respiratory system, including the trachea and lungs. 4. Compare and contrast the four body systems studied, identifying shared and unique characteristics of each.

LIST OF PRACTICALS

1. Study of anatomical plans and positions
2. Histological study of tissues
3. Study of Skeletal system
4. Study of respiratory system
5. Study of digestive system
6. Study of urinary system
7. Study of Cardiovascular system
8. Study of Nervous system
9. Study of sensory organs: eye, ear, nose, tongue and skin
10. Study of reproductive system

Note: Clinical laboratory rotation/observation can be incorporated wherever possible

Human Physiology Practical

Course Code	BML107
Course Title	Human Physiology Practical
Type of course	CC
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	Students will develop an understanding of the normal functioning of human organ systems and explain their physiological processes.
Course Outcomes	At the conclusion of the course, the students able to: 1. Understand the functioning of various organ systems of the body and their interactions 2. Elucidate the physiological aspects of normal growth and development.

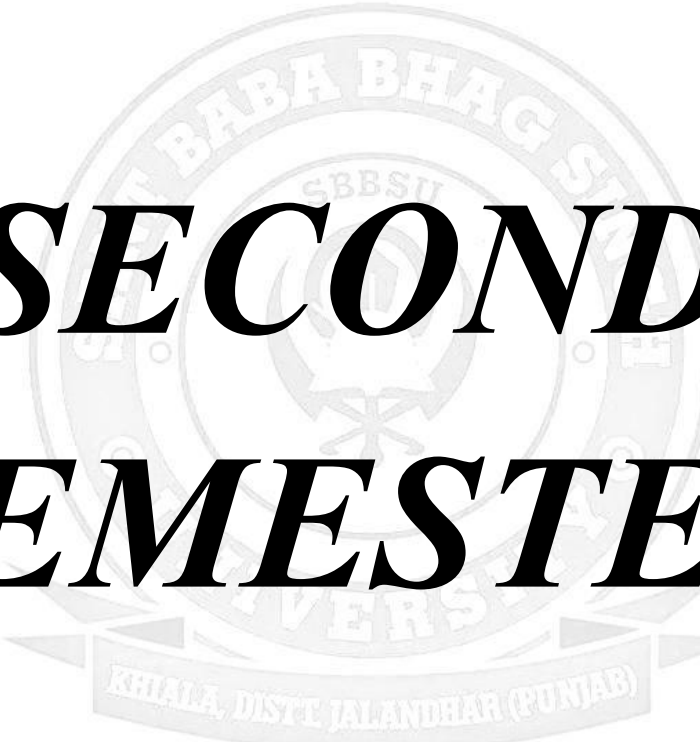
LIST OF PRACTICALS

1. Perform blood collection
2. Estimation of Hemoglobin
3. Demonstrate blood cell count – RBC count and WBC count
4. Prepare blood smear and staining
5. Measure Blood pressure and Pulse Rate
6. Demonstration of ECG
7. Demonstration of EMG
8. Perform Reflexes testing
9. Spirometry and PFT (Pulmonary function test)

Note: Clinical laboratory rotation/ observation can be incorporated wherever possible

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of Medical Physiology,	Bonnie F Fremgen	Elsevier
2.	Human Physiology,	C.C. Chatterjee	Medical Allied Agency
3.	Anatomy and Physiology in Health and Illness, 11th Ed	Ross and Wilson	Elsevier



SECOND SEMESTER

Fundamentals of Microbiology

Course Code	BMLS102
Course Title	Fundamentals of Microbiology
Type of course	CC
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical with 50% marks.
Course Objective(CO)	Students will acquire knowledge on the Historical Development of Microbiology, various types of microscopes, bacterial anatomy and staining methods, sterilisation methods, culture media, culture methods, biochemical tests and antibiotic susceptibility tests, and understand the underlying concepts of bacterial genetics and its applications in recombinant DNA technology.
Course Outcome	At the end of the course, students should be able to: 1. Comprehend knowledge of Microscopes, their types and applications 2. Explain microbial structure, physiology, growth, and reproduction. 3. Identify common methods used in the control and prevention of microbial growth and infection. 4. Demonstrate knowledge of aseptic techniques and basic microbiological laboratory procedures.

UNIT-I

Historical Development of Microbiology: Infection and Contagion, Discovery of Microorganisms, Conflict over Spontaneous Generation, Role of Microorganisms in Diseases, Scientific Development of Microbiology - Louis Pasteur, Joseph Lister, Robert Koch, Paul Ehrlich, Edward Jenner, Ignaz Semmelweis, Antony van Leeuwenhoek.

UNIT II

Microscopy: Light Microscopy, Bright -field microscopy, Dark -ground microscopy, Phase -contrast microscopy, Fluorescence microscopy, Electron microscopy

UNIT III

Morphology of Bacteria: Comparison of Prokaryotic Cells–Eukaryotic cells, size of bacteria, arrangement of bacterial cells, Anatomy of the bacterial cell- the structure, function, and clinical significance of - Cell wall, Cell membrane, Cell surface append ages, Bacterial Capsule, Cell organelles, plasmid, Spore

Principles of staining - Simple staining, Negative staining, Differential staining, Gram's and acid-fast staining, Albert's, Flagella staining, Capsule staining, Endospore staining

UNIT IV

Physiology of Bacteria: Generation time of bacteria, bacterial growth curve, bacterial nutrition, bacterial metabolism

UNIT- V

Bacterial Genetics: Different gene transfer methods: Transformation, Transduction, Lysogenic conversion, Conjugation.

UNIT- VI

Sterilisation and Disinfection: Classify sterilisation methods - Dry heat sterilisation, Moist heat sterilisation, Radiation, Filtration.

Disinfection - Classify disinfectants, general features of disinfectants -Alcohols and aldehydes, Dyes, halogens and phenols - Gases, surface active agents and metallic salts, Testing of disinfectants - Rideal Walker method, Chick Martin test, Disinfectant kill time test, Kelsey -Sykes test, In-use test, Advanced techniques in Sterilisation of Heat -Sensitive Articles.

UNIT VI

Culture Media and Methods: Culture Media - common ingredients of culture media, classification of media. Culture Methods - Methods of bacterial culture, aerobic culture, anaerobic culture, methods of anaerobiosis, methods of isolating pure cultures.

UNIT VIII

Identification of Bacteria: Methods used to identify bacteria, phenotypic characteristics, genomic characterisation, Bacterial Taxonomy -Taxonomy, Identification, classification systems, Identification of Bacteria by biochemical tests and automated systems: - Bac T alert and BACTEC systems, -VITEK and Phoenix systems - RTPCR, MALDI –TOF

UNIT IX

Antibiotic susceptibility testing (AST): A. Diffusion methods 1. Kirby–Bauer disk diffusion method 2. Stokes disk diffusion method B. Dilution methods 1. Broth dilution method 2. Agar dilution method. Epsilometer or E-test, Minimum inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC) of antibiotics,

UNIT X

Human Normal Microbial Flora and Microbiome: Microbial Infections - Microorganisms and Host, Infection and Infectious Disease, Classification of Infections, Sources and Modes of Transmission of Infection, Epidemiological Terminologies .

Text and Reference Books:

S. No	Name	Author(S)	Publisher
1.	Practical Medical Microbiology	Mackie & McCartney	Elsevier
2	Diagnostic Microbiology	Bailey & Scott	Elsevier
3	Textbook of Microbiology	R. Ananthanarayan & C.K. Jayaram Paniker	J.P.Bros, New Delhi
4	Essentials of Microbiology	Surinder Kumar	Jaypee Brothers Medical Publishers
5.	Textbook of Microbiology and Immunology	Subhash Chandra Parija	Elsevier
6.	Microbiology	Lansing M. Prescott	McGraw -Hill
7.	Essentials in Medical Microbiology	Apurba Sankar Sastry & Sandhya Bhat K	, Jaypee Brothers Medical Publishers
8.	Textbook of Medical Laboratory Technology ,	Praful B. Godkar & Darshan P. Godkar	Bhalani Publishing



Basics of Biochemistry

Course Code	BMLS106
Course Title	Basics of Biochemistry
Type of course	CC
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	Students will learn the basic concepts of Biochemistry, chemistry of carbohydrates, proteins, lipids, nucleic acids, enzymes, vitamins, minerals and nutritional requirements.
Course Outcomes	At the end of the course, students should be able to: 1. Describe the structure and function of key biomolecules, including carbohydrates, proteins, lipids, and nucleic acids. 2. Explain the fundamental principles of enzyme action, including enzyme kinetics, inhibition, and regulation. 3. Demonstrate knowledge of biochemical techniques used to analyse biomolecules.

UNIT-I

Introduction: Introduction to Biochemistry: Units of weight and volume, Preparation of solutions (percentage, Molarity, Normality), Basic concepts of acids, bases, and buffers, their application in the Laboratory. Definition and determination of pH. Preparation of distilled water, double-distilled water, and deionised water. Fundamental concepts on biophysical phenomena like osmosis, dialysis, colloidal state, viscosity, adsorption, osmotic pressure, and surface tension

UNIT -II

Chemistry of Carbohydrates: Introduction to carbohydrates, biological importance of carbohydrates, classification, physical and chemical properties

UNIT - III

Chemistry of lipids: Introduction to lipids, biological importance of lipids, Classification of lipids, Physical and chemical properties, Cholesterol and lipoproteins

UNIT-IV

Chemistry of Amino acids & Proteins: Introduction to amino acids, biological importance of Amino acids, classification of amino acids. Introduction to proteins, the biological importance of proteins. Classification of proteins, Structural organisation of Proteins, Physical and chemical properties of Proteins and Amino acids

UNIT-V

Chemistry of Nucleic acids: Introduction to Nucleic acids, nucleotides, nucleosides, biological importance of Nucleic acids, Structure of DNA and RNA, Difference between DNA and RNA

UNIT-VI

Chemistry of Enzymes: Introduction of enzymes, classification of enzymes, Coenzymes and Cofactors, Active site, Mechanism of action, Factors influencing enzyme action, Enzyme inhibition and regulation.

UNIT -VII

Vitamins & Minerals: Introduction to vitamins, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations

Introduction to minerals, Classification, RDA, Chemistry and biochemical function, deficiencies and toxic manifestations, Special references to calcium, phosphorus, magnesium, iron, zinc and copper

UNIT -VIII

Nutrition: Calorie Requirements, SDA and BMR, Respiratory Quotient, Glycemic Index, Balanced Diet and Energy Calculations, Formulation of diet and dietary fibre, Starvation, obesity, and Protein Energy Malnutrition

Text and Reference Books

S. No	Name	Author(S)	Publisher
1.	Biochemistry	U. Sathyanarayana	Elsevier
2	Fundamentals of Biochemistry,	A.C. Deb	New Central Book Agency
3	Harper's Illustrated Biochemistry	Robert K. Murray et al.	Tata McGraw-Hill
4.	Varley's Practical Clinical Biochemistry	Alan Gowenlock	CBS
5.	Textbook of Medical Biochemistry	M.N. Chatterjee & Rana Shinde	Jaypee
6.	Lehninger Principles of Biochemistry	David L. Nelson & Michael M. Cox	W.H. Freeman
7.	Textbook of Biochemistry	D.M. Vasudevan	Jaypee
8.	Basics of Clinical nutrition	Y.K. Joshi	Jaypee publishers

Fundamentals of Haematology

Course Code	BMLS110
Course Title	Fundamentals of Haematology
Type of course	CC
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical with 50% marks.
Course objectives	Students will be made aware of the composition of blood and methods of estimating different components of blood. Students will learn the basic concepts of Hematology and routine clinical investigations of the Haematology laboratory.
\Course Outcome	At the end of the course, students should be able to 1. Understand the composition of blood and the function of blood cells. 2. Identify the normal and abnormal blood cells \, viz erythrocytes, leucocytes and thrombocytes. 3. Comprehend the process of hemostasis and its physiological properties 4. Demonstrate knowledge of haematological techniques used to analyse basic parameters in the Laboratory

UNIT-I

Introduction to blood, composition and function of normal cellular components.

Haematopoiesis: Site of haematopoiesis, Bone marrow and Bone marrow collection; Cellular ratio, bone marrow biopsy and aspiration techniques and their indications for collection

UNIT-II

Erythrocytes: Normal Structure, Function, and Fate of Erythrocytes along with Clinical Indications of Jaundice, Normal Range.

Abnormal Red Blood Cells: Anisocytes, Poikilocytes, and their clinical significance
Hemoglobin: Structure, composition and function, synthesis and regulation of hemoglobin, oxygen association and dissociation curve Various types of hemoglobin with clinical significance - Fetal hemoglobin, Meth-hemoglobin, Sulf-haemoglobin, Carboxyhemoglobin, Sickle hemoglobin, Glycosylated hemoglobin, different methods of estimation

UNIT-III

Leucocytes: Structure, functions, normal range, lifespan of normal White Blood Cells. Quantitative and qualitative disorders of White Blood Cells: physiological and pathological causes

UNIT-IV

Thrombocytes: Structure, functions, normal range, lifespan of normal Platelets. Quantitative disorder of Platelets: physiological and pathological causes, Normal hemostasis and physiological properties of coagulation factors. Primary, secondary and tertiary hemostasis. Role of the platelets, coagulation factors, coagulation inhibitory system and fibrinolysis.

UNIT-V

Hematocrit and Erythrocyte Sedimentation Rate: physiological and pathological causes

UNIT-VI

Automation in Haematology lab: principles and analysis Quality assurance in Haematology, Internal and external quality control, including reference preparation, Routine quality assurance protocol, Statistical analysis, i.e. Standard deviation, Coefficient of variation, accuracy and precision

UNIT-VII

Anticoagulants: types, mode of action and preference of anticoagulants for different haematological studies. Different types of blood collection, including the preservation of blood samples for various haematological investigations. Principles of Romonowsky stain with examples and its applications

Text and Reference Books

S. No	Name	Author(S)	Publisher
1.	Biochemistry	Voet & Voet	John Willey
2	Biochemistry	Lubert Stryer, Jeremy Berg & John L tymoczko	WH Freeman & Co.
3	Harper's Bio Chemistry	Robert K Murray, David A Bender, Kathleen M. Gotham, Peter J Kennelly, victor W.Rodwell & P.Anthony.Weil.	McGraw Hill
4	Principles of Biochemistry	David.LNelson &Albert Lehninger	WH Freeman Publisher & Co.
5.	Text book of medical Biochemistry	M N Chaterjee and R. Shinde	Jaypee Brothers Publishers(P) Ltd.

Preventive and Social Medicine

Course Code	BMLS114
Course Title	Preventive and Social Medicine
Type of course	CC
LTP	2 0 0
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course objective	Through this course, students learn the principles of primary health care, the significance of health programs, and the role of communication and education in behaviour change. The inclusion of first aid and patient care in communicable diseases prepares allied health professionals to actively contribute to health promotion and disease prevention at all levels of healthcare delivery
Course Outcome	At the end of the course, students will be able to 1. Describe the epidemiology, prevention, and control of communicable and non-communicable diseases 2. Understand the concepts and principles of public health, disease prevention, and health promotion. 3. Identify the determinants of health and disease, including environmental, social, economic, and behavioural factors.

UNIT I

Basic Epidemiology: Epidemiological Triad, Carrier, Reservoir, Host for infection and diseases, Various methods of disinfection used at each level of healthcare, Incubation period, Nosocomial Infections

UNIT II

Primary Health Care: Principles, Elements, Health Programmes - Maternal and Child Health, Nutrition, Environment, older adults, Central Government Health Schemes, Occupational Health, Voluntary Health Agencies, Role of NGOs in the Health Team.

UNIT III

Demography and Family Welfare: Definition, Demographic cycle, Population Explosion, Factors influencing population growth, death rate, birth rate, and methods of contraception. Family Welfare – Definition, Objectives of Family Planning.

Types: Temporary and Permanent methods, Follow -up of contraceptive methods, Family planning counselling.

UNIT IV

Environmental Health: Air Pollution, Noise Pollution, Water Pollution, with the causes, effects, and preventive measures. Solid Waste Management - Swachh Bharat Abhiyan, Nirmal Bharat Abhiyan. Biomedical Waste Management Rules 2016 - colour coding and disposal into correctly colour-coded bags. Disease Elimination and Disease Eradication Examples.

UNIT V

Communication and Health Education: Health education–definition, principles, objectives, purpose, types, and AV aids. Communication –definition, process, and types. Behavioural change communication. IEC (Information, education, and communication): aims, scope, concept, and

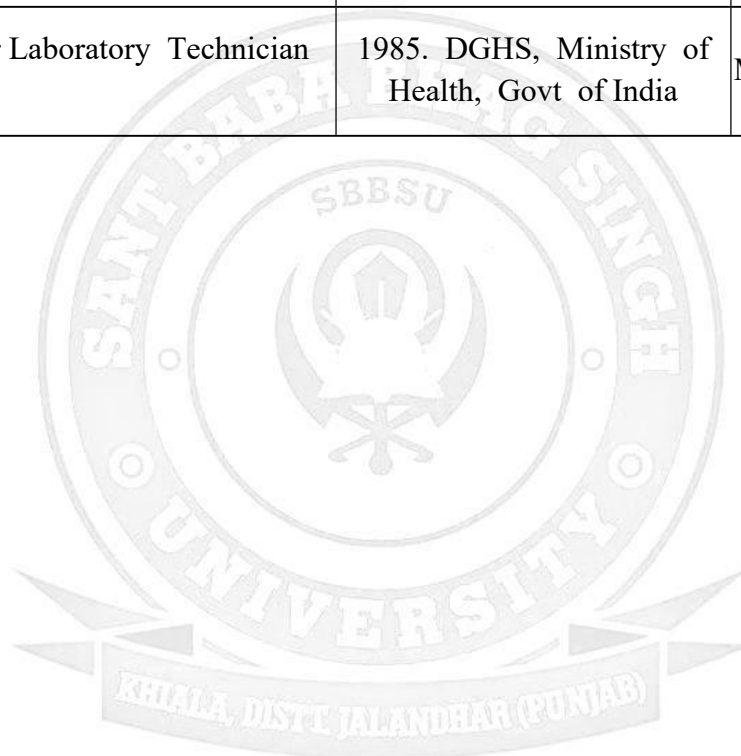
approaches. First-aid–Definition, Principles, Golden rules, and bandages. First-aid for fracture, bleeding, drowning, Convulsions, Foreign Bodies, poisoning, Shock, and Cardio -Pulmonary Resuscitation. Role and skill of health professional in Health Education; Interpersonal relationship: coordination and cooperation in health education with other members of the health team.

UNIT VI

Patient care in Communicable Diseases: Care of patients with communicable diseases, Isolation methods, Standard safety measures (Universal precautions). Role and skill of the Health professional in the management of patients with communicable diseases.

Text and Reference Books:

S. No.	Name	Author(S)	Publisher
1	Textbook of Preventive and Social Medicine	J.E.Park	J.E.Park
2	Manual for Laboratory Technician	1985. DGHS, Ministry of Health, Govt of India	1985. DGHS, Ministry of Health, Govt of India



Environment Education

Course Code	EVS200
Course Title	Environment Education
Type of course	Theory (Compulsory for undergraduate students)
L T P	4 0 0
Credits	4
Course prerequisite	10+2 in any stream with 50% marks.
Course objective	To connect and sensitize the students towards the environment and prevailing environmental issues (natural, physical, social and cultural).
Course Outcome	At the conclusion of the course, students will : 1. Appreciate the historical context of human interactions with the environment. 2. Develop an understanding of pollution and its types 3. Learn about the concept of Ecosystem, Ecosystem services 4. Learn about climate change and biodiversity conservation 5. Understand the relation between social issues and environment. 6. Learn about the major international treaties and our country's stand on and responses to the major international agreements.

UNIT I

Historical Prospective: Brief introduction of Humans as hunter-gatherers; Mastery of fire; Origin of agriculture, Emergence of city-states; Indic Knowledge and Culture of sustainability, Industrial revolution and its impact on the environment; Population growth and natural resource exploitation. Environment Definition and scope and importance. Environmental Ethics and emergence of environmentalism: World Commission on Environment and Development and the concept of sustainable development; Rio Summit and subsequent international efforts.

Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources, soil and mineral resources. Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.

UNIT II

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes.

Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact

Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-made (Anthropogenic).

Biodiversity and its distribution: Biodiversity as a natural resource. Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories.

Ecosystems in brief: forests, wetlands, grasslands, agriculture, coastal and marine.

Ecosystem services- classification and their Significance, Threats to biodiversity and ecosystems Biodiversity Conservation: Major conservation policies: in-situ and ex-situ conservation approaches the role of traditional knowledge, community-based conservation.

UNIT III

Understanding climate change: Anthropogenic climate change from greenhouse gas emissions, Climate change impact on global warming and its effect on Indian Subcontinent, rise of sea level, Changes in marine and coastal ecosystems, Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment. Mitigation of climate change, National climate action plan.

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived 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; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme.

UNIT IV

Social Issues and the Environment: Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Major International Environmental Agreements and National Acts: CBD, Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing, (CITES); Ramsar Convention on Wetlands of International Importance; Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness.

Case Studies and Field Work (Any two): Discussion on one national and one international case study related to the environment and sustainable development. Or Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report. Or Participation in plantation drive and nature camps. Or Documentation of campus biodiversity

Text and Reference Books:

S. No.	Name	Author(S)	Publisher
1	Environmental Biology	Agarwal, K.C. 2001	Nidi Publ. Ltd. Bikaner.
2	Environmental Science	Miller T.G. Jr.	Wadsworth
3	Perspectives in Environmental Studies	Anubha Kaushik and Gaurav Garg	New Age International Publishers
4	A Handbook on International Environment Conventions & Programmes	2019	Ministry of Environment, Forest and Climate Change
5	Introduction to Environmental Management 2nd Edition	Theodore, M. K. and Theodore, Louis (2021)	CRC Press.
6	Climate Change: The Science, Impacts and Solutions. 2nd Edition	Pittock, Barrie (2009)	Routledge
7	Textbook of Biodiversity	Krishnamurthy, K.V. (2003)	Science Publishers, Plymouth, U

Fundamentals of Microbiology Practical

Course Code	BMLS104
Course Title	Fundamentals of Microbiology Practical
Type of course	CC
L T P	0 0 4
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course objective	Students will acquire knowledge to demonstrate and perform basic microbiological tests in the identification of microorganisms.
Course Outcome	At the end of the course, students should be able to 1. Demonstrate the collection, transportation, processing, and safe handling of various clinical specimens following standard microbiological procedures. 2. Apply laboratory biosafety practices, aseptic techniques, and infection control measures to ensure a safe microbiology laboratory environment. 3. Perform cleaning, disinfection, and sterilization of laboratory glassware, reagents, solutions, and culture media using appropriate sterilization methods. 4. Operate microbiological equipment, including microscopes, autoclaves, hot air ovens, and filtration units, and evaluate the efficacy of sterilization procedures. 5. Prepare, process, and examine microbiological specimens using microscopy and staining techniques, including simple staining and Gram staining. 6. Prepare microbiological stains, reagents, and culture media, and perform quality control and sterility testing to ensure reliable laboratory results. 7. Identify and utilize appropriate quality control (QC) strains for culture media validation and microbiological quality assurance procedures.

LIST OF PRACTICALS

1. Demonstrate the collection of various clinical specimens and their transport and processing.
2. Demonstrate a safe code of practice in the Microbiology laboratory
3. Demonstrate cleaning and sterilisation of glassware
4. Perform microscopy and specimen processing
5. Operate the autoclave and hot air oven, including its efficacy testing.
6. Demonstrate the sterilisation of reagents and culture media
7. Demonstrate sterilisation of media/solution by filtration.
8. Demonstrate the proper precautions to take when using disinfectants and dilution of commonly used disinfectants.
9. Demonstrate Simple staining
10. Demonstrate Gram's staining
11. Demonstrate Preparation of stains, reagents and culture media, quality control of reagents and media, and sterility check
12. Identify QC strains used for culture media.

NOTE:- Clinical Laboratory rotation/observation can be incorporated wherever possible

Basics of Biochemistry - Practical

Course Code	BMLS108
Course Title	Basics of Biochemistry - Practical
Type of course	CC
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course objective	Students will learn the essential laboratory practices, which include the preparation of Lab reagents and qualitative analysis of carbohydrates, proteins and lipids.
Course Outcome	At the end of the course, students should be able to 1. Demonstrate the safe handling and effective use of laboratory apparatus, micropipettes, laboratory balances, and standard laboratory glassware. 2. Prepare, label, and standardize laboratory reagents and solutions of required concentrations, including percentage, molar, and normal solutions, and perform pH measurement of laboratory reagents and biological samples. 3. Prepare purified water samples (distilled, double-distilled, and deionized water) and apply good laboratory practices in routine biochemical laboratory work. 4. Perform qualitative analysis of carbohydrates, proteins and amino acids and lipids using standard biochemical tests and interpret the biochemical significance of the observations.

LIST OF PRACTICALS

1. Demonstrate the use of Laboratory Apparatus, Micropipettes, and their uses
2. Demonstrate cleaning of glassware
3. Demonstrate the use of a laboratory balance
4. Prepare and label common Laboratory reagents (Percentage, Molarity, Normality)
5. Preparation of distilled water, double -distilled water, and deionised water.
6. Measure pH for laboratory reagents/ biological samples
7. Perform qualitative analysis of carbohydrate and identification of unknown
8. carbohydrate - Molisch test, Benedict test, Modified Bareford test, Seliwanoff test, Bial test, Mucic acid test, Iodine test, Foulger's test, osazone test
9. Perform qualitative analysis of protein and amino acids - Precipitation test - Heat and acetic acid Test, Heller's test, alkali, alcohol, Isoelectric point precipitation.
10. Colour reaction – Ninhydrin, Nitroprusside test, Xanthoproteic test, Million test, Sakaguchi test
11. Perform qualitative analysis of lipids – Solubility test

Note:- Clinical laboratory rotation/observation can be incorporated wherever possible

Fundamentals of Haematology practical

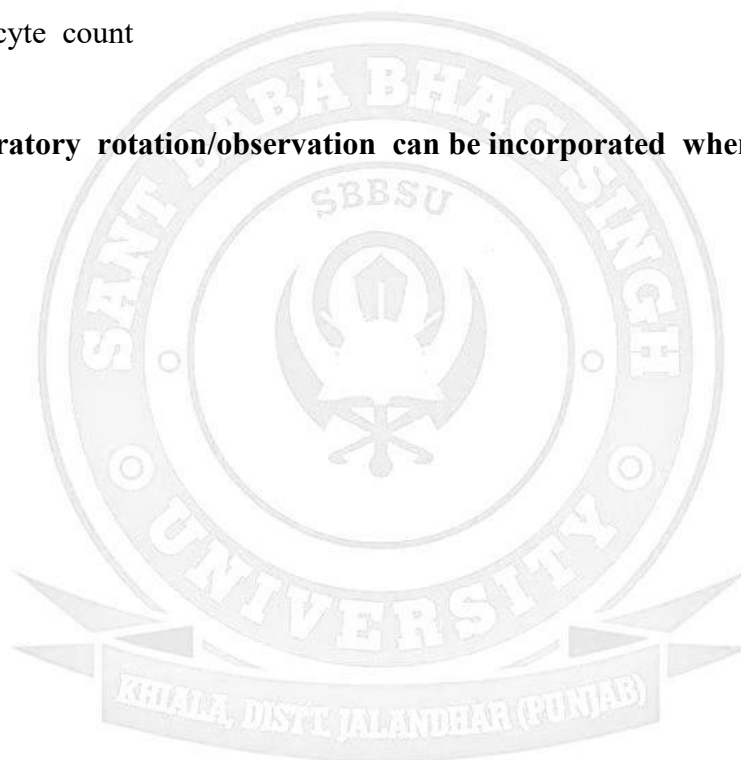
Course Code	BMLS112
Course Title	Fundamentals of Haematology practical
Type of course	CC
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical with 50% marks.
Course Objective	Students will be made aware of the composition of blood and methods of estimating different components of blood. They will learn the basic concepts of Hematology and routine clinical investigations of the Haematology laboratory.
Course Outcome	At the end of the course, students should be able to: 1. Demonstrate laboratory safety practices, biomedical waste management, and adherence to quality standards in a clinical hematology laboratory. 2. Apply pre-analytical procedures, including patient identification, preparation, specimen collection, transportation, processing, and acceptance/rejection criteria to ensure sample integrity. 3. Perform venous blood collection using standard phlebotomy techniques and demonstrate the correct order of draw for blood specimens. 4. Conduct routine hematological investigations, including hemoglobin estimation, packed cell volume (PCV), erythrocyte sedimentation rate (ESR), and reticulocyte count, following standard laboratory protocols. 5. Prepare, stain, and examine peripheral blood smears using Romanowsky stains and perform differential leukocyte count (DLC) for hematological evaluation. 6. Perform manual hematological cell counts, including RBC count, WBC count, platelet count, and absolute eosinophil count, and calculate red cell indices for clinical interpretation. 7. Assess hemostatic function by performing bleeding time and clotting time tests and correlate findings with normal physiological processes. 8. Operate automated hematology analyzers, interpret hematological parameters, and compare automated results with manual laboratory findings for quality assessment.

LIST OF PRACTICALS

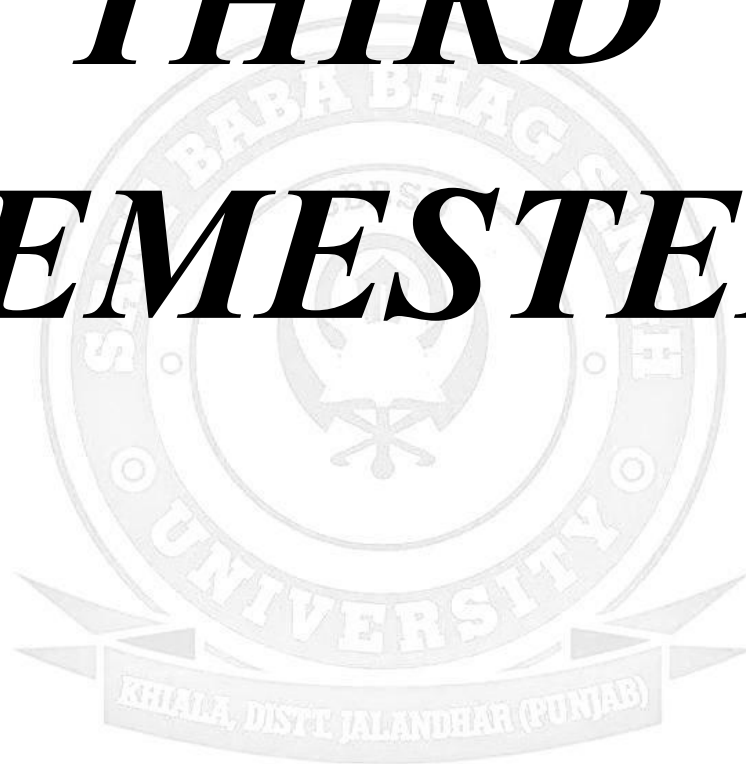
1. Demonstrate laboratory safety and biomedical waste management
2. Pre-analytical variables in clinical Laboratory: Patient and test request form identification, Patient preparation for phlebotomy, Sources of error in venous blood sample collection
3. Sample transport, processing, Sample acceptance and rejection criteria
4. Perform blood collection and demonstrate the order of draw
5. Estimation of hemoglobin by Drabkin's method

6. Perform Packed Cell Volume
7. Perform ESR by the Westergren method
8. Stain and examine the blood smear using Romanowsky stain
9. Perform Differential Leucocyte Count
10. Perform RBC count
11. Perform WBC count
12. Perform Absolute Eosinophil count
13. Perform Platelet count
14. Calculation of Red Cell Indices
15. Perform Bleeding Time and Clotting Time
16. Operate automated cell counters and interpret results
17. Perform Reticulocyte count

Note:- Clinical Laboratory rotation/observation can be incorporated wherever possible



THIRD SEMESTER



Bacteriology

Course Code	BMLS201
Course Title	Bacteriology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/ Dip in MLT with 50% marks
Course Objective (CO)	Students will identify medically important bacteria, understand their pathogenic mechanisms, and apply diagnostic methods for bacterial infections and hospital -acquired infections.
Course Outcome	At the end of the course, students should be able to: 1. Identify clinically significant bacteria that cause human disease. 2. Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases. 3. Demonstrate proper techniques for specimen collection, handling, and processing in a clinical bacteriology laboratory.

UNIT-I

Gram -positive bacteria: *Staphylococcus species*, *Streptococcus species*, *Corynebacterium diphtheriae*, *Bacillus species*

UNIT-II

Mycobacteria: Classification and morphology

UNIT-III

Anaerobes: Non-spore -forming anaerobes. Classify anaerobes, infections caused, and laboratory diagnosis of non-sporing anaerobes

UNIT-IV

Spore -forming anaerobes: Classify Clostridia species: *Clostridium perfringens*, *Clostridium tetani*, *Clostridium botulinum*, *Clostridium difficile*

UNIT-V

Gram Negative Cocci: *Neisseria meningitidis*, *Neisseria gonorrhoeae*

UNIT-VI

Enterobacteriaceae: *Escherichia coli*, *Klebsiella species*, *Proteus species*, *Salmonella species*, *Shigella species*

UNIT-VII

Vibrio species, *Pseudomonas* and *Burkholderia* . *Spirochetes*: Classification of Spirochetes - *Treponema pallidum*, *Leptospira*, *Borrelia*

UNIT-VIII

Mycoplasma, *Actinomycetes* and *Nocardia*, *Candida*

UNIT-IX

Types of infections & diagnosis - Skin and soft tissue infections, Respiratory tract infections, Cardiovascular System & Central Nervous System infections, Otitis media, Gastrointestinal tract infections, Urinary tract infections, Genital tract Infections

UNIT-X

Nosocomial Infection - Hospital Acquired Infections (HAI), risk factors, sources and route. Investigation, prevention and control of hospital -acquired infections. Bacteriology of air, food, water and milk

Text and Reference Books

S. No	Name	Author(S)	Publisher
1.	Textbook of Microbiology	R. Ananthanarayan & C.K. Jayaram Paniker	Universities Press
2	Textbook of Microbiology	C.P. Baveja	Arya Publications
3	Textbook of Microbiology and Immunology	Subhash Chandra Parija	Elsevier
4	A Textbook of Microbiology	Dubey R.C.	S. Chand Publishers
5.	Textbook of Microbiology	Arora D.R.	CBS Publishers
6.	Essentials in Medical Microbiology	Apurba Sankar Sastry & Sandhya Bhat K	Jaypee Brothers Medical Publishers
7.	Practical Medical Microbiology	Mackie & McCartney	Elsevier
8.	Clinical Microbiology Procedures Handbook	Henry D. Isenberg	ASM Press
9.	Diagnostic Microbiology	Bailey & Scott	Elsevier
10.	Colour Atlas and Textbook of Diagnostic Microbiology	Koneman et al.	Lippincott

Intermediary Metabolism & Endocrinology

Course Code	BMLS205
Course Title	Intermediary Metabolism & Endocrinology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/ Dip in MLT with 50% marks
Course Objective (CO)	To familiarise the students with the metabolism of carbohydrates, lipids, proteins, nucleic acids, haemoglobin and minerals. Students will also gain knowledge of the basics of endocrinology.
Course Outcome	At the end of the course, students should be able to 1. Explain the fundamental principles of metabolism, including anabolic and catabolic pathways. 2. Describe the key metabolic pathways such as glycolysis, the citric acid cycle (TCA cycle), oxidative phosphorylation, and beta-oxidation. 3. Understand the regulation of metabolic pathways and the role of enzymes, cofactors, and hormones in metabolic control.

UNIT-I

Metabolism of carbohydrates : Digestion and absorption, Glycolysis, TCA cycle, Gluconeogenesis, Glycogenesis and Glycogenolysis, Significance of HMP shunt and uronic acid pathway. Regulation of blood glucose. Disorders of Carbohydrate metabolism: Diabetes mellitus, glycosuria, glycogen storage diseases, galactosemia, pentosuria, fructosuria.

UNIT-II

Biological oxidation and Electron transport chain: Redox potentials, Biological oxidation and high-energy compounds, organisation of electron transport chain, Chemiosmotic theory, ATP synthase, inhibitors of ATP synthase, uncouplers of oxidative phosphorylation.

UNIT-III

Metabolism of lipid: Digestion and absorption, Beta-oxidation of fatty acids, Synthesis and breakdown of cholesterol, lipoproteins, and ketogenesis. Disorders of lipid metabolism: Hyperlipidemia, hyperlipoproteinemias, Atherosclerosis, fatty liver

UNIT-IV

Metabolism of protein and amino acid: Digestion and absorption, transamination, Oxidative and non-oxidative deamination, Urea cycle, Creatine synthesis and degradation, Metabolism of aromatic amino acids. Disorders of Protein metabolism and amino acid metabolism: Inherited disorders associated with the urea cycle, Phenylketonuria, Alkaptonuria

UNIT-V

Integration of Metabolism : Metabolism in a well-fed state and starvation. Mineral metabolism: Regulation of the blood level of calcium, phosphorus and iron. Water and electrolyte balance:

Distribution of fluids in the body, water metabolism, factors influencing the distribution of body water, thirst mechanism, intake and loss of body water, electrolyte distribution, function and regulation, and dehydration.

UNIT-VI

Purine and Pyrimidine metabolism : Biosynthesis of purines, pyrimidines, Breakdown of purine and pyrimidines

UNIT-VII

Haemoglobin metabolism : Oxygen dissociation curves and abnormal haemoglobin, formation and breakdown of hemoglobin.

UNIT-VIII

Hormones: Introduction, Classification, Major endocrine glands and their hormones, Hypothalamus, Pituitary, Thyroid, Parathyroid, Adrenal cortex, Pancreas and gonads. Mechanism of action of hormones.

Text and Reference Books:

S. No	Name	Author(S)	Publisher
1.	Biochemistry	U. Sathyanarayana	Elsevier
2	Harper's Illustrated Biochemistry	Robert K. Murray et al	Tata McGraw -Hill
3	Textbook of Medical Biochemistry	M.N. Chatterjee & Rana Shinde	Jaypee
4	Varley's Practical Clinical Biochemistry	Alan Gowenlock	,CBS
5.	Lehninger Principles of Biochemistry	David L. Nelson & Michael M. Cox.	W.H. Freeman
6.	Textbook of Biochemistry	D.M. Vasudevan	Jaypee
7.	Fundamentals of Biochemistry	A.C. Deb	New Central Book Agency
8.	Basics of Clinical nutrition	Y.K. Joshi	Jaypee publishers
9.	Tietz Textbook of Clinical Chemistry and Molecular Diagnostics,	Nader Rifai et al	Saunders / Elsevier

Clinical Haematology

Course Code	BMLS209
Course Title	Clinical Haematology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/ Dip in MLT with 50% marks
Course Objective(CO)	Students will understand the pathophysiology and laboratory diagnosis of haematological disorders, including anaemia, leukocyte abnormalities, coagulation defects, and related morphological changes in blood cells.
Course Outcome	At the conclusion of the course, students will; 1. Comprehend knowledge of Qualitative and Quantitative disorders of Erythrocytes, leucocytes and thrombocytes 2. Describe the pathophysiology and clinical features of common pathological diseases 3. Demonstrate the proper techniques for specimen collection, handling, and diagnosis of the pathological diseases

UNIT-I

Red cell indices: Definition, normal range, and calculations with their application in diagnosing anaemia

UNIT-II

Anaemia - Morphological and etiological classification: Signs, symptoms, aetiology, pathophysiology, and laboratory findings associated with Iron deficiency anaemia, Megaloblastic anaemia, Aplastic anaemia, Hemolytic anaemia, Thalassemia, Sickle cell anaemia, Hereditary spherocytosis, Paroxysmal nocturnal hemoglobinuria. Recent advances in laboratory diagnosis of anaemia

UNIT-III

Leukaemia: Leukaemia: Leukemoid reaction - Definition and clinical implications, Leukaemia - Classification, definition and clinical implications, Pathophysiology, signs, symptoms, and laboratory diagnosis of Acute lymphoid leukaemia (ALL), Acute myeloid leukaemia (AML), Chronic lymphoid leukaemia (CLL), Chronic myeloid leukaemia (CML). Pathophysiology, signs, symptoms, and laboratory diagnosis of Polycythemia vera, Multiple Myeloma. Recent advances in laboratory diagnosis of leukaemia

UNIT-IV

Haemostasis Disorders: Coagulation pathways - Extrinsic and Intrinsic Cell-Based Model of Coagulation. Coagulation Tests and Interpretation of Prothrombin, PT/INR, Activated Partial Thromboplastin Time (APTT), Thrombin Time (TT), Fibrinogen, Platelet, D-dimer test, Mixing study, and factor assay Pathophysiology, signs, symptoms, and laboratory diagnosis of common bleeding / clotting disorders - Haemophilia A & B, Von-Willebrand disease, Bernard -Soulier syndrome, Glanzman's thrombasthenia, Disseminated intravascular coagulation (DIC), Immune

Thrombocytopenic Purpura (ITP). Recent advances in laboratory diagnosis of coagulation disorders

UNIT-V

Cytogenetics, Karyotyping, FISH, chromosome analysis for interpretation of malignancies

UNIT-VI

Basics of Flow Cytometry with CD markers

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Medical Laboratory Technology, Vol-1 : Methods of Interpretation (6th). India:	Sood, R. (2009)	Jaypee Brothers
2.	Dacie and Lewis practical haematology	Dacie, J. V. (2006).	Elsevier Health Sciences.
3.	McKenzie, S. B., Williams, J. L., & Landis -Piwowar, K. (2004).	McKenzie, S. B., Williams, J. L., & Landis -Piwowar, K. (2004).	Pearson education.
4.	Manual of Medical laboratory techniques	Ramakrishnan, S., & Sulochana, K. N. (Eds.). (2012).	Jaypee Brothers Medical Publishers Pvt. Ltd.
5.	Textbook of medical laboratory technology	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.

Basics of Pharmacology

Course Code	BMLS213
Course Title	Basics of Pharmacology
Type of course	Theory
LTP	2 0 0
Credits	2
Course prerequisite	10+2 Medical/ Dip in MLT with 50% marks
Course Objective (CO)	Students will gain foundational knowledge in pharmacokinetics and pharmacodynamics, adverse drug effects, commonly used drugs in infectious and metabolic disorders, and the pharmacology relevant to laboratory diagnostics and interpretation.
Course Outcome	At the end of the course, students should be able to 1. Explain fundamental concepts of pharmacology 2. Identify major classes of drugs, their therapeutic uses mechanism of action, and common side effects. 3. Recognise signs and symptoms of common drug toxicities and the role of the laboratory in monitoring drug therapy.

UNIT-I

General Pharmacology: Branches of Pharmacology, Routes of Drug Administration, Pharmacokinetics (Absorption, Distribution, Metabolism, Excretion), Pharmacodynamics, Adverse Drug Reactions, Overview of Clinical Trials and Phases, Essential Drug Concepts for Laboratory Professionals (e.g., drug half-life, therapeutic drug monitoring)

UNIT-II

Antimicrobial Chemotherapy: Classification of Antibacterial Drugs, Mechanism of Action and Resistance, Sulfonamides, Trimethoprim, Beta-lactams: Penicillin, Cephalosporins. Protein Synthesis Inhibitors: Aminoglycosides, Tetracyclines, Macrolides, Antitubercular and Antileprotic Drugs, Antifungals and Antivirals, Relevance of Antibiotic Sensitivity Testing, Laboratory Role in Monitoring Antimicrobial Therapy

UNIT-III

Drugs Related to Hormonal and Metabolic Disorders: Insulin and Oral Hypoglycemic Agents, Thyroid and Antithyroid Drugs, Corticosteroids (overview and lab monitoring), Drugs affecting Calcium Balance, Antidiuretics, Relevance of Drug-induced Metabolic Changes in Lab Tests

UNIT-IV

Drugs Acting on Blood and Blood-forming Organs: Hematinics and Use in Anaemia, Coagulants and Anticoagulants, Blood Products and Plasma Expanders, Overview of Anticoagulant Therapy and Its Relevance to Laboratory Monitoring (e.g., PT, INR, aPTT), Effects of Drugs on Haematological Parameters

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Essentials of Medical Pharmacology	K.D. Tripathi	Jaypee
2.	Pharmacology for Nurses	Pharmacology for Nurses	Pharmacology for Nurses
3.	Pharmacology and Pharmacotherapeutics	Satoskar et al.	
4.	Relevant Laboratory Manuals/Drug Interaction Charts for Lab Technicians		



Bacteriology Practical

Course Code	BMLS203
Course Title	Bacteriology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/ Dip in MLT with 50% marks
Course Objective (CO)	Students will demonstrate and perform bacterial culture, identification, and antibiotic susceptibility testing using manual and automated methods.
Course Outcome	At the conclusion of The course, Students will : 1. Identify clinically significant bacteria that cause human disease. 2. Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases. 3. Demonstrate proper techniques for specimen collection, handling, and processing in a clinical bacteriology laboratory.

LIST OF PRACTICAL

1. Perform pure culture study of common pathogens. (*Staphylococcus aureus*, *Staphylococcus pyogenes*, *Enterococcus species*, *Corynebacterium diphtheriae*, *E. coli*, *Salmonella spp*, *Shigella spp*, *Pseudomonas*, *Proteus spp*, *K. pneumoniae*, *Vibrio cholerae*, *Pseudomonas aeruginosa*, *C. albicans*).
2. Apply diagnostic Scheme for Respiratory Tract Infections.
3. Apply diagnostic Scheme for Urinary Tract Infections.
4. Apply diagnostic Scheme for Gastrointestinal Tract Infections.
5. Apply diagnostic Scheme for Central Nervous System Infections and Bacteraemia.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1.	Practical Medical Microbiology	Mackie & McCartney	Elsevier
2.	Clinical Microbiology Procedures Handbook	Henry D. Isenberg	ASM Press
3.	Diagnostic Microbiology	Bailey & Scott	Elsevier
4.	Colour Atlas and Textbook of Diagnostic Microbiology	Koneman et al.	Lippincott

Intermediary Metabolism & Endocrinology -Practical

Course Code	BMLS207
Course Title	Intermediary Metabolism & Endocrinology -Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/Dip in MLT with 50%marks
Course Objective (CO)	Students will be taught a relevant diagnostic test and gain hands -on experience in estimating biochemical parameters using standard kit methods used in laboratories.
Course Outcome	At the conclusion of the course, Students will : 1. Able to explain the importance of generic and leadership skills. 2. Demonstrate self-development through task management and manage themselves physically, intellectually and psychologically. 3. Know about concepts of entrepreneurship including identifying a winning business opportunity, gathering funding and launching a business, growing and nurturing the organization and harvesting the rewards

List of Practical

1. Operate the colourimeter and spectrophotometer
2. Estimation of Plasma Glucose by GOD - POD method
3. Estimation of Total Protein by Biuret Method
4. Estimation of Albumin by the BCG method. Calculation of A/G ratio
5. Estimation of Cholesterol by modified CHOD -POD method
6. Estimation of Urea by Urease method
7. Estimation of Uric acid by uricase method
8. Estimation of creatinine by picric acid method
9. Demonstration of serum electrolytes
10. Estimation of Calcium
11. Perform qualitative urine analysis - 5-hydroxy indole acetic acid (HIAA), total porphyrins, Coproporphyrin

Clinical Haematology - Practical

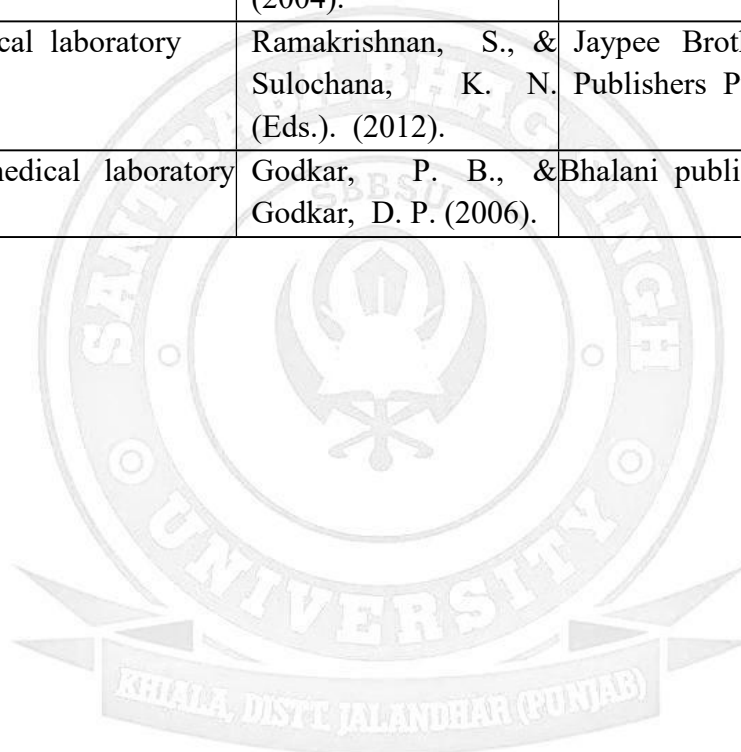
Course Code	BMLS211
Course Title	Clinical Haematology - Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/ Dip in MLT with 50% marks
Course Objective(CO)	Students will gain practical skills necessary for various laboratory investigations required for the diagnosis of haematological disorders and compare them with normal values and clinical conditions
Course Outcome	At the conclusion of the course, Students will : 1. Understand the basics of cell, its components and their functions 2. Able to demonstrate the routine cytological preparation and their routine & special staining techniques 3. Apply the knowledge to differentiate normal and abnormal cells

List of Practical

1. Preparation and staining of peripheral smear using Leishman's stain.
2. Identification of normal and abnormal morphology of red blood cells, white blood cells, and platelets.
3. Peripheral smear study, its correlation with clinical symptoms and comparison of peripheral smear results with complete blood count (CBC).
4. Reticulocyte count and its correlation with clinical symptoms
5. Demonstration of bone marrow aspiration and smear preparation.
6. Staining of bone marrow smears (Pearls 'Prussian blue stain) and its correlation with clinical symptoms
7. Preparation of iso-osmotic sucrose solution and performance of sucrose lysis test.
8. Identification of tests for hemoglobin variants and thalassemia. Explanation and interpretation of hemoglobin electrophoresis (e.g., sickle cell anaemia, thalassemia).
9. Sickling test. Performance and interpretation of the osmotic fragility test
10. Bleeding time, Clotting time, Prothrombin time (PT), Activated partial thromboplastin time (aPTT). Thrombin time, Platelet count, Fibrinogen count, and interpretation of first-line hemostasis tests. Blood collection procedures related to coagulation testing. Performance and interpretation of: Clot retraction, Inhibitor assays. Platelet function tests.
11. Identify the tests to detect hereditary haemolytic anaemia. Prepare reagents for the osmotic fragility test. Perform the osmotic fragility test and interpret the results. Integrate clinical symptoms and laboratory investigations to identify haematological disorders

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Medical Laboratory Technology, Vol-1 : Methods of Interpretation (6th). India:	Sood, R. (2009)	Jaypee Brothers
2.	Dacie and Lewis practical haematology	Dacie, J. V. (2006).	Elsevier Health Sciences.
3.	McKenzie, S. B., Williams, J. L., & Landis -Piwowar, K. (2004).	McKenzie, S. B., Williams, J. L., & Landis -Piwowar, K. (2004).	Pearson education.
4.	Manual of Medical laboratory techniques	Ramakrishnan, S., & Sulochana, K. N. (Eds.). (2012).	Jaypee Brothers Medical Publishers Pvt. Ltd.
5.	Textbook of medical laboratory technology	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.



***FOURTH
SEMESTER***

Virology and Immunology

Course Code	BMLS202
Course Title	Virology and Immunology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT/ with 50% marks
Course Objective(CO)	Students will understand the morphology and general features of viruses and gain comprehensive knowledge of the immune system, immune response, and diagnostic immunological techniques.
Course Outcome	At the end of the course, students will be able to 1. Identify clinically significant viruses that cause human disease and understand immunology 2. Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases. 3. Demonstrate proper techniques for specimen collection, handling, and processing in a clinical laboratory.

UNIT-I

Introduction to virology: History of viruses, Viral taxonomy, Virus replication, Viral pathogenesis, Viral factors, Viral Growth Curve, Viral Growth Cycle. Host response, Environmental factors

UNIT- II

Cultivation of Viruses, Detection of Virus Growth in Cell Culture, Different methods of cultivation of viruses, animal inoculations, egg inoculation, cell culture, Viral Assay, Viral Genetics, Classification of Viruses

UNIT- III

Laboratory Diagnosis of Viral Infections: Direct detection of viruses/viral antigens, demonstration of virus -induced cytopathic effects (CPEs) in the cells, virus isolation, viral assays, detection of viral proteins and other enzymes, detection of the viral genome and viral serology

UNIT IV

Classify medically important viruses, Morphology, cultural characteristics, pathogenesis, lab diagnosis and treatment of Herpes virus, Poxviruses, Rhabdovirus, Orthomyxoviruses, Paramyxoviruses, Polio virus, Hepatitis virus, HIV, Oncogenic viruses, Arboviruses, Prevention and Precautions in Virology: Safety precautions in the virology laboratory, Antiviral drugs

UNIT V

Immunology: The Immune Response, Innate immunity, adaptive immunity, acquired immunity - active and passive immunity

UNIT VI

Immune system: components of the immune system, immune cells and their functions, organs of the immune system - primary and secondary immune organs

UNIT VII

Antigen and antibody: Types of antigens and determinants of antigenicity, Structure and functions of different immunoglobulins, Properties and functions of antibodies -monoclonal and polyclonal

antibodies.

Antigen -Antibody reactions - Definition, Classification, General features, and mechanisms, applications of various antigen -antibody reactions

Immune response: Classify immune response - Primary & Secondary Basic concept of humoral and cell-mediated immunity, Cytokines - define, classify, properties and functions

UNIT VII

Complement system: definition, components and activation pathways. Hypersensitivity - definition, types of hypersensitivity reactions

UNIT VIII

Autoimmune diseases: Primary and secondary immune deficiency disorders. Autoimmunity: Basic concepts of autoimmunity, risk factors and mechanisms of autoimmunity

UNIT IX

Immunisation/Vaccination: Active and passive immunisation, classification of vaccines, and immunisation schedule in India. Brief knowledge about the extended programme of immunisation (EPI) in India

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of Microbiology	R. Ananthanarayan & C.K. Jayaram Paniker	Universities Press
2	Essentials in Medical Microbiology	Apurba Sankar Sastry & Sandhya Bhat K	Jaypee Brothers Medical Publishers Pvt. Ltd.
3.	Essentials of Microbiology	Surinder Kumar	Jaypee Brothers Medical Publishers
4.	Textbook of Microbiology and Immunology	Subhash Chandra Parija	Elsevier
5.	Fields Virology – Editors	David M. Knipe & Peter M. Howley,	Lippincott Williams & Wilkins
6.	Basic & Clinical Immunology	P. Daniel Fudenberg, H. Hugh Fudenberg & John Stites	Lange Medical Books
7.	Kuby Immunology	: Jenni Punt, Sharon Stranford, Patricia Jones & Judy Owen,	W.H. Freeman
8.	Essentials of Immunology	S.K. Gupta	Jaypee Brothers Medical Publishers

Genetics & Molecular Biology

Course Code	BMLS206
Course Title	Genetics & Molecular Biology
Type of course	Practical
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/ Dip in MLT/ with 50% marks
Course Objective(CO)	Students will learn the fundamentals of Genetics and molecular biology in order to understand the molecular basis of disease, perform and interpret basic molecular diagnostic tests.
Course Outcome	At the end of the course, students will be able to 1. Explain how genetic information is copied, transferred, and used in cells. 2. Describe how genes are inherited and how traits are passed through generations. 3. Identify common laboratory techniques used to study genes

UNIT-I

Introduction to Genetics: Mendelian genetics –Principle of dominance, Principle of segregation, Principle of Independent Assortment, Genotype & phenotype; homozygous & heterozygous; dominant& recessive; gene & allele, Trait Inheritance – ABO blood groups in human; Polygenic Inheritance –Kernel colour in Maize, skin colour in man, Sex-linked Inheritance – haemophilia and colour blindness in man, Non-Mendelian Inheritance Maternal inheritance

UNIT-II

Chromosomal basis of Inheritance: Chromosome morphology - size and shape; Euchromatin and Heterochromatin - constitutive and facultative heterochromatin Chromosomes: Packaging of DNA in to Chromosomes, structure (centromere and telomere), karyotype, Structural chromosomal aberrations - duplications, deletions, inversions & translocations with examples, Genetic consequences, Numerical chromosomal aberrations – aneuploidy, euploidy auto-polyploidy and allo-polyploidy, Genetic consequences

UNIT-III

Cell division and chromosome segregation: Mitosis – Stages in mitotic cell division - significance of mitosis. Meiosis – Formation of Synaptonemal complex, crossing over, chiasma formation, significance of meiosis. stages of mitosis, meiosis I&II& fertilization

UNIT-IV

Molecular basis of Inheritance: Structure of DNA and RNA, DNA replication, Mutations: types of mutations - transition, transversion, frame shift, silent, missense and nonsense

UNIT-V

Gene expression and regulation: Structure of eukaryotic gene, Transcriptional machinery in eukaryotes (RNA polymerases) and their structural and functional features; Genetic code, Transcription, translation

UNIT-VI

Molecular Diagnostics

- Spectroscopy – principle, instrumentation, ultraviolet and visible light spectroscopy, and

its applications

- Chromatography – types of chromatographic techniques (paper, ion exchange, chromatography, size exclusion chromatography) - principle & applications
- Centrifugation –principle and applications
- Electrophoretic techniques - types (Agarose gel electrophoresis, SDS PAGE), principle & applications
- Microscopy - principle & applications of Phase contrast microscope and bright field and fluorescence microscopy
- PCR - principles and applications
- Quantitative Real Time PCR– principle and applications.
- DNA Sequencing – principle and applications.
- Microarray - DNA and protein arrays - principle and applications.
- Blotting techniques - Southern blot, Northern blot and Western blot- principle and applications.
- Fluorescence & Chemiluminescence Imaging - principle and applications.

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Molecular Cell Biology 6th edition (2007)	Harvey F Lodish	
2.	Techniques for molecular biology,	D.Tagu C. Moussard,	CRC Press
3.	Molecular diagnostics: for the clinical laboratorian	William B. Coleman and Gregory J. Tsongalis.	Humana Press

Clinical Pathology

Course Code	BMLS210
Course Title	Clinical Pathology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will understand the principles and procedures for analysing urine, faeces, semen, sputum, and body fluids. They will learn to differentiate normal from abnormal findings and apply analytical techniques in clinical diagnosis.
Course Outcome	At the end of the course, students should be able to 1. Comprehend knowledge of formation, composition and function of body fluids 2. Demonstrate proper technique for specimen collection, handling, and processing in a clinical Pathology laboratory. 3. Apply standard laboratory techniques for the identification of the etiology of infection.

UNIT-I

Urine analysis: Formation and Normal Composition of urine, Indication of urine analysis, collection of urine, preservatives used for urine sample, examination of urine – Manual methods, dipstick method, urine analysers

- Physical examination of urine and interpret the result - Volume, colour, odour, specific gravity, pH, turbidity
- Chemical examination of urine and interpret the result for - Glucose - Protein - Blood - Ketones - Bile salt - Bile pigment
- Examination for hemosiderin, chyluria, fat globules, and myoglobin detection in urine
- Microscopic examination of urine - cells, casts, crystals, organisms, others Characteristics of a normal and abnormal urine sample. List advanced techniques used in the field of diagnosis, Sources of errors, and Clinical conditions using laboratory results of urine analysis

UNIT-II

Faecal analysis: Formation and Normal composition of stool, specimen collection, scotch tape preparation, Preservatives of stool specimen, Physical, chemical and microscopic faecal analysis

- Physical examination -Volume, colour, consistency, odour, Blood, Mucus and Adult parasites
- Test for occult blood
- Saline and Iodine wet preparation, Concentration method, floatation method, and methylene blue stain

UNIT-III

Semen analysis: Formation of semen, method of collection, importance and method of semen analysis - Normal and abnormal morphology of sperms Physical and chemical characteristics, sperm count, and Medico -legal aspects of specimen analysis

UNIT-IV

Sputum Analysis: Formation of Sputum, Collection of Sputum, Analysis of Sputum

UNIT-V

Body fluids: Different body fluids and methods of aspiration, characteristics of normal and abnormal body fluids, physical, chemical, and microscopic analysis of body fluids, procedure of cell count, clinical conditions - CSF, peritoneal, pericardial, pleural and synovial fluid Other body fluids: Function, volume and chemical composition, specimen collection, handling of amniotic fluid, examination of amniotic fluid, special tests performed in amniotic fluid Examination of bronchoalveolar Lavage, saliva, sweat, and tears.

UNIT-VI

Recent advances in clinical pathology that have led to the use of special stains in clinical pathology, and outline sample processing using automation in clinical pathology

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of medical laboratory technology	Sood, R. (2006)	Jaypee Brothers Publishers
2	Graff's text book of urinalysis and body fluids. Jone & Bartlett Learning.	Mundt, L., & Shanahan, K. (2020).	Elsevier Health Sciences.
3.	Urinalysis and body fluids. FA Davis.	Strasinger, S. K., & Di Lorenzo, M. S. (2014).	Pearson education.
4.	Textbook of medical laboratory technology	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.

Medical Laboratory Management and Quality Control

Course Code	BMLS214
Course Title	Medical Laboratory Management and Quality Control
Type of course	Theory
LTP	2 0 0
Credits	2
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students are introduced to medical laboratories, quality management, laboratory information management systems applied in diagnostic laboratories, laboratory automation and point of care testing
Course Outcome	At the end of the course, students will be able to 1. Explain the principles of effective laboratory organisation, administration, and workflow planning 2. Demonstrate knowledge of quality assurance (QA) and quality control (QC) practices in laboratory settings. 3. Understand laboratory accreditation standards and regulatory requirements

UNIT-I

Total quality management of clinical laboratories: Define a quality management system, the three phases of the laboratory testing process, laboratory error, and quality indicators. List the quality indicators in the preanalytical phase and the sources of errors in the preanalytical, analytical, and postanalytical phases. Define the Root Cause Analysis (RCA) process. Define corrective actions and preventive actions (CAPA), CAPA for the control and prevention of errors in the clinical laboratory. Classify quality control: Internal quality control method, formulating quality control charts, Levey -Jenning charts, and Interpretation of Westgard rules. Explain external quality control method, the proficiency testing method in the clinical laboratory, and illustrate good laboratory practice

UNIT-II

Accreditation and certification of laboratories: Define accreditation, certification and accreditation bodies. Explain the National Accreditation Board for Testing and Calibration Laboratories (NABL) and the International Organisation for Standardisation (ISO). Summarise the benefits of accreditation. Audit in a Medical Laboratory - Introduction and Importance, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation, Procurement of equipment and Inventory

UNIT-III

Automation in Laboratory Workflow: Definition, Automation in Preanalytical, Analytical, and Post-analytical Phases. Types of Analyzers: Continuous Flow, Discrete and Dry Chemistry Analyzers. Automation in Immunology, Microbiology, Histopathology, Haematology, Biochemistry, Clinical Pathology. Total Laboratory Automation (TLA) - Robotic Process

Automation (RPA), Laboratory Information Management System (LIMS), AI & Machine Learning – Predictive diagnostics and image analysis, Point -of-Care Testing (POCT) – Portable

diagnostic devices, Automated Storage and Retrieval Systems (ASRS) – Efficient sample archiving. Point -of-Care Testing (POCT): Definition, types, goal, advantages and disadvantages. Working Principles of POCT Devices – Glucometer, Urine Dipstick, Lateral Flow Immunoassay (LFIA) Explain Waived vs. Non-Waived Tests, Calibration and Validation, Essential for quality assurance, regulatory compliance, and patient safety.

UNIT- IV

Introduction to Laboratory information system (LIS), Laboratory Information Management Systems (LIMS). Operations: sample management, Instrument and application integration, electronic data exchange. Languages of Informatics LIS, LIMS and Middleware. Document Control, Data Mining Methods, Security, LIS Validation, components and working of LIS, applications of LIS

UNIT-V

Sustainability of Clinical Laboratories: Waste Management, Energy Efficiency, Water Conservation, Green Procurement, Digitalisation. Introduction and awareness of financial management in a clinical laboratory .

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of Medical laboratory Technology	Mirnali Sant	CBS publishers
2	Laboratory Information Management Systems (2nd edition)	Paszko Christine, Turner Elizabeth (2001)	CRC Press Inc
3.	The Complete Guide to LIMS and Laboratory Informatics (1st edition)	Douglas Shawn (2023)	LabLynx Press
4.	Textbook of medical laboratory technology	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.

Virology & Immunology Practical

Course Code	BMLS204
Course Title	Virology & Immunology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will demonstrate and perform diagnostic tests for viral infections and immunological disorders using serological and molecular techniques.
Course Outcome	At the end of the course, students should be able to 1. Comprehend knowledge of formation, composition and function of body fluids 2. Demonstrate proper technique for specimen collection, handling, and processing in a clinical Pathology laboratory. 3. Apply standard laboratory techniques for the identification of the etiology of infection.

LIST OF PRACTICAL

1. Collection, transport and processing of various clinical specimens for Virology
2. Identify the tests used for the diagnosis of viral infections
3. Integrate knowledge in the diagnosis of given clinical cases
4. Identify viruses and their replication using charts.
5. Perform Staining - Giemsa stain, Seller's stain, immunofluorescent staining procedures for the diagnosis of viral infections.
6. Demonstrate various inoculation routes in a fertilised hen egg
7. Perform serological tests, i.e. Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO Anti-Streptolysin O, C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test, RPR
8. Demonstrate ELISA, immunodiffusion, immunofluorescence, and Western blotting.

Note:- Clinical Laboratory rotation/observation can be incorporated wherever possible

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of Microbiology	R. Ananthanarayan & C.K. Jayaram Paniker	Universities Press
2.	Essentials in Medical Microbiology	Apurba Sankar Sastry & Sandhya Bhat K	Jaypee Brothers Medical Publishers Pvt. Ltd.
3.	Essentials of Microbiology	Surinder Kumar	Jaypee Brothers Medical Publishers
4.	Textbook of Microbiology and Immunology	Subhash Chandra Parija	Elsevier
5.	Fields Virology – Editors	David M. Knipe & Peter M. Howley,	Lippincott Williams & Wilkins
6.	Basic & Clinical Immunology	P. Daniel Fudenberg, H. Hugh Fudenberg & John Stites	Lange Medical Books
7.	Kuby Immunology	Jenni Punt, Sharon Stranford, Patricia Jones & Judy Owen,	W.H. Freeman
8.	Essentials of Immunology	S.K. Gupta	Jaypee Brothers Medical Publishers

Genetics & Molecular biology Practical

Course Code	BMLS208
Course Title	Genetics & Molecular biology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will demonstrate and perform diagnostic tests widely used in molecular biology labs.
Course Outcome	At the end of the course, students should be able to: 1. Comprehend knowledge of formation, composition and function of body fluids 2. Demonstrate proper technique for specimen collection, handling, and processing in a clinical Pathology laboratory. 3. Apply standard laboratory techniques for the identification of the etiology of infection.

LIST OF PRACTICAL

1. Extraction of genomic DNA
2. Quantification of DNA by spectrophotometer
3. Agarose gel electrophoresis of DNA
4. Estimation of DNA by DPA method
5. Estimation of RNA by orcinol method
6. Estimation of Protein by BSA method
7. Western blotting
8. Karyotyping (normal male/normal female)
9. Identification of chromosome anomalies using Idiograms– Autosomal disorders(Down Syndrome / Edward's syndrome, Klinefelter's syndrome / Turner's syndrome)

NOTE:- Clinical Laboratory rotation/observation can be incorporated wherever possible

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Molecular Cell Biology 6th edition (2007)	Harvey F Lodish	
2.	Techniques for molecular biology,	D.Tagu C. Moussard,	CRC Press
3.	Molecular diagnostics: for the clinical laboratorian	William B. Coleman and Gregory J. Tsongalis.	Humana Press

Clinical Pathology Practical

Course Code	BMLS212
Course Title	Clinical Pathology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2Medical /Dip in MLT with 50% marks
Course Objective (CO)	Students will demonstrate and perform physical, chemical, and microscopic examinations of clinical specimens using manual and automated methods. Pre-analytical: Proper method of sample identification for inpatients and Outpatients, Sample transport and processing, Sample acceptance and rejection criteria
Course Outcome	At the end of the course, students should be able to: 1. Comprehend knowledge of formation, composition and function of body fluids 2. Demonstrate proper technique for specimen collection, handling, and processing in a clinical Pathology laboratory. 3. Apply standard laboratory techniques for the identification of the etiology of infection.

LIST OF PRACTICALS

1. Identify and process clinical specimens (urine, stool, semen, sputum, CSF, pleural, peritoneal, synovial, pericardial fluids)
2. Perform physical, chemical, and microscopic analysis of urine and stool
3. Conduct special test in urine -hemoglobin & myoglobin, pregnancy test
4. Perform Stool analysis – Physical, Chemical and Microscopic Examination
5. Perform semen analysis - Physical, Chemical and Microscopic Examination
6. Perform Cerebrospinal Fluid (CSF) examination - Physical, Chemical, and Microscopic Examination
7. Perform Sputum Analysis -physical, chemical, and microscopic examination
8. Perform Pleural Fluid examination -physical, chemical, and microscopic examination
9. Perform Synovial fluid examination - physical, chemical, and microscopic examination
10. Perform Peritoneal Fluid examination - physical, chemical and microscopic examination
11. Perform Pericardial Fluid examination - physical, chemical, and microscopic examination
12. Operate the automation system used in Clinical pathology

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of medical laboratory technology	Sood, R. (2006)	Jaypee Brothers Publishers
2.	Urinalysis and body fluids. FA Davis.	Strasinger, S. K., & Di Lorenzo, M. S. (2014).	Pearson education.

***FIFTH
SEMESTER***

Mycology & Parasitology

Course Code	BMLS301
Course Title	Mycology & Parasitology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2Medical/ Dip in MLT with 50% marks
Course Objective(CO)	Students will gain comprehensive knowledge of medically important fungi and parasites, including their classification, morphology, pathogenesis, and laboratory diagnosis.
Course Outcome	At the end of the course, students will be able to: 1. Identify clinically significant fungi and parasites that cause human disease 2. Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases. 3. Demonstrate proper techniques for specimen collection, handling, and processing in a clinical laboratory

UNIT-I

Introduction to Mycology: Taxonomy and classification of various medically important fungi, Characteristic features of fungi, reproductive methods of fungi, Normal fungal flora. Classification of mycoses.

UNIT-II

Superficial mycoses - general characteristics of superficial mycoses, Morphology, pathogenesis, laboratory diagnosis, and treatment of *Piedra*, *Malassezia*, *Dermatophytoses*, and Subcutaneous mycoses are the general characteristics of subcutaneous mycoses. Morphology, cultural characteristics, pathogenesis and lab diagnosis and treatment of Mycotic mycetoma, Sporotrichosis, Chromoblastomycosis, Subcutaneous phycomycosis, Rhinosporidiosis, Lobomycosis

Systemic Mycoses -general characteristics of opportunistic systemic mycoses - *Histoplasmosis*, *Blastomycosis*, *Coccidioidomycosis*, *Paracoccidioidomycosis*. General characteristics of opportunistic systemic mycoses - Morphology, cultural characteristics, pathogenesis and lab diagnosis and treatment of *Candidiasis*, *Cryptococcosis*, *Aspergillosis*, *Penicillois*, *Mucormycosis*.

UNIT-III

Mycotoxigenesis: Definition of Mycotoxin, Mycetismus, Method of Mycotoxins, preventive measures and treatment.

UNIT-IV

Common fungal laboratory contaminants, Culture media used in mycology, Direct microscopy examination of fungi, Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids, Techniques used for isolation and identification of medically important fungi, Antifungal susceptibility tests, preservation of fungal cultures, Routine myco -serological tests and skin tests.

UNIT-V

Introduction of arthropods: Define and classify the arthropods of importance in public health. The sources and modes of transmission of infections are contaminated soil and water, foods, and vectors. Role of arthropods in the transmission of diseases Insects of medical importance: Morphology, life

cycle, disease transmitted and control of Mosquitoes, Tse-tse fly, Fleas, Ticks, Housefly, Sand fly, Types of animal association - parasitism, commensalism, symbiosis

UNIT-VI

Protozoology/Protozoal parasites: General characteristics of protozoa. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and prevention of

- Amoebae (*Entamoeba histolytica*, non-pathogenic amoebae),
- Flagellates (*Trichomonas*, *Giardia lamblia*, *Trypanosoma*, *Leishmania*),
- Sporozoa (*Plasmodium species*, *Toxoplasma species*)

UNIT-VII

Helminthology/ Helminthic parasites: Platyhelminthes: General characters of Platyhelminths. Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and prevention of Cestodes (*Diphyllobothrium*, *Taenia*, *Echinococcus*, *Hymenolepis*) - Trematodes (*Schistosoma*, *Fasciola*, *Fasciolopsis*, *Clonorchis* and *Paragonimus*)

UNIT-VIII

Nemathelminthes: General characters of Nemathelminthes, Geographical distribution, Habitat, Morphology, life cycle, Mode of infection, laboratory diagnosis, treatment and prevention of Nematodes (*Ascaris lumbricoides*, *Ancylostoma duodenale*, *Strongyloides stercoralis*, *Trichinella spiralis*, *Enterobius vermicularis*, *Trichuris trichura*, *Wuchereria bancrofti* and *Dracunculus medinensis*)

UNIT-IX

Laboratory diagnosis of parasitic diseases: Collection, preparation of specimens for the diagnosis of parasitic infection - Stool, Blood, Urine, sputum, Cerebrospinal fluid (CSF), Tissue and aspirates, Genital specimens

Examination of Stool for parasites- intestinal protozoal infections, Macroscopic and microscopic examination of stool samples, Staining methods, i.e. Iodine staining and permanent staining,

Concentration methods - Principles and applications, Chemical examination of stool, Occult blood, Bile pigment Examination of blood for parasites - Staining, examination of thin and thick blood film Immunology and Serology Tests - Skin Test, Animal Xenodiagnosis, Inoculation, Imaging and Haematology

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of Medical Mycology	Jagdish Chander	Jaypee Brothers Medical Publishers
2.	Fundamentals of Diagnostic Mycology	George S. Fischer	
3.	Paniker's Textbook of Medical Parasitology	C.K. Jayaram Paniker	Jaypee Brothers Medical Publishers
4.	Medical Parasitology	D.R. Arora & B. Arora	CBS Publishers & Distributors
5.	Textbook of Medical Parasitology	P. Chakraborty	New Central Book Agency
6.	Diagnostic Medical Parasitology	Lynne Shore Garcia	ASM Press
7.	Parasitology in Relation to Clinical Medicine	K.D. Chatterjee	CBS Publishers & Distributors
8.	Mackie & McCartney Practical Medical Microbiology ,	J.G. Collee, A.G. Fraser, B.P. Marmion, A. Simmons	Elsevier
9.	Textbook of Medical Microbiology and Parasitology	Praful B. Godkar	Bhalani Publishing House
10.	Park's Textbook of Preventive and Social Medicine	K. Park	Banarsidas Bhanot Publishers

Analytical Biochemistry

Course Code	BMLS305
Course Title	Analytical Biochemistry
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will gain knowledge on the principles and uses of analytical instruments such as photometry, chromatography, electrophoresis and automation used in Clinical laboratories or Research labs
Course Outcome	At the end of the course, students will be able to: 1. Understand the principles and applications of common analytical techniques used in biochemistry. 2. Demonstrate the ability to prepare samples and use laboratory instruments accurately for biochemical analysis. 3. Apply quantitative and qualitative techniques to analyse biomolecules such as proteins, nucleic acids, carbohydrates, and lipids.

UNIT-I

Photometry: Theory of colourimetry, Beer-Lambert's law, Principles and applications of colourimetry, spectrophotometry, atomic absorption Spectroscopy, Fluorimetry and flame photometry in clinical laboratory

UNIT-II

Centrifugation: Basic principles and units of centrifugation, Types of centrifugation and centrifuges, Rotors and tubes, Safety and maintenance, Applications of centrifugation in the laboratory.

UNIT-III

Chromatography: Principles, types, Components and applications of Chromatography – Paper Chromatography, TLC, Ion Exchange, Affinity Gel Filtration, Gas Chromatography and HPLC in the laboratory.

UNIT-IV

Electrophoresis: Principles, Types and applications – Agarose gel, Cellulose acetate and PAGE, and capillary electrophoresis. Electrophoresis of serum and urine protein, lipoprotein and isoenzymes

UNIT-V

Osmometry: Principle and role of osmometry in clinical laboratory

UNIT-VI

Radioactivity: Introduction, properties of alpha, beta and gamma radiations, radioisotopes, measurement of radioactivity, radiation hazards, radiation safety and precaution, Uses of radioisotopes. 6

UNIT-VII

Types of immunoassay and their principle: Competitive and Non-competitive, immunometric assay and Turbidometry. RIA, ELISA, FIA and ECLIA

UNIT-VIII

Automation: Principle of Automation, Semi -automated and fully automated chemistry analyser used in a clinical laboratory.

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Principles and techniques of biochemistry and molecular biology,	Wilson and walker's	Cambridge university press.
2.	Biochemistry	U. Sathyanarayana	Elsevier
3.	Harper's Illustrated Biochemistry ,	Robert K. Murray et al.	Tata McGraw -Hill
4.	Textbook of Medical Biochemistry ,	M.N. Chatterjee & Rana Shinde	Jaypee
5.	Practical Clinical Biochemistry	Alan Gowenlock - Varley's	CBS
6.	Textbook of Clinical Chemistry	Teitz	

Immunohaematology and Transfusion Medicine

Course Code	BMLS309
Course Title	Immuno haematology and Transfusion Medicine
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will learn about blood grouping and blood transfusion. The students will learn about the concept of blood grouping, compatibility testing in blood transfusion, and screening of donated blood for various infectious diseases.
Course Outcome	At the end of the course, students will be able to 1. Understand the principles of immunohematology, including blood group systems and their clinical significance 2. Demonstrate knowledge of donor selection, blood collection, processing, storage, and component preparation. 3. Perform routine blood grouping, cross -matching, antibody screening, and compatibility testing using standard laboratory techniques. 4. Apply safety and quality control procedures in all aspects of blood banking and transfusion services.

UNIT-I

History of transfusion, Types of blood bags and their advantages and disadvantages, Blood donor selection criteria and donor preparation for collection, Autologous transfusion: Types of autologous blood collection, Hemapheresis: pertaining to Leucocytes, platelets and plasma, Donor adverse reaction and its management

UNIT-II

History and discovery of various blood group systems, Genetics and inheritance of the ABO blood group system, Weak variants of the ABO blood groups, Bombay phenotype, Other phenotypes. Rh blood group system, weak D, Rh null, Rh mod 10

UNIT-III

Components of blood for transfusion - Packed red cells, washed red cells, frozen Red cells, platelet - rich plasma (PRP), Platelet concentrate and frozen platelets. Fresh plasma (FP), Fresh Frozen Plasma (FFP) and cryoprecipitate, process of component preparation, storage, indications, transfusion dosage, and quality control

UNIT-IV

Transfusion reactions - causes, clinical features, management and laboratory investigation, Pre-transfusion tests and their clinical significance. Compatibility test in blood transfusion: Collection of blood for cross -matching from a blood bag, Major cross -matching, Minor cross -matching, use of enzymes in the blood bank, especially Papain

UNIT-V

Transfusion -transmitted diseases and their laboratory investigations. Hemolytic disease of the newborn (HDN) and its investigations

UNIT-VI

HLA Human Leucocytic antigen, Introduction to basic concepts of HLA and clinical applications of HLA testing, Techniques and principles of histo compatibility testing

UNIT-VII

Regulatory agency that governs activities in the blood bank, Total quality management in transfusion service, including premises, personnel, instruments and reagents, Biosafety, external/internal quality control in Transfusion Medicine

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Principles of Blood Transfusion. Blood Cell-An Overview of Studies in Hematology	Mamak, N., & Aytekin, İ. (2012)	
2.	Technical manual (19th ed.). AABB.	AABB. (2017).	AABB
3.	Textbook of medical laboratory technology	Sood, R. (2006).	Jaypee Brothers Publishers.
4.	Textbook of medical laboratory technology .	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.
5.	Mollison's blood transfusion in clinical medicine .	Klein, H. G., & Anstee, D. J. (2013).	CBS
6.	Modern blood banking & transfusion practices	Harmening, D. M. (2018)	FA Davis.

Medical Law and Ethics

Course Code	BMLS313
Course Title	Medical Law and Ethics
Type of course	Theory
LTP	2 0 0
Credits	2
Course prerequisite	10+2Medical/ Dip in ML with 50% marks
Course Objective(CO)	Students are formulated to impart the basic concept of medical ethics, guidelines about human ethics, and animal ethics. Students will also learn about the Indian legal system, medico -legal cases and essential acts.
Course Outcome	At the end of the course, students will be able to 1. Comprehend knowledge of medical and bioethics 2. Follow good laboratory practice and appropriate ethical guidelines while conducting research on animal and human samples. 3. Understand the Indian Legal system, medico legal records, human rights act, disaster management, Human Organ Transplantation Act, mental Health act, professional indemnity insurance policy and IPR

UNIT-I

Medical ethics: Definition - Goal - Scope, Introduction to Code of conduct.

Basic principles of medical ethics – Confidentiality. Malpractice and negligence- Rational and irrational drug therapy. Autonomy and informed consent - Right of patients Care of the terminally ill- Euthanasia Organ transplantation

UNIT – II

Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects. Professional Indemnity insurance policy. Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent. Ethics in the profession of Medical Laboratory Science

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Medical Law and Ethics	Bonnie F. Fremgen	Pearson Education
2.	Medical Law and Ethics	Jonathan Herring	Oxford University Press
3.	Ethical Guidelines for Biomedical Research on Human Participants (2017)		ICMR
4.	Ethical Misconduct in Scientific Research. CRC Press	John D. Angelo -Ethics in Science (2012)	Taylor & Francis Group
5.	Healthcare Research Ethics and Law. Regulation, Review & Responsibility. (2010)	Cavendish Biomedical Law & Ethics Library	Hazel Biggs
6.	Best practice guidelines on publication ethics: a publisher's perspective. (2007).	Graf, C. et al	International journal of clinical practice, 61, 1-26
7.	Applied ethics in animal research: philosophy, regulation, and laboratory applications, (2002)	Gluck et al.	Purdue University Press

Mycology & Parasitology Practical

Course Code	BMLS303
Course Title	Mycology & Parasitology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2Medical/ Dip in MLT/with 50% marks
Course Objective(CO)	Students would be able to identify various fungal strains and parasites. Students will also be correlated with the diseases associated with them.
Course Outcome	At the end of the course, students will be able to 1. Identify clinically significant fungi and parasites that cause human disease 2. Describe the pathogenesis, clinical features, and modes of transmission of common infectious diseases. 3. Demonstrate proper techniques for specimen collection, handling, and processing in a clinical laboratory

LIST OF PRACTICAL

1. Collection, transport and processing of various clinical specimens for fungal culture - Skin, nail, hair, pus, sputum, CSF and other body fluids and secretions
2. Prepare culture media, reagents and stains used for fungal analysis
3. Perform KOH preparation, Gram stain, Potassium Hydroxide - Calcofluor White method, India Ink preparation, Modified Kinyoun Acid Fast Stain for Nocardia, Lactophenol Cotton Blue preparation
4. Identification of pathogenic fungi - yeast, moulds, dimorphism in fungi
5. Perform stool examination for the detection of intestinal parasites with concentration methods - sedimentation and floatation methods
6. Identify adult worms, ova, and hemoparasites from slides or models
7. Examination of blood smears for hemoparasites.

Note:- Clinical laboratory rotation/observation can be incorporated wherever possible.

Analytical Biochemistry – Practical

Course Code	BMLS307
Course Title	Analytical Biochemistry – Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/ Dip in MLT/with 50% marks
Course Objective(CO)	Students will be equipped with various diagnostic tests and hands-on experience in a semi-automated analyser.
Course Outcome	At the end of the course, students will be able to 1. Understand the principles and applications of common analytical techniques used in biochemistry. 2. Demonstrate the ability to prepare samples and use laboratory instruments accurately for biochemical analysis. 3. Apply quantitative and qualitative techniques to analyse biomolecules such as proteins, nucleic acids, carbohydrates, and lipids..

LIST OF PRACTICAL

1. Estimation of biochemical parameters using a Semi-automatic analyser
 - a. Plasma Glucose
 - b. Serum protein
 - c. Serum Albumin
 - d. Serum Urea
 - e. Serum Uric acid
 - f. Serum Creatinine
2. Demonstration of Analytical Techniques
 - a. Thin-layer chromatography
 - b. Serum protein electrophoresis
 - c. ELISA
 - d. AAS
 - e. HPLC
3. Paper chromatography and staining techniques

Note:- Clinical laboratory rotation/observation can be incorporated wherever possible

Immunohaematology and Transfusion Medicine practical

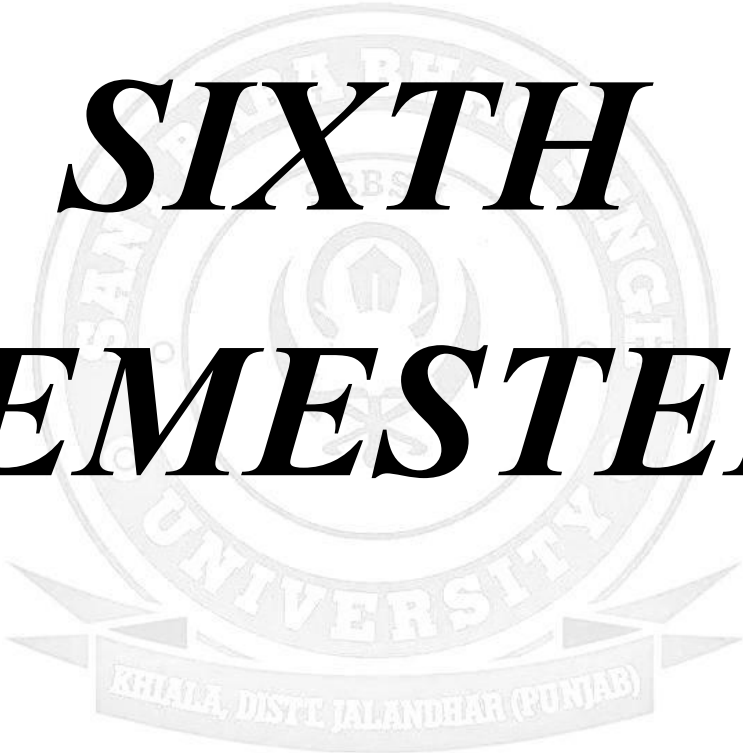
Course Code	BMLS311
Course Title	Immunohaematology and Transfusion Medicine practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2Medical/ Dip in MLT with 50% marks
Course Objective(CO)	Students will gain practical knowledge in donor selection, phlebotomy, and managing donor reactions. They will be trained in pre-transfusion testing, investigating transfusion reactions, and diagnosing hemolytic disease of the fetus and newborn. The course also equips them with skills in blood collection, disease prevention, laboratory investigations, and interpretation of results.
Course Outcome	At the end of the course, students will be able to 1. Understand the principles of immunohematology, including blood group systems and their clinical significance 2. Demonstrate knowledge of donor selection, blood collection, processing, storage, and component preparation. 3. Perform routine blood grouping, cross -matching, antibody screening, and compatibility testing using standard laboratory techniques. 4. Apply safety and quality control procedures in all aspects of blood banking and transfusion services.

LIST OF PRACTICAL

1. Demonstrate the procedure for pooled cell preparation
2. Demonstrate the preparation of 5% cell suspension
3. Demonstrate the preparation of sensitised cells
4. Demonstrate the procedure for cell washing
5. Perform ABO and Rh grouping:
 - a. Direct (preliminary) and indirect (proof) grouping.
 - b. Rh grouping and Du determination.
6. Demonstrate Antibody screening:
 - a. Forward (cell) grouping
 - b. Reverse (serum) grouping
7. Donor Screening and Blood Collection
8. Preservation of blood for transfusion
9. Cross -matching: Major and minor cross -matching.
10. Coombs test: Direct and indirect Coombs test
11. Preparation of blood components

Note:- Clinical laboratory rotation/observation can be incorporated wherever possible.

SIXTH SEMESTER



Applied Pathobiology

Course Code	BMLS302
Course Title	Applied Pathobiology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	This course provides an in-depth study of the cellular and tissue -level mechanisms that underlie disease processes. It covers key principles of cell injury, inflammation, healing, immune pathology, and neoplasia, with an emphasis on histopathological changes and their clinical implications.
Course Outcome	At the end of the course, students will be able to: 1. Understand the fundamental concepts of disease processes, including cell injury, inflammation, repair, and neoplasia 2. Explain the mechanisms of cellular adaptation, degeneration, necrosis, apoptosis, and other pathological changes. 3. Apply knowledge of general pathology to interpret basic histological findings and laboratory results relevant to common diseases.

UNIT-I

Introduction to Pathobiology & Cell Injury: Definition and scope of pathology, Cellular adaptations: hypertrophy, hyperplasia, atrophy, metaplasia, Mechanisms of cell injury: physical, chemical, biological, Morphology of reversible and irreversible injury, Cell death: necrosis (types), apoptosis, Intracellular accumulations – Lipids, cholesterol, proteins, glycogen and pigments; examples, Pathologic calcification – Types and examples.

UNIT-II

Inflammation and Repair: Definition and symptoms, Acute inflammation: signs, vascular and cellular events, Chemical mediators of inflammation, Chronic inflammation and granuloma formation,

Healing: Regeneration and fibrosis, wound healing stages, factors affecting wound healing.

UNIT-III

Hemodynamic and Immune Disorders: Edema, hyperemia, haemorrhage, thrombosis, embolism, infarction, Difference between transudate and exudate,

Shock: types and pathology, Hypersensitivity reactions (I–IV), autoimmunity: examples (SLE, rheumatoid arthritis), Diabetes, HIV, Tuberculosis

UNIT-IV

Neoplasia: Definitions and nomenclature of tumours, Differences between benign and malignant tumours, Histological features: anaplasia, differentiation, invasion, carcinogenesis: chemical, radiation, and viral, mode of tumour spread, Clinical aspects of neoplasia, grading and stages of tumour, Tumour markers and lab diagnosis (AFP, PSA, CEA, etc.)

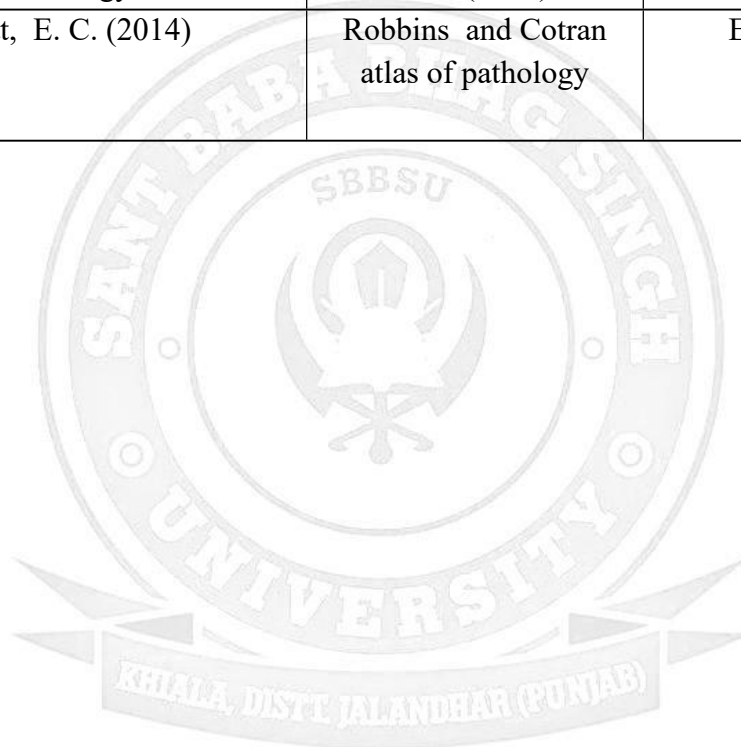
UNIT-V

Infectious and Parasitic Diseases: Anthrax, Whooping Cough (Pertussis), Candidiasis,

Amoebiasis, Malaria, TORCH Complex, Hepatitis type laboratory diagnosis, Pulmonary tuberculosis and lab diagnosis

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of pathology	Mohan, H. (2015).	Jaypee Brothers Medical Publishers
2.	Robbins and Cotran Pathologic Basis of Diseases 10th Edition	Kumar, V., Abbas, A. and Aster, J. (2020)	Elsevier
3.	Pathology Practical Book.	MOHAN, Harsh. (2013).	Delhi: Jaypee Brothers Medical.
4.	Textbook of medical laboratory technology .	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.
5.	Klatt, E. C. (2014)	Robbins and Cotran atlas of pathology	Elsevier Health Sciences.



Cytology and Histopathology

Course Code	BMLS306
Course Title	Cytology and Histopathology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will develop a comprehensive understanding of the principles and practices in Cytology and Histopathology. Students will also learn about the organisation of laboratories, specimen collection and processing, cytological and histological techniques, routine and special staining methods, and the interpretation of cellular and tissue morphology.
Course Outcome	At the end of the course, students will be able to: 1. Understand the principles and techniques involved in the preparation, fixation, processing, and staining of tissue and cytological specimens 2. Demonstrate proper techniques for specimen collection, labelling, and handling to preserve diagnostic quality. 3. Perform routine and special staining techniques used in histopathology and cytopathology.

UNIT-I

Introduction to Cytology: Definition of cytology, organization of cytology laboratory, Types of cytology, Cytological sampling techniques, Sample acceptance and rejection criteria, fixation, reception, processing, and mounting of cytological specimens, Quality control in cytology

UNIT-II

Exfoliative Cytology: Cervical cytology, Fluid cytology -Urinary tract, Respiratory system, CSF, Body fluids. Sex chromatin demonstration and karyotyping, Vital staining for sex chromatin, Aspiration cytology, Cytology staining techniques - PAP, MGG, Shorr's stain, Aceto-orcein stain

UNIT-III

Automation in Cytology: Liquid -based cytology: principles and preparation, Molecular cytology, Cell block technique

UNIT-IV

Introduction to histopathology laboratory: Definition of biopsy and autopsy, Types of tissues received, Storage and documentation, steps in tissue preparation, Grossing procedures, Handling tiny tissue specimens, Quality assurance

UNIT-V

Fixatives: Definition and classification, Qualities of ideal fixatives, Common fixatives used, Methods of fixation, Methods for removing excess fixative

UNIT-VI

Tissue processing: Definition and methods of decalcification, acid-containing decalcifying fluids, determination of endpoint of decalcification, steps in tissue processing - Dehydration, clearing, impregnation. Embedding moulds and media, Automated tissue processor: parts and working

UNIT-VII

Section cutting: Definition and classification of microtomes, Care and maintenance of microtomes, Microtome knives and sharpening techniques, Automated knife sharpener, Disposable blades, Requirements and process of section cutting, Adhesives preparation, Causes and remedies for improper sections, Frozen section -Importance, Technique, Freezing microtome and cryostat

UNIT-VIII

Routine staining technique: Theories of staining, Definitions: dye, mordents, alum. Classification of haematoxylin, H&E staining and rapid technique, Automated stainer,

Mounting media: classification, preparation, purpose.

Immunohistochemistry - Tissue preparation and staining, detection of artefacts and remedies

UNIT-IX

Special stains in histopathology - Principle and use of staining procedure

- Mucosubstances: PAS, Alcian Blue, Colloidal iron, High iron diamine, Mayer's Mucicarmine
- Connective tissue: Vangieson, Masson's Trichrome
- Reticulin fibres: Gomori's silver, Gordon and Sweets
- Elastic fibres: Verhoff's stain
- Pigments and minerals: Pearls Prussian blue
- Microorganisms: AFB stain
- Amyloid: Congo red
- Lipids and fats: Oil Red O
- Metachromatic staining: Toluidine blue (frozen section)

UNIT-X

Museum Techniques: Specimen mounting steps, fixation of specimens, Museum technique steps.

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Theory and practice of histological techniques	Bancroft, J. D., & Gamble, M. (Eds.). (2008).	Elsevier health sciences
2.	Koss' diagnostic cytology and its histopathologic bases (Vol. 1).	Koss, L. G., & Melamed, M. R. (Eds.). (2006)	Lippincott Williams & Wilkins
3.	Manual of Medical laboratory techniques .	Ramakrishnan, S., & Sulochana, K. N. (Eds.). (2012)	Jaypee Brothers Medical Publishers Pvt. Ltd.
4.	Introduction to medical laboratory technology . Butterworth -Heinemann	Baker, F. J., & Silvertown, R. E. (2014).	
5.	Review of Postgraduate Pathology (Systemic Pathology)	Nayak, R., & Nayak, R. (2023).	JP Medical Ltd
6.	Histotechnology: A self-instructional text (3rd ed.).	Carson, F. L., & Cappellano, C. H. (2009)	ASCP Press.
7.	Curran's atlas of histopathology.	Curran, R. C., & Crocker, J. (2000)	
8.	Techniques in Histopathology and Cytopathology .	Sadhana Vishwakarma (2017).	
9.	Cytology: Diagnostic principles and clinical correlates .	Cibas, E. S., & Ducatman, B. S. (2003).	Gulf Professional Publishing.

Clinical Biochemistry

Course Code	BMLS310
Course Title	Clinical Biochemistry
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective (CO)	Students will understand organ function tests, disorders related to abnormalities, and lab techniques used to diagnose disorders
Course Outcome	At the end of the course, students will be able to: 1. Explain the principles and clinical significance of biochemical tests used to assess organ function and disorders of metabolism 2. Perform routine and specialised biochemical analyses on clinical specimens 3. Demonstrate knowledge of automation, instrumentation, and data management in clinical biochemistry.

UNIT-I

GCLP: laboratory safety and Universal precaution, Introduction to Phases in Laboratory, Preanalytical - Specimen collection, processing and handling in clinical laboratory, Sample acceptance and rejection criteria, Sources of error.

UNIT-II

Analytical Phase: SOP, Laboratory equipment - maintenance, lab reagents and kits, calibrators, concept of accuracy, precision, reliability, reproducibility, Quality control (IQC and EQA), Basic statistics (Mean, Median, SD, CV), Westgard rule, LJ graph, Types of error in analytical phase.

UNIT-III

Post Analytical Phase: Report generation, Types of error in post analytical, storage and retention of sample, Documentation of report

UNIT-IV

Laboratory diagnosis of Diabetes mellitus – Plasma glucose (Fasting, Random, Post Prandial, OGTT, glycosylated haemoglobin. Screening test for inborn errors of metabolism - PKU, Alkaptonuria, Fructosuria, galactosemia, hypercholesterolemia.

UNIT-V

Liver Function Test: Indications and classification of LFT, Test based on bile pigment metabolism, classification of jaundice, Test-based serum enzymes

UNIT-VI

Renal Function Test: Indications and classification of RFT. Test based on glomerular filtration, renal plasma flow, and tubular functions. Acid-base balance, including blood gas analysis

UNIT-VII

Gastric Function Test: Indication and classification of GFT, Examination of resting content. Pancreatic Function Test: Indication of Pancreas function test- Lipases and Amylases

UNIT-VIII

Thyroid Function Test: Indications and classification of thyroid function test, tests based on primary function, and blood levels of thyroid hormones.

UNIT-IX

Cardiac Function Test: Indications of Cardiac function test, Cardiac markers, lipid profile, Enzyme pattern in AMI

UNIT-X

Biochemistry of cancer: Properties of cancer cells, morphological and biochemical changes in cancer cells, carcinogenesis, carcinogens, diagnosis of cancer – oncogenic markers (AFP, PFA, CEA, bHCG, Myeloma -Bence Jones protein, M band)

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Biochemistry	U. Sathyanarayana	Elsevier
2	Harper's Illustrated Biochemistry	Robert K. Murray et al	Tata McGraw -Hill
3.	Textbook of Medical Biochemistry	M.N. Chatterjee & Rana Shinde	Jaypee
4.	Practical Clinical Biochemistry	Alan Gowenlock – Varley's	CBS
5.	Tietz Textbook of Clinical Chemistry and Molecular Diagnostics	Nader Rifai et al	Saunders Elsevier

Biostatistics and Research Methodology

Course Code	BMLS314
Course Title	Biostatistics and Research Methodology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective (CO)	Students will understand statistical concepts and research methods applicable to laboratory sciences and be able to analyse and interpret data in clinical Research.
Course Outcome	At the end of the course, students will be able to 1. Understand basic concepts of biostatistics, including types of data, measures of central tendency, and variability. 2. Demonstrate knowledge of sampling techniques, study designs and data collection methods. 3. Apply appropriate statistical methods to analyse and interpret health and biomedical data.

UNIT-I

Introduction to biostatistics: Concepts, types, significance and scope of statistics, meaning of data, sample and parameter, Types and levels of data and their measurement, Organisation and presentation of data- tabulation of data, Frequency distribution, Graphical and tabular presentation

UNIT-II

Descriptive statistics: Measures of dispersion - Range, Inter -quartile range, Variance, Standard deviation and Coefficient of variation

UNIT-III

Introduction to probability and normal distribution. Normal distribution -characteristics of normal distribution

UNIT-IV

Sampling methods: Need for sampling and the advantages of sampling over complete enumeration, Sampling and non-sampling error, Probability and non probability sampling methods

UNIT-V

Measures of relationship: Correlation – need and meaning, Rank order correlation, Scatter plot, Simple linear regression and prediction

UNIT-VI

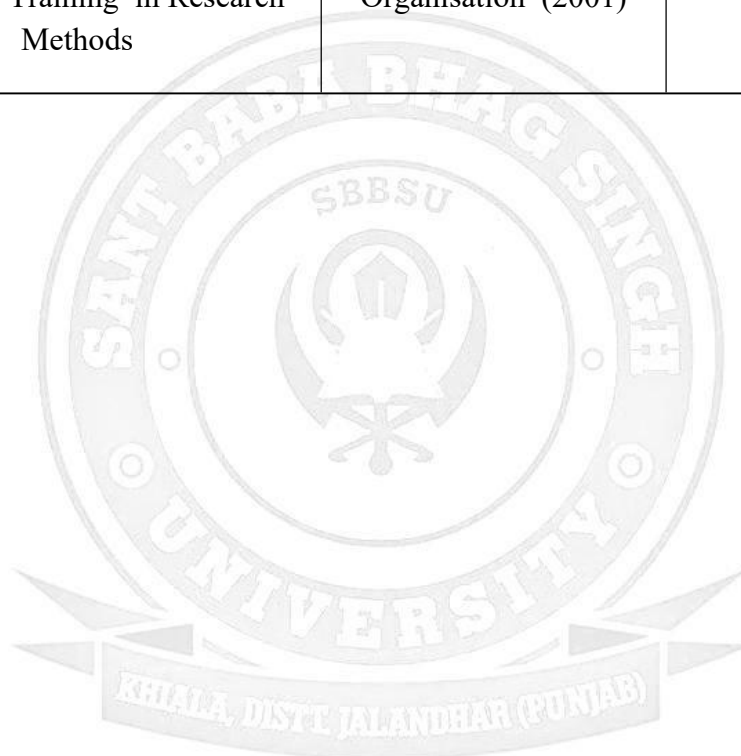
Testing of significance: Hypothesis, Non-Parametric test- Chi-square, t-test, ANOVA, Mann -Whitney U test. Use of statistical software for data analysis

UNIT-VII

Introduction to research methodology: Research methodology, research design and review of literature, Different methods of data collection and data sources

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Statistical Methods	S.P. Gupta	Sultan Chand & Sons
2.	Methods in Biostatistics for Medical Students	B.K. Mahajan	Jaypee Brothers Medical Publishers
3.	RPG Biostatistics	Himanshu Tyagi	CBS Publishers & Distributors
4.	Health Research Methodology: A Guide for Training in Research Methods	World Health Organisation (2001)	WHO Press



Applied Pathobiology Practical

Course Code	BMLS304
Course Title	Applied Pathobiology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	The course will bridge the diagnostic foundation of disease mechanisms including anatomy, physiology, and microbiology. The course emphasizes the integration of clinical knowledge with laboratory practice, enabling students to understand how cellular and tissue changes reflect disease processes.
Course Outcome	At the end of the course, students will be able to: 1. Understand the fundamental concepts of disease processes, including cell injury, inflammation, repair, and neoplasia 2. Explain the mechanisms of cellular adaptation, degeneration, necrosis, apoptosis, and other pathological changes. 3. Apply knowledge of general pathology to interpret basic histological findings and laboratory results relevant to common diseases.

LIST OF PRACTICAL

1. Basic interpretation of histopathological slides (normal vs diseased tissue)
2. Microscopic Identification of Cellular Changes: (i) Hypertrophy, (ii) atrophy (iii) dystrophy
3. Microscopic pattern recognition in (i) inflammation, (ii) neoplasia, (iii) necrosis
4. Identification of pathological features in gross specimens: (i) liver, (ii) lung, (iii) kidney, (iv) heart, and any other organs
5. Correlation with clinical symptoms and microscopic imaging of disease- case based studies
6. Reporting practice in histopathology and cytology (minimum 15-20 different case studies can be incorporated)

Text and Reference Books

S.No	Name	Author(S)	Publisher
1.	Textbook of pathology	Mohan, H. (2015).	Jaypee Brothers Medical Publishers
2.	Robbins and Cotran Pathologic Basis of Diseases 10th Edition	Kumar, V., Abbas, A. and Aster, J. (2020)	Elsevier
3.	Pathology Practical Book.	MOHAN, Harsh. (2013).	Delhi: Jaypee Brothers Medical.
4.	Textbook of medical laboratory technology .	Godkar, P. B., & Godkar, D. P. (2006).	Bhalani publishing house.
5.	Klatt, E. C. (2014)	Robbins and Cotran atlas of pathology	Elsevier Health Sciences.

Cytology and Histopathology Practical

Course Code	BMLS308
Course Title	Cytology and Histopathology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will gain practical knowledge of techniques used in Cytology and Histopathology laboratories, including specimen collection, preservation, and processing of various cytological samples. They will also learn to perform routine and special staining procedures and identify chromosomal abnormalities
Course Outcome	At the end of the course, students will be able to: 1. Understand the principles and techniques involved in the preparation, fixation, processing, and staining of tissue and cytological specimens 2. Demonstrate proper techniques for specimen collection, labelling, and handling to preserve diagnostic quality. 3. Perform routine and special staining techniques used in histopathology and cytopathology.

LIST OF PRACTICAL

1. Demonstrate receiving, handling, and labelling and specimen rejection criteria of cytological specimen.
2. Fine needle aspiration cytology
3. Preparation of fixatives in cytology laboratory and fixation of cytological specimens
4. Demonstrate cytological specimen preservation.
5. Demonstrate specimen processing in cytology – Gynaecological, Urine, Body fluids, Cerebrospinal fluid (CSF), sputum, - Liquid-based cytology.
6. Preparation for Papanicolaou (Pap) stain
7. Demonstrate staining - May-Grunwald Giemsa (MGG) staining, Myeloperoxidase staining, Sudan black B (SBB), Nonspecific esterase, Per Iodic acid Schiff staining (PAS), Neutrophil alkaline phosphatase (NAP), Gabbet's modified Ziehl Neelsen staining.
8. Quality control in a cytology laboratory
9. Demonstrate the preparation of fixatives - 10% Neutral buffered formalin, Formal Saline.
10. Demonstrate preparation of decalcifying fluid - Gooding & Stewart's fluid
11. Perform the tissue processin – fixation, dehydration, clearing, impregnation
12. Demonstrate the procedure for knife sharpening - Honing & stropping
13. Perform section cutting of tissue block using a microtome

14. Haematoxylin and Eosin staining
15. Perform mounting of the stained section
16. Demonstrate staining for carbohydrates, lipids, amyloid collagen, reticulin, elastic fibres, pigments, and Acid-Fast Bacillus (AFB).
17. Demonstrate immunohistochemistry Techniques, Enzyme histochemistry -diagnostic applications and the demonstration of phosphates, dehydrogenases, oxidases and peroxidases

Note:- Clinical laboratory rotation/observation can be incorporated wherever possible



Clinical Biochemistry Practical

Course Code	BMLS312
Course Title	Clinical Biochemistry Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	10+2 Medical/Dip in MLT with 50% marks
Course Objective(CO)	Students will be able to understand and critically diagnose various organ function tests and enzyme markers.
Course Outcome	At the end of the course, students will be able to: 1. Explain the principles and clinical significance of biochemical tests used to assess organ function and disorders of metabolism 2. Perform routine and specialised biochemical analyses on clinical specimens 4. Demonstrate knowledge of automation, instrumentation, and data management in clinical biochemistry.

LIST OF PRACTICAL

1. Construction of the Levey-Jennings (LJ) graph and interpretation of Westgard rule
2. Oral Glucose Tolerance Test (OGTT)

Estimation of following profile test using the kit method

3. Lipid profile
 - a. Triglycerides
 - b. Cholesterol
 - c. HDL
4. Renal Function Test
 - a. Urea
 - b. Uric acid
 - c. Creatinine
5. Liver function test
 - a. Total Protein
 - b. Albumin
 - c. Total Bilirubin
 - d. Direct bilirubin
 - e. SGOT
 - f. SGPT
 - g. Alkaline Phosphatase
 - h. Urinary Bile salt, Bile pigment, urobilinogen
6. Electrolytes
 - a. Sodium
 - b. Potassium
 - c. Chloride

Demonstration of the following

7. Glycosylated Hemoglobin (HbA1C)

8. Thyroid Function Test

a. T3

b. T4

c. TSH

Clinical laboratory rotation/observation can be incorporated wherever possible*Text and Reference Books**

S.No	Name	Author(S)	Publisher
1.	Biochemistry	U. Sathyanarayana	Elsevier
2	Harper's Illustrated Biochemistry	Robert K. Murray et al	Tata McGraw -Hill
3.	Textbook of Medical Biochemistry	M.N. Chatterjee & Rana Shinde	Jaypee
4.	Practical Clinical Biochemistry	Alan Gowenlock – Varley's	CBS
5.	Tietz Textbook of Clinical Chemistry and Molecular Diagnostics	Nader Rifai et al	Saunders Elsevier

SEMESTER VII & VIII

Course Code	BMLS401 & BMLS402
Course Title	Lab Posting/ Research Dissertation (Logbook and Viva)
Type of course	CC
Credits	40 (1800 Hours)
Course prerequisite	B.Sc in MLT/ BMLS with 50% marks
Course Objective(CO)	The internship provides a structured transition from theoretical understanding to practical competency in medical laboratory sciences. It supports the development of technical skills, ethical responsibility, and professional identity, preparing students to function independently and collaboratively in clinical laboratories and research settings. By rotating through specialized disciplines, students deepen their understanding of diagnostic procedures, automation, specimen handling, and healthcare workflows. This experience fosters critical thinking, interdisciplinary collaboration, and readiness for national/global healthcare environments.
Course Outcome	At the end of the course, students will be able to: 1. Preanalytical phase - Safely collect, identify, and manage clinical specimens, follow proper safety precautions. 2. Conduct clinical investigations and interpret findings 3. Perform equipment quality control and resolve technical issues 4. Manage documentation, communication, ethics, and teamwork 5. Demonstrate leadership and entrepreneurship in lab environments 6. Write and critique scientific literature reviews

Internship Rotation Structure & Competencies

Area Duration (Months) Competencies	Area Duration (Months) Competencies	Area Duration (Months) Competencies
Pathology	2	Sample processing, staining, cryostat handling, FNAC
Hematology & Clinical Pathology	2	Phlebotomy, smear reading, automation, urinalysis
Transfusion Medicine	2	Blood component preparation, donor monitoring, transfusion-transmitted disease screening
Clinical Biochemistry	2	Biochemical analysis, automated system, Quality control
Microbiology	2	Culturing, antimicrobial susceptibility testing, media preparation, QC strains
Research (Individual/group projects can be included)	2	Literature review, topic formulation, manuscript drafting

Internship Duration: 12 months (Semester VII & VIII)**Schedule:** 42 hours/week (7 hours/day, 6 days/week)

Internship Rotation Plan

- Posting Guidelines: Each student completes all rotations with documented competent acquisition.
- Attendance & Conduct: Minimum 90% attendance and adherence to institutional guidelines required.
- Assessment: Non-CGPA contributing; qualitative evaluations are documented.
- Certification: Granted upon satisfactory completion, verified by HOD/Coordinator and HOI.

Internship Logbooks

- Daily Tracking: Structured entries with dates, tasks, and supervisor validation
- Weekly Goals: Intern sets rotation-specific targets
- Competency Checklist: Per module, includes skill validation (e.g., staining, cryostat handling)
- Supervisor Feedback: 5-point scale on independence, safety, and professional behavior

Formative Assessment

- Objective Structured Practical Examination (OSPE)
- Mini Clinical Evaluation Exercise (Mini-CEX)
- Reflective Portfolios
- Supervisor Evaluations
- Peer-Reviewed Research Logs
- Recorded Demonstration

Competency Domains for Alignment

Domain	Representative Competencies
Cognitive & Technical	Clinical reasoning, diagnostic accuracy, QC protocols
Affective & Ethical	Professionalism, patient safety, lab ethics
Psychomotor	Skill-based performance, automation handling, specimen processing
Communication & Collaboration	Documentation, interdisciplinary teamwork
Research & Innovation	Literature review, evidence synthesis, scientific writing
Leadership & Entrepreneurship	Initiative, mentorship, resource management

**SEMESTER VII & SEMESTER VIII
(LOG BOOK AND SKILL ASSESSMENT PAGES)**

Cover Page of Log book

University/College logo
University/ College Name

**INTRENSHIP LOG BOOK BMLS
(VII/VIII SEMESTER) (YEAR)**

STUDENT'S RECORD**Name :****Semester :****Enrollment No. :****Session :**

DECLARATION BY THE STUDENT

Madam/Sir,

I, Mr/Ms. a student
of bearing Registration No. declare
that I have completed hours of Internship duty, out of the
assigned hours and have performed my duties in the hospital/laboratory
as stated in my logbook



(COLLEGE/UNIVERSITY LOGO)
INSTITUTE/UNIVERSITY/
COLLEGE NAME LOGBOOK CERTIFICATE

*This is to certify that the candidate
Mr/Ms..... registration
number admitted in the academic
year ofcollege, has
satisfactorily completed/ Not completed all requirements mentioned in this
logbook for seventh/ eighth semester of Bachelor of Medical Laboratory
Sciences during the period fromto in
theHospital/Laboratory.*

Signature of the Faculty in-Charge (hospital/laboratory)

Name:

Date:

Signature of the Principal/Dean HoD (University/College)

Name:

Date: