SCHEME & SYLLABUS

(Choice Based Credit System)

For

BMLT

(w.e.f. Session 2020-21)

Program Code: MLT 301

DEPARTMENT OF MEDICAL LAB TECHNOLOGY

RIMT UNIVERSITY, MANDIGOBINDGARH, PUNJAB

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RIMT UNIVERSITY MANDI GOBINDGARH, PUNJAB

SECTION 1

Vision & Mission of the University

VISION

To become one of the most preferred learning places a centre of excellence to promote and nurture future leaders who would facilitate in desired change in the society

MISSION

- To impart teaching and learning through cutting edge technologies supported by the world class infrastructure

- To empower and transform young minds into capable leaders and responsible citizens of India instilled with high ethical and moral values

SECTION 2

Vision and Mission of the Department

VISION

The Department of Medical Laboratory Technology represents one of the effective methods to meet the community needs of medical specialties for supporting various research, health, and educational institutions. Besides, it aims to invest the capacities of professors and students in the theoretical and applied researches and scientific studies. It also commits itself to improve training, awareness, and health mobilizations according to new grounds consistent with recent advances.

MISSION

- To create opportunities for students to gain a foothold in the healthcare industry
- To provide sufficient didactic and technical information for the student to understand analytical processes, interpret analytical results and appreciate the clinical significance of analyses performed in a modern clinical laboratory
- To provide the students with qualities and competencies that ensure success in the field of laboratory medicine as a medical laboratory technician
- Moreover, the department has a bright, ambitious future mission to provide the best medical teaching skills, to expand horizons of scientific cooperation with the corresponding departments, and related institutions to achieve continuous and high-quality interactions.

SECTION 3

About the Program

BMLT Program is an Outcome Based Education model which is a 3 year, 6 Semester Full time Program of 134 credit hours with a Choice Based Credit System (CBCS) and Grading Evaluation System. This program comprises of foundational courses, core courses, specialization electives courses, enrichment courses and experimental learning. The suggestive curriculum takes the BMLT program to the next level in terms of implementing Outcome Based Education and to develop management professionals who are knowledgeable in their chosen domain, responsive to the environment and culture, unfailing to the communities, ethical in all doings and with a global outlook and approach.

SECTION 4

Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PROGRAM EDUCATION OBJECTIVES

PEO1	To create knowledge about core areas related to the field of Medical Laboratory
PEO2	Analyze, interpret and apply concepts of clinical testing for healthcare decision making
PEO3	To exhibit the knowledge of entrepreneurial qualities and explore entrepreneurial opportunities by Working effectively and professionally in teams and enabling them to evaluate investment.
PE04	To employ interpersonal communication skills in relaying laboratory test information and when interacting with patients, lab personnel and other health care professionals.

PROGRAMME OUTCOMES (POs)

PO 1	**Clinical Exposure**:- Apply knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations support in number of Hospitals and diagnostics centers for sustainable development.
PO 2	**Technician**:- Perform routine clinical laboratory procedures within acceptable quality control parameters in hematology, biochemistry, immunohematology and microbiology. Recognize the impact of laboratory tests in a global and environmental context.
PO 3	**Social Exposure**:- Demonstrate technical skills, social behavior and professional awareness for functioning effectively as a laboratory technician.
PO 4	**Scientific Exposure**:- These are also several types of positions available, such as research labs, diagnostic Laboratories and management of a team. Apply the fundamental of research process to complete and present research study that enriches the field of physical therapy.
PO 5	**Skill Development**:- Apply problem solving technique in identifications and corrections of pre analytical, post analytical & analytical variable.
PO 6	**Leadership and Team Work -** Function as a leader / team member in diverse professional and industrial research areas. Ability to Communicate effectively by oral, written and graphical means to achieve collaborative cooperation for synergy in an organizational and across organizational boundaries.
PO 7	**Life Long Learning –** Aptitude to acquire newer knowledge and skills, assimilate and adapt them to be ready to confront uncharted environment scientifically and confidently.
PO 8	**Entrepreneurship –** A strong business sense to explore entrepreneurial opportunities and leverage managerial & leadership skills for initiating, leading & managing start-ups as well as professionalizing and growing businesses.
PO 9	**Social Responsiveness and Ethics** - Function in an ethical and professional manner without bias against any ethnicity, race, religion, caste or gender. Practice professional and ethical responsibilities with high degree of credibility, integrity and social concern.

PO 10	**Environment and Sustainability –** Exhibit understanding to assess the impact of managerial decisions and business priorities on the societal, economic and environmental aspects for sustainable development.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	Search professional explore about the latest research corners in the field of physical medicine and rehabilitation.
PSO 2	They expertise in advance clinical intervention techniques based on evidence based practices.
PSO 3	After successful completion the students shall be proficient in making diagnosis and skills of testing procedure and techniques.
PSO 4	As a health professional the students shall have an added responsibility towards the community health issue.

SECTION 5

Curriculum / Scheme with Examination Grading Scheme

SEMESTER WISE SUMMARY OF THE PROGRAMME: BMLT

S. No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	29	1000	23
2.	II	24	800	20
3	III	29	1000	23
4	IV	30	1000	25
5	V	27	900	23
6	VI	30	1000	20
	Total	**169**	**5700**	**134**

EXAMINATION GRADING SCHEME

Marks Percentage Range	Grade	Grade Point	Qualitative Meaning
80.00 - 100.00	O	10	OUTSTANDING
70.00 - 79.99	A+	9	EXCELLENT
60.00 - 69.99	A	8	VERY GOOD
55.00 - 59.99	B+	7	GOOD
50.00 - 54.99	B	6	ABOVE AVERAGE
45.00 - 49.99	C	5	AVERAGE
40.00 - 44.99	P	4	PASS
0.00 - 39.99	E	0	FAIL
	AB	0	Absent

Percentage Calculation: CGPA *10

Semester: First

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)				
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total
BMLT-1101	General Microbiology	4			4	16	---	24	60	100
BMLT-1102	General Microbiology practical			2	1	----	40	-----	60	100
BMLT-1103	Basic Hematology	4			4	16	---	24	60	100
BMLT-1104	Basic Hematology practical			2	1	----	40	-----	60	100
BMLT-1105	Human Anatomy & Physiology	4			4	16	---	24	60	100
BMLT-1106	Basic Biochemistry	4			4	16	---	24	60	100
BMLT-1107	Basic Biochemistry practical			2	1		40		60	100
BHUM-1101	Communication Skills	2			2	16	---	24	60	100
BHUM-1102	Communication Skills Practical			2	1	----	40	-----	60	100
Total					22					**900**

L-- Lecture T-- Tutorial P---Practical
CWA Class work Assessment
LWA Lab work Assessment
MTE Mid Term Exam
ETE End Term Exam

SEMESTER-SECOND

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)				
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total
BMLT-1201	Systematic Bacteriology	4			4	16	---	24	60	100
BMLT-1202	Systematic Bacteriology practical			2	1	----	40	-----	60	100
BMLT-1203	Basic Hematology Technique	4			4	16	---	24	60	100
BMLT-1204	Basic Hematology Technique practical			2	1	----	40	-----	60	100
BMLT-1205	Human Anatomy & Physiology	4			4	16	---	24	60	100
BMLT-1206	Metabolism of Biochemistry	4			4	16	---	24	60	100
BMLT-1207	Metabolism of Biochemistry practical			2	1		40		60	100
BMLT1208	Laboratory management and legal compliances	3			3	3	40	24	60	100
					22					800

L-- Lecture T-- Tutorial P---Practical
CWA Class work Assessment
LWA Lab work Assessment
MTE Mid Term Exam
ETE End Term Exam

Semester: Third

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)				
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total
BMLT-2301	Applied Microbiology	4			4	16	---	24	60	100
BMLT-2302	Applied Microbiology practical			2	1	----	40	-----	60	100
BMLT-2303	Applied Hematology	4			4	16	---	24	60	100
BMLT-2304	Applied Hematology practical			2	1	----	40	-----	60	100
BMLT-2305	Analytical Biochemistry	4			4	16	---	24	60	100
BMLT-2306	Analytical Biochemistry practical			2	1	----	40	-----	60	100
BMLT-2307	Basic Cellular Pathology	4			4	16	---	24	60	100
ELECTIVE COURSE										
BMLT-2310	Healthcare Law and Ethics	3			2	16	---	24	60	100
BMLT-2311	Healthcare Law and Ethics Practical			2	1	…….	40	……	60	100
BCOP-2301	Fundamental of Computer	2			2	08	---	24	60	100
BCOP-2302	Fundamental of Computer Practical			2	1	…….	40	……	60	100
Total					22					**900**

L-- Lecture T-- Tutorial P---Practical
CWA Class work Assessment
LWA Lab work Assessment
MTE Mid Term Exam
ETE End Term Exam

Semester: Fourth

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)				
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total
BMLT-2401	Immunology & serology	4			4	16	---	24	60	100
BMLT-2402	Immunology & serology practical			2	1	----	40	-----	60	100
BMLT-2403	Histotechnology	4			4	16	---	24	60	100
BMLT-2404	Histotechnology practical			2	1	----	40	-----	60	100
BMLT-2405	Applied Hematology	4			4	16	---	24	60	100
BMLT-2406	Applied Hematology practical			2	1	----	40	-----	60	100
BMLT-2407	Clinical Biochemistry	4			4	16	---	24	60	100
BMLT-2408	Clinical Biochemistry practical			2	1	----	40	-----	60	100
BMLT-2409	Blood Bank	4			4	16	---	24	60	100
BMLT-2410	Blood Bank practical			2	1	…….	40	……	60	100
Total					25					**1000**

L-- Lecture T-- Tutorial P---Practical
CWA Class work Assessment
LWA Lab work Assessment
MTE Mid Term Exam
ETE End Term Exam

Semester: Fifth

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)				
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total
BMLT-3501	Medical Parasitology	4			4	16	---	24	60	100
BMLT-3502	Medical Parasitology practical			2	1	----	40	-----	60	100
BMLT-3503	Applied Clinical Biochemistry	4			4	16	---	24	60	100
BMLT-3504	Applied Clinical Biochemistry practical			2	1	----	40	-----	60	100
BMLT-3505	Histotechnology & Cytopathology	4			4	16	---	24	60	100
BMLT-3506	Histotechnology & Cytopathology practical			2	1	----	40	-----	60	100
BMLT-3507	Virology and mycology	4			4	16	---	24	60	100
BMLT-3508	Virology and mycology practical			2	1	----	40	-----	60	100
BMLT-3509	Environmental Sciences	3			3	16	---	24	60	100
Total					23					**900**

L-- Lecture T-- Tutorial P---Practical

CWA Class work Assessment
LWA Lab work Assessment
MTE Mid Term Exam
ETE End Term Extra

SEMESTER: Sixth (INTERNSHIP)

Subject		Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)				
Code	Title	L	T	P		CWA	LWA	MTE	ETE	Total
BMLT-3601	Professional training		30		4		500		500	1000
Total					20					**1000**

Semester Wise Summary of the program

S.no.	**Semester**	**No. of Contact Hours**	**Marks**	**Credits**
1.	I	26	900	22
2.	II	25	800	22
3.	III	26	900	22
4.	IV	30	1000	25
5.	V	27	900	23
6.	VI	30	1000	20
	Total	164	5500	134

SEMESTER-I

SUBJECT TITLE: General Microbiology
SUBJECT CODE: BMLT-1101
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of microbiology and microbiological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S. NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction to Medical Microbiology:** - Definition – History, host-microbe relationship. **Safety measures in clinical Microbiology** **Glassware used in Clinical Microbiology Laboratory:** - Introduction, care and handling of glassware and Cleaning of glassware, Precautions.	15
UNIT-II	**Equipments used in clinical Microbiology Laboratory: -** Introduction, Care and maintenance of equipments. **Microscopy, Introduction and history** - Types of microscopes (a) Light microscope (b) DGI(c) Fluorescent (d) Phase contrast (e) Electron microscope: Transmission Scanning - Principles and operational mechanisms of various types of microscopes. **Sterilization:** - Definition, Types and principles of sterilization methods (a) Heat (dry heat, moist heat with special Reference to autoclave) (b) Radiation (c) Filtration - Efficiency testing to various sterilizers.	15

UNIT-III	**Antiseptics and disinfectants: -** Definition, Types and properties, Mode of action, Uses of various disinfectants - Precautions while using the disinfectants - Qualities of a good disinfectant - In-house preparation of alcoholic hand/skin disinfectants. - Testing efficiency of various disinfectants. Biomedical waste management in a Microbiology laboratory: - Types of the waste generated – Segregation – Treatment – Disposal General characteristics & classification of Microbes: (Bacteria & fungi) - Classification of microbes with special reference to prokaryotes & eukaryotes - Morphological classification of bacteria - Bacterial anatomy (Bacterial cell structures)	15
UNIT-IV	**Growth and Nutrition of Microbes:** - General nutritional & other requirements of the bacteria - Classification of bacteria on the basis of their nutritional requirements – Physical conditions required for growth. - Normal growth cycle of bacteria (growth curve) -Types of microbial cultures: Synchronous, Static, continuous culture. Culture media: - Introduction - Classification of culture media (Example & Uses) solid media, liquid media, semisolid, Media,, routine/synthetic/defined media, basal media, enriched , enrichment, Selective, differential media, sugar fermentation media, transport media, preservation media and anaerobic culture media. - Quality control in culture media -Automation in culture media preparation **Aerobic & anaerobic culture methods:** - Concepts - Methods Used for aerobic cultures - Methods used for anaerobic cultures Introductions to Immunology -Immunity -Antigens and Antibodies 14. Care & Handling of laboratory animals: - Introduction - General care & handling - Ethics & legality in use of laboratory animal	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT-1101.1**	Study the growth and control of microbes as well as different bacteriological techniques involved in microbiology.
CO2	**BMLT-1101.2**	Understand about the different cell organelles of microorganisms and their detailed functions.
CO3	**BMLT-1101.3**	Apply the knowledge to understand the microbial physiology and to identify the microorganisms.
CO4	**BMLT-1101.4**	Analyze the microorganisms on basis of appearance and function.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker (Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker (Latest Edition)

SUBJECT TITLE: General Microbiology Practical

SUBJECT CODE: BMLT-1102
SEMESTER: First
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

PRACTICALS

1. To prepare cleaning agents & to study the technique for cleaning & sterilization of glassware.
2. To demonstrate the working & handling of Compound microscope.
3. To demonstrate the method of sterilization by autoclave.
4. To demonstrate the method of sterilization by hot air oven.
5. To demonstrate the method of sterilization of media/solution by filtration.
6. To prepare working dilution of commonly used disinfectants.
7. To demonstrate the different morphological types of bacteria.
8. To demonstrate aerobic culture
9. To demonstrate anaerobic culture.

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

CO1	**BMLT -1102.1**	Know the Different Microbiological Instruments and chemicals used in laboratory
CO2	**BMLT -1102.2**	Understand the working of various instruments
CO3	**BMLT -1102.3**	Preparation of different culture media
CO4	**BMLT -1102.4**	Identification of different microbes

SUBJECT TITLE: Basic hematology
SUBJECT CODE: BMLT-1103
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of hematology and hematological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction to Hematology** Definition, Importance , Important equipment used, Precautions **Laboratory organization and safety measures in hematology Laboratory** **Introduction to blood:** Composition, Function and normal cellular components.	15
UNIT-II	**Formation of cellular components of blood.** Erythropoiesis, Leucopoiesis ,Thrombopoiesis **Collection and preservation of blood sample for various hematological investigations. .**	15

	Collection by vein punctures method and capillary method. Different types of anticoagulants used for preservation of blood.	
UNIT-III	**Preparation of blood Films Types. Methods of preparation (Thick and thin smear/film)** **Staining techniques in Hematology (Romanowsky's stains)** : Principle, composition, preparation of staining reagents and procedure of the following 1. Giemsa stain 2. Leishman stain 3. Wright's stain 4. Field's stain	15
UNIT-IV	**Definition, principles & procedure, Normal values, Clinical significance Of following** Total leucocytes count (TLC), Differential leucocytes count (DLC), Red blood cell(RBC), Platelet Count	15

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

CO1	**BMLT -1103.1**	Learn about the blood
CO2	**BMLT -1103.2**	Understand the composition of blood and different types with its function
CO3	**BMLT -1103.3**	Estimate the ways to know the different components of blood
CO4	**BMLT -1103.4**	Analyze different blood cells

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition

SUBJECT TITLE: Basic Hematology Practical
SUBJECT CODE: BMLT-1104
SEMESTER: First
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 hrs

PRACTICALS

1. Demonstration of light microscope.
2. Demonstration of centrifuge machine.
3. Preparation of anticoagulants and its uses.
4. Preparation of thin blood film.
5. Preparation of thick blood film.
6. Collection of blood by various methods
7. Separation of serum and plasma.
8. Staining of thin blood film by leishman's stain.
9. To study the morphological features of DLC series.
10. To perform the TLC.
11. To perform the RBC counting procedure.
12. To perform the platelets count procedure.

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

CO1	**BMLT -1104.1**	Know the various hematological lab instruments
CO2	**BMLT -1104.2**	Practice to Collect blood
CO3	**BMLT -1104.3**	Preparation of different anticoagulants and chemicals
CO4	**BMLT -1104.4**	Identification of different blood cells

SUBJECT TITLE: Human Anatomy & Physiology
SUBJECT CODE: BMLT-1105
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Anatomy & Physiology and Anatomy & physiological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.No.	Contents	Contact Hours
UNIT-I	**Introduction to human Anatomy and Physiology.** **2. Cell and cell organelles.** Introduction Structure and classification Function Cell division (Mitosis and Meiosis)	15
UNIT-II	**Tissues** (a) Definition (b) Classification with structure and Functions of followings Epithelial tissues Connective tissues	15

	Muscular tissues Nervous tissue **Blood:-** Composition of blood Function of blood	
UNIT-III	**Muscular skeletal system** Introduction, Classification, Structure and function of skeletal system, muscles and joints, Various movements of body **Respiratory system** Introduction, Structure, Function, Mechanism of breathing and respiration, Various terms involved in respiratory System: Vital capacity, Total Volume, Reserve volume, Total lung capacity.	15
UNIT-IV	**Cardiovascular systems.** **(**a) Anatomy and physiology of heart (b) Blood circulation. (c) Arteries and veins. (d) Conductive system of heart. (e) Cardiac cycle. (f) Introduction to ECG. **Lymphatic system.** **(**a) Introduction. (b) Structure and function (i) Lymph nodes. (ii) Spleen. (iii)Thymus gland, Tonsils **Introduction, Structure and function of sense organs:** Eye. Ear. Nose. Tongue.	15

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

CO1	**BMLT -1105.1**	Learn the basic terminology of subject
CO2	**BMLT -1105.2**	Understand about different cells, tissues and blood
CO3	**BMLT -1105.3**	Know about anatomy and physiology of human body
CO4	**BMLT -1105.4**	Develop understanding of structure and function of different organ systems

SUGGESTED READINGS:

.Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3.An introduction to Medical Lab Technology by Paniker(Latest Edition),
4.Introduction to Medical Lab Technology by Godkar (Latest Edition),
5.Diagnostic microbiology by Koss Volume –I,
6.An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Basic Bio-Chemistry
SUBJECT CODE: BMLT-1106
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Bio-Chemistry and Bio-chemistry techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction to Medical lab Technology.** • Definitions • Importance of biochemistry • Volumetric apparatus and their calibration • S.I units and their use. **Cleaning and storage of lab, glass and plastic ware.** • Methods of cleaning and storage • Different cleaning agents [soaps, detergent, chromic acid] **Cleaning and care of general laboratory glass ware and equipments.** • Steps involved in cleaning soda lime glass	15

	• Steps involved in cleaning borosil glass. • Preparation of chromic acid solution & storage • Precautions	
UNIT-II	**Distilled water.** • Method of preparation of distilled water & their storage • Type of water distillation plants. • Precautions **Units of Measurement.** • S.I unit and CGS units (with advantages & disadvantages) • Strength, molecular weight, equivalent weight, Normality, Molarity, Molality	15
UNIT-III	**Calibration of volumetric apparatus:-** Flask, Pipettes, Burettes & Cylinders **Analytical balance**: Principle, Working, Maintenance & Precautions **Electrical Balance:** Principle, Working, Maintenance & Precautions **Centrifuge:** Principle, Working, Maintenance & Precautions **Colorimeter:** Principle, Working, Maintenance & Precautions **Volumetric Analysis** • Normal and molar solutions • Standard solutions • Preparation of reagents • Stability & Storage of chemicals	15

UNIT-IV	**Blood chemistry** • Composition of blood and its functions • Use of various anti-coagulants.	15
	• **Separation of serum and plasma** Concept of pH:- Introduction, Definition, pH indicator, Methods of measurement of pH (i) pH paper (ii) pH meter (iii) Principle, working, maintenance and calibration of pH meter	

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

CO1	**BMLT -1106.1**	Learn about the different Glassware used in lab
CO2	**BMLT -1106.2**	Understand the different Apparatus , units, equipments
CO3	**BMLT -1106.3**	Know about different volumetric analysis
CO4	**BMLT -1106.4**	Calibration of glassware

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Basic Bio-Chemistry practical
SUBJECT CODE: BMLT-1107
SEMESTER: First
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

PRACTICALS

- Cleaning of glass and plastic ware.
- Demonstration of Water Distillations Instrument.
- Centrifuge, analytical balance and its care and maintenance.
- Colorimeter: Principle, working, handling and care
- Various Anticoagulants and its use.
- Collection of blood by various methods
- Separation of serum and plasma.
- Preparation of different protein precipitating agents, PFF preparation.

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

CO1	**BMLT -1107.1**	Know about various glassware including volumetric and non volumetric
CO2	**BMLT -1107.2**	Understand about different cleaning agents and how to clean glasswares
CO3	**BMLT -1107.3**	Learn about the molar solution concept
CO4	**BMLT -1107.4**	Apply the molar solution concept for preparation of different concentrations of solution

SUBJECT TITLE: COMMUNICATION SKILLS
SUBJECT CODE: BHUM-1101
SEMESTER: First
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level understanding of communication and skills.
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

THEORY

Topics taught in this module include:

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
3. Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
4. Basic concepts & principles of good communication
5. Special characteristics of health communication
6. Basic Language Skills: Grammar and Usage.
7. Business Communication Skills. With focus on speaking - Conversations, discussions, dialogues, short presentations, pronunciation.
8. Teaching the different methods of writing like letters, E-mails, report, case study, collecting the patient data etc. Basic compositions, journals, with a focus on paragraph form and organization.
9. Basic concepts & principles of good communication
10. Special characteristics of health communication
11. Types & process of communication
12. Barriers of communication & how to overcome

Soft Skills - with important sub-elements:

1. Communication Styles
2. Team work
3. Leadership Skills
4. Effective & Excellent Customer Service

5. Decision Making & Problem Solving
6. Managing Time and Pressures
7. Self-Management & Attitude

Types & process of communication

13. Barriers of communication & how to overcome

Soft Skills - with important sub-elements:

8. Communication Styles
9. Team work
10. Leadership Skills
11. Effective & Excellent Customer Service
12. Decision Making & Problem Solving
13. Managing Time and Pressures
14. Self-Management & Attitude

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

CO1	**BHUM-1101.1**	Understand and evaluate key theoretical approaches used in the medical lab field .
CO2	**BHUM-1101.2**	Able to find, use, and evaluate primary academic writing associated with the communication discipline
CO3	**BHUM-1101.3**	Able to communicate effectively orally and in writing
CO4	**BHUM-1101.4**	To develop analytical, management and interpersonal skills, together with the technical knowledge of the work in the medical lab.

Suggested readings:

1. Effective Communication and Soft Skills by Nitin Bhatnagar Pearson Education India,2011
2. Communication N Soft Skills Paperback – 2014 by Niraj Kumar, Chetan Srivastava

SUBJECT TITLE: COMMUNICATION SKILLS
SUBJECT CODE: BHUM-1102
SEMESTER: First
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

The aim of this course is to ensure that you can achieve an up-to-date level understanding of communication and skills.
Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

PRACTICAL

1. Précis writing and simple passage from a prescribed text books. At least 100 words shouldbe chosen and few questions from the passage may be said to answer.
2. To practice all forms communication i.e. drafting report, agenda notes, précis writing, telegram, circular, representations, press, release, telephonic communication, practice of writing resume and writing application of employment.

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

CO1	**BHUM-1102.1**	Understand and evaluate key theoretical approaches used in the medical lab field .
CO2	**BHUM-1102.2**	Able to find, use, and evaluate primary academic writing associated with the communication discipline
CO3	**BHUM-1102.3**	Able to communicate effectively orally and in writing
CO4	**BHUM-1102.4**	To develop analytical, management and interpersonal skills, together with the technical knowledge of the work in the medical lab.

RECOMMENDED BOOKS

1 English and Communication Skills, Boks-I by Kuldip Jaidka, Alwainder Dhillon and Parmod Kumar Singla, Prescribed by NITTTS, Chandigarh Published by Abshishek Publication, 57-59, Sector- 17, Chandigarh

SEMESTER-II

SUBJECT TITLE: Systematic Bacteriology
SUBJECT CODE: BMLT-1201
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Systematic Bacteriologyand Bacteriological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Various characteristics (morphological, cultural and biochemical),pathogenesity and laboratory diagnosis of the following bacteria:** Staphylococcus, Streptococcus, Pneumococcal, Neisseria gonorhoeae and Neisseria meningitis, Corynebacterium, bacillus, haemophilus, Enterobacteriaceae: Escherichia coli, Klebsiella Enterobacter, Proteus , Salmonella and Shigella, Vibrio,	15

UNIT-II	**Various characteristics (morphological, cultural and biochemical),pathogenesity and laboratory diagnosis of the following bacteria:** Yersinia enterocolitica , Clostridium, Mycobacterium (tuberculosis, leprae) Spirochetes – Treponema, Borrellia and leptospira, Bordetella and brucella, Mycoplasma and Ureaplasma, Rickettsia, Chlamydia,Actinomyces Pseudomonas and Burkholderia Brief introduction about non sporing anaerobic cocci and bacilli.	15
UNIT-III	**Staining techniques in bacteriology** **a) Significance of staining in bacteriology** **b) Principle, procedures and result & interpretation of the following staining techniques:-** **1.Simple staining, 2.Negative staining, 3.Gram stain, 4.Albert's stain** **5.Neisser's stain, 6.Ziehl –Nielsen staining, 7.Capsule staining, 8.Flagella staining, 9.Spore staining, 10.Fontana stain for spirochetes**	15
UNIT-IV	**Principle, procedures and result & interpretation of the following biochemical test for identification of different bacteria.** **1. Catalase 2.Coagulase 3. Indole 4.Methyl Red 5.Urease 6.Citrate 7. Oxidase 8. Nitrate reduction 9.Carbohydrate fermentation 10.Bile solubility11.H2 S production**	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1201.1**	Students will have great knowledge about morphological changes in erythrocytes and leukocytes.
CO2	**BMLT -1201.2**	Identification of Different variants
CO3	**BMLT -1201.3**	Learners will be able to perform various Staining tests.
CO4	**BMLT -1201.4**	Ability to develop knowledge related to different microorganisms.

SUGGESTED READINGS:

1. An Introduction to Medical Lab Technology by Godkar (Latest Edition)
2. Diagnostic microbiology by Koss Volume –I
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),

SUBJECT TITLE: Systematic Bacteriology practical
SUBJECT CODE: BMLT-1202
SEMESTER: Second
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Systematic bacteriology

Practical

1. To perform the Gram's stain
2. To perform the Albert stain.
3. To perform the Z-N staining
4. To perform the Capsule staining
5. To demonstrate simple staining (by Methylene blue or by using India ink)
6. To perform the IMViC Test for the detection of gram negative

(a) Catalase

(b) Coagulase

(c) Urease

(d) Oxidase

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1202.1**	Students will have great knowledge about morphological changes in erythrocytes and leukocytes.
CO2	**BMLT -1202.2**	Identification of Different variants
CO3	**BMLT -1202.3**	Learners will be able to perform various Staining tests.
CO4	**BMLT -1202.4**	Ability to develop knowledge related to different microorganisms.

SUBJECT TITLE: Basic Hematological Techniques
SUBJECT CODE: BMLT-1203
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of hematology and hematological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.No.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction of Haemoglobin pigments and their measurement.** **Haemoglobin A** **Haemoglobin F** **Abnormal hemoglobin's, their identification and estimation.** Introduction about hemoglobin S Introduction about thalassaemia and also their type	15
UNIT-II	**Determination of following hematological parameters** Hematocrit (PCV), Erythrocyte sedimentation rate(ESR), Absolute eosinophil count, Reticulocyte count.	15

UNIT-III	**Determination of red cell indices:** MCV MCH MCHC	15
UNIT-IV	**Quality assurance In hematology:** Pre analytical, analytical (internal and external), post analytical quality controls **Biomedical waste management programmes.**	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1203.1**	Learn about the blood
CO2	**BMLT -1203.2**	Understand the composition of blood and different types with its function
CO3	**BMLT -1203.3**	Estimate the ways to know the different components of blood
CO4	**BMLT -1203.4**	Analyze different blood cells

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Basic Hematology Techniques practical
SUBJECT CODE: BMLT-1204
SEMESTER: Second
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Basic Haematology Techniques Practical

1) Estimation of hemoglobin A.

2) Estimation of hemoglobin S.

3) To perform the ESR by westergren method

4) To perform the ESR & PCV both by wintrobe tube method.

5) To evaluate the results of RBC indices.

6) To perform the test for the reticulocyte count.

7) To perform the test for the absolute eosinophil count

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1204.1**	Know the various haematological lab instruments
CO2	**BMLT -1204.2**	Practice to Collect blood
CO3	**BMLT -1204.3**	Preparation of different smears, films
CO4	**BMLT -1204.4**	Identification of different blood cells using various techniques

SUBJECT TITLE: Human Anatomy & Physiology
SUBJECT CODE: BMLT-1205
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Anatomy & Physiology and Anatomy & physiological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.NO.	CONTENTS	CONTACTHOURS
UNIT-I	**Body fluids and their significance** : Important terms , types of bodyfluid , total body water , avenues by which water leaves and enters body , general principles for fluid balance , cardinal principle , How body fluids maintain Homeostasis , Electrolytes & ions Function of electrolytes , How electrolyteimbalance leads to fluid imbalance **Digestive system:** Organization ; accessory organs ; structure & function (Mouth, Tongue, Teeth, Oesophagus , Pharynx, Stomach, Intestine, Rectum, Anus); Digestive glands; physiology of digestionof carbohydrates ,lipids & proteins	15
UNIT-II	**Liver:** structure, function & proper mechanism of liver **Urinary system:** Main parts , Structure & function of kidney , structure of nephron, physiology of excretion & urine formation ,urine , additional excretory organs	15

UNIT-III	**Nervous system:** Parts, function & structure of ; brain , spinal cord ,cranial nerves with principle, role of neuro transmitters in transmission of nerve impulse **Genital system:** Structure of male and female reproductive system,	15
	Gametogenesis in male & female, menstrual cycle.	
UNIT-IV	**Spleen, Thymus:** Structure & function of spleen & Thymus gland; Tonsils -Structure & function; general information about lymphatic system Endocrine system: Endocrine glands, their location, structure & functions Exocrine system: Exocrine glands, their location, structure & functions	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1205.1**	Learn the basic terminology of subject
CO2	**BMLT -1205.2**	Understand about different cells, tissues and blood
CO3	**BMLT -1205.3**	Know about anatomy and physiology of human body
CO4	**BMLT -1205.4**	Develop understanding of structure and function of different organ systems

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Metabolism of Bio-Chemistry
SUBJECT CODE: BMLT-1206
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Biochemistry and realted techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Contents of Syllabus:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction to Cell: -** Cell Organelles & their functions. Separation & purification of Biomolecules. **Nucleic Acid** Introduction Functions of Nucleic acid Functions of energy carriers **Carbohydrate Metabolism** • Introduction & Importance • Classification • Digestion and Absorption • Metabolism: - Glycolysis, Citric acid cycle, Gluconeogenesis • Glycogenolysis, Glycogenesis • Disorders of carbohydrate metabolism	15
UNIT-II	**Protein Metabolism** • Introduction & Importance	15

	• Classification of Proteins • Important properties of proteins. • Digestion & absorption of Proteins • Metabolism: -Urea Cycle • Disorders of proteins metabolism	
UNIT-III	**Lipid** • Introduction • Classification • Digestion & absorption of fats • Fatty acid biosynthesis & fatty acid oxidation	15
UNIT-IV	**Enzymes** • Introductions & Importance • Classifications & Properties of enzymes • Mechanism of enzyme action • Factors affecting enzyme action • Enzyme kinetics & enzyme inhibiters	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1206.1**	Study the different biomolecules
CO2	**BMLT -1206.2**	Understand the metabolism of different biomolecules
CO3	**BMLT -1206.3**	They study the influence and role of structure in reactivity of biomolecules
CO4	**BMLT -1206.4**	Develop critical thinking about the functioning of biomolecules.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Metabolism of Bio-Chemistry practical
SUBJECT CODE: BMLT-1207
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Metabolism in Biochemistry

Practical

1. To determine the presence of carbohydrates by Molish test.
2. To determine the presence of reducing sugar by benedicts method.
3. To determine starch by Iodine test.
4. Determination of glucose in serum & plasma
5. Determination of urea in serum, plasma.
6. Determination of serum Protein
7. Determination of serum albumin.
8. Determination of cholesterol in serum or plasma

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1207.1**	Study the different biomolecules
CO2	**BMLT -1207.2**	Preparation of different chemicals
CO3	**BMLT -1207.3**	Presence of different biomolecules with different test
CO4	**BMLT -1207.4**	Identification of biomolecules

SUBJECT TITLE: Medical Laboratory Sciences & Management
SUBJECT CODE: BMLT-1208
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of medical laboratory management in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Ethical Principles and standards for a clinical laboratory professional** Duty to the patient Duty to colleagues and other professionals Duty to the society **Good Laboratory Practice (GLP) Regulations and Accreditation** Introduction to Basics of GLP and Accreditation Aims of GLP and Accreditation Advantages of Accreditation Brief knowledge about National and International Agencies for clinical laboratory accreditation	15
UNIT-II	**Awareness / Safety in a clinical laboratory** General safety precautions	15

	HIV: pre- and Post-exposure guidelines Hepatitis B & C: pre- and Post-exposure guidelines Drug Resistant Tuberculosis **Patient management for clinical samples collection, transportation and preservation, sample accountability** Purpose of accountability Methods of accountability **Sample analysis** Introduction Factors affecting sample analysis	
UNIT-III	**Quality Management system** Introduction Quality assurance Quality control system Internal and External quality control **Biomedical waste management in a clinical laboratory :** Introduction, precautions, advantages & disadvantages	**15**
UNIT-IV	**Ethics in Medical laboratory Practice** Understanding the term Ethics Ethics in relation to the following: Pre-Examination procedures Examination procedures Reporting of results Preserving medical records	**15**

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -1208.1**	Understand about the challenges in managing the delivery of quality lab services at affordable prices to patients, desired timely and quality reports to physicians, and ensure adequate financial returns to the labs.
CO2	**BMLT -1208.2**	Understand to deliver their assigned duties within limited time and resources

CO3	**BMLT -1208.3**	Apply the knowledge to understand ethical standards of conduct in obtaining information, conducting experiments and analyzing data.
CO4	**BMLT -1208.4**	To develop analytical, management and interpersonal skills, together with the technical knowledge of the work in the medical lab.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,

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SEMESTER-III

SUBJECT TITLE: Applied Microbiology
SUBJECT CODE: BMLT-2301
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Microbiology and microbiological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Laboratory strategy in the diagnosis of various Infective syndromes : Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications:** a) Septicemia and bacteramia b) Upper Respiratory tract infections c) Lower Respiratory tract infections d) Wound, skin, and deep sepsis e) Urinary tract infections f) Genital Tract infections g) Meningitis h) Gastro intestinal infections i) Enteric fever j) Tuberculosis (Pulmonary and Extra-pulmonary)	15
UNIT-II	**Antibiotic susceptibility testing in bacteriology** a. Definition of antibiotics b. Culture medium used for Antibiotic susceptibility testing	15

	c. Preparation and standardization of inoculum d. Control bacterial strains e. Choice of antibiotics f. MIC and MBC : Concepts and methods for determination g. Various methods of Antibiotic susceptibility testing with special	
	Reference to Stokes method and Kirby-Bauer method h. Tests for production of β-lactamase	
UNIT-III	**Bacteriological examination of water, milk, food and air** **Examination of water** a) Collection and transportation of water sample b) Presumptive coliform count c) Eijkman test d) Counts of faecal Streptococci e) Counts of Clostridium perfringens f) Membrane filtration tests g) Interpretation of results **Examination of Milk and milk products** **a)** Basic Concepts regarding gradation of milk **b)** Various tests for Bacteriological examination **Examination of food articles** a) Basic Concepts regarding classification of food like frozen Food, canned food, raw food, cooked food etc. b) Various tests for Bacteriological examination with special reference to food poisoning bacteria **Examination of Air** a) Significance of air bacteriology b) Settle plate method c) Types of air sampling instruments **d)** Collection processing and reporting of an air sample	15
UNIT-IV	**Nosocomial Infection :** **a)** Introduction, sources and types of nosocomial infections. **b)** Bacteriological surveillance of hospital environment. **c)** Role of microbiology laboratory in control of nosocomial infections	15

	Epidemiological markers: **a.** Serotyping, **b.** Phage typing and **c.** Bacteriocine typing. **Preservation methods for microbes** **a.** Basic concepts of preservation of microbes **b.** Why do we need to preserve bacteria **c.** Principle and procedures of various preservation methods with special Reference to lyophilization.	

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2301.1**	Learners will be able to make Laboratory strategies in the diagnosis of various systemic bacterial infection.
CO2	**BMLT -2301.2**	Study about Antibiotic susceptibility testing in bacteriology with various methods
CO3	**BMLT -2301.3**	Study about bacteriological examination of water, milk, food and air with various diagnostic methods and with special reference to different bacteria.
CO4	**BMLT -2301.4**	Learners will have knowledge about source and types of Nosocomial infection, epidemiological markers and preservation methods for various microbes.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Applied Microbiology practical
SUBJECT CODE: BMLT-2302
SEMESTER: Third
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Applied Microbiology

PRACTICALS

1. Inoculation of different culture media

2. Isolation of pure cultures

3. Processing of following clinical samples for culture and identification of pathogens:

- Blood

- Throat swab

- Sputum

- Pus

- Urine

- Stool for Salmonella, Shigella and Vibrio cholerae

- C.S.F. and other body fluids

4. Antimicrobial susceptibility testing

5. Collection, transportation and examination processing of:

a. water,

b. milk ,

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2302.1**	Students will be able to Inoculate different samples on culture media and identification of pure culture.
CO2	**BMLT -2302.2**	Laboratory strategies in the diagnosis of various systemic bacterial infection
CO3	**BMLT -2302.3**	Learners can perform Antibiotic susceptibility testing in bacteriology with various methods
CO4	**BMLT -2302.4**	Study about bacteriological examination of water, milk, food and air with various

		diagnostic methods and with special reference to different bacteria.

SUBJECT TITLE: Applied Hematology
SUBJECT CODE: BMLT-2303
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of hematology and hematological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTAC THOURS
UNIT-I	**Red cell anomalies** Morphological changes such as variation in size shape & stainingCharacter. **Disorder of leucocytes.** Abnormal morphology i.e. shift, left & variation in counting. **L.E.cell** **phenomenon.** Definition of L.E.cell. Principle, Procedure Demonstration of L.E.cell by various methods.Clinical significance.	15

UNIT-II	**Safety precautions in haematology** **Physiological variations in Hb, PCV, TLC and Platelets** **Automation in haematology.**	15
UNIT -III	**Haemostasis and fibrinolysis**: Mechanism of haemostasis, functions of platelets in haemostasis, coagulation process, coagulation factors and their role, fibrinolysis	15
	Estimation method, principle, procedure, clinical significance and normal values of following: Bleeding time, clotting time, clot retraction, prothrombin time, prothrombin consumption index, activated partial thromboplastic time, thrombin time, Test for fibrinogen, fibrinogen degradation product, D- Dimer	
UNIT - IV	**Red cell fragility test** Introduction Principle and procedure Clinical importance Reference values and interpretation.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2303.1**	Students will have great knowledge about morphological changes in erythrocytes and leukocytes.
CO2	**BMLT -2303.2**	Identification of variants in HB, TLC, PCV and platelets and automation hematology
CO3	**BMLT -2303.3**	Learners will be able to perform various coagulation tests related to haemostasis and fibrinolysis.
CO4	**BMLT -2303.4**	Ability to take blood sample and Can perform test for the identification of anemias.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume

SUBJECT TITLE: Applied Hematology practical
SUBJECT CODE: BMLT-2304
SEMESTER: III
CONTACT HOURS/WEEK: 4

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 Hrs

LIST OF PRACTICALS

1. To perform the test for the evaluation of red cell anomalies and interpretation of abnormalities.
2. To perform the test for the evaluation of white cell anomalies and interpretation of abnormalities.
3. To perform the bleeding time test.
4. To perform the clotting time test.
5. To perform the prothrombin time test.
6. To perform the APTT test.
7. To perform the thrombin time test.
8. To perform the FDP test.
9. To perform red cell fragility test in blood

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2304.1**	Learners will be able to perform various tests for the identification of red cell abnormalities.
CO2	**BMLT -2304.2**	Learners will be able to perform various tests for the identification of leukocyte abnormalities.
CO3	**BMLT -2304.3**	Students will have knowledge about various tests for the identification of coagulation disorders.
CO4	**BMLT -2304.4**	Students can collect blood sample and can perform various test for the identification of anemias.

SUBJECT TITLE: Analytical Bio-Chemistry
SUBJECT CODE: BMLT-2305
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of bio- chemistry and related techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Spectrophotometry** Introduction Theory of spectrophotometry and colorimetry Lambert`s law and Beer`s law Applications of spectrophotometry Advantages and disadvantages Precautions	15
UNIT-II	**Colorimetry** Introduction Theory of spectrophotometry and colorimetry Lambert`s law and Beer`s law Applications of colorimetry and spectrophotometry Advantages and disadvantages Precautions	15

UNIT-III	**Photometry** Introduction General principles of flame photometry Limitations of flame photometry, Instrumentation Applications of flame photometrry **Chromatography** Introduction, definition, types of chromatography with principle & **procedure and results** **Paper Chromatography : Introduction, principle, types ,details for qualitative and quantitative analysis, application** **Thin layer chromatography: Introduction, experimental techniques, application of TLC, limitations, High performance thin layer chromatography** **Column chromatography: Introduction, principle column efficiency, application of column chromatography** **Gas chromatography: Introduction principle, instrumentation, application** **Adsorption chromatography : Introduction, adsorbents, procedure, limitation, application** **Ion exchange chromatography: Introduction, Definition and principle, cation and anion exchangers, application** **Gel Chromatography: Introduction Principle and method, application and Advantages**	15
UNIT-IV	**Electrophoresis: Introduction, principle, Instrumentation, paper and gel electrophoresis and their application** **Atomic Absorption spectroscopy** **Introduction** **Principle** **Differences and advantages between atomic absorption spectroscopy and flame emission spectroscopy** **Disadvantages** **Instrumentation** **Applications**	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2305.1**	Learner will gain knowledge about various instruments used for the analysis of different bio-molecules.
CO2	**BMLT -2305.2**	By using spectrophotometer, colorimeter and photometric techniques students will be able to perform different test.
CO3	**BMLT -2305.3**	Study distinct Chromatography techniques, their uses and methodology.
CO4	**BMLT -2305.4**	Students will be able to use electrophoretic techniques and spectroscopic techniques.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I

SUBJECT TITLE: Analytical Bio-Chemistry practical
SUBJECT CODE: BMLT-2306
SEMESTER: Third
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Analytical Biochemistry Lab.
(PRACTICAL)

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

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2306.1**	Learner will gain knowledge about various instruments used for the analysis of different bio-molecules.
CO2	**BMLT -2306.2**	By using spectrophotometer, colorimeter and photometric techniques students will be able to perform different test.
CO3	**BMLT -2306.3**	Study distinct Chromatography techniques, their uses and methodology.
CO4	**BMLT -2306.4**	Students will be able to use electrophoretic techniques and spectroscopic techniques.

1 .

SUBJECT TITLE: Basic Cellular Pathology
SUBJECT CODE: BMLT-2307
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hr

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of cellular pathology and pathological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Alimentary System: -** Diseases of mouth, Diseases of Oesophagus- Oesophageal varices. **Digestive System:-** Gastritis, Peptic ulceration, Appendicitis microbial diseases, food poisoning, hernia, Intestinal abstrictions & malabsorbtion. **Accessory Digestive glands: - Salivary glands-** mumps, **liver** –hepatitis, liver failure and cirrhosis. **Pancreas-** pancreatitis. **GallBladder-** Gall stones, jaundice and cardiovascular diseases.	15
UNIT-II	**Circulatory System:-** Diseases of Blood vessels- Atheroma, Arteriosclerosis, heart block. Disorders of Blood Pressure-Hyper & Hypotension. **Respiratory System: -** Upper respiratory tract infection, Bronchi, Asthma, Pneumonia, Lung abscess, Tuberculosis, Lung Collapse.	15
UNIT-III	**Urinary System: -** Glomerulonephritis, Nephrotic syndrome, Renal failure, Renal calculi, Urinary obstruction, Urinary tract infection **Reproductive system:-** Sexually transmitted diseases, Pelvic inflammatory disease, disorder of cuvix(CIN), Disease of ovaries,	15

	ectopic pregnancy, prostatitis, Infertility	
UNIT-IV	**Nervous System: - Neuronal damage, ICP, Cerebral Infarction, head injury, Alzheimer's disease, dementia.** **Endocrine System:- Pituitary:- Hyper & Hypo secretions** **Thyroid: - Goiter** **Adrenal: - Cushing Syndrome, Addison Disease Pancreas: - Diabetes** **Sense Organs:- Ear:- Otitis Eye: - Cataract**	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2307.1**	Students will have basic knowledge about various systems and organs of human body.
CO2	**BMLT -2307.2**	They will know about various causes and sign symptoms of different diseases.
CO3	**BMLT -2307.3**	Learners will have understanding about medical terminology used for diseases.
CO4	**BMLT -2307.4**	They have command on diseases of alimentary, digestive, respiratory, urinary reproductive, nervous and endocrine system.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Healthcare Law and Ethics
SUBJECT CODE: BMLT-2310
SEMESTER: Second
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

OBJECTIVE:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of microbiology and various microbiological techniques such as sterilization and bio-medical waste management in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Sr. No.	Contents	Contact Hours
UNIT-I	**Introduction to Medical Law, Ethics and Bioethics** – Medical Law, Ethics, Bioethics, Ethics Committees and Quality Assurance Programs and Medical Etiquette. **The Legal System** – Sources of Law, Classification of Law, the Court System and Trial Process	**15**
UNIT-II	**Importance of the Legal System for the Physician and the Healthcare Professional** – Medical Practice Acts, Licensure, Standards of Care, Confidentiality, Statute of Limitations, Good Samaritan Law, Respondent Superior and Risk Management. **The Physician-Patient Relationship** – Physician's Rights and Responsibilities, Patient's Rights, Rights of Minors, Patient's Responsibilities and the Role of the Healthcare Consumer	**15**
UNIT-III	**Public Duties of the Physician and the Healthcare Professional** – Public Health Records and Vital Statistics, Controlled Substances Act and Regulations, Protection for the Employee and the Environment. **Workplace Law and Ethics** – Professionalism in the Workplace, Discrimination in the Workplace, Privacy, Cultural and Religious Considerations, Effective Hiring Practices	**15**
UNIT-IV	**Ethical and Bioethical Issues in Medicine** – history, Standards and Behavior, Code of Ethics, Bioethical Issues, Human Genome Project, Genetic Engineering, Healthcare Reform. **Ethical Issues Relating to Life** – Fetal Development, Assisted or Artificial Conception, Contraception, Sterilization, Abortion, Genetic Counseling and Testing, Wrongful Life Suits.	**15**

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT-1101.1**	To learn different laws and ethical issues related to healthcare
CO2	**BMLT-1101.2**	To understanding particular rules, statutes, case law, hypothetical's and examination of case studies.
CO3	**BMLT-1101.3**	To provide the student with an understanding of how to identify medical/legal ethical issues and how to respond appropriately in the workplace environment
CO4	**BMLT-1101.4**	To analyze and apply the Law of Ethics to the responsibilities and duties of the Healthcare Professional. Students will also exam ethical codes

Suggested readings:

1. Medical Law and Ethics by Bonnie F Fremgen

2. Medical Law and Ethics by Herring

3. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur

SUBJECT TITLE: Healthcare Law and Ethics
SUBJECT CODE: BMLT-2311
SEMESTER: Second
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

PRACTICAL

1. The community orientation and clinical visit will include visit to the entire chain of healthcare delivery system -Sub centre, PHC, CHC, SDH, DH and Medical College, private hospitals, dispensaries and clinics.
2. Visit to working Microbiology, Haematology, Biochemistry and Histopathology laboratories
3. The student will also be briefed regarding governance at village level including interaction and group discussion with village panchayat and front line health workers.
4. Clinical visit to their respective professional department within the hospital.
5. Evidence-based infection control principles and practices [such as Sterilization, Disinfection, Effective hand hygiene and use of Personal Protective Equipment (PPE)],
6. Prevention & control of common healthcare associated infections

SUBJECT TITLE: Basic of Computer Programming
SUBJECT CODE: BCOP-2301
SEMESTER: III
CONTACT HOURS/WEEK: 3

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment:40
End Term Exam; 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of basic computers.
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

S.NO.	CONTENTS	CONTAC THOURS
UNIT-I	Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice responsesystems). Processor and memory: The Central Processing Unit (CPU), main memory.	15
UNIT-II	Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Introduction to MS-Word: introduction, components of	15

	a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing oftable, mail merge.	
UNIT-III	Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system	15
UNIT-IV	Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in clinical settings.	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BCOP -2301.1**	Students will have knowledge about the basic hardware system of computer and laptop.
CO2	**BCOP -2301.2**	Learners will able to use Microsoft office
CO3	**BCOP -2301.3**	They will be able to install and use various software's
CO4	**BCOP -2301.4**	Learners will be able to get clerical and data entry jobs.

Suggested Readings:

1. Information technology by Anshuman Sharma (Lakhanpal Publisher)
2. Computer Fundamentals (Concepts. Systems and applications) by P. K. Sinha (University of Tokyo, Japan) BPB Publications

SUBJECT TITLE: Basic of Computer Programming
SUBJECT CODE: BCOP-2302
SEMESTER: III
CONTACT HOURS/WEEK: 3

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment:40
End Term Exam; 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of basic computers.
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

Practical

1. Demonstration of basic hardware of the computers and laptops
2. Learning to use MS office: MS word, MS PowerPoint, MS Excel
3. To install different software
4. Data entry efficiency

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BCOP -2302.1**	Students will have knowledge about the basic hardware system of computer and laptop.
CO2	**BCOP -2302.2**	Learners will able to use Microsoft office
CO3	**BCOP -2302.3**	They will be able to install and use various software's.
CO4	**BCOP -2302.4**	Learners will be able to get clerical and data entry jobs

SEMESTER-IV

TITLE: IMMUNOLOGY AND SEROLOGY
SUBJECT CODE: BMLT-2401
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of immunology and serological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S. NO.	CONTENTS	CONTACT HOURS
UNIT-I	**History and introduction to immunology** **Immunity** Introduction, types, Innate and acquired immunity including Basic concepts about their mechanisms **Definition, types of antigens and Determinants of antigenicity** **Definition, types, structure and properties of immunoglobulin's**	15
UNIT-II	**Antigen-Antibody reactions** Definition, Classification , general features and mechanisms and applications of various antigen antibody reactions **Complement system:** Definition and Basic concepts about its components and complement activation pathways	15

UNIT-III	**Immune response** : Introduction & Basic concepts of Humoral and Cellular immune responses **Hypersensitivity:** Definition and Types of hypersensitivity reactions Basic concepts of autoimmunity and brief knowledge about autoimmune Diseases	15
UNIT-IV	**Vaccines:** Definition, Types, Vaccination schedule and Brief knowledge about vaccination **Principle, procedure and applications** of Complement fixation test, Immunofluorescence, ELISA, CCIEP, and RIA, SDS-PAGE and western blotting in medical microbiology **Principle, procedure and interpretation of various serological tests** *i.e.* Widal, VDRL, ASO, CRP, Brucella tube agglutination and Rose-Waaler	15

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2401.1**	Study the history, introduction and types of antigens and immunoglobulins
CO2	**BMLT -2401.2**	Understand about the different types immune response, basic concepts of Humoral and cellular immune response
CO3	**BMLT -2401.3**	Apply the knowledge to understand the types ,vaccination and brief knowledge about vaccination
CO4	**BMLT -2401.4**	Analyze the Principles, Procedures and interpretation of various serological tests

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

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SUBJECT TITLE: Immunology & serology practical
SUBJECT CODE: BMLT-2402
SEMESTER: Fourth
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exams: 60
Duration of Exam; 3 Hrs

PRACTICAL

1. To perform the Widal test.
2. To perform the ASO test.
3. To perform the CRP Test.
4. To perform the VDRL test.
5. To perform the RA test.
6. To demonstrate the direct ELISA technique.
7. To demonstrate the indirect ELISA technique.
8. To demonstrate the RIA technique.

COURSE OUTCOMES: On completion of this course, the students will be able to

CO1	**BMLT -2402.1**	Study the basic Immunology and serology Procedures as well as to get aware of the recent trends in the immunology and serology lab.
CO2	**BMLT -2402.2**	Understand the routine staining procedures like Widal, CRP, ASO and RA factor tests.
CO3	**BMLT -2402.3**	Understand the basic requirements of the Immunology and serological specimens their collection and processing of specimens.
CO4	**BMLT -2402.4**	Understand the proper use and handling of common laboratory equipments and Glasswares.

SUBJECT TITLE: Histotechnology
SUBJECT CODE: BMLT-2403
SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Histotechnology and histotechnological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction to histotechnology** **Care and maintenance of laboratory equipment used in histotechnology** **Safety measures in a histopathology laboratory** **Basic concepts about routine methods of examination of tissues and various types of fixatives used in a routine histopathology laboratory** Simple fixative Compound fixative Special fixative for demonstration of various tissue elements	15
UNIT-II	**Decalcification** Criteria of a good decalcification agent Technique of decalcification followed with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing, Various types of decalcifying fluids: Organic & Inorganic Acid, chelating agents, Use of Ion-exchange resigns and Electrophoretic decalcification and treatment of hard tissues which are not calcified.	15

UNIT-III	**Processing of various tissues for histological examination** Embedding i. Definition	15
	ii. Various types of embedding media iii. Procedure followed by Dehydration, Clearing, Infiltration and Routine timing schedule for manual or automatic tissue processing. **iv.** Components & principles of various types of automatic tissue processors	
UNIT-IV	**Section Cutting** Introduction regarding equipment used for sectioning Microtome Knives, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications Freezing Microtome and various types of Cryostats. 10.4Faults in paraffin section cutting with reason and remedy, spreading the sections and attachment or mounting of sections to glass slide. General staining procedure in histology.	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2403.1**	Study the basic histotechnological Procedures as well as to get aware of the recent trends in Histotechnology
CO2	**BMLT -2403.2**	Understand about the different types of fixatives Examination of Tissues used in routine Histopathology Laboratory.
CO3	**BMLT -2403.3**	Apply the knowledge to understand the various types of Microtomes ,section cutting equipments and various types of equipments used in histopathology Lab.
CO4	**BMLT -2403.4**	Analyze the various types of Procedures used in dehydration, clearing,infiltration and Principles and components used in manual and automatic tissue processors.

SUGGESTED READINGS:

1.Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,

2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3.An introduction to Medical Lab Technology by Paniker(Latest Edition),
4.Introduction to Medical Lab Technology by Godkar (Latest Edition),
5.Diagnostic microbiology by Koss Volume –I,
6.An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Histotechnology practical
SUBJECT CODE: BMLT-2404
SEMESTER: Fourth
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs.

HISTOTECHNOLOGY

Practical

1. Demonstration of instruments used in histology lab.
2. To prepare simple and compound fixatives used in histology lab
3. Demonstration of freezing and cryostat microtome for the cutting of unfixed tissue.
4. Working, care and maintaince of rotary microtome.
5. Demonstration of different types of knives used in section cutting
6. To perform the honing technique for the sharpening of knife.
7. To perform the stropping technique for the sharpening of knife.
8. To perform the decalcification procedure for the cutting of hard bones.
9. To perform the general staining procedure for tissue section by H & E stain.

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2404.1**	Study the various equipments used in histopatholgy Laboratory
CO2	**BMLT -2404.2**	Understand the routine working, care and maintance of Microtomes.
CO3	**BMLT -2404.3**	Understand the basic procedures of the Honing and stropping techniques,different types of specimen used in Histotechnological specimens and collection and precessing of Histotechnological specimens.
CO4	**BMLT -2404.4**	Understand the proper use and handling of common laboratory equipments used in histotechnology laboratory.

SUBJECT TITLE: Applied Hematology
SUBJECT CODE: BMLT-2405
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of hematology and hematological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**ANAEMIA** Definition and classification of anaemias. Introduction of Iron deficiency anaemia Introduction of megaloblastic anaemia Introduction of haemolytic anaemia Laboratory diagnosis of iron deficiency anaemia Laboratory diagnosis of megaloblastic anaemia Laboratory diagnosis of haemolytic anaemia	15
UNIT-II	**LEUKAEMIA** Definition, classification and laboratory diagnosis of leukaemias Definition and laboratory diagnosis of Leukamoid reactions Cytochemical stainings, procedure and their significance in various haemopoietic disorders. Chromosomal studies in haematology and their significance.	15

UNIT-III	**DISORDERS OF BLOOD COAGULATION;** Haemophilia Von willebrand syndrome Diffuse intravascular coagulation(DIC) Idiopathic thrombocytopenic purpura (ITP) And other miscellaneous disorders	15
UNIT-IV	**BONE MARROW ASPIRATION** Clinical significance, sites of aspiration, methods used for aspiration of sample, staining procedure and normal erythroid : myeloid values Polycythemia **Erythrocyte and leucocyte cytochemistry Diagnostic radioisotopes in haematology**	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2405.1**	Study the Introduction, classification and Laboratory diagnosis of various types of anaemias.
CO2	**BMLT -2405.2**	Understand about the different types Blood coagulation tests like haemophilia, Von willebrand syndromeDiffuse intravascular coagulation(DIC)Idiopathic thrombocytopenic purpura (ITP)And other miscellaneous disorders
CO3	**BMLT -2405.3**	Apply the knowledge to understand the Bone marrow Aspiration ,its clinical significance and staining procedures.
CO4	**BMLT -2405.4**	Analyze the various staining procedures of Polycythemia Erythrocyte and leucocyte cytochemistry Diagnostic radioisotopes in haematology.

SUGGESTED READINGS: 1.Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3.An introduction to Medical Lab Technology by Paniker(Latest Edition),
4.Introduction to Medical Lab Technology by Godkar (Latest Edition),
5.Diagnostic microbiology by Koss Volume –I,
6.An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Applied Hematology practical
SUBJECT CODE: BMLT-2406
SEMESTER: Fourth
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs.

Applied Haematology
Practicals

1. To perform the lab diagnostic test for the iron deficiency anaemia.
2. To perform the lab diagnostic test for the megaloblastic anaemia.
3. To perform the lab diagnostic test for the hemolytic anaemia.
4. To perform the lab diagnostic test for the aplastic anaemia.
5. To perform the lab diagnostic test for the sidroblastic anaemia.
6. To perform the lab diagnostic test for the leukaemia.
7. To perform the lab diagnostic test for the diagnosis ofhemophilia.
8. To perform the lab diagnostic test for the von will brand'sdisease.
9. To demonstrate the bone marrow aspiration technique.

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2406.1**	Study the various equipments used in haematology Laboratory.
CO2	**BMLT -2406.2**	Understand the Various lab diagnostic tests used for different types of anemias.
CO3	**BMLT -2406.3**	Understand the basic procedures of the Bone Marrow aspiration.
CO4	**BMLT -2406.4**	Understand the proper use and handling of common laboratory equipments used in haematology Laboratory

SUBJECT TITLE: Clinical Bio-Chemistry
SUBJECT CODE: BMLT-2407
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of biochemistry and related techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	• Hazards & safety measures in clinical Biochemistry laboratory. • Quality control and quality assurance in a clinical biochemistry laboratory. • Laboratory organization, management and maintenance of records.	15
UNIT-II	Introduction, Principles, procedures , clinical significance, Precautions, normal range, result/interpretation of following: - • Glucose • Proteins • Urea • Uric acid • Creatinine • Bilirubin • g. Lipids	15

UNIT-III	Introduction, Principles, procedures , clinical significance, Precautions, normal range, result/interpretation of following: - • Sodium, Potassium and Chloride, Iodine. • b. Calcium, Phosphorous and Phosohates	15
UNIT-IV	Introduction of radioisotopes Instruments for detection of Radioactivity. Uses of Radioisotopes in clinical biochemistry. Radioisotope techniques	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2407.1**	Study the basic biochemical analytical procedures as well as to get aware of the recent trends in clinical biochemistry Laboratory.
CO2	**BMLT -2407.2**	Understand about the Laboratory management and biochemical techniques.
CO3	**BMLT -2407.3**	Apply the knowledge to understand the Introduction, Principles, procedures , clinical significance, Precautions, normal range, result/interpretation of Sodium, Potassium and Chloride, Iodine.Calcium, Phosphorous and Phosohates tests.
CO4	**BMLT -2407.4**	Analyze the Knowledge ofHazards & safety measures in clinical Biochemistry laboratory organization, management and maintenance of records.

SUGGESTED READINGS:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Clinical Biochemistry practical
SUBJECT CODE: BMLT-2408
SEMESTER: Fourth
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Clinical Biochemistry Practical

1. Estimation of Glucose in Blood.
2. Estimation of Protein in Blood.
3. Estimation of Urea in blood.
4. Estimation of uric acid in blood.
5. Estimation of serum bilirubin
6. Estimation of Total Cholestrol in blood.
7. Estimation of HDL Cholestrol.
9. Estimation of TG
10. Estimation of Creatinine in Blood

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2408.1**	Study the basic biochemical analytical procedures as well as to get aware of the recent trends in clinical biochemistry
CO2	**BMLT -2408.2**	Understand the routine biochemical investigations like blood sugar, renal function tests, Liver function tests
CO3	**BMLT -2408.3**	Understanding the basic requirements for the biochemical investigations including different biological specimens, their collection and processing of biochemical estimations and have brief knowledge of preparation of solutions and different types of assays
CO4	**BMLT -2408.4**	Understanding of proper use and handling of common Laboratory Equipment and Glassware in biochemistry lab

SUBJECT TITLE: Blood Bank
SUBJECT CODE: BMLT-2409
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Blood bank and related techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Historical introduction to Transfusion medicine (blood banking)** **Development of ABO antigen in red cells** **Glassware used in Blood Banking** Types of glassware and cleaning agents used Cleaning of new and used glassware/plastic ware Care of glassware/plasticware	15
UNIT-II	**Anticoagulants used in blood bank** Types and composition of various anticoagulants Advantages and disadvantages of various anticoagulant **Screening of blood donors for following** • MP • VDRL • HIV • HbsAg • HCV **Antigen and Antibody** Introductin, Definition of antigen and antibody Classification of antigens and antibodies.	15

UNIT-III	**ABO Blood Group System** Antigens and antibodies involved Principle and procedure of ABO blood grouping Various other sub groups A1,A2,A1B,A2B **The Rh Blood Group System** Antigen and antibody involved Principle and procedure of Rh grouping Variant of D antigen (Du) **Coombs Test** Direct coombs test (principle, procedure, importance and application) Indirect coombs test (principle, procedure, importance and application)	15
UNIT-IV	**Cross Matching** Types of cross matching Various methods and their procedures **Blood Collection and storage** Screening of blood donor and characteristics of ideal blood donor. Blood collection procedure Transportation and storage **Various blood components (Packed cells, Fresh frozen plasma, Cryoprecipitate, PRP(Platelet rich plasma)** Preparation Preservation **Blood Transfusion reactions** **Haemopheresis: pertaining to Leucocytes, platelets and plasma**	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2409.1**	Study the introduction and development of ABO antigens and antibodies
CO2	**BMLT -2409.2**	Understand about the different types of anticoagulants used in Blood banking and various types of methods and Procedures used in Cross matching.
CO3	**BMLT -2409.3**	Apply the knowledge to understand the various types of Blood group systems like ABO Blood group systems and RH blood group systems.

CO4	**BMLT -2409.4**	Analyze the Principle, Procedures and important applications used in Direct and indirect coombs tests.

Suggested reading:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3. An introduction to Medical Lab Technology by Paniker(Latest Edition),
4. Introduction to Medical Lab Technology by Godkar (Latest Edition),
5. Diagnostic microbiology by Koss Volume –I,
6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Blood Bank practical
SUBJECT CODE: BMLT-2410
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 Hrs

LIST OF PRACTICALS

1. Washing and sterilization of glass ware
2. Performing ABO blood grouping by following method:
    - Direct
    - Tube Test
    - Indirect (reverse)
    - Subgroup
3. Performing-Rh grouping by following techniques:
    - Slide
    - Tube technique
4. Performance of Coombs Test
    - Direct
    - Indirect
5. Cross Matching (compatibility testing)
    - Major
    - Minor
6. Preparation of anticoagulants
    - ACD (Acid Citrate Dextros
    - CPD (Citrate Phosphate Dextrose)
    - CPDA (Citrate Phosphate Dextrose Analine

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -2410.1**	Study the basic sterilization and glasswares used in Blood banking
CO2	**BMLT -2410.2**	Analyze the performing the major cross matching and minor matching tests.
CO3	**BMLT -2410.3**	Understand the proper handling of common Laboratory Procedures in direct and indirect ABO blood grouping systems.
CO4	**BMLT -2410.4**	Apply the knowledge to understand about preparation of various anticoagulants like ACD, CPD and CPDA.

SEMESTER-V

SUBJECT TITLE: Medical Parasitology
SUBJECT CODE: BMLT-3501
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Parasitology and Parasitological techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction to medical parasitology with respect to terms used in Parasitology.** **Protozoology/ Protozoal parasites:** 1 General characteristics of protozoa. 2 Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of Entamoeba 3Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of blood and tissue flagellates i.e. Plasmodium and Toxoplasma sp. **Helminthology/ Helminthic parasites:** 1 General characteristics of Cestodes, Trematodes and Nematodes 2 Geographical distribution, Habitat, Morphology, life cycle, Mode of infection and laboratory diagnosis of : Taeniasolium and saginata Echinococcusgranulos	15
UNIT-II	**Diagnostic procedures:**	15

	1 Examination of Stool for parasites For intestinal protozoal infections General rules for microscopic examination of stool samples Collection of stool samples Preparation of material for unstained and stained preparations Staining methods i.e. Iodine staining and permanent staining Examination of blood for parasites Preparation of thin and thick blood film Leishman staining Examination of thick and thin smear Field‘s stain Examination of blood film for Malarial parasite and Microfilariae Collection, Transport, processing and preservation of samples for routine parasitological investigations	
UNIT-III	**Morphology,** life cycle and lab-diagnosis of Giardia and Entamoeba Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms Morphology, life cycle and lab-diagnosis of T. solium and T. saginta	15
UNIT-IV	**Morphology,** life cycle and lab-diagnosis of Malarial parasite with special reference to P.vivax and P. falciparum Laboratory diagnosis of hydrated cyst and cysticercosis Concentration techniques for demonstration of Ova and Cysts (Principles, Procedure and applications)	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3501.1**	Study the growth and control of Parasites as well as different Parasitological techniques involved in Parasitology.
CO2	**BMLT -3501.2**	Understand about the different cell organelles of Parasites and their detailed functions
CO3	**BMLT -3501.3**	Apply the knowledge to understand the Parasite's physiology and to identify the Parasites.
CO4	**BMLT -3501.4**	Analyze the Parasites on basis of appearance and function

Suggested reading:

.Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3.An introduction to Medical Lab Technology by Paniker(Latest Edition),
4.Introduction to Medical Lab Technology by Godkar (Latest Edition),
5.Diagnostic microbiology by Koss Volume –I,
6.An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Medical Parasitology

SUBJECT CODE: BMLT-3502

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 Hrs

LIST OF PRACTICALS

1. Routine stool examination for detection of intestinal parasites with concentrationmethods:

   Saline preparation

   Iodine preparation

   Floatation method

   Centrifugation method

   Formal ether method

   Zinc sulphate method

2. Malarial parasite:

   Preparation of thin and thick blood smears

   Staining of smears

   Examination of smears for malarial parasites (P. vivax and P.falciparum)

   Demonstration of various stages of life cycle of malarial parasites from stained slides

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3502.1**	Study the basic virology and mycology analytical procedures as well as to get aware of the recent trends in parasitology.
CO2	**BMLT -3502.2**	Understand about the Laboratory Management of parasitology techniques skills
CO3	**BMLT -3502.3**	Apply the knowledge to understand the the diagnosis of diseases, prognosis and treatment.
CO4	**BMLT -3502.4**	Understanding of proper use and handling of common Laboratory Equipment and Glassware in parasitology lab

SUBJECT TITLE: Applied Clinical Bio-Chemistry
SUBJECT CODE: BMLT-3503
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Clinical Bio chemistry and related techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

At the end of the course you should have increased: Your capacity to think critically; your ability to design and execute an experiment; your confidence and ability in communicating ideas. This will serve as a lasting and practical basis for a career, for example, in research - whether industry or academia - as well as teaching, media, law, commerce, government or management.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Automation in clinical biochemistry** **Method of estimation and assessment for:** Glucose tolerance test Insulin tolerance test Xylose excretion test.	15
UNIT-II	**Gastric analysis.** **Clearance test for renal function.** **Qualitative test for:** Urobilinogens Barbiturates T3, T4 and TSH Ketosteroids	15

UNIT-III	**Enzymes:** Principle, procedure and Clinical significance for the estimation of following enzymes Acid phosphatase Alkaline phosphatase Lactate dehydrogenase Aspartate transaminase Alanine transaminase Creatine phosphokinase	15
UNIT-IV	**Qualitative analysis of Renal calculi.** Chemical examination of Cerebrospinal fluid. Brief knowledge about rapid techniques in clinical biochemistry	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3503.1**	Study the basic biochemical analytical procedures as well as to get aware of the recent trends in clinical biochemistry.
CO2	**BMLT -3503.2**	Understand about the Laboratory Management and Biochemical techniques skills.
CO3	**BMLT -3503.3**	Apply the knowledge to understand the the diagnosis of diseases,prognosis and treatment
CO4	**BMLT -3503.4**	Understand the need, advantages and recent advances of automation in a Clinical biochemistry laboratory

Suggested readings

1. Text book of Medical Laboratory Technology by P.B. Godkar.
2. Medical Laboratory Science, Theory & Practical by A. Kolhatkar.
3. Practical Clinical Biochemistry by Harold Varley.
4. Biochemistry, U. Satyanarayan& U. Chakrapani.
5. Text book of Medical Biochemistry by Chaterjee&Shinde.
6. Principal of Biochemistry by Lehninger
7. Biochemistry by Voet&Voet
8. Biochemistry by Stryer

SUBJECT TITLE: Applied Clinical Bio-Chemistry Practical

SUBJECT CODE: BMLT-3504

SEMESTER: V

CONTACT HOURS/WEEK: 4

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 Hrs

1. Estimation of Glucose tolerance test (GTT).
2. Estimation of Insulin Tolerance Test (ITT).
3. Estimation of SGOT.
4. Estimation of SGPT.
5. Determination of Serum acid phosphate.
6. Determination of Serum Alkaline phosphatase.
7. Determination of Serum Lactate Dehydrogenase.

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3504.1**	Study the basic biochemical analytical procedures as well as to get aware of the recent trends in clinical biochemistry.
CO2	**BMLT -3504.2**	Understand the routine biochemical investigations like blood sugar, renal function tests, Liver function tests
CO3	**BMLT -3504.3**	Understanding the basic requirements for the biochemical investigations including different biological specimens, their collection and processing of biochemical estimations and have brief knowledge of preparation of solutions and different types of assays
CO4	**BMLT -3504.4**	Understanding of proper use and handling of common Laboratory Equipment and Glassware in biochemistry lab

SUBJECT TITLE: Histotechnology & Cytopathology
SUBJECT CODE: BMLT-3505
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Histotechnology and cytopathology techniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACTHOURS
UNIT-I	**1. Staining, Impregnation and Mountants** Theory of Staining, Classifications of Dyes, Principles of Dye Chemistry, Stains and Dyes and their uses, Types of Stains, Chemical Staining Action, Mordant andAccentuators, Metachromasy. Use of Controls in Staining Procedures, Preparation of Stains, solvents, aniline water and buffers etc.,Commonly used mountants in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embeddedtissue. Nuclear Stains and Cytoplasmic stains Equipment and Procedure for manual Staining and Automatic StainingTechnique. Mounting of Cover Slips, Labeling and Cataloguing the Slides. **Special stains:** Principle, Procedure, clinical significance andinterpretation of different types of stains PAS (Periodic	15

	Acid Schiff's Reagent) , Silver impergnation stain – Reticulin fibre, Ziehl Neelson's – for AFB and Leprae, Gram's stain – **Gram +ve and Gram –ve, etc.** **Enzyme Cytochemistry:** **Diagnostic applications ,Demonstration of Phosphatases, Dehydrogenases, Oxidases & Peroxidases**	
UNIT-II	**Introduction about cytology** Exfoliative cytology (Papanicolaou technique for the staining of cervical smears) Cervical cytology Fluid Cytology Urine CSF Body Fluids (Pleural, Pericardial, Ascitic)	15
UNIT-III	**Museum Technique** Introduction to museum with emphasis on importance of museum Reception, fixation and processing of various museum specimens Cataloguing of museum specimen	15
UNIT-IV	**Autopsy** **Introduction to autopsy technique** **Care and maintenance of autopsy area, autopsy instruments, handling of dead bodies** **Use of autopsy**	

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3505.1**	Study the basic Histotechnology & Cytopathology analytical procedures as well as to get aware of the recent trends in Histotechnology & Cytopathology.
CO2	**BMLT -3505.2**	Understand about the Laboratory Management and Histotechnology & Cytopathology techniques skills
CO3	**BMLT -3505.3**	Apply the knowledge to understand the the diagnosis of diseases,prognosis and treatment.
CO4	**BMLT -3505.4**	Understand the need, advantages and recent advances of automation in a Histotechnology & Cytopathology laboratory

Suggested reading:

.Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,

2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,

3.An introduction to Medical Lab Technology by Paniker(Latest Edition),

4.Introduction to Medical Lab Technology by Godkar (Latest Edition),

5.Diagnostic microbiology by Koss Volume –I,

6. An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: Histotechnology & Cytopathology practical

SUBJECT CODE: BMLT-3506

SEMESTER: V

CONTACT HOURS/WEEK: 4

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 Hrs

BMLT-3508: Histotechnology & Cytopathology – Practical

1. To perform the staining procedure for the identification of reticulin fibers.
2. To perform the staining procedure for the identification of carbohydrates.
3. To perform the staining procedure for the identification of lipids.
4. To perform the staining procedure for the identification of micro-organisms.
5. To perform the staining procedure for the identification of enzymes.
6. 6 To perform PAP stain for cervical smear.
7. To perform staining for demonstration sex chromatin (Barr bodies on a buccal smear)
8. To perform Shorr's staining for Hormonal assessment
9. To prepare the fixative and mounting medium that is used in museum.

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3506.1**	Study the basic Histotechnology & Cytopathology analytical procedures as well as to get aware of the recent trends in Histotechnology & Cytopathology Lab.
CO2	**BMLT -3506.2**	Understand the routine staining procedure like identification of carbohydrates lipids, enzymes, micro-organisms.
CO3	**BMLT -3506.3**	Understanding the basic requirements for the Histotechnological & Cytopathological investigations including different biological specimens, their collection and processing of Histotechnological & Cytopathological estimations and have brief knowledge of preparation of solutions and different types of assays
CO4	**BMLT -3506.4**	Understanding of proper use and handling of common Laboratory Equipment and Glassware used in Histotechnology & Cytopathology lab

SUBJECT TITLE: VIROLOGY AND MYCOLOGY
SUBJECT CODE: BMLT-3507
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Virology and mycology and realatedtechniques in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACTHOURS
UNIT-I	**Introduction to medical mycology-** 1. Moulds, yeasts, and dimorphic fungi 2. Reproduction in fungi 3. Classes offungi 4. Asexual sporulation 5. Classification of fungal infection (mycoses). **Taxonomy and classification and general characteristics of variousmedically important fungi (superficial and systemic).** **Laboratory techniques in mycology, identification of fungal isolates byspecial techniques.** **Fungal infections** 1. Superficial mycoses 2. Subcutaneous mycoses 3. Systemic mycoses 4. Opportunistic mycoses	15
UNIT-II	**Introduction of virology, general properties of virus** **Structure of viruses, susceptibility to physical and chemical agents,replication of viruses, viral vaccines, bacteriophage**	

UNIT -III	**Classification of viruses-:** 1.viriods 2.prions **DNA VIRUSES (**morphology,pathogenicity,lab diagnosis) poxviridae,herpesviridae,adenoviridae,papoviridae,hepadnaviridae, parvoviridae RNA VIRUSES Orthomyxoviridae,paramyxoviridae,rhabdoviridae,filoviridae,picornaviridae, caliciviridae, togaviridae, flaviviridae, coronaviridae, arenaviridae, retroviridae other miscellaneous viruses	15
UNIT - IV	**Virus isolation** Culture techniques-chick embryos, laboratory animals, cell culture(primary cell culture, diploid cell culture, continuous cell culture lines), growth media Detection of virus growth in cell culture 1.cytopathic effects, 2.haemadsorption, 3.interference, 4.transformation, 5.fluorescent antibody testing,6.immunoperoxidase, 7.detection of enzymes, 8.electron microscopy	

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3507.1**	Study the basic virology and mycology analytical procedures as well as to get aware of the recent trends in parasitology.
CO2	**BMLT -3507.2**	Understand about the Laboratory Management and parasitology techniques skills
CO3	**BMLT -3507.3**	Apply the knowledge to understand the the diagnosis of diseases, prognosis and treatment.
CO4	**BMLT -3507.4**	Understanding of proper use and handling of common Laboratory Equipment and Glassware in parasitology lab

Suggested reading:

1. Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnostic microbiology by Koss Volume –I,
3.An introduction to Medical Lab Technology by Paniker(Latest Edition),

4.Introduction to Medical Lab Technology by Godkar (Latest Edition),
5.Diagnostic microbiology by Koss Volume –I,
6.An introduction to Medical Lab Technology by Paniker(Latest Edition)

SUBJECT TITLE: VIROLOGY AND MYCOLOGY practical
SUBJECT CODE: BMLT-3508
SEMESTER: V
CONTACT HOURS/WEEK: 4

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Duration of Exam; 3 Hrs

1. To perform for the test the KOH preparation diagnosis of fungal infection.
2. To perform the India ink preparation for the detection of fungal infection.
3. To perform the lactophenol cotton blue stain for the detection of fungal infection.
4. To prepare the SDA media
5. Cultivation of fungal sample on the SDA media.
6. To demonstrate the technique for the cultivation of virus in the chick embryo.
7. To demonstrate the technique used for the cultivation of virus by cell culture method.

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3508.1**	Study the basic Histotechnology & Cytopathology analytical procedures as well as to get aware of the recent trends in Histotechnology & Cytopathology Lab.
CO2	**BMLT -3508.2**	Understand the routine staining procedure like identification of carbohydrates lipids, enzymes, micro-organisms.
CO3	**BMLT -3508.3**	Understanding the basic requirements for the Histotechnological & Cytopathological investigations including different biological specimens, their collection and processing of Histotechnological & Cytopathological estimations and have brief knowledge of preparation of solutions and different types of assays
CO4	**BMLT -3508.4**	Understanding of proper use and handling of common Laboratory Equipment and Glassware used in Histotechnology & Cytopathology lab

SUBJECT TITLE: Environmental science
SUBJECT CODE: BMLT-3509
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Objective:-

- The aim of this course is to ensure that you can achieve an up-to-date level of understanding of Environmental sciences in proper manner
- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.

CONTENTS OF SYALLBUS:

S.NO.	CONTENTS	CONTACT HOURS
UNIT-I	**Introduction:** Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness. **Natural Resources:** Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources **Ecosystems:** Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity	15
UNIT-II	**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. Role of an individual in prevention of pollution. Pollution case studies. Social blemishes and the Environment From Unsustainable to	15

	Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, water shed management Resettlement and rehabilitation of people; its pros and concerns. Case studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layerdepletion, nuclear accidents and holocaust. Case studies, Wasteland reclamation. Consumerism and waste products, 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. Human Population and the Environment, Population growth, variation among nations. Population explosion–Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Casestudies.	
UNIT-III	**Understanding the Hospital Environment** **Understanding the environment in the following clinicallaboratories:** 3.1 Microbiology32 Biochemistry Histopathology Haematology	15

UNIT-IV	**Clinical laboratory hazards to the environment from thefollowing and means to prevent:** Infectious material Toxic Chemicals Radioactive Material Other miscellaneous wastes	15

Course Outcomes:

After taking the course, students will be able to:

CO1	**BMLT -3509.1**	Study the intellectual and methodological tools to understand and address the crucial current environmental issues.
CO2	**BMLT -3509.2**	Understand and create environmental ethics and raise people's awareness of the importance of environmental protection and biodiversity
CO3	**BMLT -3509.3**	Apply the knowledge to understand the the impact of individuals, society on significant environmental issues.
CO4	**BMLT -3509.4**	Understanding of proper use of skills and analytical tools needed to face the environmental issues

Suggested reading:

.Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, RachnaAgarwal, Sujata Chaturvedi and Rajiv Thakur,
2. An Introduction to Medical Lab Technology by Godkar (Latest Edition), Diagnosticmicrobiology by Koss Volume –I,
3.An introduction to Medical Lab Technology by Paniker(Latest Edition),4.Introduction to Medical Lab Technology by Godkar (Latest Edition), 5.Diagnostic microbiology by Koss Volume –I,
6.An introduction to Medical Lab Technology by Paniker(Latest Edition)

SEMESTER-VI

SEMESTER: Sixth (INTERNSHIP)

6.1 PROJECT BASED PROFESSIONAL TRAINING-I

OBJECTIVE

The objective of providing professional training is to:

1. Create confidence in the students to work in world of work by developing practical skills pertaining to laboratory management and diagnostic skills in the field of clinical hematology, transfusion medicine blood banking, clinical biochemistry, clinical microbiology, histopathology and cytology and ensuring laboratory safety and quality assurance.
2. Create necessary awareness regarding use of various types of diagnostic equipment particularly sophisticated ones which are used in the field of medical laboratory technology.
3. Develop appreciation regarding size and scale of operations, environment and other related aspects like value of teamwork, interpersonal relations and professional ethics in the field of medical laboratory technology.
4. Develop necessary traits for starting small clinical laboratories as per requirements.

	Subject	Contact Hours/Week			Credit	Evaluation Scheme (% of Total Marks)					Exam Duration (Hours)
Code	Title	L	T	P		CWA	LWA	MTE	ETE	TOTAL	
BMLT-3601	Clinical Hematology		30		4		100		100	200	
BMLT-3602	Clinical Microbiology		30		4		100		100	200	
BMLT-3603	Clinical Bio-Chemistry		30		4		100		100	200	
BMLT-3604	Blood Bank & Transfusion Medicine		30		4		100		100	200	
BMLT-3605	Histotechnology & Cytology		30		4		100		100	200	
	Total				20					1000	

SELECTION OF TRAINING PLACES

The institute offering B.Sc. programme in Medical Laboratory Technology should establish contact/rapport by personal visit to following types of organizations:

1. Medical Colleges/Research institutions
2. Civil Hospitals at District Headquarters having well equipped laboratory
3. Hospitals in private sector
4. Well established clinical laboratories being run by a qualified person.

METHODOLOGY OF ORGANIZING PROFESSIONAL TRAINING

Each concerned teacher will be responsible for a group of students in respective specialty to plan, supervise and monitor the progress when placed in different organizations for Practical training. For this purpose, necessary recurring expenditure for making payment of TA/DA to the faculty of institute and the experts may be worked out by respective Institutes, keeping in view, number of visits and the distances involved in such travelling. The concerned teacher will have to continuously interact with training centers to monitor the progress of the students

COURSE OUTCOMES:

After taking the course, students will be able to:

1. Study about the various biological laboratory tests principles and procedures
2. How to report the diagnosis test and how to relate these reports with diseases process
3. Do further education to upgrade their knowledge and to be in professional competence
4. Learn about the laboratory safety, infections borne from body fluids, hazardous chemical, universal precaution to protect society and lab workers along with patients from infection and how to dispose biomedical waste

GENERAL GUIDELINES

(i) The students are expected to prepare practical record book as per given list of the Experiments. Besides, they can also add other experiments as well.
(ii) External examiner along with internal faculty should evaluate the student's Performance through viva voice/spotting/performance and synopsis.