Curriculum Book

And

Assessment and Evaluation Scheme

Based on

Outcome Based Education (OBE)

In

Bachelor of Medical Laboratory Technology

(BMLT)

3 Year Degree Program

Revised as on 01 August 2023 Applicable w.e.f.
Academic Session 2023-24

AKS University

Satna 485001, Madhya Pradesh, India

Faculty of Medical Science

Department of Paramedical Science

A K S University
Faculty of Medical Science
Department of Paramedical Science
Curriculum of Bachelor of Medical Laboratory Technology Program
(Revised as on 01 August 2023)

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Vice Chancellor

Professor B.A. Chopade
Vice-Chancellor
AKS University
485001 (M.P.)

A K S University

Faculty of Medical sciences
Department of Paramedical Sciences
Curriculum of Bachelor of Medical Laboratory Technology Program
(Revised as on 01 August 2023)

Forwarding

I am thrilled to observe the updated curriculum of department of Paramedical sciences for Bachelor of Medical laboratory technology Program, which seamlessly integrates the mostrecenttechnologicaladvancementsandadherestotheguidelinessetforth by mppmc. The revised curriculum also thoughtfully incorporates the directives of NEP-2020 and the Sustainable Development Goals.

The alignment of course outcomes (COs), Programme Outcome (POs) and Programme specific outcomes (PSOs) has been intricately executed, aligning perfectly with the requisites of NEP-2020andNAACstandards.Iholdthebeliefthat this revised syllabus will significantly enhance the skills and employability of our students.

With immense satisfaction, I hereby present the revised curriculum for the bachelor of Medical Laboratory Technology Program for implementation in the upcoming session.

ER. AnantSoni
Pro Chancellor & Chairman
AKS University,Satna

01 August 2023

A K S University

Faculty of Medical Science

Department of Paramedical Science

Curriculum of Bachelor of Medical Laboratory Technology Program

(Revised as on 01 August 2023)

From the Desk of the Vice-Chancellor

AKS University is currently undergoing a process to revamp its curriculum in to an outcome-based approach, with the aim of enhancing the teaching and learning process. The foundation of quality of quality education lies in the implementation of a curriculum that aligns with both societal and Medical needs, focusing on relevant outcomes. This entails dedicated and inspired faculty members, as well as impactful Medical internships.

Hence, it is of utmost importance to begin this endeavor by crafting an outcome-based curriculum in collaboration with academia and Medical experts. This curriculum design should be informed by the latest technological advancements, market demands, the guidelines outlined in the National Education Policy (NEP) of 2020, and sustainable goals.

I'm delighted to learn that the revised curriculum has been meticulously crafted by the department of Paramedical sciences for Bachelor of Medical Laboratory Technology Program and academia. This curriculum effectively integrates the principles outlined in theNEP-2020 guidelines, as well as sustainable goals. It also adeptly incorporates the latest advancements in medical science.

Furthermore, the curriculum takes into account the specific needs of the Medical Science, focusing on the treatment of the patient and services. It extends its reach to optimizing function of adults and optimizing their function in society. This inclusion not only imparts knowledge but also encourages students' independent thinking for potential enhancements in this area.

The curriculum goes beyond theoretical learning and embraces practical applications by incorporating the utilization of medical. To enhance students' skills, the curriculum integrates Hands- on Training, hospital visits, and On- Job Training experiences, research and progress. This well-rounded approach ensures that students receive a comprehensive education, fostering their skill development and preparing them for success in the medical industry.

I am confident that the up dated curriculum for Bachelor of Medical Laboratory Technology will not only enhance students' technical skills but also contribute significantly to their employability. During the process of revising the curriculum, I am pleased to observe that the department of Paramedical sciences has diligently adhered to the guidelines provided by the MPPMC.

It's worth noting that curriculum revision is an ongoing and dynamic process, designed to address the continuous evolution of technological advancements and both local and global concerns. This ensures that the curriculum remains responsive and attuned to the changing landscape of education and hospital industry.

AKS University warmly invites input and suggestions from industry experts and technocrats and Alumni students to enhance the curriculum and make it more student-centered. Your valuable insights will greatly contribute to shaping an education that best serves the needs and aspirations of our students.

01 August 2023

Professor. B. A Chopade
Vice- Chancellor

A K S University
Faculty of Medical science
Department of Paramedical Science
Curriculum Bachelor of Medical Laboratory Technology Program

(Revised as on 01 August 2023)
Preface

As part of our commitment to ongoing enhancement, the Department of Paramedical sciences consistently reviews and updates its Bachelor of Medical Laboratory Technology program curriculum every four years. Through this process, we ensure that the curriculum remains aligned with the latest technological advancements, as well as local and global industrial and social demands. During this procedure, the existing curriculum for the Bachelor of Medical Laboratory Technology Program undergoes evaluation by a panel of technocrats, hospital industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formula ted and is set to be implemented starting from August 01, 2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body. This curriculum closely adheres to the MPPMC syllabus distributed in May 2023. It seamlessly integrates the guidelines set for the by the Ministry of Higher Education , Government of India, through NEP- 2020, as well as the principles of Sustainable Development Goals. In order to foster the holistic skill development of students, a range of practical activities, including Hands-On Training, Industrial Visits, Project planning and execution, Report Writing, Seminars, and Industrial On-Job Training, have been incorporated. Furthermore, in alignment with MPPMC directives,. This curriculum is enriched with course components in alignment with MPPMC guidelines, To ensure a comprehensive learning experience, detailed evaluation schemes and rubrics have also been meticulously provided. For each course, a thorough mapping of Course Outcomes, Program Outcomes, and Programme Specific Outcomes has been undertaken. As the course syllabus is being meticulously developed, various elements such as session outcomes, laboratory instruction, classroom instruction, self-learning activities, assignments, and mini projects are meticulously outlined. We hold the belief that this dynamic curriculum will undoubtedly enhance independent thinking, skills, and overall employability of the students.

Professor (Dr.) G.P. Richariya
Dean, Faculty of Medical Science
AKS University, Satna

01 August 2023

A K S University

Faculty of Medical sciences
Department of Paramedical Sciences
Curriculum of Bachelor of Medical Laboratory Technology Program
(Revised as on 01 August 2023

Preface

As part of our commitment to ongoing enhancement, the Department of Paramedical sciences consistently reviews and update sits bachelor of Medical Laboratory Technology program curriculum every three years. Through this process, we ensure that the curriculum remains aligned with the latest technological advancements, as well as local and global industrial and social demands. During this procedure, the existing curriculum for the bachelor of physiotherapy Program undergoes evaluation by a panel of technocrats, hospital industry specialists, and academics. Following meticulous scrutiny, the revised curriculum has been formula tedandissettobeimp lamented starting from August01,2023. This implementation is contingent upon the endorsement of the curriculum by the University's Board of Studies and Governing Body. This curriculum closely adheres to the MPPMC syllabus distributed in May 2023. It seamlessly integrates the guidelines set for the by the Ministry of Higher Education , Government of India, through NEP- 2020, as well as the principles of Sustainable Development Goals. In order to foster the holistic skill development of students, a range of practical activities, including Hands-On Training, Industrial Visits, Project planning and execution, Report Writing, Seminars, and Industrial On-Job Training, have been incorporated. Furthermore, in alignment with MPPMC directives,. This curriculum is enriched with course components in alignment with MPPMC guidelines, To ensure a comprehensive learnin experience, detailed evaluation schemes and rubrics have also been meticulously provided. For each course, a thorough mapping of Course Outcomes, Program Outcomes, and Programme Specific Outcomes has been undertaken. As the course syllabus is being meticulously developed, various elements such as session outcomes, laboratory instruction, classroom instruction, self-learning activities, assignments, and mini projects are meticulously outlined. We hold the belief that this dynamic curriculum will undoubtedly enhance independent thinking, skills, and overall employability of the students

Professor G C Mishra
Director IQAC
AKS University

01August2023

A K S University

Faculty of Medical sciences
Department of Paramedical Sciences
Curriculum of Bachelor of Medical Laboratory Technology Program
AKS University
Department of Paramedical Sciences

Introduction:

AKS University is University to introduce 3 years Bachelor of Medical Laboratory Technology program in the in the year 2021. The course curriculum is design as per the requirement of the paramedical sciences and the latest technological advancement. At present 122 students are perusing their Bachelor of Medical Laboratory Technology in this department. The department is equipped with state of the art laboratories for hands on training of the students. The in-clinical training and sandwich hospital training is the part of the curriculum. Some of the faculties of the department are pathology experts with adequate clinical experience. With the sound class room knowledge and adequate practical and clinical knowledge the students confidently contributing in the hospitals sector.

Vision:

AKS University aims to be a top ranking center of Excellence in Health Science Education, Health Care and Research

Mission:

M-1:

Students graduating from the Institute will have the required skills to deliver the quality health care to all the sections of the society with compassion and benevolence, without prejudice or discrimination at an affordable cost

M-2:

As a Research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain highest ethical standard

M-3: Inculcate technical competence and collective discipline in students to excel for physiotherapy field, hospital industry and society

M-4: Establish focus research groups in leading areas of PARAMEDICAL SCIENCES for optimization of thermal and electrical energy in cement manufacture and environmental needs.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO -01: Systematic, extensive and coherent knowledge and skill in Pathology Laboratory and its applications including critical understanding of established theories, principles and concepts, knowledge of advanced and emerging issues in Laboratory, skills in Medical microbiology. Pathology, Biochemistry and recent advances and research in Pathological evaluation and diagnosis procedures.

PEO-02: Comprehensive information about clinical Investigation, Laboratory equipment, advance learning material, skills and techniques

POE 03: Skill in collecting quantitative and qualitative data, analysis and interpretation of data using appropriate methodology and communicating results to scientific community and beneficiaries for formulating appropriate evidence based health care solutions.

PEO 04: Address self-learning needs related to current and emerging areas of study, use research and professional material, apply knowledge to new concepts and unfamiliar areas and seek solutions in real life situations

Program Outcomes (POs)

Bachelor of Medical Laboratory Technology Graduate will able to perform:

1. **Disciplinary knowledge:** The student must demonstrate comprehensive knowledge and understanding of curricular content that form the program**.** The student must demonstrate cognitive learning skills, ability to receive, interpret, remember, reproduce and use information in the cognitive, psychomotor, and affective domains of learning to solve problems, evaluate work, and generate new ways of processing or categorizing similar information listed in course objectives.

2. **Psychomotor Skills:** medical Laboratory students must demonstrate psychomotor skills of locomotors ability to access lecture halls, practical laboratory and clinics.

a. They must possess ability to move with reasonable swiftness in emergency situations to protect the patient (e.g. from falling).

b. They should be competent to perform clinical laboratory test such as blood CSF. Urine Pus and Sputum.

c. Students should be competent to perform risk assessment, safely and effectively guide, facilitate, inhibit, and resist movement and motor patterns through physical facilitation and inhibition techniques (including ability to give timely urgent verbal feedback), perform transfers, positioning, exercise, mobilization techniques and use assistive devices and perform cardiopulmonary resuscitation.

d. Students must possess fine motor skills to legibly record thoughts for written assignments (including diagrams) and tests, document evaluations, patient care notes, referrals, etc. in

standard medical charts in hospital/clinical settings in a timely manner and consistent with the acceptable norms of clinical settings and safely use electrotherapy modalities and fine mobilization techniques.

e. Students must possess visual acuity to read patient's treatment chart, observe demonstrations, visual training, receive visual information from patients, treatment environment and clues of treatment tolerance. Auditory acuity to distinguish between normal and abnormal sounds, engage in patients and conversation with retrieve meaningful information relevant to patient care.

3. Communication skills: The student must be able to express thoughts and ideas effectively in writing and verbally, communicate with others using appropriate media, share views, demonstrate ability to listen carefully, write analytically, present complex information in a clear, and concise manner. Student must be able to effectively communicate information and safety concerns with other students, teachers, patients, peers, staff and personnel by asking questions, giving information, explaining conditions and procedures, or teaching home programs. They should be able to receive and send verbal communication in life threatening situations in a timely manner within the acceptable norms of clinical settings. Medical Laboratory education presents exceptional challenges in the volume and breadth of required reading and the necessity to impart information to others. Students must be able to communicate quickly, effectively and efficiently in oral and written English with all members of the health care team.

4. Critical thinking: Student should be able to apply analytical thought to a body of knowledge, analyze based on empirical evidence, draw relevant assumptions or implications, formulate arguments, critically evaluate policies and theoretical framework and formulate a scientific approach to knowledge development. They should be able to identify structural and functional, identify contextual factors influencing function, critically appraise treatment options and implement care that is socio-culturally relevant to each patient. .

5. Problem Solving: Students must demonstrate capacity to extrapolate theoretical knowledge and apply competencies gained to solve non- familiar problems and real life situations.

6. Analytical reasoning: To a certain extent, students should be able to evaluate reliability and relevance of evidence, synthesize data, draw valid conclusions and support them with evidence

7. Research – Related Skills: Students should be able to define research problem, formulate hypothesis, manage resources, analyze and interpret data, explore cause – effect relationships, plan and execute a report, present results of the experiment and demonstrate a sense of scientific enquiry, reflective thinking, self-directed learning and creativity.

8. Co-operation /Team Work: Students should demonstrate the ability to work effectively and respectfully with a multi-disciplinary team, facilitate co-operative and coordinated effort for the common cause in various clinical settings.

9. Socio-cultural and multicultural competency: Knowledge of socio-cultural values, attitudes and beliefs relevant to a particular society, nation and global perspectives must be present to effectively engage and identify with diverse groups.

10. Awareness of moral, ethical and legal issues: Students must demonstrate moral /ethical values in conduct, awareness of ethical issues related to patient care, work practices, refraining from malpractice, unethical Behavior, falsification, plagiarism, misinterpretation of data, non-adherence to intellectual property rights, adhering to truthful, unbiased actions in all aspects of

work without discrimination based on age, race, gender, sexual preference, disease, mental status, lifestyle, opinions or personal values.

11. Leadership qualities: Students must demonstrate ability for task allocation, organization of task elements, setting direction, formulating an inspiring vision, team building, to achieve a vision, engaging, knowledge and respect individual values and opinions in order to foster harmonious working relationships with colleagues, peers, and patients.

12. Ongoing Learning: Students must demonstrate ability to acquire knowledge and skills through ongoing learning, participation in continuous education programs, engaging in self-paced, self- directed learning aimed at personal development, meeting social and cultural objectives, skill development, adapting to changing environment and workplace requirements and challenges.

Program Specific Outcomes (PSOs)

On completion of Bachelor of Medical laboratory technology Program, the students will achieve the following program specific outcomes:-

PSO- 1: Aquire assess apply and integrate new knowledge learn to adapt to changing circumstances and ensures that patient receives the highest level of professional care .

PSO-2: Ability to understand the day to plant operational problems of cement manufacture and provide economical solution to enhance the production without compromising quality of cement.

PSO-3: Ability to understand the latest cement manufacturing technology and it application in conservation of electrical and thermal energy in Portland cement manufacture.

PSO-4 : Ability to use the research based innovative knowledge for sustainable development in cement manufacture.

Consistency/Mapping of PEOs with Mission of the Department

PEO	M1	M2	M3	M4
PEO-1	3	2	3	2
PEO-2	2	2	2	3
PEO-3	2	3	2	1
PEO-4	2	2	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-": No correlation

General Course Structure & Theme

Lecture (L) per week	16 Hour
Practical (P) per week	8 Hour

Components of the Curriculum

(Program curriculum grouping based on course components)

Sl No	Course Component	% of total number of Hour of the Program	Total number of Hour
1.	Program Core Course (PCC)	100%	1820
	Total	100%	**1820**

General Course Structure and Credit Distribution

Curriculum of Bachelor of Medical laboratory Technology

Year –I		**Year – II**	
Course Title	Hours	Course Title	Hours
1. Basic Histology (Human Anatomy & Physiology)	4:2 = 6	**1.** Histology	4:2 = 6
2. Microbiology - I	4:2 = 6	**2.** Microbiology - II	4:2 = 6
3. Biochemistry - I	4:2 = 6	**3.** Biochemistry - II	4:2 = 6
4. Hematology-I	4:2 = 6	**4.** Hematology-II	4:2 = 6
Total Hour	**24**	**Total Hour**	**24**

Year–III	
Course Title	Hours
1. Applied Histopathology	4:2 = 6
2. Microbiology - II	4:2 = 6
3. Biochemistry - II	4:2 = 6
4. Hematology-II	4:2 = 6
5. Instrumentation	4:2 = 6
Total Hour	**30**

Major Research Project and Training Programme**:** major research project and training is compulsory for all 3rd Year students in a particular topic of management.

Course code and definition:

L	Lecture
P	Practical
PCC	Professional core courses

Course level coding scheme:

Two-digit number used as suffix with the Course Code for identifying the level of the course. Digit at ten's place signifies the year in which course is offered. e.g.

01, 02 … etc. for first year.

21, 22…. Etc. for second year.

31, 32 … for third year.

Category-wise Courses

Program Core Course (PCC)

Number of Program Core Course (PCC): 09, Hour: 38

Sl.	Code No.	Subject	Year	Total Hour
1.	**124BML01**	Basic histology (Human Anatomy & Physiology)	1	140
2.	**124BML02**	Microbiology - I	1	140
3.	**124BML03**	Biochemistry - I	1	140
4.	**124BML04**	Hematology- I	1	140
5.	**124BML21**	Histology	2	140
6.	**124BML22**	Microbiology- II	2	140
7.	**124BML23**	Biochemistry-II	2	140
8.	**124BML24**	Hematology- II	2	140
9.	**124BML31**	Applied Histopathology	3	140
10.	**124BML32**	Microbiology-III	3	140
11.	**124BML33**	Biochemistry- III	3	140
12.	**124BML34**	Hematology- III	3	140
13.	**124BML35**	Instrumentation	3	140
Total Hour:				**1820**

Induction Program

Induction program for students to be offered right at the start of the first year. It is mandatory. AKS University has designed an induction program for 1st year student, details are below:

i. Physical activity
ii. Creative Arts
iii. Universal Human Values
iv. Literary
v. Proficiency Modules
vi. Lectures by Eminent speakers
vii. Visits to local Areas
viii. Familiarization to Dept./Branch & Innovations

Mandatory Visits/ Workshop/Expert Lectures:

i. It is mandatory to arrange one industrial visit every semester for the students.

ii. It is mandatory to conduct a One-week workshop during the winter break after third year on professional/ hospital/ entrepreneurial orientation.

iii. It is mandatory to organize at least one expert lecture per year for each branch by expert resource persons from Medical College.

Evaluation Scheme:

1. For Theory Courses:
i. The weightage of Internal assessment is 50% and
ii. Final exams is 50%
The student has to obtain at least 50% marks individually both in internal assessment and Final exams to pass.

2. For Practical Courses:
i. The weightage of Internal assessment is 50% and
ii. Final exams Exam is 50%
The student has to obtain at least 40% marks individually both in internal assessment and Final exams to pass.

Year wise Course Structure

Year wise Brief of total Credits and Teaching Hours

Year	L	P	Total Hours Per Week	Total Hours
Year –I	**16**	**8**	**22**	**27**
Year –II	**16**	**8**	**22**	**24**
Year –III	**16**	**8**	**22**	**25**
Total	**48**	**24**	**66**	**105**

Details of Year Wise Course Structure

Year – I

SN	Category	Code	Course Title	L	P	Total Hour
1	**PCC**	**124BML01**	Basic histology (Human Anatomy & Physiology)	**4**	**2**	**6**
2	**PCC**	**124BML02**	Microbiology - I	**4**	**2**	**6**
3	**PCC**	**124BML03**	Biochemistry - I	**4**	**2**	**6**
4	**PCC**	**124BML04**	Hematology- I	**4**	**2**	**6**
Total				**16**	**8**	**24**

N.B.-Internal Assessment marks will be added in theory marks; candidate have to get min. 50% marks i.e.-100 marks in theory and internal assessment collectively for passing the examination and in practical he/she should get 50% marks i.e.-50 marks to get pass.

Year – II

SN	Category	Code	Course Title	L	P	Total Hour
1	**PCC**	**124BML21**	Histology	**4**	**2**	**6**
2	**PCC**	**124BML22**	Microbiology - II	**4**	**2**	**6**
3	**PCC**	**124BML23**	Biochemistry - II	**4**	**2**	**6**
4	**PCC**	**124BML24**	Hematology- II	**4**	**2**	**6**
Total				**16**	**8**	**24**

N.B.-Internal Assessment marks will be added in theory marks; candidate have to get min. 50% marks i.e.-100 marks in theory and internal assessment collectively for passing the examination and in practical he/she should get 50% marks i.e.-50 marks to get pass.

Year – III

SN	Category	Code	Course Title	L	P	Total Hour
1	**PCC**	**124BML31**	Applied Histopathology	**4**	**2**	**6**
2	**PCC**	**124BML32**	Microbiology-III	**4**	**2**	**6**
3	**PCC**	**124BML33**	Biochemistry- III	**4**	**2**	**6**
4	**PCC**	**124BML34**	Hematology- III	**4**	**2**	**6**
5	**PCC**	**124BML35**	Instrumentation	**4**	**2**	**6**
Total				**20**	**10**	**30**

N.B.-Internal Assessment marks will be added in theory marks; candidate have to get min. 50% marks i.e.-100 marks in theory and internal assessment collectively for passing the examination and in practical he/she should get 50% marks i.e.-50 marks to get pass.

BMLT I YEAR

Year-I

Course Code: 124BML01

Course Title: Basic Histology (Human Anatomy and Physiology)

Pre- requisite: Student should have basic knowledge Of human body structure and location.

Rationale: The students studying Anatomy and physiology work together to define how the human body operates by explaining the function and structure of the many components This course provides a comprehensive view of the major body regions and systems and explores how they interact to maintain homeostasis and enable survival.

Course Outcomes:

124BML01.1: Basic Histology (Anatomy & Physiology) Total No. of teaching

124BML01.2: Respiratory system, Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure

124BML01.3: Urinary system, Male genital system, Female genital system.

124BML01.4: Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.

124BML01.5: Fundamentals of applied histology.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BML01	Basic Histology (Human Anatomy and Physiology)	4	2	2	1	(4+2+2+1)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, a n d different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BML01	Basic Histology (Human Anatomy & Physiology)	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML01.1; Find how to extend the basic concepts of Basic Histology (Anatomy & Physiology)

Approximate Hours

Item	Hrs.
Cl	20
LI	04
SW	04
SL	02
Total	30

Session Out comes (SOs)	Laboratory Instruction(LI)	Classroom Instruction(CI)	Self Learning(SL)
SO1.1 Understand The anatomic and physiological terminology and basic medical science **SO1.2** read and understand Cell and function **SO1.3** understand bones, joints, and muscles **SO1.4** understand Body fluids **SO1.5** understands about. Blood.	1. demonstration of Skeletal system, bones 2. demonstration of Skeletal system, bones 3. join, Muscles (demonstration only) 4. join, Muscles (demonstration only)	**Unite: 1 Basic Histology (Anatomy & Physiology)** 1.1 The anatomic and physiological organization of human body and integrated physiology. 1.2 The anatomic and physiological organization of human body and integrated physiology. 1.3 The anatomic and physiological organization of human body and integrated physiology. 1.4 The anatomic and physiological organization of human body and integrated physiology. 1.5 The anatomic and physiological organization of human body and integrated physiology. 1.6 The anatomic and physiological organization of human body and integrated physiology. 1.7 Cell organization and function. 1.8 Cell organization and function. 1.9 Cell organization and function. 1.10 Cell organization and function. 1.11 Cell organization and function. 1.12 Cell organization and function. 1.13 Cell organization and function. 1.14 Skeletal system, bones, joints, and muscles. 1.15 Skeletal system, bones, joints, and muscles. 1.16 Skeletal system, bones, joints, and muscles. 1.17 Body fluids and their significance. 1.18 Body fluids and their significance. 1.19 Blood morphology, chemistry and function. 1.20 Blood morphology, chemistry and function.	1. Learn the key points about cells 2.Learn about tissues

SW-1 Suggested Sectional Work (SW):

Assignments:

Cell organization

Mini Project:

Skeletal system

Other Activities (Specify):

Poster presentation on skeletal system

124BML01.2 Apply concepts in Respiratory system, Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure.

Approximate Hours

Item	Hrs.
Cl	11
LI	03
SW	04
SL	02
Total	20

Session Out comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO2.1 To Understand Respiratory system **SO2.2** To learn about lungs volume **SO2.3** learn and understand the liver and its use **SO2.4** learn about cardiovascular system **SO2.5** understand about cardiac output	1.Spirometey to measure various lung capacities & volumes, Respiratory rate, tidal volume, 2. VC, timed VC, IRV, IC, ERV, EC on Spirometery 3.(demonstration only) Spirometry : Lung volumes and capacities.	**Unit-2 Respiratory system ,Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption ,Liver structure** 2.1.0 Regulation of respiratory activity, non-chemical influences on respiratory activity 2.2Functional anatomy of Respiratory System , Physiological anatomy of lungs, mechanics of respiration 2.3General introduction of cardiovascular systems 2.4Structure and properties of Cardiac muscle 2.5Cardiac cycle and Heart sou Mechanical events of Cardiac c Cardiac output, its regulation 2.6Venous return, 2.7 Heart rate and its regulatio 2.8 Structure and organization vascular tree 2.9 Digestion & absorption of nutrients 2.10Functions of Liver 2.11.Liver structure	1.digestion & absorption of nutrients 2.anatomy of liver

SW-1 Suggested Sectional Work (SW):
Assignments:
Heart and blood circulation
Mini Project:
Anatomy of lung
Other Activities (Specify):

124BML01.3 Learn the concepts of Urinary system, Male genital system, Female genital system.

Approximate Hours.

Item	Hrs.
Cl	20
LI	02
SW	03
SL	01
Total	26

Session Out comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
SO3.1 To Understand anatomy of renal system **SO3.2** To learn about GFR **SO3. 3**To learn about reproductive system. **SO3.4** Menstruation cycle **SO3.5** description about reproductive organ	**1**.. practical all biomechanical modalities **2.** Posture and analysis of posture.	**Unit-3 Urinary system, Male genital system, Female genital system.** 3.1 Functions of Kidney , Formation of Urine , Glomerular filtration rate, clearance, Tubular function 3.2 Functions of Kidney , Formation of Urine , Glomerular filtration rate, clearance, Tubular function 3.3 Functions of Kidney , Formation of Urine , Glomerular filtration rate, clearance, Tubular function 3.4 Water excretion 3.5 urine filtration stages. 3.6 urine filtration stages. 3.7 urine filtration stages. 3.8 Male & female reproductive system 3.9 Male & female reproductive system 3.10 Male & female reproductive system 3.11 Male & female reproductive system 3.12 Male & female reproductive system 3.13 Spermatogenesis, Functions of Testosterone. 3.14 Spermatogenesis, Functions of Testosterone. 3.15 Spermatogenesis, Functions of Testosterone. 3.16 Spermatogenesis, Functions of Testosterone. 3.17 Ovarian and Menstrual Cycle and their hormonal control. 3.18 Ovarian and Menstrual Cycle and their hormonal control.	1. Spermatogenesis, Functions of Testosterone.

		3.19 Ovarian and Menstrual Cycle and their hormonal control. 3.20 Hormones of Ovary and their functions.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Menstruations cycle

Mini Project:

Spermatogenesis

Other Activities (Specify):

Poster presentation on urine filtration

124BML01.4: Recall the concepts of Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.

Approximate Hours.

Item	Hrs.
Cl	20
LI	00
SW	04
SL	02
Total	26

Session Out comes (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO4.1 To Understand Nervous system **SO4.2** To learn about functions of spleen and lymph nodes **SO4.3** To learn about special senses **SO4.4** Application of anatomy of Ascending tracts of the Spinal cord and effects of their lesions. **SO4.5** Analysis of anatomy and Functions Autonomic nervous system & Hypothalamus.		Unit 4 **Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.** 4.1 Organization of Nervous system. Neuron and Neuralgia 4.2 Organization of Nervous system. Neuron and Neuralgia 4.3 Organization of Nervous system. Neuron and Neuralgia 4.4 Synapse: Properties and Synaptic transmission. Reflex arc, its components, properties, type and neurological impairments. 4.5 Synapse: Properties and Synaptic transmission. Reflex arc, its components, properties, type and neurological impairments. 4.6 Synapse: Properties and Synaptic transmission. Reflex arc, its components, properties, type and neurological impairments. 4.7 Synapse: Properties and Synaptic transmission. Reflex arc, its components, properties, type and neurological impairments. 4.8 General sensations and their properties. 4.4 Ascending tracts of th Spinal cord and effects of their lesion 4.9 General sensations and their properties. 4.4 Ascending tracts of th Spinal cord and effects of their lesion 4.10 General sensations and their properties. 4.4 Ascending tracts of th Spinal cord and effects of their lesion 4.11General sensations and their properties. 4.4 Ascending tracts of th Spinal cord and effects of their lesion	1.General sensations 2. Control of Voluntary movement

		4.12 function of spleen 4.13 structure and function of lymph nodes 4.14 structure and function of lymph nodes 4.15 structure and function of lymph nodes 4.16 structure and function of lymph nodes 4.17 Functions and hypo & hyper secretion of hormones of a. Pituitary b. Thyroid c. Parathyroid d. Adrenal e. Endocrine part of pancreas. 4.18 Functions and hypo & hyper secretion of hormones of a. Pituitary b. Thyroid c. Parathyroid d. Adrenal e. Endocrine part of pancreas. 4.19 Functions and hypo & hyper secretion of hormones of a. Pituitary b. Thyroid c. Parathyroid d. Adrenal e. Endocrine part of pancreas. 4.20 Functions and hypo & hyper secretion of hormones of a. Pituitary b. Thyroid c. Parathyroid d. Adrenal e. Endocrine part of pancreas.	

SW-1 Suggested Sectional Work (SW):
Assignments:
Brain structure
Mini Project:
Cranial nerve
Other Activities (Specify):
Poster on lymph vessels of body

124BML01.5: Relate the basic idea of Fundamentals of applied histology.

Approximate Hours

Item	Hrs
Cl	20
LI	04
SW	04
SL	02
Total	38

Session Out comes (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction(CI)**	**Self Learning (SL)**
SO5.1 To Understand THE TISSUE **SO5.2** To learn about laboratory functions **SO5.3** To learn about process of laboratory histological test **SO5.4** learns about basic of cytology. **SO5.5** to understand Collection processing and staining of the Cytologic specimen	1. Microtome knives and knife sharpening. 2. Practical section cutting, cutting faults and remedies. 3. Routine staining procedures, mounting and mounting media. 4 .Collection processing and staining of the Cytologic specimen	**Unit-5 Introduction to histopathology and laboratory organization. Laboratory equipment, uses and maintenance.** 5.1 Laboratory hazards and safety precautions. 5.2 Laboratory hazards and safety precautions. 5.3 Laboratory hazards and safety precautions. 5.4 Compound microscope - optical system, magnification and maintenance.. Reception, recording and labeling of histology specimens. 5.5 Compound microscope - optical system, magnification and maintenance.. Reception, recording and labeling of histology specimens. 5.6 Compound microscope - optical system, magnification and maintenance.. Reception, recording and labeling of histology specimens. 5.7 Fixation and various fixatives. 5.8 Processing of histological tissues for paraffin bedding. 5.9Processing of histological tissues for paraffin bedding. 5.10 Processing of histological tissues for paraffin bedding. 5.11 Processing of histological tissues for paraffin bedding. 5.12 Embedding and embedding media. Decalcification various types, there. Micro tomes various types, there working principle and maintenance. 5.12 Embedding and embedding media. Decalcification various types, there. Micro tomes various types, there working principle and maintenance. 5.113 Embedding and embedding media. Decalcification various types, there.	1. Laboratory precautions 2. 2 Stain composition

		Micro tomes various types, there working principle and maintenance. 5.14 Dye chemistry, theory and practice of staining. Solvents, mordents, accelerators and accentuates. 5.15 Dye chemistry, theory and practice of staining. Solvents, mordents, accelerators and accentuates. 5.16 Dye chemistry, theory and practice of staining. Solvents, mordents, accelerators and accentuates. 5.17 Uses of controls in various staining procedures. 5.18 CYTOLOGY LECTURES: Introduction to exfoliative cytology with special emphasis on female genital tract. Collection processing and staining of the Cytologic specimen 5.19 CYTOLOGY LECTURES: Introduction to exfoliative cytology with special emphasis on female genital tract. Collection processing and staining of the Cytologic specimen 5.20 CYTOLOGY LECTURES: Introduction to exfoliative cytology with special emphasis on female genital tract. Collection processing and staining of the Cytologic specimen	

SW-1 Suggested Sectional Work (SW):
Assignments:
Tissue processing
Mini Project:
Microtomes
Other Activities (Specify):
Poster presentation on tissue processing

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML01.1 Find how to extend the basic concepts of Basic Histology (Anatomy & Physiology.	20	04	04	02	30
124BML01.2 Apply concepts in Respiratory system, Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure.	11	03	04	02	20
124BML01.3 Learn the concepts of Urinary system, Male genital system, Female genital system.	20	02	03	01	26
124BML01.4 Recall the concepts of Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.	20	00	04	02	26
124BML01.5 Relate the basic idea of Fundamentals of applied histology.	20	04	04	02	30
Total Hours	91	13	19	09	132

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the basic concepts of Basic Histology (Anatomy & Physiology.					
CO-2	Apply concepts in Respiratory system, Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure.					
CO-3	Learn the concepts of Urinary system, Male genital system, Female genital system.					
CO-4	Recall the concepts of Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.					
CO-5	Relate the basic idea of Fundamentals of applied histology.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Visit to Hospital
5. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Human Anatomy	Chaurasia, B D	Regional and CBS, New Delhi	2009
2	Fundamentals of Medical Physiology	A. P. Krishna	IP Innovative Publication Pvt. Ltd.	First Edition (27 June 2021)
3	Essentials of Human Anatomy	Datta, A.K.	Neuroanatomy Current Book, Calcutta	First Edition
4	Bancroft's Theory and Practice of Histological Techniques	Kim S Suvarna MBBS BSc FRCP FRCPath Christopher Layton PhD	Elsevier; 8th edition	(22 June 2018)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML01
Course title: Basic Histology (Human Anatomy and physiology)

Course outcomes	Program outcomes												Program specific outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3	PSO4
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the basic concepts of Basic Histology (Anatomy & Physiology.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**
CO2: Apply concepts in Respiratory system, Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Urinary system, Male genital system, Female genital system.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Relate the basic idea of Fundamentals of applied histology.	**2**	**1**	**2**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends: 1- Low, 2- Medium, 3- High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO1**: Find how to extend the basic concepts of Basic Histology (Anatomy & Physiology.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	04	**UNIT 1:-**Basic Histology (Anatomy & Physiology**)** 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20	02
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO2:** Apply concepts in Respiratory system, Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	03	**Unit-2 Respiratory** system , Cardiovascular system viii) Alimentary system, mechanism and physiology of digestion and absorption, Liver structure. 1,2,3,4,5,6,7,8,9,10,11	02
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO3:** Learn the concepts of Urinary system, Male genital system, Female genital system.m	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	02	**Unit-3** Urinary system, Male genital system, Female genital system. 1,2,3,4,5,6,7,8/,9,10,11,12,13,14,15,16,17,18,19,20	01
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO4:** Recall the concepts of Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	00	**Unit 4** Nervous system, Spleen, lymph node and R.E. system, Endocrine glands and their functions. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20	02
PO: 1,2,3,4,5,6,7,8,9,1,11,12 PSO 1,2, 3, 4,	**CO5:** Relate the basic idea of Fundamentals of applied histology.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	04	**Unit-5** Introduction to histopathology and laboratory organization. Laboratory equipment, uses and maintenance. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20	02

Year-I

Course Code: 124BML02

Course Title: Microbiology- I

Pre- requisite: Student should have basic knowledge history and general microbiology.

Rationale: The students studying Viruses, bacteria, fungi, and parasites are some of these microbes. Microbiology in medicine is significant for a number of reasons. Microbiologists are able to recognise, isolate, diagnose, and prevent harmful bacteria due to their expertise in medical microbiology.

Course Outcomes:

124BML02.1To understands introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.

124BML02.2 Acquire Knowledge regarding antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.

124BML02.3 Acquire Knowledge of sample processing and transportation, laboratory organization management result and quality control of Microbiology.

124BML02.4 Acquire Knowledge of virus and its classification collection transportation processing and diagnosis of viral sample.

124BML02.5 Acquire Knowledge of virus Parasite E. Histolytica, G. Lambila. M.parasite, A. Lumb., T. Vaganilis, E. Vericularis, Ancylostoma, Stronglyoides, diagnosis.

Scheme of Studies

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BML02	Microbiology- I	4	2	1	1	(4+2+1+1)	8

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BML02	Microbiology- I	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML02.1 Find how to extend the introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.

Approximate Hours.

Item	Hrs.
Cl	15
LI	05
SW	03
SL	04
Total	27

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand introduction and history of microbiology. **SO1.2** Understand the instruments handling **SO1.3**Analysis of bacterial growth and their morphology. **SO1.4**Analysis of microscope with their parts. **SO1.5**Applicationof Microorganism.	**1.** Introduction to use different instrument ad their safety. **2.** Sterilization technique. **3.** Handling various microscopes. **4.** Gram staining **5.** AFB Staining	**Unite 1:-introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.** 1.1 Introduction microbiology 1.2 brief history of microbiology, 1.3 Safety measures in microbiology 1.4.1 General characteristics classification of bacteria and fungi. 1.4.2 General characteristics classification of bacteria and fungi. 1.4.3 General characteristics classification of bacteria and fungi. 1.5.1 Growth and nutrition of microbes. 1.5.2 Growth and nutrition of microbes 1.6 Care and maintenance of laboratory equipments. 1.7.1 Care and handling of various microscopes – binocular, DGI, phase – contrast, fluorescence and electron microscopes. 1.7.2 Care and handling of various microscopes – binocular, DGI, phase – contrast, fluorescence and electron microscopes. 1.7.3 Care and handling of various microscopes – binocular, DGI, phase – contrast, fluorescence and electron microscopes	**1.**Bacterial cell **2.** Fungi **3.** Autoclave **4.** Hot air oven

		1.5.1 Principles and methods of sterilization. 1.5.2 Principles and methods of sterilization.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Microscope and its part.

Mini Project:

History of Microbiology

Other Activities (Specify):

Handling of Light microscope

124BML02.2 Acquire Knowledge regarding antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.

Approximate Hours.

Item	Hrs
Cl	15
LI	06
SW	03
SL	03
Total	27

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand about disinfectant and antiseptic. **SO1.2** Understand preparation of culture media. **SO1.3**Analysis of bacterial growth n culture media. **SO1.4**Analysis of antigen antibody reaction. **SO1.5**Application antibiotic sensitivity test.	**1.** To prepare following culture media. **2.** Various serological tests. **3.** VDLR, **4.** RA, **5.** ASO, **6.** Widal test.	**Unite 2:- Acquire Knowledge regarding antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.** 2.1.1Uses and mode of action of antiseptics and disinfectants. 2.1.2Uses and mode of action of antiseptics and disinfectants. 2.2.1Handling and cleaning of glassware apparatus. Decontamination and disposal of contaminated material. 2.2.2Handling and cleaning of glassware apparatus. Decontamination and disposal of contaminated material. 2.3. Preparation, uses and standardization of culture media. 2.4.1 Principles of staining methods and preparation of reagents. 2.4.2 Principles of staining methods and preparation of reagents. 2.5.1Aerobic and anaerobic culture methods. 2.5.2Aerobic and anaerobic culture methods. 2.6.1 General characters and nature of antigens and antibodies. 2.6.2 General characters and nature of antigens and antibodies. 2.6.3 General characters and nature of antigens and antibodies. 2.6.4 General characters and nature of	**1.**Antigen **2.** handling of glassware **3.** Hot Air Oven

		antigens and antibodies. 2.7.1 Principles of Antigen Antibody reactions. 2.7.2 Principles of Antigen Antibody reactions.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Autoclave and hot air oven.

Mini Project:

Nutrient agar media.

Other Activities (Specify):

Preparation of media

124BML02.3 Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.

Approximate Hours.

Item	Hrs.
Cl	15
LI	08
SW	02
SL	02
Total	27

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Sample collection of microbiology. **SO1.2** Understand transportation of sample. **SO1.3**Analysis of processing of microbiological sample. **SO1.4**Analysis of antibiotic test on bacterial sample. **SO1.5**Application of result and quality control.	**1.** To prepare MHA culture media. **2.** Culture technique 3. Streaking technique. 4. Stroke culture 5. Stab culture 6. Lawn culture 7.Anaerobic culture technique **8.** ABST Test. Gram negative profile Gram positive profile	**Unite 3:- Acquire Knowledge of sample processing and transportation, laboratory organization management result and quality control of Microbiology** 3.1.1Collection, transportation and processing of clinical samples for microbiology investigations. 3.1.2Collection, transportation and processing of clinical samples for microbiology investigations. 3.1.3Collection, transportation and processing of clinical samples for microbiology investigations. 3.1.4Collection, transportation and processing of clinical samples for microbiology investigations. 3.2.1Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi. 3.2.2Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi. 3.2.3 Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi. 3.2.4Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi. 3.2.5Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi. 3.2.6Principles and mode of action of antibiotics and chemotherapeutic agents for bacteria and fungi 3.2.7 Principles and mode of action of antibiotics and chemotherapeutic	**1.** Laboratory organization. **2.** Quality control of microbiology lab.

		agents for bacteria and fungi 3.3.1 Care and handling of laboratory animals. 3.3.2 Care and handling of laboratory animals. 3.4.1 Laboratory organization, management, recording of results and quality control in microbiology. 3.4.2 Laboratory organization, management, recording of results and quality control in microbiology.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Care and handling of laboratory animal.

Mini Project:

Laboratory organization

Other Activities (Specify):

Check quality control in microbiology lab.

124BML02.4 Recall the concepts of virus and its classification collection transportation processing and diagnosis of viral sample.

Approximate Hours.

Item	Approx. Hrs
Cl	15
LI	04
SW	03
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about medical virology. **SO1.2** Understand collection transportation of viral sample. **SO1.3**Analysis of viral sample. **SO1.4**Analysis of diagnosis of viral sample. **SO1.5**Application of result and quality control.	**1.** Rapid kit method test of viral infected sample. **2.** Collection of viral sample. **3.** Transportation and processing of viral sample. 4. Demonstration of preservation of viruses, viral antigens, infected biological materials and viruses	**Unite 4:- Acquire Knowledge of virus and its classification collection transportation processing and diagnosis of viral sample.** 4.1.1 Introduction to Medical Virology. 4.1.2 Introduction to Medical Virology. 4.2.1 Nomenclature and classification of viruses. 4.2.2 Nomenclature and classification of viruses. 4.2.3 Nomenclature and classification of viruses. 4.2.4 Nomenclature and classification of viruses. 4.3.1General characteristics of viruses: physical, chemical and biological properties. 4.3.2General characteristics of viruses: physical, chemical and biological properties. 4.3.3General characteristics of viruses: physical, chemical and biological properties. 4.3.4 General characteristics of viruses: physical, chemical and biological properties. 4.3.5 General characteristics of viruses: physical, chemical and biological properties. 4.4.1Collection, transport, processing and storage of sample for viral	**1.** Properties of virus. **2.** Storage of sample.

		diagnosis. 4.4.2Collection, transport, processing and storage of sample for viral diagnosis. 4.4.3Collection, transport, processing and storage of sample for viral diagnosis. 4.4.4Collection, transport, processing and storage of sample for viral diagnosis.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Viral structure.

Mini Project:

Processing of viral sample

Other Activities (Specify):

Viral antigen

124BML02.5 Relate the basic idea of Parasite E. Histolytica, G. Lambila. M.parasite, A. Lumb., T. Vaganilis, E. Vericularis, Ancylostoma, Stronglyoides, diagnosis.

Approximate Hours.

Item	Hrs
Cl	16
LI	06
SW	04
SL	03
Total	29

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand about Parasite. **SO1.2** Understand different parasite. **SO1.3**Analysis of parasitic infection of human body. **SO1.4**Analysis of diagnosis of parasite in different sample. **SO1.5**Application of investigate of morphology of parasite.	**1.** Macroscopic examination of adult worms, cysts, tissues, and processing of stood sample for routine examination. **2.** Introduction to operation of laboratory instruments and safety precautions **3.** Saline and I2 preparation for protozoa cysts and trophozoites. **4.** Concentration procedures for protozoa cysts and trophoziotes. **5.** Concentration procedures for helminthic ova and cyst. **6.** Examination and identification of ova and cyst of parasites of medical importance	**Unite 5:- Acquire Knowledge of virus Parasite E. Histolytica, G. Lambila. M.parasite, A. Lumb., T. Vaganilis, E. Vericularis, Ancylostoma, Stronglyoides, diagnosis.** 5.1Introduction to medical and safety. 5.2 General characters and classification of protozoa. 5.3 Laboratory procedure collections, preservation and processing of sample for parasites stool/blood/fluids/tissue/biopsy. 5.4 Morphology and life cycles of intestinal protocol, Amoeba-Giardia. Laboratory diagnosis of intestinal protozoa infection: - 5.5 Amoeba-Giardia. Morphology and diagnosis of oral of – trichomonas vaginal flagellates – E. Gingivalia. 5.6.1 Morphology and life cycle of Haemopro- malaria protozoa-parasite. 5.6.2 Morphology and life cycle of Haemopro- malaria protozoa-parasite. 5.6.3 Morphology and life cycle of Haemopro- malaria protozoa-parasite 5.7 Laboratory diagnosis of malarial infection. 5.8 General characters and classification of medical helminthology. 5.9.1Morphology and life cycles of Nematodes (Intestinal), - Ascaris, Enterobious, - ancylostoma, - Strongyloides.	**1.** E. Hisolytica **2.** Malaria parasite. **3.** G. Lambila

		5.9.2Morphology and life cycles of Nematodes (Intestinal), - Ascaris, Enterobious, - ancylostoma, - Strongyloides. 5.9.3Morphology and life cycles of Nematodes (Intestinal), - Ascaris, Enterobious, - ancylostoma, - Strongyloides. 5.9.4 Morphology and life cycles of Nematodes (Intestinal), - Ascaris, Enterobious, - ancylostoma, - Strongyloides. 5.9.5 Morphology and life cycles of Nematodes (Intestinal), - Ascaris, Enterobious, - ancylostoma, - Strongyloides. 5.10. Laboratory diagnosis of intestinal Nematode infection	

SW-1 Suggested Sectional Work (SW):

Assignments:

M.Parasite.

Mini Project:

E. Histolytica

Other Activities (Specify):

Differentiateadultandlarvaform.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML02.1 Find how to extend the introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.	15	05	03	04	27
124BML02.2 Apply concepts in antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.	15	06	03	03	27
124BML02.3 Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.	15	08	02	02	27
124BML02.4 Recall the concepts of virus classification collection transportation processing and diagnosis of viral sample	15	04	03	02	24
124BML02.5 Relate the basic idea of ParasiteE.Histolytica,G.Lambil a. M. parasite, A. Lumb., T.Vaganilis,E.Vericularis,Anc ylostoma,Stronglyoides, diagnosis.	16	06	04	03	29
Total hour	76	29	15	14	126

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.					
CO-2	Apply concepts in antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.					
CO-3	Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.					
CO-4	Recall the concepts of virus classification collection transportation processing and diagnosis of viral sample					
CO-5	Relate the basic idea of ParasiteE.Histolytica,G.Lambila. M. parasite, A. Lumb., T.Vaganilis,E.Vericularis,Ancylostoma,Stronglyoides, diagnosis.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Visit to Hospital
5. Demonstration

Suggested Learning Resources:

(b) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Essentials of Medical Microbiology	Apurba S Sastry, Sandhya Bhat	Jaypee Brothers Medical Publishers Pvt. Limited, 2021	2021
2	Essentials of Medical Parasitology	Apurba S Sastry, Sandhya Bhat	Jaypee Brothers Medical Publishers;	Second edition (1 January 2018)
3	Practical Medical Microbiology for BMLT	Dr. Rajesh Bareja	IP Innovative Publication Pvt. Ltd.	First Edition, 2020
4	Text and Practical Microbiology For MLT	V Baveja C P Baveja	Arya Publishing Company	2 March 2022
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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2. Dr. Debjeet dutta Principal Department of paramedical science AKS University ,
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4. Mr. Ekalakurrhaman , Assistant Professor , Department of paramedical science
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6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML02
Course title: Microbiology - I

Course outcomes	Program outcomes												Program specific outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3	PSO4
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.	2	3	2	3	2	1	3	2	1	1	3	1	3	1	3	1
CO2: Apply concepts in antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.	1	1	2	2	1	2	3	2	1	1	2	2	2	2	2	1
CO3: Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.	2	2	1	1	2	2	2	1	2	1	2	1	1	2	2	2
CO4: Recall the concepts of virus classification collection transportation processing and diagnosis of viral sample	1	1	2	2	3	2	3	2	2	1	3	2	2	3	3	1
CO5: Relate the basic idea of ParasiteE.Histolytica,G.Lambila. M. parasite, A. Lumb., T.Vaganilis,E.Vericularis,Ancylostoma,Stronglyoides, diagnosis.	2	1	2	1	1	3	3	3	1	1	2	2	1	3	1	3

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	CO1: Find how to extend the introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	05	Unit 1:-introduction and history of microbiology, bacterial nutrition and growth, care ad handling of instrument and about sterilization. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	04
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	CO2: Apply concepts in antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	06	Unit 2:- Acquire Knowledge regarding antiseptic disinfectant, handling of glassware preparation of culture media, antigen antibody reaction. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	03
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	CO3: Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	08	Unit 3:- Acquire Knowledge of sample processing and transportation, laboratory organization management result and quality control of Microbiology 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	CO4: Recall the concepts of virus classification collection transportation processing and diagnosis of viral sample	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	04	Unit 4:- Acquire Knowledge of virus and its classification collection transportation processing and diagnosis of viral sample. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO: 1,2,3,4,5,6,7,8,9,1,11,12 PSO 1,2, 3, 4,	CO5: Relate the basic idea of Parasite E.Histolytica,G.Lambila. M. parasite, A. Lumb.,T.Vaganilis,E.Vericularis,Ancylostoma,Stronglyoides, diagnosis.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	06	Unit 5:- Acquire Knowledge of virus Parasite E. Histolytica, G. Lambila. M.parasite, A. Lumb., T. Vaganilis, E. Vericularis, Ancylostoma, Stronglyoides, diagnosis. 1,2,3,4,56,7,8,9,10,11,12,13,14,15,16	03

Course Code:	124BML03
Course Title:	Biochemistry- I
Pre- requisite:	Student should have basic knowledge Instruments ethics and reagent.
Rationale:	The students studying the study of body function, biochemistry has broadened our understanding of how biochemical changes relate to physiological alteration in the body. It helps us understand chemical aspect of biochemical process such as digestion, hormonal action and muscle contraction-relaxation.

Course Outcomes:

124BMLT03.1 To understands About Instructions Of Medical Laboratories. About Ethics and Etical Process in the Laboratories and Ethics Regaurding Lab Technologist.

124BMLT03.2 Cleaning and care of general laboratory glassware and equipment, preparation and storage of distilled water analytical balance, preparation of reagents and standard solutions, storage of chemicals .

124BMLT03.3 Collection and recording of biological specimens separation of serum plasma, preservation and disposal of biological samples material. Basic statistics (mean, SD, CV, normal distribution, probability).

124BMLT03.4 Urine analysis (qualitative) for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.

124BMLT03.5 Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BML03	Biochemistry- I	4	2	2	1	(4+2+2+1)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BML03	Biochemistry- I	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML03.1 Find how to extend the Instructions of Medical Laboratories. About Ethics and Ethical Process in the Laboratories and Ethics Regarding Lab Technologist.

Approximate Hours.

Item	Hrs.
Cl	08
LI	05
SW	01
SL	04
Total	18

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand About Instructions Of Medical Laboratories **SO1.2** Understand Ethics Of Medical Lab.Technologist. **SO1.3**Analysis Of Lab Safety Parameters And Ethicas Of Lab.Technologists As Well As Hazards and First Aids **SO1.4**Application To Avoid Accidents/Bio.And Phisical Hazards And What First Aid Will be Applicable in right Condition. **SO1.5**.Knowledge Of Psm To Apply In Relevent Hazardous Conditions.	1. About Instructions Of Medical Laboratories 2. About Ethics and Etical Process in The Laboratories and Ethics Regaurding Lab Technologists. **3.** About Lab Technologists Responsibility Towards Medical Lab as Well as Petients. **4.**About Safety Of Self, Laboratory ,Workers and Patients **5.**About Hazards/Accidents in the Laboratories and 6. Thair First Aid.	**3. Unit- 1:- To understands About Instructions of Medical Laboratories. About Ethics and Etical Process in The Laboratories and Ethics Regaurding Lab Technologist.** 1.1. Introduction to alltechnologies whom Is Required to Medical Labs 1.2. Introduction to medical technology 1.3 role of medical laboratory Technologists, 1.4 ethics , 1.5 responsibility, 1.6 safety measures 1.7 First aid 1.8 accidents/Hazards	**1.**Medicine Applied In Hazardous Or Accident Codition **2.**Chemical Hazards **3.** Phisical Hazards 4.Regaurding Deals and Problems which will be Comes In Ground Labells

SW-1 Suggested Sectional Work (SW):

Assignments:

Draw and explain About Physical Hazards, And How to Deal with these Problems.

Mini Project:

All Safety Measures And Ethics Which will Be Perform In The Lab.

124BMLT03.2 Apply concepts in Cleaning and care of general laboratory glassware and equipment, preparation and storage of distilled water analytical balance, preparation of reagents and standard solutions, storage of chemicals.

Approximate Hours.

Item	Hrs
Cl	21
LI	05
SW	07
SL	06
Total	39

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO2.1 Understand About Glasswares Which Is Used In Laboratories AndAnd How To Clean And Care. **SO2.2** Application Of Acid and Basic Solution In The Laboratory Testing. **SO2.3.**Understand How To Use And Handeling Equipments,And How To Use Analytic Balance. **SO2.4** Understand about Normal values and What Are the Factores Causeing Influencing And How To Determine And How To Short Out These Problems. **SO.2.5** What is The Principal,Process,Clinical Significance<normal Values Of chloride estimation. SO 2.6 How To Measure With The Help Of Volumetric Glasswares.	1 Preparation Of standard solutions 2. Preparation Of Acid solutions 3. Preparation Of Base solutions 4. How To Use Analytical balance 5. chloride estimation Test	Unit-2:- **Cleaning and care of general laboratory glassware and equipment, preparation and storage of distilled water analytical balance, preparation of reagents and standard solutions, storage of chemicals.** 2.1 Cleaning And Reagents Used For Cleaning. 2.2 Care of general laboratory glassware and equipment 2.3 Preparation and storage of distilled water 2.4 Analytical balance 2.5 Preparation of reagents 2.6 Preparation Of Standard solutions 2.7Storage of chemicals . 2.8 Units of measurement 2.9 S.I. Units 2.10 Measurement of volumetric apparatus 2.10.1 pipettes 2.10.2 flasks 2.10.3 cylinders 2.11 Calibration of volumetric apparatus. 2.12 Volumetric analysis 2.13 Preparation of standard acid 2.14 Preparation base solutions 2.15 chloride estimation. 2.16 Normal or Reference range. 2.17 Definition Of Normal Values 2.18 Influencing factors and determination.	1. Units of measurement, 2. S.I. Units, 3. Measurement of volumetric apparatus, (**pipettes, flasks, cylinders**) Calibration of volumetric apparatus 4. Normal or Reference range. 5. Definition, influencing factors, determination. 6. Distillation Plant

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw a Diagram Of Measurement of volumetric apparatus, **(**pipettes, flasks, cylinders**)**
2. Units of measurement,
3. S.I. Units,
4. Normal or Reference range

Mini Project:

Influencing factors and determination.

Other Activities (Specify):

Preparation of Acid And Base Solutions

124BMLT03.3 Learn the concepts of Collection and recording of biological specimens separation of serum plasma, preservation and disposal of biological samples material. Basic statistics (mean, SD, CV, normal distribution, probability).
Approximate Hours.

Item	Hrs.
Cl	13
LI	05
SW	04
SL	05
Total	27

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1. Analysis Laboratory diagnosis By The Help Of Serum And Plasma **SO1.2U**rological test for fungal infection **SO1.3** Application of Anticoagulants Use In Different Tests. **SO1.4** How To Apply Statistics For Quality Control And Quality Assurance For Calibration Of Medical Lab **SO1.5**UnderstandSerological test	1. Identification Of Sites Of Collection Of Blood And Urine. 4. Separate Serum And Plasma by Blood In The Lab. 3.Types Of Anticoagulants In The Lab 4.How To Apply Statistics In Diagnostics Test Results 5.Types Of Preservatives Seen In The Lab.	**Unite 3:- Collection and recording of biological specimens separation of serum plasma, preservation and disposal of biological samples material. Basic statistics (mean, SD, CV, normal distribution, probability).** 3.1 Collection Of Blood And Urine In The Medical Laboratory. 3.2Different Sites and Different Methods Used In Collection Of Body Fluids(Blood And Urine) 3.3 How To Separate Serum And Plasma by Blood In The Lab. 3.4 How To Preserve Blood By clotting 3.5Types Of Preservatives Used In The Labs. 3.6How To Dispose The Sample And When Dispose Biological Samples 3.7 Statistics Used In Diagnosis 3.8 Standard Deviation (SD) 3.9Mean 3.10Median 3.11 Coefficient Of Variation(CV) 3.12 Normal distribution 3.13.Probability	1. Laboratory organization. 2. Quality control of Biochemistry lab. 3.Complete Study Of Anticoagulants 4.Centrifugation Process 5. Different types Collection of Blood In Different Age Of Patients.

SW-1 Suggested Sectional Work (SW):
Assignments:
1. Draw A Diagram Of How To Perform Blood Collection.
2. How to Separate Serum And Plasma By Whole Blood
Mini Project:
Laboratory organization
Other Activities (Specify):
Check Quality control in biochemistry lab

124BMLT03.4 Recall the concepts of Urine analysis (qualitative) for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.
Approximate Hours.

Item	Hrs
Cl	07
LI	06
SW	06
SL	12
Total	31

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Analysis principle of serology techniqueuse in Urine analysis (qualitative) for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood **SO1.2.**Selection Of Best Method For The Diagnosis And Treatment. **SO1.3**Understand About Severity Of Deasese by The Imabalancing Of Phisiological And Biochemicaly **SO1.4**Knowledge Of Desease And Sign And Symptoms To Identify The Patients Disease. **SO1.5** Students Will Be Perform All The Tests Of Urine,With Ethical Mathod And Very Much Sound And Accurate To Do Test As Well As Know All Complications And Source Of Errors In Test With Quality Control And Quality Assurance.	1.Urine analysis Qualitative for sugar, 2. Urine analysis Qualitative for Proteins 3. Urine analysis Qualitative for Bile pigments 4. Urine analysis Qualitative for ketone bodies 5.Urine analysis Qualitative for porpholinogen 6. Urine analysis Qualitative for faecal of blood	**Unite 4- Urine analysis (qualitative) for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.** 4.1 Urine analysis 4.2Qualitative Test For Sugar 4.3 Qualitative Test For Proteins 4.4Qualitative Test For Bile Pigments, 4.5 Qualitative Test For Ketone bodies, 4.6 Qualitative Test For Porpholinogen 4.7 Qualitative Test For Fecal of blood	1Introduction To Urine 2. Formation Of Urine. 3.Renal Function 4.Components Present In Urine 5. Proteins Present In Urine 6. Bile Pigments Clinical Significance 7. Detailes Of Ketone bodies Study 8. Theory OfPorpholinogen And Desease Porphoria. 9. Theory Of Formation Of Faecal And Faecal of blood Present(Clinical Significance0 10. Physical And Chemical Methods Of Urine 11. Urine Random and Microscopic Examination. 12. Abnormal Cells Present in Urine

SW-1 Suggested Sectional Work (SW):
Assignments:
1. Abnormal Cell Components Present In The Urine.
2. Diagrammatical Representation Of Methods Of Ketone Body Examination.
3. Diagrammatical Representation Of Methods Of Porphobilinogen Examination.
4. Diagrammatical Representation Of Methods Of Sugar And Protein Examination

Mini Project:
1. All Complicated Cells In The Urine.

Other Activities (Specify):
1. Bile Salts

124BMLT03.5 Relate the basic idea of Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension.

Approximate Hours.

Item	Hrs
Cl	09
LI	05
SW	03
SL	04
Total	21

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Parasite. **SO1.2** Understand different Parameters Of Morality And Normality. **SO1.**Principal,Procedure To Prepare Buffer Solution **SO1.**Students Will Be Do Dialysis For Diagnosis **SO1.5**Knoledge of Pressures Exists In Our Bodies.	1. Prepairation Of Moler Solutions. 2.Prepairation Of 10N Solutions 3.Prepairation Of Buffer Solutions 4. How To Take pH, with The Help Of pH Meter And Methodology. 5.Prepairation Of 10M Solutions	**Unite 5 Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension.** 5.1Introduction To Radioisotopes. 5.2 Radioisotopes and their use in Biochemistry 5.3 Mole and Morality and Their Calculations. 5.4 Normality, Normal Solutions and Importance And Calculations. 5.5 pH and pH measurement And Their Equations And Derivations. 5.6 Buffer Solutions. 5.7 Osmosis And Osmotic Pressures. 5.8 Surface Tension. 5.9 Dialysis And Their Importance.	**1.** Medical,Clinical and Industrial Importance Of Radioisotopes. **2.** Knowledge Of Urea And Creatinine With Their Matabolic Pathways. **3.** Sodium-Potassium Pump 4.Quality Control In Dialysis Process

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw A Diagram Of Dialysis Machine.
2. Explain with Diagrammatically Osmotic and Osmosis pressure

Mini Project:

1. PH Meter

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML03.1 Find how to extend the Instructions of Medical Laboratories. About Ethics and Ethical Process in the Laboratories.	08	05	01	04	18
124BML03.2 Apply concepts in Cleaning and care of general laboratory glassware and equipment, preparation of reagents and standard solutions, storage of chemicals.	21	05	07	06	22
124BML03.3 Learn the concepts of Collection and recording of biological specimens separation of serum plasma, Basic statistics	13	05	04	05	27
124BML03.4 Recall the concepts of Urine analysis for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.	07	06	06	12	31
124BML03.5 Relate the basic idea of Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH measurement, Osmosis, dialysis.	09	05	03	04	21
Total hour	58	26	21	31	119

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the Instructions of Medical Laboratories. About Ethics and Ethical Process in the Laboratories.					
CO-2	Apply concepts in Cleaning and care of general laboratory glassware and equipment, preparation of reagents and standard solutions, storage of chemicals.					
CO-3	Learn the concepts of Collection and recording of biological specimens separation of serum plasma, Basic statistics					
CO-4	Recall the concepts of Urine analysis for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.					
CO-5	Relate the basic idea of Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH measurement, Osmosis, dialysis.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

6. Improved Lecture
7. Tutorial
8. Group Discussion
9. Visit to Hospital
10. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Biochemistry	Satyanarayana	Elsevier	6th edition 1 January 2021
2	Textbook of Biochemistry for Medical Students	DM Vasudevan , Sreekumari S, Kannan Vaidyanathan	Jaypee Brothers Medical Publishers;	10th edition (11 July 2023)
3	A Textbook on Biochemistry for Paramedical Students	Dr. Kiran Dahiya	IP Innovative Publication Pvt. Ltd.;	First Edition (6 September 2022)
4	Manual of Practical Biochemistry for MBBS	Dr. Anju Jain Dr. S.K. Gupta, Dr. Veena Singh Ghalaut	Arya Publishing Company	(1 January 2021)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML03
Course title: Biochemistry - I

Course outcomes	Program outcomes												Program specific outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3	PSO4
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be ableto demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the Instructions of Medical Laboratories. About Ethics and Ethical Process in the Laboratories.	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**
CO2: Apply concepts in Cleaning and care of general laboratory glassware and equipment, preparation of reagents and standard solutions, storage of chemicals.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Collection and recording of biological specimens separation of serum plasma, Basic statistics	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Urine analysis for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO5: Relate the basic idea of Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH measurement, Osmosis, dialysis.	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends: 1-Low, 2-Medium, 3-High

Course Curriculum Map

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO1**: : Find how to extend the Instructions of Medical Laboratories. About Ethics and Ethical Process in the Laboratories.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	05	**Unit- 1:-** To understands About Instructions of Medical Laboratories. About Ethics and Etical Process in The Laboratories and Ethics Regaurding Lab Technologist. 1,2,3,4,5,6,7,8	04
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO2** Apply concepts in Cleaning and care of general laboratory glassware and equipment, preparation of reagents and standard solutions, storage of chemicals.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	05	**Unit-2:-** Cleaning and care of general laboratory glassware and equipment, preparation and storage of distilled water analytical balance, preparation of reagents and standard solutions, storage of chemicals**.** 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21	06
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO3**: Learn the concepts of Collection and recording of biological specimens separation of serum plasma, Basic statistics	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	05	**Unit 3:-** Collection and recording of biological specimens separation of serum plasma, preservation and disposal of biological samples material. Basic statistics (mean, SD, CV, normal distribution, probability). 1,2,3,4,5,6,7,8,9,10,11,12,13	05
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO4** Recall the concepts of Urine analysis for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	06	**Unit 4**- Urine analysis (qualitative) for sugar, proteins bile pigments, ketone bodies, porpholinogen, faecal of blood. 1,2,3,4,5,6,7	12
PO: 1,2,3,4,5,6,7,8,9,1,11,12 PSO 1,2, 3, 4,	**CO5**: Relate the basic idea of Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH measurement, Osmosis, dialysis.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	05	**Unit 5** Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension. 1,2,3,4,5,6,7,8,9	04

Course Code:	**122BML04**
Course Title:	Hematology- I
Pre- requisite:	Student should have basic knowledge Blood and its component.
Rationale:	The students studying Hematology is the specialty responsible for the diagnosis and management of a wide range of benign and malignant disorders of the red and white blood cells, platelets and the coagulation system in adults and children. Hematologists care directly for patients on hospital wards and outpatient clinics.

Course Outcomes:

122BML04.1 To understand about hematology and their instrument, composition and formation of blood and anticoagulant..

122BML04.2 Collection & preservation of blood for various hematological investigations. Physiological variations in Hb, PCV, TLC and platelet. Normal and absolute values in hematology. Quality assurance in hematology

122BML04.3 Acquire the knowledge of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for adaptation for Hb estimation. Hemocytometry, procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts.

122BML04.4 Acquire the knowledge of an error involved and means to minimize such errors. Romanowsky dyes, preparation and staining procedure of the blood smears. Morphology of normal blood cells and their identification. Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance.

122BML04.5 Acquire the knowledge of Haemocrit value by macro and micro methods their merit and demerits. Routine examination of urine. Examination of biological fluids such as CSF, etc. Examination of semen.

Scheme of Studies

Board Of Study	Course Code	Course title	Scheme of Studies(Hours/week)					Total Hours
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BML04	hematology- I	4	2	1	2	(4+2+1+2)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BML04	hematology- I	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

122BML04.1 Find how to extend the Instructions about hematology and their instrument, composition and formation of blood and anticoagulant.

Approximate Hours.

Item	Hrs.
Cl	15
LI	06
SW	02
SL	02
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about hematology. **SO1.2** Understand the blood and their types. **SO1.3** Analysis of lab diagnosis of blood cells. **SO1. 4** Analysis of hemoglobin synthesis. **SO1.5** Application of blood and its composition.	1. Hb Estimation sahl's method. 2. Hb estimation by CMG method. 3. WBC count. 4. RBC's count 5. Platelets count. 6. DLC count	**Unit.1 To understands about hematology and their instrument, composition and formation of blood and anticoagulant.** 1.1.1 Introduction to hematology and Laboratory Organization. 1.1.2 Introduction to hematology and Laboratory Organization. 1.2.1 Lab. Safety and instrumentation. 1.2.2 Lab. Safety and instrumentation. 1.3.1Formation of blood. 1.3.2Formation of blood. 1.3.3Formation of blood. 1.3.4Formation of blood. 1.4.1 Composition and functions of blood. 1.4.2 Composition and functions of blood. 1.5.1 Various anticoagulants, their uses, mode of action and their merits and demerits. 1.5.2 Various anticoagulants, their uses, mode of action and their merits and demerits. 1.5.3 Various anticoagulants, their uses, mode of action and their merits and demerits. 1.5.4 Various anticoagulants, their uses, mode of action and their merits and demerits. 1.5.5 Various anticoagulants, their	**1.** Blood and its composition. **2**. Anticoagulant.

		uses, mode of action and their merits and demerits.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Leucopoiesis

Mini Project:

Erythropoietin

Other Activities (Specify):

Function of blood.

122BML04.2 Apply concepts in Collection & preservation of blood for various hematological investigations. Physiological variations in Hb, PCV, TLC and platelet. Normal and absolute values in hematology. Quality assurance in hematology

Approximate Hours.

Item	Hrs
Cl	15
LI	06
SW	02
SL	02
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about hematology. **SO1.2** Understand the blood and their types. **SO1.3** Analysis of lab diagnosis of blood cells. **SO1. 4** Analysis of hemoglobin synthesis. **SO1.5** Application of blood and its composition.	1. Hb Estimation sahl's method. 2. PCV by macro method. 3. PCV by wintrob's method. 4. PCV by macro method. 5. TLC Count. 6. Platelet count.	**Unit.2 Collection & preservation of blood for various hematological investigations. Physiological variations in Hb, PCV, TLC and platelet. Normal and absolute values in hematology. Quality assurance in hematology** 2.1.1 Collection & preservation of blood for various hematological investigations. 2.1.2 Collection & preservation of blood for various hematological investigations. 2.1.3 Collection & preservation of blood for various hematological investigations. 2.2.1 Physiological variations in Hb. 2.2.2 Physiological variations in Hb. 2.2.3 Physiological variations in Hb. 2.3.1Physiological variations in PCV. 2.3.2Physiological variations in PCV 2.3.3 Physiological variations in PCV. 2.4.1 Physiological variations in TLC and platelets. 2.4.2 Physiological variations in TLC and platelets.21.5.1Normal and absolute values in hematology. 2.5.2 Normal and absolute values in hematology. 2.5.3 Normal and absolute values in hematology. 2.6.1 Quality assurance in hematology. 2.6.2 Quality assurance in hematology.	1. Physiological variations in Hb. 2. Quality assurance.

SW-1 Suggested Sectional Work (SW):

Assignments:

Hb synthesis

Mini Project:

DLC

Other Activities (Specify):

Quality assurance.

122BML04.3 Learn the concepts of Acquire the knowledge of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for adaptation for Hb estimation. Hemocytometry, procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts.

Approximate Hours

Item	Hrs
Cl	15
LI	06
SW	02
SL	02
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Haemoglobinometry. **SO1.2** Understand the Hemocytometry. **SO1.3** Analysis of various method of Hb estimation. **SO1. 4** Analysis of error of Blood cell count. **SO1.5** Application of method of blood cell count.	1. Hb Estimation sahl's method. 2. PCV by macro method. 3. PCV by wintrob's method. 4. PCV by macro method. 5. TLC Count. 6. Platelet count.	**Unit.3 Acquire the knowledge of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for adaptation for Hb estimation. Hemocytometry, procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts.** 3.1.1Haemoglobinometry 3.1.2 Haemoglobinometry 3.2.1 Various methods of estimation of Hb. 3.2.2 Various methods of estimation of Hb. 3.2.3 various methods of estimation of Hb 3.3.1 Errors involved and standardization of instrument for adaptation for Hb estimation. 3.3.2 Errors involved and standardization of instrument for adaptation for Hb estimation. 3.3.3 Errors involved and standardization of instrument for adaptation for Hb estimation. 3.4.1Hemocytometry 3.4.2 Hemocytometry 3.5.1procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts. 3.5.2 Procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts. 3.5.3 Procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts. 3.5.4procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts. 3.5.5procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts.	1. Haemoglobinometry. 2. Hemocytometry.

SW-1 Suggested Sectional Work (SW):
Assignments:
Haemoglobinometry
Mini Project:
Hemocytometry
Other Activities (Specify):

122BML04.4 Recall the concepts of an error involved and means to minimize such errors. Romanowsky dyes, preparation and staining procedure of the blood smears. Morphology of normal blood cells and their identification. Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance.

Approximate Hours

Item	Hrs
Cl	15
LI	06
SW	03
SL	02
Total	26

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Dye. **SO1.2** Understand about preparation of dye. **SO1.3** Analysis of Morphology of red blood cell. **SO1. 4** Analysis of Blood cell identification. **SO1.5** Application of factor influencing the hematological test.	1. Hb Estimation sahl's method. 2. **ESR** by macro method. 3. ESR by westerngren method. 4. Lieshman stain. 5. Giemsa stain 6. Platelet count.	**Unit.4 Acquire the knowledge of an error involved and means to minimize such errors. 11. Romanowsky dyes, preparation and staining procedure of the blood smears. 12. Morphology of normal blood cells and their identification. 13. Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance.** 4.1.1An error involved and means to minimize such errors. 4.1.2 An error involved and means to minimize such errors. 4.2.1 Romanowsky dyes, preparation and staining procedure of the blood smears. 4.2.2 Romanowsky dyes, preparation and staining procedure of the blood smears. 4.2.3 Romanowsky dyes, preparation and staining procedure of the blood smears. 4.3.1 Morphology of normal blood cells 4.3.2 Morphology of normal blood cells 4.3.3 Morphology of normal blood cells 4.4.1Blood cell identification. 4.4.2 Blood cell identification. 4.5.1Erythrocyte sedimentation rate,	**1.** ESR. **2.** RBC Indices.

		factors influencing and various procedures for its estimation with their significance. 4.5.2 Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance. 4.5.3 Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance. 45.4Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance. 4.5.5Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance.	

SW-1 Suggested Sectional Work (SW):
Assignments:
ESR
Mini Project:
Morphology of WBC, RBC
Other Activities (Specify):
Explaination about blood cell.

122BML04.5 Relate the basic idea of Haemocrit value by macro and micro methods their merit and demerits. Routine examination of urine. Examination of biological fluids such as CSF, etc. Examination of semen.

Approximate Hours

Item	Hrs.
Cl	15
LI	06
SW	03
SL	02
Total	26

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Dye. **SO1.2** Understand about preparation of dye. **SO1.3** Analysis of Morphology of red blood cell. **SO1. 3** Analysis of Blood cell identification. **SO1.5** Application of factor influencing the hematological test.	1. Glucose in urine. 2. Protein in urine. 3. Urobil;inogen in urine. 4. ketone bodies in urine. 5. Fructose in semen. 6. CSF test.	**Unit.5 Acquire the knowledge ofHaemocrit value by macro and micro methods their merit and demerits.Routine examination of urine.Examination of biological fluids such as CSF, etc.Examination of semen.** 5.1.1Haemocrit value by macro and micro methods 5.1.2 Haemocrit value by macro and micro methods 5.2.1 their merit and demerits. 5.2.2 their merit and demerits. 5.2.3 their merit and demerits. 5.3.1. Routine examination of urine. 5.3.2. Routine examination of urine. 5.3.3 . Routine examination of urine. 5.4.1 Examination of biological fluids such as CSF, etc. 5.4.2 Examination of biological fluids such as CSF, etc. 5.4.3 Examination of biological fluids such as CSF, etc. 5.5.1Examination of semen. 5.5.2Examination of semen. 5.5.3 Examination of semen. 5.5.4Examination of semen.	**1.** ESR. **2**. Red cell indices.

SW-1 Suggested Sectional Work (SW):

Assignments:

Microscopic examination of Urine

Mini Project:

Microscopic examination of CSF

Other Activities (Specify):

Semenanalysis

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML04.**1** Find how to extend the Instructions about hematology and their instrument, composition and formation of blood and anticoagulant.	15	06	02	02	25
124BML04.**2** Apply concepts in Collection & preservation of blood for various hematological investigations. Hb, PCV, TLC and platelet.	15	06	02	02	25
124BML04.**3** Learn the concepts of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for Hb estimation.	15	06	02	02	25
124BML04.**4** Recall the concepts of Morphology of normal blood cells and their identification. ESR factors influencing and their significance.	15	06	03	02	26
124BML04.**5** Relate the basic idea of PCV value by macro and micro methods. Routine examination of urine. Examination of biological fluids such as CSF, semen.	15	06	03	02	26
Total hour	75	30	10	10	127

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the Instructions about hematology and their instrument, composition and formation of blood and anticoagulant.					
CO-2	Apply concepts in Collection & preservation of blood for various hematological investigations. Hb, PCV, TLC and platelet.					
CO-3	Learn the concepts of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for Hb estimation.					
CO-4	Recall the concepts of Morphology of normal blood cells and their identification. ESR factors influencing and their significance.					
CO-5	Relate the basic idea of PCV value by macro and micro methods. Routine examination of urine. Examination of biological fluids such as CSF, semen.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

1. Improved Lecture
2. Tutorial
3. Group Discussion
4. Visit to Hospital
5. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Essentials of Hematology	Shirish M Kawthalkar	Jaypee Brothers Medical Publishers;	Third edition (1 January 2020)
2	The Bethesda Handbook of Clinical Hematology	Rodgers	Wolters Kluwer (India) Pvt. Ltd	Fourth edition (12 May 2018
3	Essentials in Hematology and Clinical Pathology	Ramadas Nayak ,Sharada Rai	Jaypee Brothers Medical Publishers;	Second edition (1 January 2017)
4	The Bethesda Handbook of Clinical Hematology	GRIFFIN RODGERS NEAL STUART YOUNG	Wolters Kluwer Health; 5th edition	(13 February 2024)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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5. Mr. Shailesh Kumar Saket , Assistant Professor , Department of paramedical science
6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML04
Course title: Hematology -I

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio - cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct.	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the Instructions about hematology and their instrument, composition and formation of blood and anticoagulant**.**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**
CO2: Apply concepts in Collection & preservation of blood for various hematological investigations. Hb, PCV, TLC and platelet.	**3**	**1**	**3**	**2**	**1**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**2**	**3**
CO3: Learn the concepts of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for Hb estimation.	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Morphology of normal blood cells and their identification. ESR factors influencing and their significance.	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**1**	**3**	**3**	**3**
CO5: Relate the basic idea of PCV value by macro and micro methods. Routine examination of urine. Examination of biological fluids such as CSF, semen.	**3**	**1**	**3**	**2**	**1**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**2**	**2**	**3**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO1:** Find how to extend the Instructions about hematology and their instrument, composition and formation of blood and anticoagulant.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	06	**Unit- 1**:- To understands About Instructions of Medical Laboratories. About Ethics and Etical Process in The Laboratories and Ethics Regaurding Lab Technologist 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO2:** Apply concepts in Collection & preservation of blood for various hematological investigations. Hb, PCV, TLC and platelet.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	06	**Unit.2** Collection & preservation of blood for various hematological investigations. Physiological variations in Hb, PCV, TLC and platelet. Normal and absolute values in hematology. Quality assurance in hematology 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO3:** Learn the concepts of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for Hb estimation.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	06	**Unit.3**Acquire the knowledge of Haemoglobinometry, various methods of estimation of Hb, errors involved and standardization of instrument for adaptation for Hb estimation. Hemocytometry, procedures for cell counts visual as well as electronic, red cell, leucocytes and platelet counts. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8,9,10,11,12 PSO 1,2, 3, 4	**CO4:** Recall the concepts of Morphology of normal blood cells and their identification. ESR factors influencing and their significance.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	06	**Unit.4** Acquire the knowledge of an error involved and means to minimize such errors. 11. Romanowsky dyes, preparation and staining procedure of the blood smears. 12. Morphology of normal blood cells and their identification. 13. Erythrocyte sedimentation rate, factors influencing and various procedures for its estimation with their significance. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO: 1,2,3,4,5,6,7,8,9,1,11,12 PSO 1,2,3,4	**CO5**: Relate the basic idea of PCV value by macro and micro methods. Routine examination of urine. Examination of biological fluids such as CSF, semen.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	06	**Unit.5** Acquire the knowledge ofHaemocrit value by macro and micro methods their merit and demerits.Routine examination of urine.Examination of biological fluids such as CSF, etc.Examination of semen**.** 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02

BMLT II YEAR

Year-II

Course Code: 124BMLT21

Course Title: Histology

Pre- requisite: Student should have basic knowledge Cell and Tissue and histology of organ.

Rationale: The students studying Histology, also known as microscopic anatomy or microanatomy, is the branch of biology that studies the microscopic anatomy of biological tissue Histology is the microscopic counterpart to gross anatomy, which looks at larger structures visible without a microscope.

Course Outcomes:

124BMLT21.1 To understand various body tissue epithelial tissue connective tissue nervous tissue muscular tissue gland and endocrine glands.

124BMLT21.2 Acquire Knowledge histological study of various system circulatory system reproductive system urinary, alimentary, respiratory endocrine glands, digestive system

124BMLT21.3 Acquire Knowledge microscopy, working principle, maintenance and application of various types of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.

124BMLT21.4 Acquire Knowledge about dyes Haematoxylene its importance in histology–special stains procedures Principle of metal impregnation techniques. Demonstration and identification of mineral pigments

124BMLT21.5 Acquire Knowledge about Stain cytologic preparation with special emphasis of MGG,PAP, PAS, mucicaramine , alcian blue ,schmorl and acid phosphates Cytololologic screening and quality control in cytology laboratory

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT21	Histology	4	2	1	2	(4+2+1+2)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 21	Histology	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML21.1 Find how to extend the various body tissue epithelial tissue connective tissue nervous tissue muscular tissue gland and endocrine glands.

Approximate Hours

Item	Hrs
Cl	15
LI	02
SW	03
SL	01
Total	21

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand cell and histology of the body. **SO1.2** Understand histological structure of the body. **SO1.3** Analysis of the epithelial tissue after biopsy. **SO1. 4** Analysis of the nervous tissue after biopsy. **SO1.5** Application of the identified various biopsy sample.	1. Haemotoxyline and eosin stain. **2.** Giemsa stain	**Unite 1:- To understands various body tissue epithelial tissue connective tissue nervous tissue muscular tissue gland and endocrine glands.** Study of various body tissues. 1. 1.1 Epithelial tissue. 1. 1.2 Epithelial tissue. 1.2.3 Epithelial tissue. 1.3.1 Connective tissue including bone and cartilage. 1.3.2Connective tissue including bone and cartilage. 1.3.3 Connective tissue including bone and cartilage. 1.3.4Connective tissue including bone and cartilage. 1.3.5 Connective tissue including bone and cartilage. 1.4.1 Muscular tissue. 1.4.2 Muscular tissue. 1.4.3 Muscular tissue. 1.5.1 Nervous tissue. 1.5.2 Nervous tissue. 1.6.1 Glands ,epithetical and endocrine glands 1.6.2 Glands , epithetical and endocrine glands.	**1.** Cell.

SW-1 Suggested Sectional Work (SW):

Assignments:

Cell (human body)

Mini Project:

Nervous tissue

Other Activities (Specify):

Intracellular fluid.

124BML21.2 Apply concepts in histological study of various system circulatory system reproductive system urinary, alimentary, respiratory endocrine glands, digestive system.

Approximate Hours

Item	Hrs
Cl	15
LI	04
SW	03
SL	03
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about histological system of the body. **SO1.2** Understand the histology of the circulatory and respiratory system of the body. **SO1.3**Analysis of the histology of alimentary system and reproductive system. **SO1. 4** Analysis of the histology of urinary and digestive system of the body. **SO1.5** Application og nerve ending and organ of special senses.	1. Haemotoxyline and eosin stain. 2. Giemsa stain 3. PAP Stain 4. Silver stain	**Unite 2:- Acquire Knowledge histological study of various system circulatory system reproductive system urinary, alimentary, respiratory endocrine glands, digestive system**. histological study of various system 2.1.1 The circulatory system. 2.1.2 The circulatory system. 2.2.1 The alimentary system. 2.2.2 The alimentary system. 2.3.1The digestive system including liver, pancreas and gall bladder. 2.3.2The digestive system including liver, pancreas and gall bladder. 2.3.3The digestive system including liver, pancreas and gall bladder. 2.3.4The digestive system including liver, pancreas and gall bladder. 2.3.5 The digestive system including liver, pancreas and gall bladder. 2.4.1The respiratory system. The urinary system. 2.4.2The respiratory system. The urinary system. 2.4.3The respiratory system. The urinary system. 2.5.1 the endocrinal gland system the reproductive system nerve ending and organ of special senses 2.5.2 the endocrinal gland system the reproductive system nerve ending and organ of special senses 2.5.3 the endocrinal gland system the reproductive system nerve ending and organ of special senses	**1.** circulatory system **2**. The urinary system **3.**pancreas and gall bladder

SW-1 Suggested Sectional Work (SW):

Assignments:

Female reproductive system

Mini Project:

Histology of nephron

Other Activities (Specify):

Grossing of the Biopsy sample

124BML21.3 Learn the concepts of microscopy, working principle, maintenance and application of various types of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.

Approximate Hours

Item	Hrs
Cl	15
LI	04
SW	03
SL	03
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about microscope. **SO1.2** Understand the different type of micrometry. **SO1.3**Analysis of the Working principle, maintenance and application of various types of microscope. **SO1. 4** Analysis of the maintenance of microtome. **SO1.5** Application of the grossing and section cutting of the sample.	**1.** Haemotoxyline and eosin stain. **2.** Giemsa stain **3**. PAP Stain **4.** Silver stain	**Unite 3:- Acquire Knowledge microscopy, working principle, maintenance and application of various types of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.** 3.1.1Microscopy ,working principle, maintenance and application of various types of microscope :- 3.1.2Microscopy ,working principle, maintenance and application of various types of microscope :- 3.2.1Dark ground microscope. 3.2.2Dark ground microscope. 3.2.3Dark ground microscope. 3.3.1Polarizing microscope. 3.3.2Polarizing microscope. 3.3.3Polarizing microscope. 3.4.1Phase contrast microscope. 3.4.2Phase contrast microscope. 3.4.3Phase contrast microscope. 3.5.1Interference microscope. 3.5.2Interference microscope. 3.6.1UV microscope. 3.6.1UV microscope.	**1.** Honing and stropping **2**. Rotary microtome **3.**Light microscope

SW-1 Suggested Sectional Work (SW):

Assignments:

Microscope

Mini Project:

Rotary microtome

Other Activities (Specify):

Section cutting

124BML21.4 Recall the concepts of Acquire Knowledge about dyes Haematoxylene its importance in histology–special stains procedures Principle of metal impregnation techniques. Demonstration and identification of mineral pigments

Approximate Hour

Item	Hrs
Cl	15
LI	04
SW	03
SL	03
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about microscope. **SO1.2** Understand the different type of micrometry. **SO1.3**Analysis of the Working principle, maintenance and application of various types of microscope. **SO1. 3**Analysis of the maintenance of microtome. **SO1.5** Application of the grossing and section cutting of the sample.	**1.** Haemotoxyline and eosin stain. **2.**impregnation techniques **3**. PAP Stain **4.** Silver stain	**Unite 4:- Acquire Knowledge about dyes Haematoxylene its importance in histology–special stains procedures Principle of metal impregnation techniques. Demonstration and identification of mineral pigments.** 4.1Metachromasis and metachromatic dyes. 4.2.1Haematoxylene its importance in histology. 4.2.2Haematoxylene its importance in histology. 4.3.1Carbohydrates and amyloid –special stains procedures. 4.3.2Carbohydrates and amyloid –special stains procedures. 4.3.3Carbohydrates and amyloid –special stains procedures. 4.4 Connective tissue, 4.5 impregnation techniques 4.6.1 Other special stains for the muscular fibres. 4.6.2 Other special stains for the muscular fibres. 4.7 reticulin. 4.8 collagen fibres. 4.9.1Principle of metal impregnation techniques. 4.9.2 Principle of metal impregnation techniques. 4.10.1 Demonstration and identification of mineral pigments.	**1.** Metachromasis and metachromatic **2**. collagen fibres **3.**elastic.reticulin and collagen fibres

SW-1 Suggested Sectional Work (SW):

Assignments:

Principle of metal impregnation techniques

Mini Project:

PAP Stain

Other Activities (Specify):

Staining technique

124BML21.5 Relate the basic idea of about Stain cytologic preparation with special emphasis of MGG,PAP, PAS, mucicaramine , alcian blue ,schmorl and acid phosphates Cytololologic screening and quality control in cytology laboratory

Approximate Hours

Item	Hrs
Cl	15
LI	04
SW	03
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand cell of the body. **SO1.2** Understand the cytological stain. **SO1.3**Analysis of the FNAC Processing. **SO1. 4** Analysis of the quality control in cytology laboratory. **SO1.5** Application of the special stain used in cytology stain.	1. Alcian blue, schmorl and acid phosphates stain. 2. PAS stain. 3. PAP Stain. 4. MGG Stain.	**Unite 5:- Acquire Knowledge about Stain cytologic preparation with special emphasis of MGG,PAP, PAS, mucicaramine , alcian blue ,schmorl and acid phosphates Cytololologic screening and quality control in cytology laboratory** 5.1 Stain cytological preparation. 5.2 special emphases. 5.3 PAPANICOLOU stains. 5.4 Special stains like PAS. 5.5mucicaramine. 5.6 alcian blue. 5.7 schmorl. 5.8 acid phosphates. 5.9.1 Cytololologic screening. 5.9.2 Cytololologic screening. 5.9.3 Cytololologic screening. 5.10.1quality control in cytology laboratory. 5.10.1quality control in cytology laboratory. 5.10.1quality control in cytology laboratory. 5.11MGG.	**1.** Cytololologic screening **2**. quality control in cytology laboratory

SW-1 Suggested Sectional Work (SW):

Assignments:

Quality control in cytology laboratory

Mini Project:

PAS Stain

Other Activities (Specify):

Special stain used in cytology

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML21.1 Find how to extend the various body tissue epithelial connective nervous muscular tissue and endocrine glands.	15	02	03	01	21
124BML21.2 Apply concepts in histological of various circulatory reproductive urinary, alimentary, respiratory endocrine glands, digestive system.	15	04	03	03	25
124BML21.3 Learn the concepts of microscopy, working principle, maintenance and application of several of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.	15	04	03	03	25
124BML21.4 Recall the concepts of Acquire Knowledge about dyes Haematoxylene its importance Principle	15	04	03	03	25
124BML21.5 Relate the basic idea of about Stain cytologic preparation with special emphasis of MGG,PAP, PAS, mucicaramine, alcian blue , and QC in cytology.	15	04	03	02	24
Total hour	75	18	15	12	120

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the various body tissue epithelial connective nervous muscular tissue and endocrine glands.					
CO-2	Apply concepts in histological of various circulatory reproductive urinary, alimentary, respiratory endocrine glands, digestive system.					
CO-3	Learn the concepts of microscopy, working principle, maintenance and application of several of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.					
CO-4	Recall the concepts of Acquire Knowledge about dyes Haematoxylene its importance Principle					
	Relate the basic idea of about Stain cytologic preparation with special emphasis of MGG,PAP, PAS, mucicaramine, alcian blue , and QC in cytology.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

11. Improved Lecture
12. Tutorial
13. Group Discussion
14. Visit to Hospital
15. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Inderbir Singh's Textbook of Human Histology	Pushpalatha K , Deepa Bhat	Jaypee Brothers Medical Publishers	10th edition (11 July 2023)
2	Histology – Text and Atlas	Brijesh Kumar	Wolters Kluwer;	Third edition (1 June 2023)
3	Textbook of Human Histology with Color Atlas	SONTAKKE Y	CBS	(1 January 2020)
4	Companion Workbook for Human Histology	BHANARKAR U	CBS Publishers and Distributors Pvt. Ltd.	(15 July 2023)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML21
Course title: Histology

Course outcomes	Program outcomes												Program specific outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3	PSO4
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct.	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the various body tissue epithelial connective nervous muscular tissue and endocrine glands**.**	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**
CO2: Apply concepts in histological of various circulatory reproductive urinary, alimentary, respiratory endocrine glands, digestive system.	**2**	**2**	**1**	**2**	**3**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of microscopy, working principle, maintenance and application of several of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Acquire Knowledge about dyes Haematoxylene its importance Principle	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Relate the basic idea of about Stain cytologic preparation with special emphasis of MGG,PAP, PAS, mucicaramine, alcian blue , and QC in cytology.	**2**	**3**	**2**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends:1-Low,2-Medium,3-High

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO-1: Find how to extend the Introduction Study of various body tissues Of Epithelial tissue, Connective tissue including bone and cartilage, Muscular tissue, Nervous tissue and Glands, epithetical and endocrine glands.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	02	Unit-1 To Understands various body tissue epithelial tissue connective tissue nervous tissue muscular tissue gland and endocrine glands. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	01
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 2 : Apply concept histological study of various system. The circulatory system, The digestive system including liver, pancreas and gall bladder. The the endocrinal gland system the reproductive system nerve ending and organ of special senses Respiratory system.the endocrinal gland system the reproductive system nerve ending and organ of special senses .	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	04	Unit-2 Understand about Histological system of the body. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO3: Learn the concept Microscopy, working principle, maintenance and application of various types of microscope Dark ground, Polarizing, Phase contrast, Interference, UV Micrometry.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	04	Unit-3: Understand about microscope. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 4: Recall the concept Knowledge about dyes Haematoxylene its importance in histology–special stains procedures Principle of metal impregnation techniques. Demonstration and identification of mineral pigments**.**	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	04	Unit-4 Demonstration and identification of mineral pigments ,Haematoxylin and Eosin. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	03
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 5: Relate the basic idea Stain cytologic preparation with special emphasis of MGG,Shorr's, Pap's, mucicaramine , alcian blue ,schmorl and acid phosphates Cytolologic screening and quality control in cytology laboratory.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	04	Unit-5 Understand the cytological stain. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02

Course Code: 124BMLT22

Course Title: Microbiology -II

Pre-Requisite: Student should have basic knowledge Medical microbiology and Morphology of bacteria.

Rationale: The student studying BMLT should be about pathogenic and non pathogenic bacteria,fungi and Laboratory diagnosis. Morphology,Life cycle,and laboratory diagnosis of Cestodes and Nematodes etc.

Course Outcomes:

124BMLT22.1: Understand the general character and general properties of bacteria and Morphology.

124BMLT22.2: Acquire knowledge regarding the basic staining use in microbiology Gram's ,AFB, Alber's

124BMLT22.3: Acquire knowledge about identification of bacteria,pathogenesis and lab diagnosis.like micrococci,staphylococci,streptococci,pneumonia,corynebacteria, Enterobacteriaceae species.etc.

124BMLT22.4: Acquire knowledge about identification of fungi pathogenesis and lab diagnosis.like Candida,Cryptococcus,Dermatophytes,Sprotrichous,histoplasma,blastomyses,coccidioides,paracoccidioid es,mycetoma etc.

124BMLT22.5: Acquire knowledge about Morphology ,Life cycle ,lab diagnosis of protozoa like Leishmania ,trepanosomes and cestodes and nematodes etc.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies (Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT22	Microbiology -II	4	2	2	2	(4+2+2+2)	10

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 22	Microbiology -II	100	100	100	300

124BMLT22.1 Find how to extend the various Instrument and culture media in microbiology Laboratory.

Approximate Hours

Item	Hrs
Cl	15
LI	03
SW	03
SL	02
Total	23

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand Microscope. **SO1.2** Understand Instrument in microbiology **SO1.3**Analysis of Sterilization (Autoclave.) **SO1.4** Analysis Hot air oven. Incubator. **SO1.5** Application different culture media.	**1**. Autoclave. **2.** Hot air oven. **3.** Incubator.	**Unite 1:- To understands various Instrument and culture media in microbiology Laboratory.** Study of instrument in microbiology laboratory. 1.1Autocalve. 1.2 Hot air oven 1.3 Incubator. 1.4 Inoculating loop 1.5 Petri disc. 1.6 Laminar air flow. 1.7 water bath. 1.8culture media. 1.9Nutrient Agar media. 1.10 Mac-conkey Agar media. 1.11 Blood Agar media. 1.12 Mueller Hinton Agars. 1.13 CLED agar media 1.14Glassware 1.15 Bunsen burner.	1. Antiseptic. 2. Antigen &Antibodies

SW-1 Suggested Sectional Work (SW):

Assignments:

Sterilization

Mini Project:

Water bath.

Other Activities (Specify):

Autoclave.

124BMLT22.2 Apply concepts in virology study. Laboratory diagnosis of virus.

Approximate Hours

Item	Hrs
Cl	15
LI	06
SW	00
SL	04
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about virology lab. **SO1.2** Understand the ELISA and RIA. **SO1.3**Analysis of virus disease,diagnos by ELISA **SO1. 4** Analysis of culturing of virus. **SO1.5** Application Embryonated Eggs.	1. Culture technique for virus. 2. Sample collection of virus. 3. Giemsa stain. 4. Serology test. 5. ELISA method. 6. RPR test.	**Unite 2:- Acquire Knowledge about virology study. Laboratory diagnosis of virus.** 2.1 Different staining technique use virology. 2.2 Use of embrocated eggs in clinical virology. 2.3 Principle of animal cell culture and their use in virology. 2.4Preparation of stains and demonstration inclusion bodies. 2.5. seller's stain for Negri body demonstration. 2.6 Giemsa's stain for CMV and Herpes viral infection. 2.7 preparation of reagent for serological test phosphate buffer,saline,verona buffer saline,alseve's solution,Dextrose,gelatin,verona buffer and tris buffer. 2.8 principle and performance of viral haemoagglutination and haemoagglutination in hibition test. 2.9 Demonstration of haemadsorption test IHA & RPHA test. 2.10 collection, titration and reservation of gunes pig serum for complement. 2.11 Demonstration of complement fixation test. 2.12 Demonstration of immunofluoroscens. 2.13 Immunoperoxidase test. 2.14 Demonstration of ELISA for HBsAG detection. 2.15 HIV, HCV.	1. General characteristics of virus. 2. Morphology of virus. 3. Bacteriophase. 4. AIDS.

124BMLT22.3 Learn the concepts of Identification of bacteria, pathogenesis and lab diagnosis

Approximate Hours

Item	Hrs
Cl	15
LI	06
SW	03
SL	04
Total	28

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Bacteri morphology. **SO1.2** Understand about T.B,Leprosy disease. **SO1.3** Analysis of the All pathogen bacteria disease. **SO1. 4** Application of culture media and observe growth of bacteria. **SO1.5** Analysis of bacteria differentiat by Biochemical test.	1. Gram's stain. 2. AFB stai**n.** 3. Albert's stain. 4. Biochemical test. 5. coagulase. 6. catalase.	**Unite3 :- Acquire Knowledge about Identification of bacteria,pathogenesis and lab diagnosis** 3.1Micrococci. 3.2staphylococci 3.3streptococci. 3.4Pneumococci 3.5corynebacteria 3.6 Enterobacteriaceae species Ecoli, Kiebsiella,enterobacter,proteus,salmonella,arrizona,shigella,citrobacter,yersinia, 3.7 pseudomonas,vibrio,haemophilus 3.8 Hydrobacteria,brucella,bacillus 3.9 clostridia. 3.10 Anaerobiccocci. 3.11 Neisseria species. 3.12 Treponema,borrelia,Laptospira. 3.13 Mycoplasma. 3.14 Ricketessia. 3.15 chlomydia.	**1.** morphology of bacteria. **2.** Classification of bacteria. **3.** History of bacteria**.** **4.** Culture media.

SW-1 Suggested Sectional Work (SW):
Assignments:
Microscope
Mini Project:
Morphology of bacteria
Other Activities (Specify):
Culture technique

124BMLT22.4 Recall the concepts of Pathogenic and non pathogenic Fungi Study morphology, species, pathogenesis and lab diagnosis.

Approximate Hours

Item	Approx. Hrs
Cl	15
LI	06
SW	03
SL	04
Total	28

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about disease of fungi. **SO1.2** Understand about fungus morphology general characteristics and disease **SO1.3**Analysis of the Working principle, maintenance and application of various types of microscope. **SO1. 3**Analysis of fungi by culture and staining observe in microscopes **SO1.5** Application study mycology.	1. Negative (Nigrosin) stain. 2. Media preparation for fungi. 3. Lacto phenol cotton blue stain. 4. Gram's stain. 5. SDA media, blood agar. 6. Biochemical test.	**Unite 4:AcquireKnowledge about Pathogenic and non pathogenic Fungi** **Study morphology,species,pathogenesis and lab diagnosis.** 4.1 Candida 4.2 cryptococci 4.3 Dermatophytes 4.4 Sprotrichoums 4.5 histoplasma 4.6 blastomyces 4.7 coccidioides,paracoccidioides 4.8 Dematiaceous fungi 4.9 mycetoma 4.10 actinomyces,nocardia, 4.11 biochemical test use for the identification of bacteria and fungi 4.12 Antimicrobial senstivity test 4.13 Antimicrobial susceptibility testing for mycobacterium 4.14 Antimicrobial susceptibility testing for mycobacterium 4.15Preparation and standardization of antigen and antibody	**1.** culture media for fungi **2**. Gram's stain **3.** Negative stain **4**. Sample collection of fungi.

SW-1 Suggested Sectional Work (SW):

Assignments:

Culture media of fungi.

Mini Project:

Giemsa stain

Other Activities (Specify):

Morphology of fungi.

124BMLT22.5 Relate the basic idea of Morphology, Life cycle and Lab diagnosis of cestodes, Nematodes etc.

Approximate Hours

Item	Hrs
Cl	15
LI	04
SW	03
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand morphology (trophozoites,cyctes) **SO1.2** Understand Filariasis ,adult ,larva, egg **SO1.3**Analysis Stool examination shows worm,eggs larva **SO1. 4** Understand Route of infection and habitates etc. **SO1.5** Application diagnosis,disease,protect all pathogen	1.Egg counting 2. Cason's test 3. Observe adult ,larva,egg in stool sample 4.Giemsa stain	**Unite 5:- Acquire Knowledge about Morphology,Life cycle and Lab diagnosis of cestodes ,Nematodes etc.** 5.1morphology and Life cycle of haemoflagellates Leishmania. 5.2trepanosomes. 5.3morphology, Life cycleand lab 5.4 Laboratory diagnosis of hydatid, cysticercoide. 5.5Nematodes of morphology life cycle. 5.6, Trichnella. 5.7 Dracunculus. 5.8 Putting up cason's test and interpretation. 5.9 culture technique for protozoa Amoeba,Giardia,Leishmania. 5.10 Filariae,Trichnella,Dracunculus, 5.11morphology, Life cycle of intestinal cestodes lab diagnosis H.nana. 5.12 D.Latum. 5.13 taenia. species 5.14 Echinococcus. 5.15Culture method for helminth hook worm,round,Egg counting.	**1.** Malaria parasites. **2**. Filaria .

SW-1 Suggested Sectional Work (SW):

Assignments:

Quality control in parasitology laboratory

Mini Project:

Stool Examination

Other Activities (Specify):

Egg counting

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML22.1Find how to extend the various Instrument and culture media in microbiology Laboratory.	15	03	03	02	23
124BML22.2Apply concepts in virology study. Laboratory diagnosis of virus.	15	06	00	04	25
124BML22.3Learn the concepts of Identification of bacteria, pathogenesis and lab diagnosis	15	06	03	04	28
124BML22.4Recall the concepts of Pathogenic and non pathogenic Fungi Study morphology, species, pathogenesis and lab diagnosis.	15	06	03	04	26
124BML22.5Relate the basic idea of Morphology, Life cycle and Lab diagnosis of cestodes ,Nematodes etc.	15	04	03	02	24
Total hour	75	25	12	20	126

Suggestion for End Session Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the various Instrument and culture media in microbiology Laboratory.					
CO-2	Apply concepts in virology study. Laboratory diagnosis of virus.					
CO-3	Learn the concepts of Identification of bacteria, pathogenesis and lab diagnosis					
CO-4	Recall the concepts of Pathogenic and non pathogenic Fungi Study morphology, species, pathogenesis and lab diagnosis.					
CO-5	Relate the basic idea of Morphology, Life cycle and Lab diagnosis of cestodes ,Nematodes etc.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

16. Improved Lecture
17. Tutorial
18. Group Discussion
19. Visit to Hospital
20. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Essentials of Medical Microbiology	Apurba S Sastry, Sandhya Bhat	Jaypee Brothers Medical Publishers Pvt. Limited, 2021	2021
2	Essentials of Medical Parasitology	Apurba S Sastry, Sandhya Bhat	Jaypee Brothers Medical Publishers;	Second edition (1 January 2018)
3	Practical Medical Microbiology for BMLT	Dr. Rajesh Bareja	IP Innovative Publication Pvt. Ltd.	First Edition, 2020
4	Text and Practical Microbiology For MLT	V Baveja C P Baveja	Arya Publishing Company	2 March 2022
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML22
Course title: Microbiology - II

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the various Instrument and culture media in microbiology Laboratory.	**1**	**1**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**3**	**3**	**1**
CO2: Apply concepts in virology study. Laboratory diagnosis of virus.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**1**	**3**	**3**	**2**
CO3: Learn the concepts of Identification of bacteria, pathogenesis and lab diagnosis	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Pathogenic and non pathogenic Fungi Study morphology, species, pathogenesis and lab diagnosis.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**2**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Relate the basic idea of Morphology, Life cycle and Lab diagnosis of cestodes ,Nematodes etc.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO- Find how to extend the Study of instrument in microbiology laboratory. Autoclave, Hot air oven Incubator, Inoculating loop, Petri disc, Laminar air flow. Water bath, culture media. Nutrient Agar media. Mac-conkey Agar media. Blood Agar media. Mueller Hintor Agar, CLED agar mediaGlassware, Bunsen burner.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	03	Unit-1 To understand various Instrument and culture media in microbiology Laboratory. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 2 Apply concept regarding different staining technique use virology, Culture technique for virus, Embryonated , Animal and Tissue culture.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	06	Unit-2 Understand about virology lab. . 1,2,3,4,56,7,8,9,10,11,12,13,14,15	04
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO3 Learn the concept about Identification of bacteria, pathogenesis and lab diagnosis. Micrococcus, staphylococci, Streptococci, Pneumococci Corynebacteria, Enterobacteriaceae specie etc.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	06	Unit-3 Understand about Bacteria disease and diagnosis. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	04
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 4: Recall the concept of the about Pathogenic and non pathogenic Fungi morphology, species, pathogenesis and lab diagnosis,	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	06	Unit-4 Understand about disease of fungi. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	04
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 5: Relate the basic idea the about Morphology, Life cycle and Lab diagnosis of cestodes ,Nematodes	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	04	Unit-5 Understand about protozoa and helminthes. 1,2,3,4,56,7,8,9,10,11,12,13,14,15	02

Course Code: 124BML23

Course Title: Biochemistry -II

Pre-Requisite: Student should have knowledge about Metabolism of carbohydrate, Protein and Lipid.

Rationale: The student studying the goals of biochemistry are to describe and explain all chemical processes in cells on a molecular level and to understand the origins of life. Biochemistry is essential to medicine, as many diagnostic techniques and drugs are developed based on biochemical discoveries and processes.

Course Outcomes:

124BMLT23.1 To Introduction, properties and simple metabolism of carbohydrates, protein, fats, nucleic Acid and enzymes, Study Of Colorimeter, Study of spectrophotometer, Study of flame photometer, Study of Gel Electrophoresis, Study of pH meter To prepare phosphate buffer (200 mlpH 7.45) and determine its pH by using meter. Determine the pKa value of acetic acid.

124BMLT23.2 Digestion and absorption Of Nutrition (vitamin and calories),Electrometric determination of Na + and K +Chromatography and electrophoresis,Atomic absorption spectroscopy,Radioimmunoassay (RIA) and ELISA

124BMLT23.3 Estimation of sugar by DNS method. . To extract invertase enzyme from solanum tuberosum (patato). Estimation of protein by lawry's method. Estimation of protein by DNS method for determining the invertase activity. Different type of glassware's and their composition.

124BMLT23.4 Preparation of benedict's qualitative reagent. Estimation of serum glutamate pyruvate transaminase enzyme (SGPT & ALT). Determination of SGOT . Plot a standard graph of SGPT. Plot a standard graph of SGOT, Determination of serum acid phosphatase.,. To plot a standard graph of serum acid phosphatase ,Determination of serum amylase by colorimeteric method.

124BMLT23.5 Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies (Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT23	Biochemistry -II	4	2	2	2	(4+2+2+2)	06

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 23	Biochemistry -II	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML23.1 Find how to extend the basic concepts of properties and simple metabolism of carbohydrates, protein, fats, nucleic Acid and enzymes, Study Of Colorimeter, Study of spectrophotometer, Study of flame photometer, Study of Gel Electrophoresis, Study of pH meter Determine the pKa value of acetic acid.

Approximate Hours.

Item	Hrs
Cl	71
LI	15
SW	05
SL	03
Total	94

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand allAbout Charbohydrate,Protein,Lipid And Enzymes. **SO1.2** Student Should Be Perforn All Specific Techniques Available For The Indentification Of SO1.Medical Lab.Technology.. **SO1.3** Student Should Be Perforn And Understand Principal,Procedure,And Clinical Significance With Their Normal Values,For The Diagnosis Of Disease For The Help Of Patient As Well As In The Treatment.	**1**Routhras Test For Ketone Bodies In The Urine 1. Blood Sugar Test By GOD/POD For The Detection Of Dibetes Mellitus And Hypoglycemia. 2. Test For Glycosurya In urine **4.** Test For Protein In Urine. **5.**Test For Protein In blood **6.** Test For The Detection Of Bil Salts And Bile Pigments By Urine Sample. **7**. Test For Porphobilinogen By Urine Sample. **8.** Tests For Lipid Profile (Total Choesterol,VLDL,LDL,HDL,TriGlyceride etc.) **9.** Test For Urea Through Blood **10** Test For enzymes like AST,ALT, LDH etc. **11.**Test For Spectrophotometer,	**Unite 1:- Introduction,properties and simple metabolism of carbohydrates,protein,fats,nucleic Acid and enzymes , Study Of Colorimeter, Study of spectrophotometer, Study of flame photometer , Study of Gel Electrophoresis,Study of pH meter To prepare phosphate buffer (200 mlpH 7.45) and determine its pH by using meter. Determine the pKa value of acetic acid.** **1.1.** Introduction,properties and simple metabolism of carbohydrates 1.1.1 Introduction To Charbohydrates 1.1.2 Classification Of charbohydrates 1.1.3 Function Of Charbohydrates And Their Abnormalitise 1.1.4 Isomerisms And Sterioisomerisms 1.1.5 Optical Activity Of Charbohydrates 1.1.6 Properties Of Charbohydrates 1.1.7 Linkages of Charbohydrates And Reduction Tests 1.1.8 Benedict Test 1.1.9 Structure Of Different Types Of Charbohydrates (Structure Of Starch, Glycogens,dextrin,Cellulose,Inulin,Proteoglycan,Glycoproteins And Mucpolysachrides etc.) 1.1.10 Biomedical Importance Of mucopolysachrides 1.1.11 Special Types Charbohydrates 1.1.12 Digestion Of Charbohydrates 1.1.13 Absorption Of Charbohydrates 1.1.14 Metabolism Of Charbohydrates 1.1.15 Glycolysis Pathway (aerobic and Anaerobic Glycolysis,And Their Energetics) 1.1.16 Tricarboxylic Acid Cycle (TCA Cycle) And Their Energetics	**1.**All Classification And Regulations **2.**Quality Control Process **3.** Phisical Hazards

SO1.4 Student Should Be Perforn With Accurately With Specific Ethical Method **SO 1.5**.Knowledge Of Electrophoresis, Chrometography,Optimum pH,And Source Of Errors,And How To Heal These Errors.	**12.**Test For Flame Photometer 13. Test ForGel Electrophoresis **14.** Test For pH meter To prepare phosphate buffer (200 ml p H 7. 45) and determine its pH by using meter In Deffrent Parameters. **15.** Test For Urobilinogens	1.1.17 Role Of TCA Cycle 1.1.18 Metabolism Of Glycogens 1.1.19 Glycogenesis Pathway 1.1.20 Glycogenolysis Pathway 1.1.21 Glycogen Storage Diseases 1.1.22 Regulation Of Glycogen Metabolism 1.1.23 Glyconeogenesis Pathway By Deffrent Other Then Charbohydrates Products. 1.1.24 Hexose Monophosphate Pathway(HNP Shunt)Pathway And Their Metabolism And Regulations. 1.1.25 Fructose And Galactose Metabolism 1.1.26 Regulation Of Blood Glucose(Metabolic Processes,Hormonal Control And Renal Control) 1.1.27 Uronic Acid Pathway. **1.2.** Introduction,properties and simple metabolism of Lipid 1.2.1 Defination,Function Of Lipid 1.2.2 Chemistry,Classification And Properties Of Lipid 1.2.3 Simple Lipis And Compound Lipids 1.2.4 Lipoproteins And Derived Lipids 1.2.5 Fatty Acid Metabolism And Classification 1.2.6 Steroids And Cholesterols 1.2.7 Properties Of Lipids 1.2.8 Prostaglandins PGs) And Related Compounds 1.2.9 Digestion And Absorption Of Lipids 1.2.10 Oxidation Of Fatty Acids And Their Energetics 1.2.11 Biosynthesis Of Fatty Acid 1.2.12 Cholestrol Metabolism 1.2.13 Synthasis Of Cholesterol And Metabolic Fate Of Cholesterols 1.2.14 Ketone Bodies Metabolism Formation And Utilisation 1.2.15 Role Of Lever In Lipid Metabolism And Regulation Of Lipid Metabolism **1.3.** Introduction,properties and simple metabolism of Proteins 1.3.1 Defination And General Functions Of Proteins 1.3.2 Defination Of An α-Amino Acid And Classification Of Amino Acids 1.3.3 Glucogenic And Ketogenic Amino Acids 1.3.4 Peptides And Peptide Bonds 1.3.5 Charge Properties Of Amino Acids And Proteins 1.3.6 Classification Of Proteis And Biological Roles Of Proteins 1.3.7 Structure Of Proteins With Classified 1.3.8 Denaturation Of Protein And Modification Of Protein After Denaturation. 1.3.9 Plasma Proteins With Their Functions 1.3.10 Tests For Protein And Amino Acids 1.3.11 Metabolism And Catabolism Of Amino Acids 1.3.12 Transamination,Deamination 1.3.13 Urea Cycle And Other Fates Of Ammonia. 1.3.14 Catabolism Of Skeleton Of Amino acid	

		1.3.15 Catabolism Of Important Amino Acid And Defeciency Deseases 1.3.16 Synthesis Of Creatine In Our Body And their Roles **1.4** Enzymes 1.4.1 Introduction Of Enzymes 1.4.2 Types Of Enzymes And Their Importance 1.4.3 Classification Of Enzyme 1.4.4 Diagnostics Role Of Enzymes 1.4.5 Enzymes Present In The Serum 1.4.6 Isoenzymes And Their Classifications And Importance. 1.4.7 Derivation Of M.M Equation And Applications , 1.5Study Of Colorimeter 1.6Study of Spectrophotometer 1.7Study of flame Photometer 1.8Study of Gel Electrophoresis, 1.9Study of pH meter 1.10 Prepare Phosphate Buffer (200 ml p H 7.45) And Determine Its pH By using Meter. Determine The pKa Value Of Acetic Acid	

SW-1 Suggested Sectional Work (SW):

Assignments:

Draw And explain all About Gel Electrophoresis With All Steps.
Draw And explain all About flame Photometer With All Steps.
Draw And explain all About Spectrophotometer With All Steps.
Draw And explain all About prepare phosphate buffer With Different Ratios..

Mini Project:

Flag All about Study of pH meter

124BML23.2 Apply concepts in Digestion and absorption Of Nutrition (vitamin and calories),Electrometric determination of Na + and K +Chromatography and electrophoresis,Atomic absorption spectroscopy,Radioimmunoassay (RIA) and ELISA

Approximate Hours

Item	Approx. Hrs
Cl	18
LI	05
SW	07
SL	03
Total	33

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Students Should Be Understand Do Test Related To Vitamins **SO1.2** Application Of Electrophoresis Should Be Understood By Students. **SO1.3**Understand How To Use And Handeling Equipments,And How To Use. **SO1.4** Understand Principal,Procedure,Clinical Significance And Normal Values. **SO1.5**Students Should Be Understand The Source Of Errors Which May Be Come During The Test Performance.	1 Test Of Elisa In Different parameters 2. Test Of RIA In Different parameters 3. Test Of Na+ And K+ By Electrophoresis 4. Tests Of Chromatography 5. Tests Of Vitamins	**Unite 2. Digestion and absorption Of Nutrition (vitamin and calories),Electrometric determination of Na + and K +Chromatography and electrophoresis,Atomic absorption spectroscopy,Radioimmunoassay (RIA) and ELISA** 2.1:-Digestion and absorption Of Nutrition (vitamin and calories) 2.1.1 Digestion and absorption Of Vitamin A With Their Biological Importance And Significance. 2.1.2 Digestion and absorption Of Vitamin B With Their Biological Importance And Significance. 2.1.3 Digestion and absorption Of Vitamin D With Their Biological Importance And Significance 2.1.4 Digestion and absorption Of Vitamin C With Their Biological Importance And Significance 2.1.5 Digestion and absorption Of Vitamin K With Their Biological Importance And Significance 2.1.6 Digestion and absorption Of Mineral Iron With Their Biological Importance And Significance 2.1.7 Digestion and absorption Of Mineral Copper With Their Biological Importance And Significance 2.1.8 Digestion and absorption Of MineralZink With Their Biological Importance And	1. Fix The Error, 2. Radio Isotopes And There Importance In Medical Field. 3. Normal or Reference range.

		Significance 2.1.9 Digestion and absorption Of Mineral Sodium (Na+) With Their Biological Importance And Significance 2.1.10 Digestion and absorption Of Mineral Sodium (Na+) With Their Biological Importance And Significance 2.1.11 Digestion and absorption Of Mineral Fluoride(F) With Their Biological Importance And Significance 2.1.12 Digestion and absorption Of Mineral Sodium (Na+) With Their Biological Importance And Significance 2.1.13 Digestion and absorption Of Mineral Potassium(K+) With Their Biological Importance And Significance 2.1.14 Digestion and absorption Of Mineral Chloride (Cl) With Their Biological Importance And Significance 2.1.15 Digestion and absorption Of Mineral Manganese (Mn) With Their Biological Importance And Significance 2.2 Study Of ELISA 2.3 Study Of RIA 2.4 Electrophoresis Of Na+ And K+	

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw a Diagram Of Spectrophotometer
2. Units of measurement,
3. S.I. Units,
4. Normal or Reference range
5. Draw a Diagram Of Chromatography
6. Draw a Diagram Of Electrophoresis

Mini Project:

Influencing factors and determination.

Other Activities (Specify):

Radioimmunoassay (RIA)
ELISA

124BML23.3 Learn the concepts of Estimation of sugar by DNS method. . To extract invertase enzyme from solanum tuberosum (patato). Estimation of protein by lawry's method. protein by DNS method for determining the invertase activity.

Approximate Hours

Item	Hrs.
Cl	06
LI	03
SW	04
SL	06
Total	19

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Analysis Laboratory diagnosis By The Help Of Serum And Plasma **SO1.2 Pr**incipal,Procedure,Clinical significance And Normal Values of The Protein **SO1.3** Students Shuld Be Know What Kind Of Glasswares Is Usefull And What Not. **SO1.4** Students Should Be Know TheImportance Of DNS Method	1. DNS Method. 2.Test Of Protein by lawry's method .	**Unite 3:- Estimation of sugar by DNS method. . To extract invertase enzyme from solanum tuberosum (patato). Estimation of protein by lawry's method. Estimation of protein by DNS method for determining the invertase activity. Different type of glassware's and their composition.** 3.1Estimation of sugar by DNS method 3.2 To extract invertase enzyme from solanum tuberosum (Patato) 3.3Estimation of protein by lawry's method 3.4 Estimation of protein by DNS method 3.5Determining the invertase activity. 3.6Different type of glassware's and their composition.	**1.** Laboratory organization. **2.** Quality control of Biochemistry lab. **3.**Complete Study Of Anticoagulants **4.**Centrifugation Process **5.** Different typesCollection of Blood In Different Age Of Patients. **6.** How To Operate Machine

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw A Diagram Of All Glasswares And Their Compositions Used In The Laboratory.
2. How To Separate Serum And Plasma By Whole Blood Diagrameticaly Represent.

Mini Project:

DNS Method

124BMLT23.4 Recall the concepts of Preparation of benedict's qualitative reagent. Estimation of SGPT, SGOT. Plot a standard graph of SGOT, SGPT. Determination of ACP To plot a standard graph ofACP, Determination of serum amylase.

Approximate Hours

Item	Hrs
Cl	09
LI	07
SW	02
SL	04
Total	22

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Analysis principle of serology techniqueuse SGPT,SGOT,Amylase **SO1.2**.Selection Of Best Method For The Diagnosis And Treatment. **SO1.3** Understand About Severity Of Deasese by The Imabalancing Of Phisiological And Biochemicaly **SO1.4** Knowledge Of Desease And Sign And Symptoms To Identify The Patients Disease. **SO1.5** Students Will Be Perform All The Tests Of Serum ,With Ethical Mathod And Very Much Sound And Accurate To Do Test As Well As Know All Complications And Source Of Errors In Test With Quality Control And Quality Assurance.	1. Benedict's Test 2. SGPT Test 3.SGOT Test 4.Acid Phosphate Test 5.Serum Amylase Test 6. Standard Graph PlottingDetermination 7.Source Of Error And How To Examine Error	**Unite 4- Preparation of benedict's qualitative reagent. Estimation of serum glutamate pyruvate transaminase enzyme (SGPT & ALT). Determination of SGOT . Plot a standard graph of SGPT. Plot a standard graph of SGOT, Determination of serum acid phosphatase.,. To plot a standard graph of serum acid phosphatase ,Determination of serum amylase by colorimeteric method.** 4.1 Preparation of benedict's qualitative reagent 4.2. Estimation of serum glutamate pyruvate transaminase enzyme (SGPT & ALT). 4.3 Determination of SGOT 4.4 Plot a standard graph of SGPT 4.5 Plot a standard graph of SGOT, 4.6 Determination of serum acid phosphatasez 4.7 Determination of serum acid phosphatase. 4.8To plot a standard graph of serum acid phosphatase 4.9Determination of serum amylase by colorimeteric method	**1** Importance Of Benedict Reagents And Their Components. **2.** Sample Application. **3.** Complication Of Standard Graph Method. **4.**Source Of Errors of serum amylase by colorimeteric method

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw a Lebel Diagram Of benedict's qualitative Test.

Mini Project:

1. Draw a Diagram Of Fully Automated Analyzer

124BML23.5 Relate the basic idea of Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension.

Approximate Hours

Item	Approx. Hrs
Cl	09
LI	05
SW	03
SL	03
Total	20

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Parasite. **SO1.2** Understand different Parameters Of Morality And Normality. **SO1.3**Principal,Procedure To Prepare Buffer Solution **SO1.4**Students Will Be Do Dialysis For Diagnosis **SO1.5** Knowledge of Pressures Exists In Our Bodies.	1. Preparation Of Molar Solutions. 2. Preparation Of 10N Solutions 3. Preparation Of Buffer Solutions 4. How To Take pH, with The Help Of pH Meter And Methodology. 5. Preparation Of 10M Solutions	**Unite 5: Radioisotopes and their use in Biochemistry, mole, molar and normal solutions, pH, buffer solutions, pH and pH measurement, Osmosis, dialysis, surface tension** 5.1 Introduction To Radioisotopes. 5.2 Radioisotopes and their use in Biochemistry 5.3 Mole and Morality and Their Calculations. 5.4 Normality, Normal Solutions and Importance And Calculations. 5.5 pH and pH measurement And Their Equations And Derivations. 5.6 Buffer Solutions. 5.7 Osmosis And Osmotic Pressures. 5.8 Surface Tension. 5.9 Dialysis And Their Importance.	1. Medical, Clinical and Industrial Importance Of Radioisotopes. 2. Knowledge Of Urea And Creatinine With Their Metabolic Pathways. 3. Sodium-Potassium Pump 4.Quality Control In Dialysis Process

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw A Diagram Of Dialysis Machine.
2. Explan with Digramatically Osmotic and Osmosis pressure

Mini Project:

1. PH Meter

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML23.1 Find how to extend the basic concepts of metabolism of carbohydrates, protein, fats, nucleic Acid and enzymes, Study,spectrophotometer, flame photometer, Gel Electrophoresis	71	15	05	03	94
124BML23.1 Apply concepts in Digestion and absorption Of Nutrition calories,vitaminand), determination of Na K +ChromatographyRIAand ELISA	18	05	07	03	33
124BML23.1 Learn the concepts of Estimation of sugar by DNS method. . To extract invertase enzyme from solanum tuberosum (patato). Estimation of protein by lawry'and DNS method for determining the invertase activity.	06	03	04	06	19
124BML23.1 Recall the concepts of Preparation of Benedict's qualitative reagent. Estimation of AST,ALT and ACP Plot a standard graph of AST,ALT ACP.	09	07	02	04	22
124BML23.1 Relate the basic idea of Radioisotopes and their use mole, molar and normal solutions, pH, buffer solutions,	09	05	03	03	20
Total hour	113	35	21	19	188

Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the basic concepts of metabolism of carbohydrates, protein, fats, nucleic Acid and enzymes, Study,spectrophotometer, flame photometer, Gel Electrophoresis					
CO-2	Apply concepts in Digestion and absorption Of Nutrition calories,vitaminand), determination of Na K +Chromatography RIA and ELISA					
CO-3	Learn the concepts of Estimation of sugar by DNS method. . To extract invertase enzyme from solanum tuberosum (patato). Estimation of protein by lawry'and DNS method for determining the invertase activity.					
CO-4	Recall the concepts of Preparation of Benedict's qualitative reagent. Estimation of AST, ALT and ACP Plot a standard graph of AST, ALT ACP.					
CO-5	Relate the basic idea of Radioisotopes and their use mole, molar and normal solutions, pH, buffer solutions,					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

21. Improved Lecture
22. Tutorial
23. Group Discussion
24. Visit to Hospital
25. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Biochemistry	Satyanarayana	Elsevier	6th edition 1 January 2021
2	Textbook of Biochemistry for Medical Students	DM Vasudevan , Sreekumari S, Kannan Vaidyanathan	Jaypee Brothers Medical Publishers;	10th edition (11 July 2023)
3	A Textbook on Biochemistry for Paramedical Students	Dr. Kiran Dahiya	IP Innovative Publication Pvt. Ltd.;	First Edition (6 September 2022)
4	Manual of Practical Biochemistry for MBBS	Dr. Anju Jain Dr. S.K. Gupta, Dr. Veena Singh Ghalaut	Arya Publishing Company	(1 January 2021)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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5. Mr. Shailesh Kumar Saket , Assistant Professor , Department of paramedical science
6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML23
Course title: Biochemistry -II

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the basic concepts of metabolism of carbohydrates, protein, fats, nucleic Acid and enzymes, Study,spectrophotometer, flame photometer, Gel Electrophoresis	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO2: Apply concepts in Digestion and absorption Of Nutrition calories,vitaminand), determination of Na K +ChromatographyRIAand ELISA	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Estimation of sugar by DNS method. . To extract invertase enzyme from solanum tuberosum (patato). Estimation of protein by lawry'and DNS method for determining the invertase activity.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Preparation of Benedict's qualitative reagent. Estimation of AST,ALT and ACP Plot a standard graph of AST,ALT ACP.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5 Relate the basic idea of Radioisotopes and their use mole, molar and normal solutions, pH, buffer solutions,	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO-1: Find how to extend the Introduction,properties and simple metabolism of carbohydrates,protein,lipid,enzyme	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	15	Unit;1 Introduction,properties and simple metabolism 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 2 : Apply concept histological study of Tests For Lipid Profile (Total Choesterol, VLDL, LDL, HDL, Triglyceride etc.)Test For enzymes like AST, ALT, LDH etc.Blood Sugar Test By GOD/POD For The Detection Of Dibetes Mellitus And Hypoglycemia.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	05	Unit-2 Student Should Be Perforn And Understand Principal,Procedure,And Clinical Significance Their Normal Values,and diagnosis . 1,2,3,4,56,7,8,9,10,11,12,13,14,15	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO3 : Learn the concept Digestion and absorption Of Nutrition (vitamin and calories).A,Bcomlex,C,D,E,K etc.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	03	Unit-3: Students Should Be Understand Do Test Related To Vitamins. 1,2,3,4,5,6,	06
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 4: Recall the concept Knowledge about Estimation of sugar by DNS method, To extract invertase enzyme from solanum tuberosum (Patato	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	07	Unit-4 Students Should Know The Importance Of DNS Method. 1,2,3,4,5,6,7,8,9	04
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 5: Relate the basic idea Preparation of benedict's qualitative reagent, Estimation of serum glutamate pyruvate transaminase enzyme (SGPT & ALT). Determination of serum,Amylase,lipase,phosphatase.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	05	Unit-5 Students Will Be Perform All The Tests Of Serum ,With Ethical Mathod And Very Much Sound And Accurate To Do Test As Well As Know All Complications And Source Of Errors In Test With Quality Control And Quality Assurance. 1,2,3,4,5,6,7,8,9	03

Course Code: 124BMLT24

Course Title: Hematology- II

Pre- requisite: Student should have basic knowledge Hematological Disease and their investigation.

Rationale: The students studying They specialize in diseases of the blood and blood components. These include blood and bone marrow cells. Hematological tests can help diagnose anemia, infection, and hemophilia. They also include blood-clotting disorders, and leukemia.

Course Outcomes:

124BMLT24.1 To understand introduction and history of Fundamental of Hematology

124BMLT24.2 Acquire Knowledge regarding Laboratory investigation of transfusion reaction and mismatched transfusion.

124BMLT24.3 Acquire Knowledge of Haemoglobin its sysnthesis function anddegradation. Abnormal haemoglobin and their mean of identification and estimation.

124BMLT24.4 Acquire Knowledge of Lupus Erythematosus(LE cell) phenomenon and Various method of its demonstration.

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Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT24	Hematology- II	4	2	2	1	(4+2+2+1)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 24	Hematology- II	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML24.1 Find how to extend the basic concepts of introduction and history of Fundamental of Hematology

Approximate Hours

Item	Hrs
Cl	15
LI	05
SW	03
SL	04
Total	27

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand introduction and history of Blood bank. **SO1.2** Understand the Blood group and Rh. **SO1.3**Analysis Direct Coom's and Indirect Coom's test. **SO1.4**Analysis of Cross match. **SO1.5**Applicatio nof blood transfusion reaction.	**1.** Introduction of blood bank and safety. **2.** Anticoagulants use of blood bank and their function. 3. Handling, care and maintenance of microscopes. 4. AHG. 5. Blood group.	**Unite 1:-introduction and history of Fundamental of Hematology.** 1.1 Introduction Hematology. 1.2 Brief history and discovery of blood group system. 1.3 Safety measures in Blood bank. 1.4.1 General introduction of ABO blood group system. 1.4.2 General introduction of Rh blood group system. 1.4.3Blood group system ABO, Rh, MNS, Lutheran system, kell, and Duffy system. 1.5.1introduction of compatibility test. 1.5.2Cross match and their types 1.6 introductions of majar and minar cross match principle and procedure. 1.7.1 Introduction Coom's test. 1.7.2Principles and method Direct Coom's test. 1.7.3 Principles and methods of Indirect Coom's test. 1.5.1introduction blood transfusion reaction. 1.5.2various types of transfusion reaction. 1.5.3 Safety measures transfusion reaction.	1. Anticoagulants 2.coom's 3. Transfusion reaction. 4.G6pd

SW-1 Suggested Sectional Work (SW):

Assignments:
AHG.

Mini Project:

Cross Match

Other Activities (Specify):

Leishman's staining

124BML24.2 Apply concepts in regarding Laboratory investigation of transfusion reaction and mismatched transfusion.

Approximate Hours

Item	Hrs
Cl	13
LI	05
SW	03
SL	03
Total	24

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand about Bone marrow. **SO1.2** UnderstandJamshedi needle . **SO1.3**Analysis of Haematoxylin and eosin stain **SO1.4**MGG stai **SO1.5**preparation of packed cell for transfusion reaction.	1. Introduction, principle and method of Salah's needle. 2. Collection of bone marrow. 3. H&E. 4. Wright stain. 5. MGG stain.	**Unite 2:- Acquire Knowledge regarding Laboratory investigation of transfusion reaction and mismatched transfusion.** **Approximate Hours.** 2.1.1Transfusion reaction various types. 2.1.2 Acute immunologic reactions Acute hemolytic transfusion reaction, allergic reaction, febrile non hemolytic transfusion reaction, transfusion related acute lung injury. 2.2.1Delayed immunological reaction. 2.2.2 Acute non immunological reaction. 2.3. Delayed non immunological reaction. 2.4.1 Principles of staining methods and preparation of Leishman's stain. 2.4.2Principles of staining methods and preparation of Bone marrow. 2.5. MGG stain. 2.5.2. Wright stain. 2.6.1 Special stain of bone marrow Haematoxylin and eosin stain. 2.6.2 Collection of bone marrow various types method. 2.6.3 General characters and nature of antigens and antibodies. 2.6.4 Introduction preparation of packed cell for transfusion reaction.	1. Jamshedi needle. 2. Aspiration of bone marrow cell. 3**.** L.P needle.

SW-1 Suggested Sectional Work (SW):

Assignments:

Preparation of packed cell.

Mini Project:

Jamshedi needle**.**

Other Activities (Specify):

Aspiration of bone marrow cell.

124BMLT24.3 Acquire Knowledge of Haemoglobin its sysnthesis function anddegradation.
124BML24.3 Learn the concepts of abnormal hemoglobin and their mean of identification and estimation.

Approximate Hours

Item	Hrs.
Cl	15
LI	05
SW	02
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Introduction of haemoglobin. **SO1.2** Understand principle,method,procedure of haemoglobin in various method. **SO1.3**Analysis of haemoglobin estimation **SO1.4**Analysis of Drabkin's method **SO1.5**Application of abnormal haemoglobin estimation.	**1.** To prepare of blood smear. **2.** Blood grouping. 3. Leishman's stain. 4. Alkaline hematin method. 5. Sahli's Acid hematin merthod.	**Unite 3:- Acquire Knowledge of Haemoglobin its sysnthesis function and degradation.** **Abnormal haemoglobin and their mean of identification and estimation.** 3.1.1Introduction of haemoglobin. 3.1.2 principle,method,procedure of haemoglobin in various method. 3.1.3 Sahli's Acid hematin merthod. 3.1.4 Drabkin's method or Cyanmethemoglobin method. 3.2.1 Alkaline hematin method. 3.2.2 Copper sulfate gravimetric method. 3.2.3 Tallquist methodmeasuring HB. 3.2.4 Demonstration of abnormal hemoglobin. 3.2.5P Principle,procedure of various abnormal hemoglobin. 3.2.6 Hemoglobin 'F" 3.2.7 Hemoglobin 'A1' 3.3.1 Hemoglobin 'A2' 3.3.2 Demonstration of HPLC. 3.4.1 Laboratory organization, management, recording of results and quality control in Hematology. 3.4.2 Laboratory organization, management, recording of results and quality control in Hematology.	**1.** Laboratory organization. 2. Demonstration of HPLC.

SW-1 Suggested Sectional Work (SW):
Assignments:
Sahli's Acid hematin merthod.
Mini Project:
Laboratory organization
Other Activities (Specify):
Abnormal haemoglobin estimation.

124BMLT24.4 Recall the concepts of Acquire Knowledge of Lupus Erythematosus (LE cell) phenomenon and various method of its demonstration.
Approximate Hours.

Item	Approx. Hrs
Cl	15
LI	04
SW	03
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Lupus Erythematosus. **SO1.2** Understand mechanism of haemostatic. **SO1.3** Analysis of coagulation cascade. **SO1.4**Analysis of B.T and CT. **SO1.5**Application coagulation Profile.	1. Coagulation profile teat. 2. LE cell preparation for testing. 3. Mechanism of haemostatic. 4. Demonstration of coagulation factor.	**Unite 4:-Acquire Knowledge of Lupus Erythematous (LE cell) phenomenon and Various method of its demonstration.** 4.1.1 Introduction of Lupus Erythematosus. 4.1.2 Introduction haemostatics. 4.2.1 Mechanism of haemostatics. 4.2.2 Demonstration blood coagulation. 4.2.3Demonstration of coagulation factor. 4.2.4 Introduction,principle,procedure, and clinical significance of coagulation Profile test. 4.3.1Bleeding Time (BT). 4.3.2 Clotting Time (CT). 4.3. 3PT test. 4.3.4. APTT test. 4.3.5. LE test by rotary bead method. 4.4.1. LE test by Fluorescent 4.4.2Demonstration D dimer. 4.4.3 Demonstration anticoagulant for coagulation profile test. 4.4.4 Fibrinogen test. 4.4.5 Platelet count.	1. Lee-white method. 2. Quantitative assay of coagulation factor.

SW-1 Suggested Sectional Work (SW):
Assignments:
LE cell preparation.
Mini Project:
BT CT.
Other Activities (Specify):
PT- INR.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML24.1 Find how to extend the basic concepts of introduction and history of Fundamental of Hematology	15	05	03	04	27
124BML24.2 Apply concepts in regarding Laboratory investigation of transfusion reaction and mismatched transfusion.	13	05	03	03	24
124BML24.3 Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.	15	05	02	02	24
124BML24.4 Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.	15	04	03	02	24
Total hour	58	19	09	11	99

Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the basic concepts of introduction and history of Fundamental of Hematology					
CO-2	Apply concepts in regarding Laboratory investigation of transfusion reaction and mismatched transfusion.					
CO-3	Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.					
CO-4	Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

26. Improved Lecture
27. Tutorial
28. Group Discussion
29. Visit to Hospital
30. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Essentials of Hematology	Shirish M Kawthalkar	Jaypee Brothers Medical Publishers;	Third edition (1 January 2020)
2	The Bethesda Handbook of Clinical Hematology	Rodgers	Wolters Kluwer (India) Pvt. Ltd	Fourth edition (12 May 2018
3	Essentials in Hematology and Clinical Pathology	Ramadas Nayak ,Sharada Rai	Jaypee Brothers Medical Publishers;	Second edition (1 January 2017)
4	The Bethesda Handbook of Clinical Hematology	GRIFFIN RODGERS NEAL STUART YOUNG	Wolters Kluwer Health; 5th edition	(13 February 2024)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML24
Course title: Hematology - II

Course outcomes	Program outcomes												Program specific outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3	PSO4
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the basic concepts of introduction and history of Fundamental of Hematology	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**1**	**3**	**3**	**2**
CO2: Apply concepts in regarding Laboratory investigation of transfusion reaction and mismatched transfusion.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.	**3**	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: ---------	-	.	.	-	-	-	-	-	-	-	-	-	-	-	-	-

Legends:1-Low,2-Medium,3-High

Course Curriculum Map;

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	**CO1:** Find how to extend the basic concepts of introduction and history of Fundamental of Hematology	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	05	Unite 1:-introduction and history of Fundamental of Hematology. . 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	04
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	**CO2:** Apply concepts in regarding Laboratory investigation of transfusion reaction and mismatched transfusion.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	05	Unite 2:- Acquire Knowledge regarding Laboratory investigation of transfusion reaction and mismatched transfusion. 1,2,3,4,5,6,7,8,9,10,11,12,13	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	**CO3:** Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	05	Unite 3:- Acquire Knowledge of Haemoglobin its sysnthesis function and degradation. Abnormal haemoglobin and their mean of identification and estimation. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	**CO4:** Learn the concepts of Abnormal hemoglobin and their mean of identification and estimation.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	04	Unite 4:-Acquire Knowledge of Lupus Erythematosus(LE cell) phenomenon and Various method of its demonstration. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02

BMLT III YEAR

Course Code: 124BML31

Course Title: Applied Histopathology

Pre-Requisite: Student should have basic knowledge of Histology,Histopathology and cytopathology.

Rationale: The student studying BMLT should posses structural understanding about Studying human disease like cancer,tumour helps students and diagnosis in the Laboratory. Handiling of fresh tissues histological specimen ,cryo/froze section of fresh tissue. Different technique use in histopathology laboratory. Tissue processing, section cutting, Staining, mounting and finally microscopic examination.

Course Outcomes:

124BML311: Understanding of handling histological specimen.

124BML31.2: Acquire knowledge regarding the Electron microscope.

124BML31.3: Acquire knowledge regarding the handling of Microtomes.

124BML31.4: Understanding of handling cytological,FNAC specimen.

124BML31.5: Acquire knowledge regarding the types of Museum technique.

124BML02.5 Acquire Knowledge of virus Parasite E. Histolytica, G. Lambila. M.parasite, A. Lumb., T. Vaganilis, E. Vericularis, Ancylostoma, Stronglyoides, diagnosis.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT314	Applied Histopathology	4	2	2	2	(4+2+2+2)	10

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 314	Applied Histopathology	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML31.1 Find how to extend the Handling of fresh histological specimen, cryo/frozen section of fresh and fixed tissue, freeze drying Lipid identification and demonstration Micro-organism in the tissue-various staining techniques for their demonstration and identification Nucleic acid, DNA and RNA special stains and procedures.

Approximate Hours.

Item	Hrs
Cl	15
LI	04
SW	03
SL	02
Total	22

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand About handling histological sample. **SO1.2** Understand about preservation of section. **SO1.3**Analysis of tissue section cutting. **SO1.4**Analysis of the lipid identification. **SO1.5** Application of DNA , RNA Special Stain.	1. Tissue processing. 2. Grossing. 3. Embedding. 4. Section cutting.	**Unit 1:- Understand the Handling of fresh histological specimen, cryo/frozen section of fresh and fixed tissue, freeze drying Lipid identification and demonstration Micro-organism in the tissue-various staining techniques for their demonstration and identification Nucleic acid ,DNA and RNA special stains and procedures.** 1.1.1 Handling of fresh histological specimen, cryo/frozen section of fresh and fixed tissue, freeze drying. 1.1.2 Handling of fresh histological specimen, cryo/frozen section of fresh and fixed tissue, freeze drying. 1.1.3 Handling of fresh histological specimen, cryo/frozen section of fresh and fixed tissue, freeze drying. 1.2.1 Lipid identification and demonstration. 1.2.2 Lipid identification and demonstration. 1.3.1 Micro-organism in the tissue-various staining techniques for their demonstration and identification. 1.3.2 Micro-organism in the tissue-various staining techniques for their demonstration and identification. 1.3.3 Micro-organism in the tissue-various staining techniques for their demonstration and identification.	1. DNA. 2. RNA.

		1.4.1 Nucleic acid, DNA. 1.4.2 Nucleic acid, DNA. 1.4.3 Nucleic acid, DNA. 1.5.1 RNA special stains and procedures. 1.5.2 RNA special stains and procedures. 1.5.3 RNA special stains and procedures. 1.5.4 RNA special stains and procedures.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Embedding

Mini Project:

DNA

Other Activities (Specify):

Section cutting of tissue sample.

124BML31.2 Apply concepts in the Cytoplasm constituent and their demonstration Tissue requiring special treatment i.e. eye ball, biopsy, under calcified bones. Neuropathology techniques Enzyme histochemistry demonstration of phosphatase, dehydrogenase, oxidase and peroxidase etc, Electron microscope , their working ,component and allied techniques for electron microscopy.

Approximate Hours.

Item	Hrs
Cl	15
LI	03
SW	02
SL	02
Total	22

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand About handling cytological sample. **SO1.2** Understand about preservation and fixation of smear. **SO1.3**Analysis of collection of cytological sample. **SO1.4**Analysis of special treatment of biopsy. **SO1.5** Application of electron microscope.	1. PAP. 2. Giemsa. 3. PAS.	**Unit 2:- Understand theCytoplasmic constituent and their demonstration Tissue requiring special treatment i.e eye ball,B.M.biopsy ,under calcified bones. Neuropathology techniques Enzyme histochemistry demonstration of phosphatase,dehydrogenase,oxidase and peroxidase etc, Electron microscope ,their working ,component and allied techniques for electron microscopy.** 2.1.1 Cytoplasmic constituent and their demonstration. 2.1.2 Cytoplasmic constituent and their demonstration. 2.2.1 Tissue requiring special treatment i.e eye ball, B.M. biopsy, under calcified bones. 2.2.2 Tissue requiring special treatment i.e eye ball, B.M. biopsy, under calcified bones. 2.2.3 Tissue requiring special treatment i.e eye ball, B.M. biopsy, under calcified bones. 2.3.1 Neuropathology techniques. 2.3.2 Neuropathology techniques. 2.4.1 Enzyme histochemistry demonstration of phosphatase, dehydrogenase, oxidase and peroxidase etc. 2.4.2 Enzyme histochemistry demonstration of phosphatase, dehydrogenase, oxidase and peroxidase etc. 2.4.3 Enzyme histochemistry demonstration of phosphatase, dehydrogenase, oxidase and peroxidase etc. 2.4.4 Enzyme histochemistry demonstration of	1. Electron Microscope. 2. Biopsy.

		phosphatase,dehydrogenase,oxidase and peroxidase etc. 2.5.1 Electron microscope, their working, component and allied techniques for electron microscopy. 2.5.2 Electron microscope, their working, component and allied techniques for electron microscopy. 2.5.3 Electron microscope, their working, component and allied techniques for electron microscopy. 2.5.4 Electron microscope, their working, component and allied techniques for electron microscopy.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Electron microscope.

Mini Project:

Recod of cytological slide.

Other Activities (Specify):

Focusing of microscope.

124BML31.3 Learn the concepts of Ultra microtomy Museum technique. Cervical cytology basis of detection of malignant and pre malignant lesions. Hormonal assessment with cytological techniques and sex chromatin and pregnancy test.

Approximat Hours.

Item	Hrs
Cl	15
LI	03
SW	02
SL	02
Total	22

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand About handling Microtome. **SO1.2** Understand about Museum technique. **SO1.3**Analysis of cytological stain of cervical smear. **SO1.4**Analysis of special Hormonal assessment of cytological technique. **SO1.5** Application of upt and pregnancy test.	1. PAP. 2. Giemsa. 3. PAS.	**Unit 3:- Learn the concepts of Ultra microtomy Museum technique. Cervical cytology basis of detection of malignant and pre malignant lesions. Hormonal assessment with cytological techniques and sex chromatin and pregnancy test.** 3.1.1 .Ultra microtome. 3.1.2 .Ultra microtome. 3.2.1 Museum technique. 3.2.2 Museum technique. 3.3.1 Cervical cytology –basis of detection of malignant and pre malignant lesions. 3.3.2 Cervical cytology –basis of detection of malignant and pre malignant lesions. 3.3.3 Cervical cytology –basis of detection of malignant and pre malignant lesions. 3.3.4 Cervical cytology –basis of detection of malignant and pre malignant lesions. 3.3.5 Cervical cytology –basis of detection of malignant and pre malignant lesions. 3.4.1 Hormonal assessment with cytological techniques. 3.4.2 Hormonal assessment with cytological techniques. 3.4.3 Hormonal assessment with cytological techniques. 3.4.3 Hormonal assessment with cytological techniques. 3.5.1 Sex chromatin and pregnancy test. 3.5.2 Sex chromatin and pregnancy test. 3.5.3 Sex chromatin and pregnancy test.	1. Ultra Microtome. 2. Museum Technique.

SW-1 Suggested Sectional Work (SW):

Assignments:

Microtome.

Mini Project:

Museum technique.

Other Activities (Specify):

Focusing of microscope

124BML31.4 Recall the concepts of Aspiration cytology principles, indications and utility of technician in FNAC clinics. Cells and organs of immune systems Immunoglobulin's antibodies and humoral immune response. Allergy.
Approximate Hours.

Item	Hrs
Cl	15
LI	03
SW	03
SL	02
Total	23

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand About principle of cytology. **SO1.2** Understand about FNAC technique. **SO1.3**Analysis of Immune response. **SO1.4**Analysis of special antibodies detection. **SO1.5** Application of Immune system.	1. Monteux test. 2. Giemsa. 3. PAS.	**Unit 4:- Recall the concepts of Aspiration cytology principles, indications and utility of technician in FNAC clinics. Cells and organs of immune systems Immunoglobulin's antibodies and humoral immune response. Allergy.** 4.1.1. Aspiration cytology principles. 4.1.2. . Aspiration cytology principles. 4.1.3. Aspiration cytology principles. 4.2.1 Indications and utility of technician in FNAC clinics. 4.2.2 Indications and utility of technician in FNAC clinics. 4.2.3 Indications and utility of technician in FNAC clinics. 4.2.4 Indications and utility of technician in FNAC clinics 4.3.1 Cells and organs of immune systems. 4.3.2 Cells and organs of immune systems. 4.3. Cells and organs of immune systems. 4.5.1 Immunoglobulin's antibodies and humoral immune response. 4.5.2 Immunoglobulin's antibodies and humoral immune response. 4.5.3 Immunoglobulin's antibodies and humoral immune response. 4.6.1 Allergy. 4.6.2 Allergy.	1. FNAC. 2. Antibodies.

SW-1 Suggested Sectional Work (SW):
Assignments:
FNAC.
Mini Project:
IgM Antibvodies.
Other Activities (Specify):
Explanation about immune system.

124BML31.5 Relate the basic idea of rheumatological diseases and investigations. Infection and the immune system. Cancer immunology. Tissue typing for kidney transplant.
Approximate Hours.

Item	Hrs
Cl	15
LI	05
SW	02
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand About Autoimmune disease. **SO1.2** Understand about immune system. **SO1.3**Analysis of different type of cancer. **SO1.4**Analysis of cord factor typing. **SO1.5** Application of histocomptability typing.	1. RA. 2. ASO. 3. CRP. 4. IgG. 5. IgM.	**Unit 5:- Relate the basic idea of rheumatologic diseases and investigations. Infection and the immune system. Cancer immunology. Tissue typing for kidney transplant.** 5.1.1 Rheumatologic diseases and investigations. 5.1.2 Rheumatologic diseases and investigations. 5.1.3 Rheumatologic diseases and investigations. 5.1.4 Rheumatologic diseases and investigations. 5.2.1 Infection and the immune system. 5.2.2 Infection and the immune system. 5.2.3 Infection and the immune system. 5.2.4 Infection and the immune system. 5.3.1 Cancer immunology. 5.3.2 Cancer immunology. 5.3.3 Cancer immunology. 5.4.1 Tissue typing for kidney transplant. 5.4.2 Tissue typing for kidney transplant. 5.4.3 Tissue typing for kidney transplant. 5.4.4 Tissue typing for kidney transplant.	1. Kidney. 2. Antibodies.

SW-1 Suggested Sectional Work (SW):
Assignments:
Kidney.
Mini Project:
IgG.
Other Activities (Specify):
Explainatiaboutcancer.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction(I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML31.1Find how to extend the Handling of fresh histological specimen, cryo/frozen section. Demonstration Micro-organism in the tissue-various staining techniques. Nucleic acid, DNA and RNA special stains and procedures.	15	04	03	02	22
124BML31.2 Apply concepts in the Cytoplasm constituent and their demonstration Tissue requiring special treatment i.e. eye ball, biopsy, under calcified bones. Electron microscope, their working.	15	03	02	02	22
124BML31.3 Learn the concepts of Ultra microtome Museum technique. Cervical cytology basis of detection of malignant and pre malignant lesions.	15	03	02	02	22
124BML31.4 Recall the concepts of principles, indications and utility of technician in FNAC clinics. Cells and organs of immune systems	15	03	03	02	23
124BML31.5Relate the basic idea of rheumatological diseases and investigations.Cancer immunology. Tissue typing for kidney transplant.	15	05	02	02	24
Total hour	75	18	12	10	113

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the Handling of fresh histological specimen, cryo/frozen section. Demonstration Micro-organism in the tissue-various staining techniques. Nucleic acid, DNA and RNA special stains and procedures.					
CO-2	Apply concepts in the Cytoplasm constituent and their demonstration Tissue requiring special treatment i.e. eye ball, biopsy, under calcified bones. Electron microscope, their working.					
CO-3	Learn the concepts of Ultra microtome Museum technique. Cervical cytology basis of detection of malignant and pre malignant lesions.					
CO-4	Recall the concepts of principles, indications and utility of technician in FNAC clinics. Cells and organs of immune systems					
CO-5	Relate the basic idea of rheumatological diseases and investigations.Cancer immunology. Tissue typing for kidney transplant.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

31. Improved Lecture
32. Tutorial
33. Group Discussion
34. Visit to Hospital
35. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Inderbir Singh's Textbook of Human Histology	Pushpalatha K , Deepa Bhat	Jaypee Brothers Medical Publishers	10th edition (11 July 2023)
2	Histology – Text and Atlas	Brijesh Kumar	Wolters Kluwer;	Third edition (1 June 2023)
3	Textbook of Human Histology with Color Atlas	SONTAKKE Y	CBS	(1 January 2020)
4	Companion Workbook for Human Histology	BHANARKAR U	CBS Publishers and Distributors Pvt. Ltd.	(15 July 2023)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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2. Dr. Debjeet dutta Principal Department of paramedical science AKS University ,
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5. Mr. Shailesh Kumar Saket , Assistant Professor , Department of paramedical science
6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BM31
Course title: Applied Histopathology

Course outcomes	Program outcomes												Program specific outcome			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2	PSO3	PSO4
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the Handling of fresh histological specimen, cryo/frozen section. Demonstration Micro-organism in the tissue-various staining techniques. Nucleic acid, DNA and RNA special stains and procedures.	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO2: Apply concepts in the Cytoplasm constituent and their demonstration Tissue requiring special treatment i.e. eye ball, biopsy, under calcified bones. Electron microscope, their working.	**2**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Ultra microtome Museum technique. Cervical cytology basis of detection of malignant and pre malignant lesions.	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of principles, indications and utility of technician in FNAC clinics. Cells and organs of immune systems	**2**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Relate the basic idea of rheumatological diseases and investigations.Cancer immunology. Tissue typing for kidney transplant.	**3**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO-1: Learn the concept the Handling of fresh histological specimen,cryo/frozen section of fresh and fixed tissue,freeze drying.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	04	Unit-1 Handling histological sample. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 2: Recall the concept staining techniques for their demonstration and identification,Nucleic acid, DNA special stains and procedures, Nucleic acid, RNA special stains and procedures.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	03	Unit-2 DNA , RNA Special Stain. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO3: Relate the basic idea Lipid demonstration,principle,requiredment material ,procedure,clinical significance and result.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	03	Unit-3 Analysis of the Lipid identification. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 4: Find how to extend the basic Cytoplasm constituent and their demonstration, Cervical cytology –basis of detection of malignant and pre malignant lesions, FNAC technique.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	03	Unit-4 Handling cytological sample 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 5: Apply concepts the introduction of Immunoglobulin's antibodies and humoral immune response. Immunoglobulin's antibodies and humoral immune response. Immunoglobulin's antibodies and humoral immune response.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	05	Unit-5 Immune Mechanism, Cells and organs of immune systems. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02

Year – III

Course Code: 124BML32

Course Title: Microbiology-III

Pre-Requisite: Student should have basic knowledge of Medical microbiology and its types.

Rationale: The student studying BMLT should posses understanding human disease spread by bacteria, fungus,parasite, virus e.t.c understanding infection in human .

Course Outcomes:

124BML32.1: Understand Total and viable count of bacteria.

124BML32.2: Acquire knowledge regarding the disinfectant Riedeal walker and chick martin test.

124BML32.3: Acquire knowledge regarding the Laboratory diagnosis of common bacteria pyogenic infection,Respiratory infection,Meningitis,Diphtheria,whooping caugh,Gas gangrene, Food poisoning and Enteric fever.

124BML32.4: Acquire knowledge regarding Toxin and Antitoxin.

124BML32.5: Acquire knowledge regarding Serological test Widal,ASO,LET,CRP,VDRL, TPHA,FTA-ABS, Brucella agglutination.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT32	Microbiology-III	4	2	2	2	(4+2+2+2)	10

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 32	Microbiology-III	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML32.1 Find how to extend the introduction preservation of microbes and lyophilisation method, Bacteriological Examination of water, milk, food and air, testing of disinfectant Riedeal walker and chick martin.

Approximate Hours.

Item	. Hrs
Cl	15
LI	04
SW	03
SL	04
Total	26

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand preservation of microbes and lyophilisation method **SO1.2** Understand Total and viable count of bacteria **SO1.3** Analysis Testing of disinfectant Riedeal walker and chick martin test **SO1.4** Application Preparation of standardisation of vaccin and immunisation schedule **SO1.5** Analysis Bacteriological Examination of water,milk,food and air	1. Culturing of bacteria in culture media observe growth curve. 2. Riedeal walker and chick martin test. Principle, procedure and calculation. 3. Preparation of vaccine. 4. Chemical and microscopy Examination of water, milk, food and air.	**Unite 1:-understands introduction understands introduction preservation of microbes and lyophilisation method, Bacteriological Examination of water, milk, food and air, Testing of disinfectant Riedeal walker and chick martin.** 1.1Introduction principle procedure advantage and disadvantage of lyophilisation in microbiology 1.2Bacteria Growth curve and their types 1.3Total and viable count of bacteria 1.4Introduction of Riedeal walker principle ,procedure and calculation 1.5 chick martin test principle ,procedure and calculation 1.6preparation of vaccine immunization 1.7Bacteriological Examination of air. 1.8 Bacteriological Examination of water. 1.9 Bacteriological Examination of milk. 1.10 Bacteriological Examination of Food. 1.11Preparation of standardization of vaccine and immunization schedule 1.12 Nosocomial infection. 1.13Nosocomial infection and sterility testing of IV fluid various sample for hospital. 1.14 E epidemiology marker of micro- organism. **1.15** E epidemiology marker of micro- organism.	1. Bacterial morphology . 2. Gram staining. 3. AFB staining. 4. Food poisoning.

SW-1 Suggested Sectional Work (SW):

Assignments:

Lyophilisation.

Mini Project:

Gran's staining

Other Activities (Specify):

Handling of Light microscope

124BML32.2 Apply concepts Introduction of Toxin-Antitoxin, Preparation of antitoxin. Laboratory diagnosis of common.

Approximate Hours.

Item	Hrs
Cl	15
LI	06
SW	03
SL	04
Total	28

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Toxin-Antitoxin. **SO1.2** Application disease of bacteria. **SO1.3**Understand Bacteriophage and bacteriocin . **SO1.4** Analysis Laboratory diagnosis of common bacteria pyogenic infection,Respiratory infection, Meningitis,Diphtheria, whooping caugh, gas gangrene,food poisoning,Enteric fever. **SO1.5**Analysis Accut diarrhoea cholera,UTI, T.B ,STD ,Leprosy,plague,anthrax,syphilis,gonorrhea	1. Serological test. 2. Widal. 3. ASO. 4. LET, CRP. 5. VDRL, TPHA, FTA-ABS. 6. Ropewalker brucell agglutination.	**Unite2:- Apply concepts Introduction of Toxin-Antitoxin, Preparation of antitoxin. Laboratory diagnosis of common.** 2.1Introduction of Toxin-Antitoxin , Preparation of antitoxin 2.2 Laboratory diagnosis of common 1.3 Bacteria pyogenic infection. 2.4 Respiratory infection. 2.5 Meningitis. 2.6 Diphtheria 2.7 whooping caugh, 2.8 Gas gangrene 2.9 Food poisoning 2.10 Enteric fever. 2.11 Accut diarrhoea 2.12cholera,UTI, 2.13 Tuberculosis bacteria,Leprosy disease. 2.14STD (syphilis,gonorrhea, 2.15 plague, anthrax.	1. Serological test 2. RA factor. 3. Culture media. 4. Sterilization.

SW-1 Suggested Sectional Work (SW):

Assignments:

Autoclave and hot air oven.

Mini Project:

Nutrient agar media.

Other Activities (Specify):

Preparation of media

124BML32.3 Learn the concepts of Pathogenesis and Laboratory diagnosis of fungal infection.

Approximate Hours.

Item	Hrs
Cl	15
LI	05
SW	03
SL	02
Total	25

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1. Analysis Laboratory diagnosis of fungal infection **SO1.2**UnderstandSerological test for fungal infection and skin test. **SO1.3** Application of ELISA, RIA and CCIE. **SO1.4**Analysis GLC, HPLC. **SO1.5**UnderstandSerological test for fungal infection.	1. To prepare SDA culture media for fungi. 2. Principle, procedure and types of method ELISA. 3. RIA. 4. Principle, procedure of GLC. 5. HPLC.	**Unite 3:- Learn the concepts of Pathogenesis and Laboratory diagnosis of fungal infection.** 3.1Dermatophytes. 3.2candidiasis infection. 3.3cryptococcosis pulmonary. 3.4infection mycetoma. 3.5 mycotic infections. 3.6 subcutaneous fungal infections. 3.7 sporotrichosis. 3.8 chromoblasatom. 3.9 mycosis eye and ear fungal infection. 3.10 serological tests for fungi. 3.11 To prepare SDA culture media for fungi. 3.12 General properties of fungi. 3.13 Other media use for fungal infection diagnosis. 3.14 Diagnosis of Ring warm. 3.15 principle, procedure and types of method ELISA.	**1.** Laboratory organization. **2.** Quality control of microbiology lab.

SW-1 Suggested Sectional Work (SW):

Assignments:

Care and handling of laboratory animal.

Mini Project:

Laboratory organization

Other Activities (Specify):

Check quality control in microbiology lab.

124BML32.4 Recall the concepts of Acquire Knowledge of principle of serology technique use in virology and its classification collection transportation processing and diagnosis of viral sample.

Approximate Hours.

Item	. Hrs
Cl	15
LI	06
SW	03
SL	03
Total	27

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Analysis principle of serology technique use in virology **SO1.2**.Understand HA, HAI, HAB, SRB, RPHA, JHA, CET, CIEP. **SO1.3**Understand Mode of transmission of viral agent. **SO1.4**Application morphology and life cycle free living amoeba balantidium Toxoplasma **SO1.5** Application morphology, life cycle and lab diagnosis of schistosomos,intestinal flukes and blood flukes.	1.HA,HAI,HAB,SRB,RPHA,JHA, CET,CIEP 2. Collection of viral sample. 3. Transportation and processing of viral sample. 4. ELISA. 5. RIA. 6..IF,Immuno Ferooxidase test.	**Unite 4:- Recall the concepts of Acquire Knowledge of principle of serology technique use in virology and its classification collection transportation processing and diagnosis of viral sample.** 4.1 HAB. 4.2 HA, HAI, 4.3 RPHA, JHA, CET, CIEP. 4.4. HA, HAI. 4.5 HAB, SRB. 4.6 RPHA, JHA. 4.7 CET, CIEP. 4.8 prevention of viral disease. 4.9 Morphology and Life cycle. 4.10 Amoeba. 4.11 Balantidium. 4.12 Toxoplasma. 4.3 schistosomos, 4.4 intestinal flukes. 4.15 Blood flukes.	**1.**collection of virus sample **2.** Storage of sample. **3.** ELISA.

SW-1 Suggested Sectional Work (SW):

Assignments:

Virus structure.

Mini Project:

collection of viral sample.

Other Activities (Specify):

Viral antigen

124BML32.5 Relate the basic idea Laboratory diagnosis of Parasite E. Histolytica, G.

Lambila. Malaria parasite, T. Vaganilis, diagnosis.

Approximate Hours.

Item	Hrs
Cl	15
LI	06
SW	03
SL	03
Total	27

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Parasite. **SO1.2** Understand different parasite. **SO1.3**Analysis of parasitic infection of human body. **SO1.4**Analysis of diagnosis of parasite in different sample. **SO1.5**Application of investigate of morphology of parasite.	1. Macroscopic examination of adult worms, cysts, tissues, and processing of stood sample for routine examination. 2. Introduction to operation of laboratory instruments and safety precautions 3. Saline and I2 preparation for protozoa cysts and trophozoites. 4. Concentration procedures for protozoa cysts and trophoziotes. 5. Concentration procedures for helminthic ova and cyst. 6. Examination and identification of ova and cyst of parasites of medical importance	**Unite 5:- Relate the basic idea Laboratory diagnosis of Parasite E. Histolytica, G. Lambila. Malaria parasite, T. Vaganilis, diagnosis.** 5.1Introduction to medical and safety. 5.2General characters and classification of protozoa. 5.3Laboratory procedure collections, preservation and processing of sample. 5.4Morphology and life cycles of intestinal protocol, Amoeba-Giardia. 5.5Laboratory diagnosis of intestinal protozoa infection: - 5.6 Amoeba-Giardia. Morphology and diagnosis of oral of trichomonas vaginal flagellates 5.7malaria protozoa-parasite. 5.8Laboratory diagnosis of malarial infection. 5.9 General characters and classification of medical helminthology. 5.10Morphology and life cycles of Nematodes (Intestinal), - 5.11 Ascaris. 5.12Enterobious,. 5.13Ancylostoma. 5.14Strongyloides. 5.15 Laboratory diagnosis of intestinal Nematode infection	**1.** E. Histolytic. **2.** Malaria parasite. **3.** G. Lambila

SW-1 Suggested Sectional Work (SW):
Assignments:
M.Parasite.
Mini Project:
E. Histolytica
Other Activities (Specify):
Differentiateadultandlarvaform

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML32.1 Find how to extend the introduction preservation of microbes and lyophilisation method, Bacteriological Examination of water, milk, food and air, Testing of disinfectant Riedeal walker and chick martin.	15	04	03	04	26
124BML32.2 Apply concepts Introduction of Toxin-Antitoxin, Preparation of antitoxin. Laboratory diagnosis of common.	15	06	03	04	28
124BML32.3 Learn the concepts of Pathogenesis and Laboratory diagnosis of fungal infection.	15	05	03	02	25
124BML32.4 Recall the concepts of principle of serology technique use in virology and its classification collection transportation processing and diagnosis of viral sample.	15	06	03	03	27
124BML32.5 Relate the basic idea Laboratory diagnosis of Parasite E. Histolytica, G. Lambila. Malaria parasite, T. Vaganilis, diagnosis.	15	06	03	03	27
Total hour	75	27	15	16	133

Suggestion for End Session Assessment
Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the introduction preservation of microbes and lyophilisation method, Bacteriological Examination of water, milk, food and air, Testing of disinfectant Redial walker and chick martin.					
CO-2	Apply concepts Introduction of Toxin-Antitoxin, Preparation of antitoxin. Laboratory diagnosis of common.					
CO-3	Learn the concepts of Pathogenesis and Laboratory diagnosis of fungal infection.					
CO-4	Recall the concepts of principle of serology technique use in virology and its classification collection transportation processing and diagnosis of viral sample.					
CO-5	Relate the basic idea Laboratory diagnosis of Parasite E. Histolytica, G. Lambila. Malaria parasite, T. Vaganilis, diagnosis.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

36. Improved Lecture
37. Tutorial
38. Group Discussion
39. Visit to Hospital
40. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Essentials of Medical Microbiology	Apurba S Sastry, Sandhya Bhat	Jaypee Brothers Medical Publishers Pvt. Limited, 2021	2021
2	Essentials of Medical Parasitology	Apurba S Sastry, Sandhya Bhat	Jaypee Brothers Medical Publishers;	Second edition (1 January 2018)
3	Practical Medical Microbiology for BMLT	Dr. Rajesh Bareja	IP Innovative Publication Pvt. Ltd.	First Edition, 2020
4	Text and Practical Microbiology For MLT	V Baveja C P Baveja	Arya Publishing Company	2 March 2022
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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5. Mr. Shailesh Kumar Saket , Assistant Professor , Department of paramedical science
6. Mr. Brijnanadan Singh , Assistant Professor , Department of paramedical science
7. Mr.Akhtar Ali , Assistant Professor , Department of paramedical science

CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML32
Course title: Microbiology - III

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the introduction preservation of microbes and lyophilisation method, Bacteriological Examination of water, milk, food and air, Testing of disinfectant Riedeal walker and chick martin.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**2**	**2**	**3**	**2**
CO2 Apply concepts Introduction of Toxin-Antitoxin, Preparation of antitoxin. Laboratory diagnosis of common.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Pathogenesis and Laboratory diagnosis of fungal infection.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**2**
CO4 Recall the concepts of principle of serology technique use in virology and its classification collection transportation processing and diagnosis of viral sample.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**2**	**2**	**3**	**2**
CO5: Relate the basic idea Laboratory diagnosis of Parasite E. Histolytica, G. Lambila. Malaria parasite, T. Vaganilis, diagnosis**.**	**2**	**1**	**3**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**3**	**3**	**1**	**3**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO-1 Learn the concept Introduction principle procedure advantage and disadvantage of lyophilisation in microbiology.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	04	Unit-1 preservation of microbes and lyophilisation method 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	04
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 2 Recall the concept Introduction of Total and viable count of bacteria and Riedeal walker principle ,procedure and calculation Chick martin test principle ,procedure and calculation.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	06	Unit-2 viable count of bacteria, Analysis Testing of disinfectant Riedeal walker and chick martin test. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	04
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	1.1 CO3 Relate the basic idea pyogenicinfection,Respiratory infection, Meningitis,Diphtheria,whooping caugh, gas gangrene,food poisoning,Enteric fever. Accut diarrhoea cholera,UTI, T.B ,STD ,Leprosy,plague,anthrax,syphilis,gonorrhea. Dermatophytes, candidiasis infection, cryptococcosis pulmonary etc.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	05	Unit-3 Laboratory diagnosis of common bacterial and fungal infection. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 4: Find how to extend the basic principle of serology techniqueuse in virology RPHA, JHA, CET, CIEP, HA, HAI. HAB, SRB. RPHA, JHA. CET, CIEP. prevention of viral disease	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	06	Unit-4 Analysis principle of serology technique use in virology. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	03
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 5: Apply concepts. Morphology and Life cycle. Amoeba Balantidium. Toxoplasma.schistosomos, Intestinal flukes. Blood flukes.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	06	Unit-5 Morphology and life cycle free living amoeba balantidium Toxoplasma and Trematodes. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	03

Year – III

Course Code: 124BML33

Course Title: Biochemistry-III

Pre-Requisite: Student should have basic knowledge of Various clinical test of biochemistry.

Rationale: Clinical biochemistry plays a crucial role in the identification and monitoring of disease. By measuring the levels of biochemical markers in bodily fluids, healthcare professionals can detect the presence of disease, monitor its progression, and evaluate the effectiveness of treatments.

Course Outcomes:

124BML33.1 To Principle for assay procedure for biological material. Total protein,Total albumin,Glucose,Urea,Uricacid,Creatinine,Cholesterol,Bilirubin,Sodium.Potassium,Chloride,Calcium,Inorganic Phosphates ,PBD 17 Ketosterious,Barbiturates

124BML33.2 Glucose tolerance test, Insulin tolerance test gastric analysis, Xylems absorption test , Clearance test for renal function

124BML33.3 Enzyme-acid and alkaline phosphatase, AST , ALT , Amylase lactate dehydrogenase ,CP

124BML33.4 Analysis of calculi and CSF ,Quality control of clinical investigations , Automation in clinical biochemistry laboratory

124BML33.5 Laboratory organizations ,Management and maintenance of records

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	Total Hour Per week
Program Core (PCC)	124BMLT33	Biochemistry-III	4	2	2	1	(4+2+2+1)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 33	Biochemistry-III	100	100	100	300

Course-Curriculum Detailing:

This course syllabus illustrates the expected learning achievements, both at the course and session levels, which students are anticipated to accomplish through various modes of instruction including Classroom Instruction (CI), Laboratory Instruction (LI), Sessional Work (SW), and Self Learning (SL). As the course progresses, students should showcase their mastery of Session Outcomes (SOs), culminating in the overall achievement of Course Outcomes (COs) upon the course's conclusion.

124BML33.1 Find how to extend the Principle for assay procedure for biological material. Total protein,Totalalbumin,Glucose,Urea,Uricacid,Creatinine,Cholesterol,Bilirubin,Sodium.Potassium,Chloride,Calcium,Inorganic Phosphates ,PBD 17 Ketosterious, Barbiturates

Approximate Hours.

Item	Hrs
Cl	32
LI	15
SW	03
SL	05
Total	55

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1. Understand About Principal, Procedure And Different Reagents Use In The Tests. **SO1.2**Understand Ethical Tests Of Medical Lab. Technology, Which Is Certified By International Union Of Biochemistry And Also By WHO. **SO1.3** Analysis Of Lab Safety Parameters And Ethics Of Lab. Technologists As Well As Hazards and First Aids, And Will Be Do Test Very Qualitatively With QC. **SO1.4** Student Will Be Know More Than One Methods For Crosscheck And Compile His Test Results.	1.Test Of Albumin 2.Test Of Total Protein 3.Test Of Glucose In Blood 4. Test Of Glucose In Urine 5. Test Of Urea Clearance 6.Test Of Creatinine Clearance 7.Test Of Uric Acid 8.Test Of Cholesterol 9.Test Of T.Bilirubine,Direct And Indirect 10.Test Of Sodium 11.Test Of Chloride 12Test Of Potassium 13Test Of Calcium 14Test Of Inorganic Phosphates (ALP,ACP) 15Test Of PBD 17 Ketosterious Barbiturates	**Unite 1:- Find how to extend the Principle for assay procedure for biological material. Total protein,Totalalbumin,Glucose,Urea,Uricacid,Creatinine,Cholesterol,Bilirubin,Sodium. Potassium,Chloride,Calcium,Inorganic Phosphates ,PBD 17 Ketosterious, Barbiturates** **1.1.** Total Protein **1.3**Glucose 1.3.1 Introduction Of Glucose 1.3.2 Glucose In Urine and Blood 1.3.3 Ketosis, Ketonuria And Ketonemia 1.3.4 Tests Available For Diagnosis Of Glycosemia (Hyper And Hypo) 1.3.5 Diabetes Mellitus and Their Types 1.3.6 Diabetes Insipid us and Responsive Hormones. **1.4**Introduction Of Urea, 1.4.1 Metabolism And Excretion Of Urea Through UTI 1.4.2 Clinical Significance Of Urea **1.5**UricAcid 1.5.1 Metabolism And Excretion Of Uric Acid Through UTI 1.4.2 Clinical Significance Of Uric Acid **1.6**Introduction Of Creatinine 1.6.1 Metabolism And Excretion Of Creatinine Through UTI 1.6.2 Clinical Significance Of Creatinine **1.7**Introduction Of Cholesterol	**1.**How To Work With Fully Automated And Semi automated Analyzers **2.**Chemical Hazards **3.** Physical Hazards 4.Regaurding Deals and Problems which will be Comes In Ground Labelle **5**.How To Get Certification Related To A Slandered Medical Lab.

		1.7.1 Metabolism Of Cholesterol 1.7.2 Clinical Significance Of Cholesterol In The Blood **1.8**Introduction Of Bilirubine, 1.8.1 Normal Liver Structure And Function 1.8.2 Abnormality in Function Of Lever 1.8.3 Types Of Bilirubin And Their Complications. **1.9**Introduction Of Sodium **1.10**Potassium,Chloride **1.11**Calcium **1.12**Inorganic Phosphates **1.13** Introduction PBD 17 Ketosterious Barbiturates 1.13.1PBDComplications 17 Ketosterious Barbiturates	

SW-1 Suggested Sectional Work (SW):

Assignments:

Draw and explain About Blood Collection.

Draw Diagram of Lever

Mini Project:

Normal Values of All Parameters Used In the Medical Lab. Biochemistry Test

124BML33.2 Apply concepts in the Glucose tolerance test, Insulin tolerance test gastric analysis, Xylems absorption test , Clearance test for renal function.

Approximate Hours.

Item	Hrs
Cl	06
LI	09
SW	07
SL	07
Total	29

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO2.1 Understand About Principal, Procedure And Different Reagents Use In The Tests. **SO1.2** Application Of Acid and Basic Solution In The Laboratory Testing. **SO1.3**.Understand How To Use And Handling Equipments, And How To Use Analytic Balance. **SO1.4** Understand about Normal values and What Are the Factors Causing Influencing And How To Determine And How To Short Out These Problems. SO.**1.5** What is The Principal, Process, Clinical Significance Normal Values Of chloride estimation. SO **1.6** How To Measure With The Help Of Volumetric Glassware's.	1 Tests For Urea Clearance 2. Tests For Creatinine Clearance 3. Tests For NPN 4. Tests For GGT 5. Tests For Electrolytes 6. Sodium, 7. Potassium 8. Chlorides 9. Calcium	Unite2:- **Apply concepts in the Glucose tolerance test, Insulin tolerance test gastric analysis, Xylems absorption test, Clearance test for renal function.** 2.1 Glucose tolerance test. 2.1.1 Clinical Significance Of Glucose 2.2 Insulin tolerance 2.3 gastric analysis 2.4 Xylose absorption test 2.5 Clearance test for renal function	1. Discussion For Glucose Importance In The Body, Insulin Metabolism And Node Of Action 2. How To Get Gastric Juice For Test. 3. Normal or Reference ranges Of Components Present In The Juice. 4. Types Of Glucose And Importance Of Xylose, determination. 5. Renal Normal Function Constituents Of Normal Urine And Waist Products In The Urine 6. Source Of Errors Comes To Avoid Fault In Results, And Process To Short Out These Type Of Problems.

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Draw a Diagram of Measurement of volumetric apparatus, **(**pipettes, flasks, cylinders**)**

2. Units of measurement,

3. S.I. Units,

4. Normal or Reference range

5. Draw a Diagram of Kidney

Mini Project:

Diagrammatically Representation Of, How Do Kidney Function.

Other Activities (Specify):

Preparation of Buffer Solutions

124BML33.3 Learn the concepts of Enzyme-acid and alkaline phosphatase, AST , ALT , Amylase lactate dehydrogenase ,CP

Approximate Hours.

Item	Hrs
Cl	08
LI	06
SW	04
SL	05
Total	23

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Analysis Laboratory diagnosis By The Help Of Serum And Plasma **SO1.2**Students Will Be Perfectly Do Test Of Clinical Biochemistry **SO1.3** Students Perfectly Get The Knowledge Of Different Principal, Procedures As Well as Reagents Should Be Use In Different Tests. **SO1.4**How To Apply Statistics For Quality Control And Quality Assurance For Calibration Of Medical Lab **SO1.5**Students Should Be Understand All About How To Wok In Automated And Semi Automated Analyzer With Their Manual Methods.	1.Determination Of Of ACP 2. Determination of ALP In The Lab. 3. Perform Test For SGPT 4. Perform Test For SGOT 5.Perform Test For Lactate dehydrogenase	**Unite 3: Learn the concepts of Enzyme-acid and alkaline phosphatase, AST , ALT , Amylase lactate dehydrogenase ,CP** 3.1Enzyme 3.2 Acid phosphatase (ACP) 3.3 alkaline phosphates(ALP) 3.4AST 3.5ALT 3.6Amylase. 3.7lactate dehydrogenase 3.8CPK	1. How To Operate Micro Pipeting For Measurement Of Reagents And Sample.. 2. Basic Knowledge Of Biochemistry Tests In The lab (End Point Chemistry, Kinatic Chemistry etc.). 3. For Manual Method How To Preparation Of Reagents Required For Test Performance. 4. How to Run Automated And Semi automated Analysers Ethically. 5. Different types Collection of Samples of Blood (Types Of Anticoagulants Used For Specifically and Most Of Time Serum Sample Is To Be Used.

SW-1 Suggested Sectional Work (SW):

Assignments:

1.Draw A Diagram Of Semiautomated automated Analyzer Machine.

2.How To Separate Serum And Plasma By Whole Blood

3.Diffrent Types Of Anticoagulants for Blood

Mini Project:

Fully Automated Analyzers Diagram

Other Activities (Specify):

Check Quality control in biochemistry lab.

124BML33.4 Recall the concepts of Analysis of calculi and CSF, Quality control of clinical investigations , Automation in clinical biochemistry laboratory
Approximate Hours.

Item	Hrs
Cl	12
LI	06
SW	05
SL	12
Total	35

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Analysis principle, Procedure Of Urine Components With Their Clinical significance **SO1.2**.Selection Of Best Method For The Diagnosis And Treatment. **SO1.3** Understand All About CSF Present In The Body with Their Function And Importance. **SO1.4** Knowledge Of Quality control Maintenance In clinical investigations **SO1.5** Students Will Be Understand About The Facilities Of Automation In The Lab..	1. Urine analysis Qualitative for sugar, 2. Urine analysis Qualitative for Proteins 3. Urine analysis Qualitative for Bile pigments 4. Urine analysis Qualitative for ketone bodies 5. CSF Smear Prepairation And Examinations.	**Unite 4- Recall the concepts of Analysis of calculi and CSF, Quality control of clinical investigations , Automation in clinical biochemistry laboratory** 4.1 Analysis of calculi 4.1.1 Kidney And Structure 4.1.2 Function Of Kidney 4.1.3 Formation Of Urine 4.1.4AbnormalityInCalculi(Uttered functions) 4.2Analysis of CSF 4.2.1 Normal Components Of CSF 4.2.2 Abnormal Components And Functions Of CSF 4.2.3 Disease Causes By Abnormal Components And Altered Functions Because Of Abnormal Components 4.2.4 Normal Values And Reference Values Of The Components Of CSF. 4.3 Quality control of clinical investigation 4.4 Internal Quality Control And External Quality Control In The Labs. 4.5 Automation in clinical biochemistry laboratory.	1Introduction To Urine 2. Formation Of Urine. 3.Renal Function 4.Components Present In Urine 5. How To Analyze Urinary Calculi. 6. Introduction Of Brain Structure. 7. Study The Components Of CSF 8. Study The Components Of CSF 9. Study The Function And Role Of CSF 10. Test Perform For Analysis Of CSF. 11. Automated Fully And Semi Automated Analyses Function And Mechanics. 12. Quality control of clinical investigations Of Test Perform In The Lab.

SW-1 Suggested Sectional Work (SW):

Assignments:

1. Abnormal Cell Components Present In the Urine.
2. Diagrammatical Representation of Methods of Ketone Body Examination.
3. Diagrammatical Representation of Methods of Porphobilinogen Examination.
4. Diagrammatical Representation of Methods of Sugar and Protein Examination
5. Diagrammatical Representation of Methods of CSF Examination

124BML33.5 Relate the basic idea of Laboratory organizations , Management and maintenance of records.

Approximate Hours.

Item	Hrs
Cl	03
LI	02
SW	01
SL	03
Total	09

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Lab Structure **SO1.2** Understand different About Lab Management **SO3.**Principal,Of Lab Recording, How To Maintain Records. **SO4.**Students Will Be Understand All About Management, Development, And Running Of Organizations.	1. Demonstration Of Ethical Lab. And Lab Management Structure. 2. Demonstration Of Ethical Lab. Recording And Management.	**Unite 5 Relate the basic idea of Laboratory organizations, Management and maintenance of records.** 5.1 Laboratory organizations 5.2 Management Of Lab 5.3 Maintenance of records	1. Self Responsibility And Ethics Towards Patient and Medical Authorities. 2. Knowledge Of Structure Of Quality Control And Quality Assurance. 3. Knowledge Of Structure Of Certifications as Like ISO, NABL etc.

SW-1 Suggested Sectional Work (SW):
Assignments:
1. Draw A Diagram Of Lab Management Structures.

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML33.1 Find how to extend the Principle for assay procedure for biological material. Total protein,albumin,Glucose,Urea, Uricacid,Creatinine,Cholester Bilirubin,Na,K,Ca,ClInorganic Phosphates ,PBD 17 Ketosterious, Barbiturates	32	15	03	05	55
124BML33.2 Apply concepts in the Glucose tolerance test, Insulin tolerance test gastric analysis, Xylems absorption test, Clearance test for renal function.	06	09	07	07	29
124BML33.3 Learn the concepts of Enzyme-acid andALP, AST , ALT , Amylase LDH,CP.	08	06	04	05	23
124BML33.4 Recall the concepts of Analysis of calculi and CSF ,QC of clinical investigations , Automation in clinical biochemistry laboratory	12	06	05	12	35
124BML33.5 Relate the basic idea of Laboratory organizations, Management and maintenance of records.	03	02	01	03	09
Total hour	61	38	20	33	151

Suggestion for End Semester Assessment
Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend the Principle for assay procedure for biological material. Total protein,albumin,Glucose,Urea,Uricacid,Creatinine,Cholester Bilirubin,Na,K,Ca,ClInorganic Phosphates ,PBD 17 Ketosterious, Barbiturates					
CO-2	Apply concepts in the Glucose tolerance test, Insulin tolerance test gastric analysis, Xylems absorption test, Clearance test for renal function.					
CO-3	Learn the concepts of Enzyme-acid andALP, AST , ALT , Amylase LDH,CP.					
CO-4	Recall the concepts of Analysis of calculi and CSF ,QC of clinical investigations , Automation in clinical biochemistry laboratory					
CO-5	Relate the basic idea of Laboratory organizations, Management and maintenance of records.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

41. Improved Lecture
42. Tutorial
43. Group Discussion
44. Visit to Hospital
45. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Biochemistry	Satyanarayana	Elsevier	6th edition 1 January 2021
2	Textbook of Biochemistry for Medical Students	DM Vasudevan , Sreekumari S, Kannan Vaidyanathan	Jaypee Brothers Medical Publishers;	10th edition (11 July 2023)
3	A Textbook on Biochemistry for Paramedical Students	Dr. Kiran Dahiya	IP Innovative Publication Pvt. Ltd.;	First Edition (6 September 2022)
4	Manual of Practical Biochemistry for MBBS	Dr. Anju Jain Dr. S.K. Gupta, Dr. Veena Singh Ghalaut	Arya Publishing Company	(1 January 2021)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML33
Course title: Biochemistry - III

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend the Principle for assay procedure for biological material. Total protein,albumin,Glucose,Urea, Uricacid,Creatinine,Cholester Bilirubin,Na,K,Ca,ClInorganic Phosphates ,PBD 17 Ketosterious, Barbiturates	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO2: Apply concepts in the Glucose tolerance test, Insulin tolerance test gastric analysis, Xylems absorption test, Clearance test for renal function.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Enzyme-acid andALP, AST , ALT , Amylase LDH,CP.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of Analysis of calculi and CSF ,QC of clinical investigations , Automation in clinical biochemistry laboratory	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Relate the basic idea of Laboratory organizations, Management and maintenance of records.	**2**	**1**	**3**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends:1-Low,2-Medium,3-High

Course curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO-1: Find how to extend Tests For Urea ClearanceTests For Creatinine Clearance Tests For NPN , Tests For GGT Tests For Electrolites Sodium, Pottasium Chlorides, Calcium.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	15	Unit-1 Understand About Principal,Procedure And Different Reagents Use In The Tests. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19, 20,21,22,23,24,25,26,27,28,29,30,31,32	05
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 2 : Apply concept Introduction Of , Glucose tolerance test.Clinical Significance Of Glucose Insulin tolerancegastric analysis Xylose absorption test Clearance test for renal function	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	09	Unit-2 Glucose tolerance test,Insulin tolerance test gastric analysis , Xylose absorption test , Clearance test for renal function . 1,2,3,4,5,6,	07
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO3 : Learn the concept Determination Of Of ACP, Determination of ALP In The Lab. Perform Test For SGPT, Perform Test For SGOT, Perform Test For Lactate dehydrogenase, Perform Test For Citrate Phospho Kinase (CPK) .	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	06	Unit-3: Enzyme-acid and alkaline phosphatase, AST , ALT , Amylase lactate dehydrogenase ,CP. 1,2,3,4,5,6,7,8	05
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 4: Recall the concept Analysis of calculi Kidney And Structure Function Of Kidney Formation Of Urine AbnormalityInCalculi(Ultered functions) Analysis of CSF Normal Components Of CSF Abnormal Components And Functions Of CSF.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	06	Unit-4 Analysis of calculi and CSF Quality control of clinical investigations Automation in clinical biochemistry laboratory. 1,2,3,4,5,6,7,8,9,10,11,12	12
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 5: Relate the basic idea introduction Demonstration Of Ethical Lab.And Lab Management Structure. Demonstration Of Ethical Lab.Recording And Management. Laboratory organizations ManagementOf Lab Maintenance of records	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	02	Unit-5 Laboratory organizations ,Management and maintenance of records . 1,2,3,	03

Course Code: 124BML34

Course Title: Hematology-III

Pre-Requisite: Student should have basic knowledge of Anemia and Leukemia.

Rationale: The student studying Coagulation tests measure your blood's ability to clot, and how long it takes to clot. Testing can help your doctor assess your risk of excessive bleeding or developing clots (thrombosis) somewhere in your blood vessels.

Course Outcomes:

124BMLT34.1 To understands classification of Anemia's. Laboratory investigations of megaloblastic anemia Laboratory investigations of iron deficiency anemia.

124BMLT34.2 Acquire KnowledgeLaboratory investigations of haemolytic anaemia including classification and causes. Leukaemia :-definition and classification Cytochemical staining procedures in various haemopioetic disorder. Laboratory test for assessing bleeding disorder.

124BMLT34.3 Acquire KnowledgeLaboratory investigation for disseminated intravascular coagulation Mechanism of fibrinolysis.

124BMLT34.4 Acquire KnowledgePlatelets function test and their interpretation. Techniques available for cytogenetic studiesTest for fibrinolysis.

124BMLT34.5 Acquire Knowledgeuses of radio-isotopes in hematology. Safety measures for handling radio-isotopes.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT34	Hematology-III	4	2	1	2	(4+2+1+2)	9

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback of teacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 34	Hematology-III	100	100	100	300

124BML34.1 Find how to extend classification of Anemia's. Laboratory investigations of megaloblastic anemia Laboratory investigations of iron deficiency anemia.

Approximate Hours.

Item	Hrs
Cl	15
LI	03
SW	03
SL	02
Total	23

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand anemia. **SO1.2** Understand the different classification anemia. **SO1.3** Analysis of lab diagnosis of iron deficiency anemia. **SO1. 3** Analysis of lab diagnosis of megaloblastic deficiency anemia **SO1.5** Application of the diagnosis of anemia.	**1.**Lab. diagnosis of anemia **2.** Lab. Diagnosis iron deficiency anemia **3**. Laboratory investigations of megaloblastic anemia.	**Unite 1:- Find how to extend classification of Anemia's. Laboratory investigations of megaloblastic anemia Laboratory investigations of iron deficiency anemia.** 1.1.1Definition and classification of Anemia's. 1.1.2 Definition and classification of Anemia's. 1.1.3 Definition and classification of Anemia's. 1.1.4 Definition and classification of Anemia's. 1.1.5 Definition and classification of Anemia's. 1.1.6 Definition and classification of Anemia's. 1.1.7 Definition and classification of Anemia's. 1.1.8 Definition and classification of Anemia's. 1.1.9 Definition and classification of Anemia's. 1.1.10 Definition and classification of Anemia's. 1.2.1 Laboratory investigations of megaloblastic anemia. 1.2.2 Laboratory investigations of megaloblastic anemia. 1.3.1Laboratory investigations of iron deficiency anemia. 1.3.2Laboratory investigations of iron deficiency anemia. 1.3.3Laboratory investigations of iron deficiency anemia.	**1.** Blood and its composition. **2**. Iron deficiency anemia.

SW-1 Suggested Sectional Work (SW):
Assignments:
Etiological classification
Mini Project:
Iron deficiency anemia
Other Activities (Specify):
Diagnosis of anemia

124BML34.2 Apply concepts in the Laboratory investigations of hemolytic anemia including classification and causes. Leukemia: - definition and classification Cytochemical stain procedures in various haemopioetic disorders. Laboratory test for assessing bleeding disorder.

Approximate Hours.

Item	Hrs
Cl	15
LI	04
SW	03
SL	02
Total	24

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand sickle cell anemia. **SO1.2** Understand the different type of sickl cell anemia. **SO1.3** Analysis of leukemia patient. **SO1. 4**Analysis of lab diagnosis of leukemia. **SO1.5** Application of the diagnosis of leukemia.	1.Lab. diagnosis of anemia 2. Lab. Diagnosis of sickle cell anemia 3. MGG stain. 4. Ramnwosky stain	**Unit 2:- Apply concepts in the Laboratory investigations of hemolytic anemia including classification and causes. Leukemia:- definition and classification Cytochemical staining procedures in various haemopioetic disorder. Laboratory test for assessing bleeding disorder** 2.1.1 Laboratory investigations of hemolytic anemia including classification and causes. 2.1.2 Laboratory investigations of hemolytic anemia including classification and causes. 2.1.3 Laboratory investigations of hemolytic anemia including classification and causes. 2.2.1 Leukemia: - definition and classification. 2.2.2 Leukemia: - definition and classification. 2.2.3 Leukemia: - definition and classification. 2.2.4 Leukemia: - definition and classification. 2.2.5 Leukemia: - definition and classification. 2.2.6 Leukemia: - definition and classification. 2.3.1 Cytochemical staining procedures in various haemopioetic	**1.** haemopioetic stem cell. **2**. Leukemia.

		disorders. 2.3.2 Cytochemical staining procedures in various haemopioetic disorders. 2.3.3 Cytochemical staining procedures in various haemopioetic disorders. 2.3.4 Cytochemical staining procedures in various haemopioetic disorders. 2.4.1 Laboratory test for assessing bleeding disorder. 2.4.2 Laboratory test for assessing bleeding disorder.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Leukemia

Mini Project:

Sickle cell anemia

Other Activities (Specify):

Diagnosis of Leukemia

124BML34.3 Learn the concepts of Laboratory investigation for disseminated intravascular coagulation Mechanism of fibrinolysis.

Approximate Hours.

Item	Hrs
Cl	10
LI	06
SW	03
SL	02
Total	21

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand coagulation. **SO1.2** Understand the intravascular coagulation. **SO1.3** Analysis of coagulation factor. **SO1. 3** Analysis of natural anticoagulant. **SO1.5** Application of the coagulation cascade.	1.MGG stain 2. Ramnwosky stain 3. APTT Test 4. PT test 5. INR. 6. BT and CT	**Unite 3:- Acquire Knowledge Laboratory investigation for disseminated intravascular coagulation Mechanism of fibrinolysis: Test for fibrinolysis.** 3.1.1 Laboratory investigation for disseminated intravascular coagulation. 3.1.2 Laboratory investigation for disseminated intravascular coagulation. 3.1.3 Laboratory investigation for disseminated intravascular coagulation. 3.1.4 Laboratory investigation for disseminated intravascular coagulation. 3.1.5 Laboratory investigation for disseminated intravascular coagulation. 3.2.1 Mechanism of fibrinolysis: Test for fibrinolysis. 3.2.2 Mechanism of fibrinolysis: Test for fibrinolysis. 3.2.3 Mechanism of fibrinolysis: Test for fibrinolysis. 3.2.4 Mechanism of fibrinolysis: Test for fibrinolysis. 3.2.5 Mechanism of fibrinolysis: Test for fibrinolysis.	**1.**Coagulation Cascade **2**. Intrinsic and extrinsic pathway.

SW-1 Suggested Sectional Work (SW):
Assignments:
Intravascular coagulation
Mini Project:
Intrinsic pathway
Other Activities (Specify):

BT and CT tes

124BML34.4 Recall the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.

Approximate Hours.

Item	Hrs
Cl	10
LI	06
SW	04
SL	02
Total	22

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand platelets. **SO1.2** Understand the intravascular coagulation. **SO1.3** Analysis of extrinsic and intrinsic pathway. **SO1. 4** Analysis of natural anticoagulant. **SO1.5** Application of the coagulation cascade.	1.MGG stain 2. Ramnwosky stain 3. APTT Test 4. PT test 5. INR. 6. BT and CT	**Unit 4:- Acquire Knowledge Platelets function test and their interpretation. Techniques available for cytogenetic studies. Test for fibrinolysis.** 4.1.1 Platelets function test and their interpretation. 4.1.2 Platelets function test and their interpretation. 4.1.3 Platelets function test and their interpretation. 4.1.4 Platelets function test and their interpretation. 4.1.5 Platelets function test and their interpretation. 4.2.1 Techniques available for cytogenetic studies. Test for fibrinolysis. 4.2.2 Techniques available for cytogenetic studies. Test for fibrinolysis. 4.2.3 Techniques available for cytogenetic studies. Test for fibrinolysis. 4.2.4 Techniques available for cytogenetic studies. Test for fibrinolysis. 4.2.5 Techniques available for cytogenetic studies. Test for fibrinolysis.	**1.** platelets **2**. Fibrinogen.

SW-1 Suggested Sectional Work (SW):
Assignments:
Platelets
Mini Project:
Extrinsic pathway
Other Activities (Specify):

BT and CT test

124BMLT34.5 Relate the basic idea of radio-isotopes in hematology. Safety measures for handling radio-isotopes.

Approximate Hours.

Item	Hrs
Cl	10
LI	02
SW	03
SL	02
Total	17

Session outcome (SOs)	**Laboratory Instruction (LI)**	**Classroom Instruction (CI)**	**Self Learning (SL)**
SO1.1 Understand safety measures in hematologylab. **SO1.2** Understand the isotope. **SO1.3** Analysis of radio-isotope in hematology lab. **SO1. 4** Analysis of handling of isotope. **SO1.5** Application of radioactive testuse in hematology.	1.MGG stain 2. Radio immunoassay	**Unit 5:- Relate the basic idea of radio-isotopes in hematology. Safety measures for handling radio-isotopes.** 5.1.1 Uses of radio-isotopes in hematology. 5.1.2 Uses of radio-isotopes in hematology. 5.1.3 Uses of radio-isotopes in hematology. 5.1.4 Uses of radio-isotopes in hematology. 5.1.5 Uses of radio-isotopes in hematology. 5.2.1 Safety measures for handling radio-isotopes. 5.2.2 Safety measures for handling radio-isotopes. 5.2.3 Safety measures for handling radio-isotopes. 5.2.4 Safety measures for handling radio-isotopes. 5.2.5 Safety measures for handling radio-isotopes.	1. radio-isotopes 2. Safety measures for handling.

SW-1 Suggested Sectional Work (SW):

Assignments:

Radio Isotope

Mini Project:

Safety measures in hematology

Other Activities (Specify):

Explain radioactive

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML34.1 Find how to extend classification of Anemia's. Laboratory investigations of megaloblastic, deficiency anemia.	15	03	03	02	23
124BML34.2 Apply concepts in the Laboratory investigations of hemolytic anemia including classification and causes. Leukemia:- definition and classification Cytochemical stain procedures in various haemopioetic disorders.	15	04	03	02	24
124BML34.3 Learn the concepts of Laboratory investigation for DIC Mechanism of fibrinolysis.	10	06	03	02	21
124BML34.4 **Recall** the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.	10	06	04	02	22
124BML34.5 Recall the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.	10	02	03	02	17
Total hour	60	20	18	10	107

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend classification of Anemia's. Laboratory investigations of megaloblastic, deficiency anemia.					
CO-2	Apply concepts in the Laboratory investigations of hemolytic anemia including classification and causes. Leukemia:-definition and classification Cytochemical stain procedures in various haemopioetic disorders.					
CO-3	Learn the concepts of Laboratory investigation for DIC Mechanism of fibrinolysis.					
CO-4	Recall the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.					
CO-5	Recall the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

46. Improved Lecture
47. Tutorial
48. Group Discussion
49. Visit to Hospital
50. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition &Year
1	Essentials of Hematology	Shirish M Kawthalkar	Jaypee Brothers Medical Publishers;	Third edition (1 January 2020)
2	The Bethesda Handbook of Clinical Hematology	Rodgers	Wolters Kluwer (India) Pvt. Ltd	Fourth edition (12 May 2018
3	Essentials in Hematology and Clinical Pathology	Ramadas Nayak ,Shara da Rai	Jaypee Brothers Medical Publishers;	Second edition (1 January 2017)
4	The Bethesda Handbook of Clinical Hematology	GRIFFIN RODGERS NEAL STUART YOUNG	Wolters Kluwer Health; 5th edition	(13 February 2024)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML34
Course title: Hematology - III

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigation
CO1: Find how to extend classification of Anemia's. Laboratory investigations of megaloblastic, deficiency anemia.	**3**	**1**	**2**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**
CO2: Apply concepts in the Laboratory investigations of haemolytic anaemia including classification and causes. Leukaemia :-definition and classification Cytochemical staining procedures in various haemopioetic disorder.	**1**	**1**	**2**	**2**	**1**	**2**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**1**
CO3: Learn the concepts of Laboratory investigation for DIC Mechanism of fibrinolysis.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4 Recall the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.	**1**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Recall the concepts of Platelets function test and their interpretation. Techniques available for cytogenetic studies Test for fibrinolysis.	**3**	**1**	**2**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO- 1 Learn the concept Definition and classification of Anemia's Laboratory investigations of megaloblastic anemia, iron deficiency anemia., hemolytic anemia and Leukemia: - definition and classification.	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	03	Unit-1 Anemia. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	co 2 Recall the concept the Laboratory investigation for disseminated intravascular coagulation, APTT Test PT test INR. BT and CT.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	04	Unit-2: Coagulation. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO3 Relate the basic idea . Platelets function test and their interpretation.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	06	Unit-3 Understand platelets. 1,2,3,4,5,6,7,8,9,10	02
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 4: Find how to extend the basic. Anticoagulant use for hematology and blood bank.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	06	Unit4- Anticoagulant 1,2,3,4,5,6,7,8,9,10	02
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4,5	CO 5: Apply concepts Uses of radio-isotopes in hematology, Safety measures for handling radio-isotopes.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	02	Unit-5 Handling of isotope. 1,2,3,4,5,6,7,8,9,10	02

Course Code: 124BML35

Course Title: Instrumentation

Pre-Requisite: Student should have basic knowledge of Anemia and Leukemia.

Rationale: The student studying Coagulation tests measure your blood's ability to clot, and how long it takes to clot. Testing can help your doctor assess your risk of excessive bleeding or developing clots (thrombosis) somewhere in your blood vessels.

Course Outcomes:

124BMLT35.1 To Understands introduction and history of There will be institutional examination/practical demonstrations of following instruments and procedures.

124BMLT35.2 Understands introduction and history of There will be institutional examination practical demonstrations of following instruments and procedures.

124BMLT35.3 Acquire Knowledge of sample processing and transportation, laboratory organization management result and quality control of Microbiology.

124BMLT35.4 Acquire Knowledge of There will be institutional examination/practical demonstrations of following instruments and procedures.

124BMLT35.5 Acquire Knowledge of examination/practical demonstrations of following instruments and procedures.

Scheme of Studies

Board Of Study	Course Code	Course title			Scheme of Studies(Hours/week)			Total Hour
			CI	LI	SW	SL	Total Study Hour (CI+ LI+ SW+ SL)	
Program Core (PCC)	124BMLT35	Instrumentation	4	2	2	2	(4+2+2+2)	10

Legend: **CI:** Class Instruction (Includes different instructional strategies i.e. Lecture (L) and Tutorial.
LI: Laboratory Instruction (Includes Practical performances in laboratory workshop, and different instructional strategies)
SW: Sessional Work (includes assignment, seminar, mini project etc.),
SL: Self Learning,
C: Credits.

Note: SW & SL has to be planned and performed under the continuous guidance and feedback ofteacher to ensure outcome of Learning.

Scheme of Assessment:

CODE	Course Code	Course Title	Theory	Internal Assessment	Practical	Total
(PCC)	124BMLT 35	Instrumentation	100	100	100	300

124BML35.1 Find how to extend introduction and history of There will be institutional examination/practical demonstrations of following instruments and procedures.

Approximate Hours.

Item	Hrs
Cl	30
LI	05
SW	03
SL	03
Total	41

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand Simple microscopy. **SO1.2** Understand Compound microscopy. **SO1.3** Analysis Dark ground microscopy. **SO1.4** Application Phase contrast microscopy **SO1.5**Analysis Fluorescence microscopy	1. Introduction principle procedure advantage and disadvantage of Simple microscopy. 2. Introduction principle procedure advantage and disadvantage of Compound microscopy. 3. Introduction principle procedure advantage and disadvantage of Dark ground microscopy. 4. Introduction principle procedure advantage and disadvantage Phase. .contrast microscopy. 5. Introduction principle procedure advantage and disadvantage of Fluorescence microscopy. .	**Unite 1:- Find how to extend introduction and history of There will be institutional examination/practical demonstrations of following instruments and procedures.** 1.1Introduction of simple microscope 1.2 Principle of microscope. 1.3 procedure of microscope. 1.4 Explain all parts of microscope. 1.5 Diagram of microscope. 1.6 Introduction of compound microscope. 1.7 Principle of microscope. 1.8 procedure of microscope. 1.9 Explain all parts of microscope. 1.10Diagram of microscope. 1.11 Introduction of Dark ground microscope. 1.12 Principle of microscope. 1.13 procedure of microscope. 1.14 Explain all parts of microscope. 1.15Diagram of microscope. 1.16 Introduction of Phase contrast microscope. 1.17 Principle of microscope. 1.18 procedure of microscope. 1.19 Explain all parts of microscope. 1.20Diagram of microscope. 1.21 Introduction of Fluorescence microscope 1.22 Principle of microscope. 1.23 procedure of microscope. 1.24 Explain all parts of microscope. 1.25Diagram of microscope. 1.26 Introduction of PTL metry 1.27 Principle of microscope. 1.28procedure of microscope. 1.29Explain all parts of microscope. 1.30 Diagram of microscope.	1. Microscope simple microscopy. 2.Compound microscopy 3. Fluorescence microscopy.

SW-1 Suggested Sectional Work (SW):

Assignments:

Compound Microscope.

Mini Project:

Simple Microbiology

Other Activities (Specify):

Handling of Light microscope

124BML35.2 Apply concepts in the Understands introduction and history of There will be institutional examination practical demonstrations of following instruments and procedures.

Approximate Hours.

Item	Approx. Hrs
Cl	23
LI	03
SW	03
SL	03
Total	32

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Photometry electro **SO1.2** Application about Spectrophotometer **SO1.3**.Understand Haemoglobinometry **SO1.4** Analysis Haemocyt meter **SO1.5**Analysis Haematocrit.	1.Principle,procedure and clinical significance Of Hemoglobin by Sahli's method and Drab kin's 2. Rbc. Wbc. Platelets etc. Count in haemocytometer 3. Haematocrit (PCV) analysis by wintrobe method.	**Unite 2- understands introduction and history of There will be institutional examination practical demonstrations of following instruments and procedures.** 2.1 Introduction of photometry electro. 2.2 Principle of photometry electro. 2.3 procedure of photometry electro. 2.4 Explain all parts photometry electro. 2.5 Diagram of photometry electro. 2.6 Introduction of Spectrophotometer. 2.7 Principle of Spectrophotometer 2.8 procedure of Spectrophotometer 2.9 Explain all parts Spectrophotometer 2.10 Diagram of Spectrophotometer. 2.11 Red blood cell Count in haemocytometer 2.12 white blood cell Count in haemocytometer. 2.13 Principle, procedure and clinical significance Of Hemoglobin 2.14 Sahli's method 2.15 Drab kin's method. 2.16 Alkaline method. 2.17 Introduction of centrifuge. 2.18 Principle of centrifuge. 2.19 procedure of centrifuge. 2.20 Explain all types of centrifuge. 2.21 Diagram of centrifuge. 2.22 Platelets Count in haemocytometer. 2.23 Sperm Count in haemocytometer	1. Rbc count. 2. Wbc count. 3. Platelets count.

SW-1 Suggested Sectional Work (SW):

Assignments:

Spectrophotometry

Mini Project:

Centrifuge.

Other Activities (Specify):

Haemoglobin by Sahli's

124BML35.3 Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.

Approximate Hours.

Item	Hrs
Cl	21
LI	04
SW	02
SL	05
Total	32

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand Sterilization instrument. **SO1.2** Application of Egg incubator and dental drill. **SO1.3**Application of Co incubator. **SO1.4**Analysis Bacteriological incubator. **SO1.5**Understand Microtome and accessories.	1.SterilizationTechnique 2. principle ,procedure and types of method (Autoclave, Hot air oven, Laminar air flow). 3.Bacteriological incubator 4. principle ,procedure and types of method Microtome.	**Unite 3: Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.** 1.1 Introduction of Sterilization. 3.2Principle of Sterilization. 3.3Procedure of Sterilization 3.4Classification of Sterilization. 3.5Introduction , principle ,procedure Of Autoclave. 3.6 Introduction, principle procedure Of Hot air oven, 3.71Introduction principle procedure Of Laminar air flow. Diagram of Autoclave. 3.8 Introduction of incubator 3.9 principle of incubator. 3.10Types of incubator. 3.11Diagram of incubator. 3.12 Introduction of microtome. 3.14 procedure of microtome. 3.15 Diagram of microtome. 3.16 Introduction Tissue floatation bath. 3.17 principle Tissue floatation bath. 3.18procedure of Tissue floatation bath. 3.19 Diagram of microtome. 3.20 principle of microtome. 3.21 Types of microtome	1. Autoclave. 2. Hot air oven. 3. Laminar air flow. 4. Microtome. 5. Tissue flotation bath.

SW-1 Suggested Sectional Work (SW):

Assignments:

Sterilization instrument

Mini Project:

Bacteriological incubator.

124BML35.4 Recall the concepts of There will be institutional examination/practical demonstrations of following instruments and procedures.

Approximate Hours.

Item	Hrs
Cl	21
LI	03
SW	01
SL	03
Total	33

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO 1.1 Analysis Tissue meton. **SO 1.2** Understand Serological water bath. **SO 1.3**Understand Micropipettes and microlitre plates. **SO 1.4**Application Cellophane tubes and bags. **SO1.5** Application Paper and gel electrophoresis.	1.whater bath 2. Demonstration of micropipette and microlitre plates. 3. Demonstration of Electrophoresis.	**Unite 4: Recall the concepts of There will be institutional examination/practical demonstrations of following instruments and procedures.** 4.1Tissues analysis in laboratory. 4.2Tissue processing in histopathology laboratory. 4.3Tissue section cutting. 4.4Staining of tissue section. 4.5 Introduction of water bath. 4.6 principle of water bath. 4.7 procedure of water bath. 4.8 Types of water bath. 4.9 Diagram of water bath. 4.10 Introduction of electrophoresis. 4.11 principle of electrophoresis. 4.12 procedure of electrophoresis. 4.13 Diagram of electrophoresis. 4.14 Introduction of Flame photometer. 4.15 principle of Flame photometer. 4.16procedure of Flame photometer. 4.17Diagram of Flame photometer. 4.18Introduction of Cellophane tubes. 4.19principles of Cellophane tubes. 4.20 Use of Cellophane tubes. 4.21Types of Cellophane tubes.	1. Electrophoresis. 2. Flame photometer. 3. Serological water bath.

SW-1 Suggested Sectional Work (SW):

Assignments:

electrophoresis.

Mini Project:

Cellephan tubes and bags.

Other Activities (Specify):

Tissue meson.

124BMLT35.5 Relate the basic idea of examination/practical demonstrations of following instruments and procedures.

Approximate Hours.

Item	Hrs
Cl	15
LI	06
SW	04
SL	04
Total	29

Session outcome (SOs)	Laboratory Instruction (LI)	Classroom Instruction (CI)	Self Learning (SL)
SO1.1 Understand about Polarizing microscope. **SO1.2** Understand Micro-hematocrit centrifuge. **SO1.3**Analysis of Gas chromatography . **SO1.4**Analysis of Radio immune assay **SO1.5**Application of Auto analyzers. .	1. Demonstration of Polarizing microscope. 2. Demonstration of Micro-hematocrit centrifuge. 3. Demonstration of Gas chromatography 4. Demonstration of Radio immune assay. 5. Demonstration of Auto analyzer. 6. Demonstration of ECG and various types.	**Unite 5:- Relate the basic idea of examination/practical demonstrations of following instruments and procedures.** 5.1 Introduction of Polarizing microscope. 5.2 Principle of Polarizing microscope. 5.36 Identify of various parts of Polarizing microscope. 5.4 Use of Polarizing microscope. 5.5 Structure of Polarizing microscope. 5.6 Introduction of Micro-hematocrit centrifuge. 5.7 Principle of Micro-hematocrit centrifuge. 5.8 Identify of various parts of Micro-hematocrit centrifuge. 5.9 Function of Micro-hematocrit centrifuge. 5.10 Structure of Micro-hematocrit centrifuge. 5.11 Introduction of Gas chromatography. 5.12 Principle of Gas chromatography. 5.13 Identify of various parts of Gas chromatography. 5.14 Function of Gas chromatography. 5.15 Diagram of Gas chromatography. 5.16 Introduction of Radio immune assay. 5.17 Principle of Radio immune assay. 5.18 Identify of various parts of Radio immune assay. 5.19 Function of Radio immune assay.	1. ELISA. 2. HPLC. 3. RIA.

		5.20 Diagram of Radio immune assay. 5.51 Introduction of Auto analyzers. 5.22 Principle of Auto analyzers. 5.23 Types of Auto analyzers. 5.24 Function of Auto analyzers. 5.25 Diagram of Auto analyzers. 5.26 Introduction of ECG. 5.27 Principle of ECG. 5.28 Types of ECG. 5.29 Function of ECG. 5.30 Diagram of ECG.	

SW-1 Suggested Sectional Work (SW):

Assignments:

Polarizing microscope.

Mini Project:

ECG.

Other Activities (Specify):

Auto analyzers

Brief of Hours suggested for the Course Outcome

Course Outcomes	Class Lecture (CI)	Laboratory Instruction (I)	Sessional Work (SW)	Self-Learning (SI)	Total hour (CI+LI+SW+SI)
124BML35.1Find how to extend introduction and history of There will be institutional examination/practical demonstrations of following instruments and procedures.	30	05	03	03	41
124BML35.1Apply concepts in the Understands introduction and history of There will be institutional examination practical demonstrations procedures.	23	03	03	03	32
124BML35.1 Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.	21	04	02	05	32
124BML35.1Recall the concepts of There will be institutional examination/practical demonstrations of following instruments and procedures.	21	03	01	03	28
124BML35.1Relate the basic idea of examination/practical demonstrations of following instruments and procedures.	30	06	04	04	44
Total hour	125	21	13	18	177

Suggestion for End Semester Assessment

Suggested Specification Table (For ESA)

CO	Unit Titles	Marks Distribution				Total Marks
		Ap	An	Ev	Cr	
CO-1	Find how to extend introduction and history of There will be institutional examination/practical demonstrations of following instruments and procedures.					
CO-2	Apply concepts in the Understands introduction and history of There will be institutional examination practical demonstrations procedures.					
CO-3	Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.					
CO-4	Recall the concepts of There will be institutional examination/practical demonstrations of following instruments and procedures.					
CO-5	Relate the basic idea of examination/practical demonstrations of following instruments and procedures.					
Total						50

Legend: Ap: Apply, An: Analyze, Ev: Evaluat Cr: Create

Note. Detailed Assessment rubric need to be prepared by the course wise teachers for above tasks. Teachers can also design different tasks as per requirement, for end semester assessment.

Suggested Instructional/Implementation Strategies:

51. Improved Lecture
52. Tutorial
53. Group Discussion
54. Visit to Hospital
55. Demonstration

Suggested Learning Resources:

(a) Books:

S. No.	Title	Author	Publisher	Edition & Year
1	Essentials of Hematology	Shirish M Kawthalkar	Jaypee Brothers Medical Publishers;	Third edition (1 January 2020)
2	The Bethesda Handbook of Clinical Hematology	Rodgers	Wolters Kluwer (India) Pvt. Ltd	Fourth edition (12 May 2018
3	Essentials in Hematology and Clinical Pathology	Ramadas Nayak ,Sharada Rai	Jaypee Brothers Medical Publishers;	Second edition (1 January 2017)
4	The Bethesda Handbook of Clinical Hematology	GRIFFIN RODGERS NEAL STUART YOUNG	Wolters Kluwer Health; 5th edition	(13 February 2024)
5	Lecture note provided by Faculty of medical sciences, AKS University, Satna .			

Curriculum Development Team

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CO, POs and PSOs Mapping

Program title: B.M.L.T (Bachelor of Medical Laboratory Technology)
Course code: 124BML35
Course title: Instrumentation

Course outcomes	Program outcomes												Program specific outcome			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
	Disciplinary knowledge	Psychomotor Skills	Communication skills	Critical thinking	Problem Solving	Analytical reasoning	Research – Related Skills	Co-operation /Team Work	Socio-cultural and multicultural competency	Awareness of moral, ethical and legal issues	Leadership qualities	Ongoing Learning	Student will be able to demonstrate the theoretical knowledge and technical skills to ensure the accuracy of laboratory test result.	Student will be able to communicate courteously and effectively with laboratory personnel, other health care professionals, patients and the public.	Ability to Student will be able to demonstrate laboratory practice standards in safety, professional behavior and ethical conduct..	Student will able to Knowledge and technical skills associated with medical laboratory technology for delivering quality clinical investigations.
CO1: Find how to extend introduction and history of There will be institutional examination/practical demonstrations of following instruments and procedures.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO2: Apply concepts in the Understands introduction and history of There will be institutional examination practical demonstrations procedures.	**2**	**1**	**3**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**
CO3: Learn the concepts of sample processing and transportation, laboratory organization management result and quality control of Microbiology.	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**
CO4: Recall the concepts of There will be institutional examination/practical demonstrations of following instruments and procedures.	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**	**1**	**2**	**3**	**1**	**3**	**3**	**2**
CO5: Relate the basic idea of examination/practical demonstrations of following instruments and procedures.	**2**	**1**	**3**	**1**	**1**	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**3**

Legends:1-Low,2-Medium,3-High

Course Curriculum Map:

POs & PSOs No.	COs No.& Titles	SOs No.	Laboratory Instruction (LI)	Classroom Instruction(CI)	Self Learning (SL)
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO- Find how to extend the Introduction, Principle, procedure,types, formation of image ,care and maintenance and Diagram of microscopes .	SO1.1 SO1.2 SO1.3 SO1.4 SO1.5	05	Unit-1 To Understand about the microscopy,and their working. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23 ,24,26,27,28,29,30,	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 2 Apply concept regarding the Introduction, Principle , procedure,types, Diagram of Photometry electro , Spectrophotometry, Haemoglobinometry, Haemocytometer , Haematocrit.	SO2.1 SO2.2 SO2.3 SO2.4 SO2.5	03	Unit-2 To understands introduction and history of There will be institutional examinationpractical demonstrations of following instruments and procedures. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21	03
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO3 Learn the concept Introduction of electrophoresis. principle of electrophoresis. procedure of electrophoresis. Diagram of electrophoresis.	SO3.1 SO3.2 SO3.3 SO3.4 SO3.5	04	Unit-3 Application Paper and gel electrophoresis. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23	05
PO 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 4: Recall the Introduction of Auto analyzers , Types of Auto analyzers. Function of Auto analyzers. Diagram of Auto analyzers.	SO4.1 SO4.2 SO4.3 SO4.4 SO4.5	03	Unit-4Application of Auto analyzers. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23, 24,26	03
PO: 1,2,3,4,5,6,7,8 PSO 1,2, 3, 4	CO 5: Relate the basic Introduction, Principle, Identify of various parts of Polarizing microscope, Use of Polarizing microscope.	SO5.1 SO5.2 SO5.3 SO5.4 SO5.5	06	Unit-5 Understand about Polarizing microscope. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	04