

Study & Evaluation Scheme

of

B.Sc. Medical Lab Techniques (B.Sc. MLT)

[Applicable W.E.F. Academic Session - 2019-20 till Revised]
[As per CBCS guidelines given by UGC]



TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh 244001
Website: www.tmu.ac.in



TEERTHANKER MAHAVEERUNIVERSITY
 (Established Under Govt. of U.P. Act No. 30,
 2008) Delhi Road, Bagadpur, Moradabad(U.P.)

<u>Study & Evaluation Scheme</u>	
<u>SUMMARY</u>	
Institute Name	Teerthanker Mahaveer University, College of Paramedical Sciences, Delhi Road, Moradabad
Programme	Bachelor of Science in Medical Laboratory Techniques (B.Sc. MLT)
Duration	Three year (06 Semester) Full Time and Six Months Rotatory Internship
Medium	English
Minimum Required Attendance	75%
<u>Credits</u>	
Total Credits	<u>162</u>

Programme Outcomes (PO):

On completion of the Programme, the student will be:

PO1.	Understanding ways of functioning effectively as an individual independently and as a member in diverse team in multidisciplinary settings (Attitude)
PO2.	Understanding requirements of continuous education as a function of growth and maintenance of professional competence (Lifelong learning)
PO3	Describing environmental consciousness and societal concerns in achieving sustainable development (Environment and Sustainability)
PO4.	Applying computer skills in health care system and taking entrepreneurial decisions (Entrepreneurship)
PO5.	Applying knowledge to assess societal, health, safety and legal issues related to professional practice (Social interaction & effective citizenship)
PO6.	Applying systematized problem solving techniques to identify and correct procedural errors to verify the accuracy of laboratory result obtained (Problem analysis and solving)
PO7.	Applying appropriate techniques, resources and tools with an understanding of limitations(Technology savvy/usage)
PO8.	Evaluating professional conduct and interpersonal communicational skills effectively with society at large(Communication)

Assessment:

	Internal	External	Total
Theory	40	60	100
Practical	50	50	100

✚ Internal Evaluation (Theory papers):

Class Test-I	Class Test-II	Class Test-III	Attendance	Assignment /work book assignments & viva	Total
Best Two out of Three CTs					
10	10	10	10	10	40
	Duration of Examination		External	Internal	
			3 Hours	1.5 Hours	

✚ Internal Practical Evaluation (50 marks)

The internal evaluation would also be done by the Internal Examiner based on the experiment performed during the internal examination.

During Semester				On the day of Examination	
Experiment	File Work	Viva Voce	Attendance	Experiment	Viva Voce
5 Marks	10 Marks	10 Marks	10 Marks	5 Marks	10 Marks

✚ External Practical Evaluation (50 marks)

The external evaluation would also be done by the External Examiner based on the experiment performed during the external examination.

Experiment	File Work	Viva Voce	Total Experiment
30 Marks	10Marks	10 Marks	50 Marks

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester examination and teacher's continuous evaluation. (i.e. both internal and external). A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have secured at least 50 CPI in aggregate to clear the programme.

Student will be eligible for internship only after the clearing all the papers along with supplementary if any.

Question Paper Structure

1	<i>The question paper shall consist of six questions, Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.</i>
2	<i>Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.</i>
3	<i>The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.</i>

IMPORTANT NOTES:

1	<i>The purpose of examination should be to assess the Course Outcomes (COs) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).</i>
2	<i>Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. All courses may not have case teaching method used as pedagogy.</i>
3	<i>There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.</i>

English Evaluation Scheme from I-IV Semester

<i>Internal Evaluation</i>			<i>External Evaluation</i>		<i>Total Marks</i>
<i>40 Marks</i>			<i>60 Marks</i>		<i>100</i>
<i>20 Marks (Best 2 out of Three CTs)</i>	<i>10 Marks (Oral Assignments)</i>	<i>10 Marks (Attendance)</i>	<i>40 Marks (External Written Examination)</i>	<i>20 Marks (External Viva)*</i>	

Parameters of External Viva for Ist Semester

<i>Content</i>	<i>Body Language</i>	<i>Confidence</i>	<i>Question Responsiveness</i>	<i>TOTAL</i>
<i>05 Marks</i>	<i>05 Marks</i>	<i>05 Marks</i>	<i>05 Marks</i>	<i>20 Marks</i>

Parameters of External Viva for II-IV Semesters

<i>Content</i>	<i>Body Language</i>	<i>Communication skills</i>	<i>Confidence</i>	<i>TOTAL</i>
<i>05 Marks</i>	<i>05 Marks</i>	<i>05 Marks</i>	<i>05 Marks</i>	<i>20 Marks</i>

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Program Structure-B.Sc.-MLT

A. Introduction:

High-quality health care education is essential for the digital age and using technology is powerful way to enhance changing requirements of the corporate, business enterprises and society. MLT students should be equipped to work across time zones, languages, and cultures. Employability, innovation, theory to practice connectedness is the central focus of this curriculum. The curriculum is designed as such that the students can gain an in-depth mastery of the academic disciplines and applied functional areas necessary to meet the requirements of business enterprises and the industry.

The college emphasis on courses *balanced with core and elective courses*: The curriculum of MLT program emphasizes an intensive, flexible education of core courses (all types), and electives. Total 161 credits are allotted for the MLT degree.

The programme structure and credits for MLT are finalized based on the stakeholders' requirements and general structure of the programme. However, the maximum number of the credits for award of MLT degree will be 161 credits. Out of 115 credits of classroom contact teaching, 24 credits are to be assigned for core courses (CC), 63 credits to discipline specific course (DSC), 16 credits are assigned to ability enhancement courses (AECC), 2 credits are assigned to open elective course (OEC), 6 credits are assigned to compulsory specifies course (CSC), and 4 credits to (DSEC).

Course handouts for students will be provided in every course. A course handout is a thorough teaching plan of a faculty taking up a course. It is a blueprint which will guide the students about the pedagogical tools being used at different stages of the syllabus coverage and more specifically the topic-wise complete plan of discourse, that is, how the faculty members treat each and every topic from the syllabus and what they want the student to do, as an extra effort, for creating an effective learning. It may be a case study, a role-play, a classroom exercise, an assignment- home or field, or anything else which is relevant and which can enhance their learning about that particular concept or topic. Due to limited availability of time, most relevant topics will have this kind of method in course handout.

Internship Time Period

Internship for Qualifying B.Sc. MLT Programme will be of six months. Minimum 720 hours of internship should be completed by the candidate to be awarded the degree.

Students have to undertake the rotational postings during which students have to work under supervision of an experienced staff in the following areas:

Sl. No	Postings	Duration
1.	Haematology & Clinical Pathology	1 Month
2.	Biochemistry	1 Month
3.	Blood Banking	1 Month
4.	Microbiology & Serology	1 Month
5.	Histopathology	1 Month
6.	Cytology	1 Month
	Total	6 Months

Other Details:

- Entire internship shall be done in a Hospital or Medical College approved by the College/University.
- Every candidate will be required after passing the final B.Sc. (Medical Lab. Tech.) Examination to undergo compulsory rotatory internship to the satisfaction of the College Authorities and University concerned for a period of six months so as to be eligible for the award of the degree of Bachelor of Science in Medical Laboratory Techniques and registration.
- The University shall issue a provisional degree of Bachelor of Science in Medical Laboratory Techniques on passing the final examination and after the completion of internship on demand by the candidate.
- The internee shall be entrusted with laboratory responsibilities under direct supervision of Senior Medical Officer/Technician. They shall not be working independently.
- Internee will not issue any certified copy of investigation reports or other related documents under their signature.
- Assessment of Internship:
 - The Internee shall maintain the record of work, which is to be verified and certified by the senior medical officer/Technician under whom he /she works. Apart from scrutiny of record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during at the end of training. Based on the record of work and date of evaluation The Director/Principal shall issue certificate for satisfactory completion of training following which the University shall award the degree of Bachelor of Science in Medical Laboratory Techniques.

Satisfactory completion shall be determined on the basis of the following:

- Proficiency of knowledge required for each Laboratory Techniques
- The competency and skills expected to manage each laboratory technique.
- Responsibility, punctuality, works up of laboratory techniques, involvement in special procedures and preparation of reports.
- Capacity to work in a team (behavior with colleagues, nursing staff and relationship with medical and paramedical.
- Initiating, participating in discussions and developing research aptitude.
- Only twelve leave are allowed to an internee during the period of his/her internship. If he/she extend his/her leave in the duration of internship, the period the internship shall be extended by double the days for which the student was absent.

Internship Log Book:

Duly signed and completed Internship log book is compulsory to submit in the department/college to obtain internship completion and course completion letter/certificates.

B.Sc.-MLT: Three Year Six Months (6-Semester) CBCS Programme

Basic Structure: Distribution of Courses

S.No.	Type of Course	Credit Hours	Total Credits
1	Core Course (CC)	8 Courses of 3 Credit Hrs. each (Total Credit Hrs. 8X3)	24
2	Discipline Specific Course (DSC)	19 Courses of 3 Credit Hrs. each (Total Credit Hrs. 19X3) 3 Courses of 2 Credit Hrs. each (Total Credit Hrs. 3X2)	57 6
3	Discipline Specific Elective Course (DSEC)	1 Course of 3 Credit Hrs. (Total Credit Hrs. 1X3) 1 Course of 1 Credit Hrs. (Total Credit Hrs. 1X1)	3 1
3	Ability-Enhancement Compulsory Course (AECC)	4 Courses of 3 Credit Hrs. each (Total Credit Hrs. 4X3) 1 Course of 4 Credit Hrs. (Total Credit Hrs. 1X4)	12 4
4	Skill-Enhancement Elective Course (SEC)	27 Courses of 1 Credit Hrs. each (Total Credit Hrs. 27X1) 5 Course of 3 Credit Hrs. each (Total Credit Hrs. 5X3)	27 15
5	Open Elective Course (OEC)	1 Course of 3 Credit Hrs. (Total Credit Hrs. 1X3)	3
6	Compulsory Specified Course (CSC)	2 Courses of 3 Credit Hrs. each (Total Credit Hrs. 2X3)	6
7	Value Added Course (VAC)	2 Courses of 0 Credit Hrs. each (Total Credit Hrs. 2X0)	0
8	MOOC Course	2 Courses of 2 Credit Hrs. each (Total Credit Hrs. 2X2)	4
Total Credits			162

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University.

The following is the course module designed for the MLT program:

Core Course (CC): Core courses of MLT program will provide a holistic approach to health care education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish health related knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.

The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the business and community at large. We offer eight core courses from I-VI semester. Each CC ranges from 2-3credits.

Ability Enhancement Compulsory Course (AECC): As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and

B.Sc. Medical Lab Techniques (B.Sc. MLT) Syllabus as per CBCS (w.e.f. 2019-20)

exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offer five AECCs courses from I –VI semester of the program. Each AECC ranges from 2-4 credits.

Program/Discipline Specific Elective Course (DSEC): The discipline specific elective course is chosen to make students specialist or having specialized knowledge of a specific domain like marketing, human resource, etc. It is covered in VI semester of the program relevant to chosen disciplines of core courses of the program. The student will have to choose any one out of two. This course is of 4 credit including theory and practical.

Skill Enhancement Course (SEC): These courses are designed to provide value-based and/or skill-based knowledge. We offer thirty two SECs from I-VI Semester. Each SEC ranges from 1-3 credits.

Open/Generic Elective Course (GEC): Open/Generic Elective is an interdisciplinary additional subject that is compulsory in the fifth and sixth semester of a program. The score of Open/Generic Elective is counted in your overall aggregate marks under Choice Based Credit System (CBCS). Dept. offers one open elective course of 3 credits in semV. Student should select one open elective course from the pool of courses provided by the university.

Compulsory Specified Course (CSC): This is a compulsory course that does not have any choice and will be of 3 credits. Each student of MLT program has to compulsorily pass this course.

Value Added Course (VAC): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be one course each in Semester III & Semester IV and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the Degree certificate. These marks will not be included in the calculation of CPI. Students have to specifically be registered in the specific course of the respective semesters.

Massive open online course (MOOC) is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials, such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums or social media discussions to support community interactions among students, professors, and teaching assistants (TAs), as well as immediate feedback to quick quizzes and assignments. MOOCs are a recent and widely researched development in distance education first introduced in 2008 and emerged as a popular mode of learning in 2012.

College offers two MOOC courses each of 2 credits in IV & V semesters.

C. Programme Specific Outcomes (PSOs)

On completion of the Programme, the student will be:

PSO1.	Understanding the concepts, theories & principles of medical laboratory techniques and applied sciences.
PSO2.	Understanding the role of various GOI, NGOs, health programmes/ policies and Organizations.
PSO3.	Applying quality control measures, safety procedures and maintenance of laboratory equipment's and lab accreditation systems.
PSO4.	Applying techniques for collection and preservation of biological Samples.
PSO5.	Analysing the process of accreditation and certification in different health care systems.
PSO6.	Evaluating the results and explaining underlying principle in each investigation.

Pedagogy & Unique practices adopted: "Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will **emphasize on experiential learning.**

1. Case Based Learning: Case based learning enhances student skills at delineating the critical decision dilemmas faced by organizations, helps in applying concepts, principles and analytical skills to solve the delineated problems and develops effective templates for health related problem solving. Case method of teaching is used as a critical learning tool for effective learning and we encourage it to the fullest.

2. Role Play & Simulation: Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play & simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

3. Video Based Learning (VBL) & Learning through Movies (LTM): These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the

learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

4. Field / Live Projects: The students, who take up experiential projects in different hospitals/health organizations, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

5. Industrial Visits/ Educational tour: Industrial visit are essential to give students hands-on exposure and experience of how things and processes work in education. College organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

6. MOOCS: Students may earn credits by passing MOOCS as decided by the college from time to time. Graduate level programs may award Honours degree provided students earn pre-requisite credits throughMOOCs

7. Special Guest Lectures (SGL): Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific health organizations/domain to make things/concepts clear for a better understanding from the perspective of the health care system. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and health organizations from time to time to deliver their vital inputs and insights

8. Student Development Programs (SDP): Harnessing and developing the right talent for the right organizations an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, workshops etc. that may be required as per the need of the student and healthcare trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

9. Special assistance Programme for slow learners: Special classes are arranged for slow learners. They are assisted patiently and consistently. Motivation is one of the most essential requirements to help them continue learning. Proper acknowledgement and praise helps the overall development of such student.

10. Laboratory Focused programs: Establishing collaborations with various health partners to deliver the Programme on sharing basis. The specific courses are to be delivered by health care experts to provide practice based insight to the students.

11. Orientation program: Two week Programme is arranged to introduce students to college services which will support their educational and personal goals. To facilitate initial academic process, course selection and registration, creating an atmosphere that minimizes anxiety, promotes positive attitude and stimulates excitement for learning. It also helps knowledge of scope, information regarding academic and student service resources and Programme. It provides a welcoming atmosphere for student's to meet faculty, staff, senior students as well as other new students.

12. Mentoring scheme: The College follows the mentoring scheme. Every student is provided with a faculty mentor to help him/her in their personal & academic issues. The mentor maintains a register along with the mentor mentee booklet provided to all students. In that book all the details of student are filled and every month 2 times they meet with their mentor. Ment or fills the details of meeting in every students register and tries to solve the issue and after solving the issue the issue closed in that register.

13. Career & personal counseling: College has training and placement cell for career and personal counseling of the students.

14. Competitive exam preparation: College provides different subject experts for competitive exam preparation of students.

15. Extracurricular Activities: organizing & participation of students in extracurricular activities are mandatory to help students and develop confidence & face audience with care.

16. Participation in workshop, seminars, writing & presenting paper: College encourages students to take part in these types of activities. Most of our students are participating in these types of activities.

17. Formation of Student clubs, membership & organizing and participating events: College has students club and students are participating in many events like youth festival and other activities those are performed in our Universities as well as in other Universities participation.

18. Capability enhancement & development scheme: College offers some schemes like soft skill development, remedial coaching, yoga and meditation and personal counseling to enhance the capability and holistic development of the students.

19. Library visit & Utilization of E-Learning resources: College as well as faculty members encourage students to go to library and study. To enhance this department has provision of Library schedule in the time table so student can use that time to refer different books and use E learn in library. College has well developed and organized library.

Study & Evaluation Scheme

B.Sc. MLT- Semester-I

S.N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-1	BML-S- 101	Human Anatomy-I	3	-	-	3	40	60	100
2	CC-2	BML -S-102	Human Physiology-I	3	-	-	3	40	60	100
3	DSC-1	BML-S- 103	Basic Haematology & Clinical Pathology-I	3	-	-	3	40	60	100
4	DSC-2	BML-S- 104	Fundamentals of Biochemistry-I	3	-	-	3	40	60	100
5	CC-3	BML -S-105	Preventive Medicine & Community Healthcare	3	-	-	3	40	60	100
6	DSC-3	BML -S-106	Fundamentals of Microbiology-I	3	-	-	3	40	60	100
7	AECC-1	TMUGE101	English communication-I	2	-	2	3	40	60	100
8	SEC-1	BML-S- 151	LAB: Human Anatomy-I	-	-	2	1	50	50	100
9	SEC-2	BML-S- 152	LAB: Human Physiology-I	-	-	2	1	50	50	100
10	SEC-3	BML-S- 153	LAB: Basic Haematology & Clinical Pathology-I	-	-	2	1	50	50	100
11	SEC-4	BML-S- 154	LAB: Fundamentals of Biochemistry-I	-	-	2	1	50	50	100
12	SEC-5	BML-S- 156	LAB: Fundamentals of Microbiology-I	-	-	2	1	50	50	100
			Total	20	00	12	26	530	670	1200

B.Sc. MLT -Semester II

S. N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-4	BML –S-201	Human Anatomy-II	3	-	-	3	40	60	100
2	CC-5	BML –S-202	Human Physiology-II	3	-	-	3	40	60	100
3	DSC-4	BML –S-203	Basic Haematology & Clinical Pathology-II	3	-	-	3	40	60	100
4	DSC-5	BML–S- 204	Fundamentals of Biochemistry-II	3	-	-	3	40	60	100
5	SEC-6	BML–S- 205	Fundamentals of Computer	3	-	-	3	40	60	100
6	DSC-6	BML–S- 206	Fundamentals of Microbiology-II	3	-	-	3	40	60	100
7	AECC-2	TMUGE201	English Communication- II	2	-	2	3	40	60	100
8	SEC-7	BML –S-251	LAB: Human Physiology- II	-	-	2	1	50	50	100
9	SEC-8	BML –S-252	LAB: Basic Haematology & Clinical Pathology-II	-	-	2	1	50	50	100
10	SEC-9	BML –S-253	LAB: Fundamentals of Biochemistry-II	-	-	2	1	50	50	100
11	SEC-10	BML –S-254	LAB : Fundamentals of Computer	-	-	2	1	50	50	100
12	SEC-11	BML–S-256	LAB: Fundamentals of Microbiology-II	-	-	2	1	50	50	100
Total				20	00	12	26	530	670	1200

B.Sc. MLT –Semester III

S. N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	DSC-7	BML-S- 301	Clinical Haematology-I	3	-	-	3	40	60	100
2	DSC-8	BML-S- 302	Clinical Biochemistry-I	3	-	-	3	40	60	100
3	DSC-9	BML-S- 308	Clinical Microbiology-I	3	-	-	3	40	60	100
4	DSC-10	BML –S- 304	Immunology & Serology-I	2	-	-	2	40	60	100
5	DSC-11	BML-S- 305	Histopathology & Histotechniques –I	3	-	-	3	40	60	100
6	AECC-3	BML –S- 307	Environmental Sciences	4	-	-	4	40	60	100
7	AECC-4	TMUGE301	English Communication- III	2	-	2	3	40	60	100
8	SEC-12	BML-S- 351	LAB: Clinical Haematology-I	-	-	2	1	50	50	100
9	SEC-13	BML –S- 352	LAB: Clinical Biochemistry-I	-	-	2	1	50	50	100
10	SEC-14	BML-S- 358	LAB: Clinical Microbiology-I & Immunology- I	-	-	2	1	50	50	100
11	SEC-15	BML –S- 354	LAB: Histopathology & Histotechniques –I	-	-	2	1	50	50	100
12	SEC-16	BML-S- 355	Clinical Training	-	-	6	3	50	50	100
Total				20	0	16	28	530	670	1200

Value Added Course (VAC-1)

1.	VAC-1	TMUGS-301	Managing Self	2	1	0	0	50	50	100
----	-------	-----------	---------------	---	---	---	---	----	----	-----

B.Sc. MLT –Semester IV

S. N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	DSC-12	BML–S- 401	Clinical Haematology-II	3		-	3	40	60	100
2	DSC-13	BML–S- 402	Clinical Biochemistry-II	3		-	3	40	60	100
3	DSC-14	BML–S- 408	Clinical Microbiology-II	3		-	3	40	60	100
4	DSC-15	BML–S- 404	Immunology & Serology-II	2		-	2	40	60	100
5	DSC-16	BML –S- 405	Histopathology & Histotechniques –II	2			2	40	60	100
6	CC-6	BML–S- 407	General Pathology	3		-	3	40	60	100
7	AECC-5	TMUGE401	English Communication-IV	2		2	3	40	60	100
8	SEC-17	BML –S- 451	LAB: Clinical Haematology-II	-		2	1	50	50	100
9	SEC-18	BML –S- 452	LAB: Clinical Biochemistry-II	-		2	1	50	50	100
10	SEC-19	BML–S- 458	LAB: Clinical Microbiology-II	-		2	1	50	50	100
11	SEC-20	BML–S- 454	LAB: Immunology & Serology-II	-		2	1	50	50	100
12	SEC-21	BML–S- 455	LAB: Histopathology & Histotechniques –II	-		2	1	50	50	100
13	SEC-22	BML–S- 456	Clinical Training	-		6	3	50	50	100
14		MOOC I		-	-	-	2	-	-	100
Total				18	0	18	29	580	720	1400

Value Added Course (VAC-2)

2	VAC-2	TMUGS-401	Managing Work and Others	2	1	0	0	50	50	100
---	-------	-----------	--------------------------	---	---	---	---	----	----	-----

B.Sc. MLT -Semester V

S. N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	DSC-17	BML –S- 501	Immunohematology & Blood Banking	3	-	-	3	40	60	100
2	CC-7	BML –S- 502	Clinical Enzymology & Automation	3	-	-	3	40	60	100
3	DSC-18	BML–S- 507	Medical Microbiology-I	3	-	-	3	40	60	100
4	DSC-19	BML –S- 504	Parasitology	3	-	-	3	40	60	100
5	DSC-20	BML–S- 505	Diagnostic Cytology	3	-	-	3	40	60	100
6	CSC-1	BML –S- 506	Principles of Laboratory Management	3	-	-	3	40	60	100
7	SEC-23	BML –S- 551	LAB: Immunohematology & Blood Banking	-	-	2	1	50	50	100
8	SEC-24	BML–S- 552	LAB: Clinical Enzymology	-	-	2	1	50	50	100
9	SEC-25	BML –S- 557	LAB: Medical Microbiology-I	-	-	2	1	50	50	100
10	SEC-26	BML–S- 554	LAB: Parasitology	-	-	2	1	50	50	100
11	SEC-27	BML–S- 555	LAB: Diagnostic Cytology-I	-	-	2	1	50	50	100
12	SEC-28	BML–S- 556	Clinical Training	-	-	6	3	50	50	100
13		MOOC II		-	-	-	2	-	-	100
14			Open Elective				3	As Per University Guidelines		
Total				18	0	16	31	540	660	1300

B.Sc. MLT -Semester VI

S. N	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC-8	BML-S- 601	Clinical Endocrinology & Toxicology	3	-	-	3	40	60	100
2	DSC-21	BML-S- 609	Medical Microbiology-II	3	-	-	3	40	60	100
3	DSC-22	BML-S- 605	Clinical Virology	3	-	-	3	40	60	100
4	CSC-2	BML -S- 606	Biostatistics & Research Methodology	3	-	-	3	40	60	100
5	DSEC	-	Discipline Specific Elective Course	3	-	-	3	40	60	100
6	SEC-29	BML-S- 651	LAB: Clinical Endocrinology & Toxicology	-	-	2	1	50	50	100
7	SEC-30	BML-S- 659	LAB: Medical Microbiology-II	-	-	2	1	50	50	100
8	SEC-31	BML-S- 655	LAB: Clinical Virology	-	-	2	1	50	50	100
9	SEC-32	BML -S- 656	Clinical Training	-	-	6	3	50	50	100
10	DSEC Practical	-	LAB: Discipline Specific Elective Course	-	-	2	1	50	50	100
Total				15	0	14	22	450	550	1000

Note: DSEC courses are to be selected from the list of courses offered.

DISCIPLINE SPECIFIC ELECTIVE COURSES OFFERED (DSEC)

S.No	Code	Course	L	T	P	Credit
Semester VI (Any One) (including LAB)						
1	BML –S- 607	Advance Diagnostic Techniques	3	0	-	3
2	BML –S- 608	Diagnostic Molecular Biology	3	0	-	3
3	BML–S- 657	LAB: Advance Diagnostic Techniques	-	-	2	1
4	BML–S- 658	LAB: Diagnostic Molecular Biology	-	-	2	1

Course Code: BML-S-101	<u>Core Course -1 (CC-1)</u> BMLT- Semester-I <u>Human Anatomy-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Describing different terminology and recognizing organs, organ system	
CO2.	Understanding the major structures of human body.	
CO3.	Differentiating the various organ system and its related disorders	
CO4.	Explaining various organ systems and employ knowledge of human anatomy to solve questions regarding functions, diseases and sample collection	
CO5.	Analyzing appropriate sample collection site	
Course Content:		
Unit-1:	Terminology and General Plan of the Body, Body Parts and Areas, Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections	8 Hours
Unit-2:	Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division Tissue, Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue The Integumentary System: structure and function of The Skin, Subcutaneous Tissue	7 Hours
Unit-3:	Musculoskeletal System: Basic anatomy of important muscles and bones	7Hours
Unit-4:	Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs	8 Hours
Unit-5:	Digestive system: basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas	6Hours
<u>Text Books:</u>	<i>1. Text Book of Physiology, Sujit Chaudhary</i>	
<u>Reference Books:</u>	<i>1. Anatomy & Physiology, Ross & Wilson</i> <i>2. Human Anatomy, B D Chaurasia</i> <i>3. https://open.umn.edu/opentextbooks/textbooks/169</i> <i>4. https://www.classcentral.com/course/humanphysio-380</i>	

Course Code: BML-S-102	Core Course -2 (CC-2) BMLT- Semester-I Human Physiology-I	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the function & structure of cells, tissues and major human organs system/parts.	
CO2.	Understanding physiological processes accurately and using relevant scientific terminology and nomenclature.	
CO3.	Understanding physiological processes accurately and using relevant scientific terminology and nomenclature.	
CO4.	Explaining the interrelation between different organ systems to maintain biological equilibrium	
CO5.	Classifying functions of various organ systems and employ its knowledge to understand diseases	
CO6.	Applying various experimental techniques related to physiology	
Course Content:		
Unit-1:	Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis	6 Hours
Unit-2:	Blood-composition, function, cellular component & their function, haemoglobin & anaemia, blood groups and coagulation Lymphatic system-Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus	7 Hours
Unit-3:	Cardiovascular system-general arrange, heart, arteries, veins and capillaries, heart structure and function, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock	8Hours
Unit-4:	Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues, Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases	8 Hours
Unit-5:	Gastrointestinal physiology: Organs of GIT and their structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gallbladder & pancreas, Jaundice, Cirrhosis & Pancreatitis.	7Hours

1.

<u>Text Books:</u>	<i>Text Book of Physiology, Sujit Chaudhary</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none">1. <i>Anatomy & Physiology, Ross & Wilson</i>2. <i>Human Anatomy, B D Chaurasia</i>3. https://open.umn.edu/opentextbooks/textbooks/1694. https://www.classcentral.com/course/humanphysio-380	

Course Code: BML-S-103	Discipline Specific Course -1 (DSC-1) BMLT- Semester-I <u>Basic Hematology & Clinical Pathology-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the formation of blood & its composition.	
CO2.	Describing different stage of cells development.	
CO3.	Understanding the concept of Haemopoiesis, biomedical waste management, & microscopy	
CO4.	Applying the specific technique for sample collection, its preservation & biomedical waste management.	
CO5.	Analyzing infected blood samples and sites for hematological investigations	
Course Content:		
Unit-1:	Introduction to Haematology, Organization of laboratory and safety measures, Laboratory Safety guidelines, Biomedical waste management, BMW – Segregation, collection, transportation, treatment and disposal (including colour coding), Personal Protective Equipment, The Microscope and its parts, care and maintenance, monocular and binocular microscope, Corrective Actions in Light Microscopy, Important equipment used in haematology lab	8 Hours
Unit-2:	Haematopoiesis, Erythropoiesis, Leucopoiesis, Thrombopoiesis, Mechanism of hemopoiesis, stages of cell development, sites of hemopoiesis, Blood and its composition, plasma and its composition, RBC, WBC, Platelets, Anticoagulants, mechanism of action, types and uses, merits and demerits, effect of storage on blood cells	7 Hours
Unit-3:	Collection, Transport, Preservation, and Processing of various clinical Specimens, Blood collection for hematological investigations, Venipuncture, Capillary blood, Arterial blood, Vacutainer, its type and uses, sample acceptance and rejection criteria.	6 Hours
Unit-4:	Hemoglobin, structure ,function and types , Hemoglobinometry , Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on blood parameters Hemocytometry, visual and electronic method, Neubauer counting chamber, RBC count, WBC count, Platelets count, absolute	8 Hours

	eosinophil count, principle, procedure, calculation , significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological changes in values	
Unit-5:	Preparation of thin and thick smears, staining of smears, Romanowsky dyes, preparation and staining procedures of blood smears, Morphology of normal blood cells and their identifications, differential leucocytes count by manual and automated method, physiological and pathological variations in value	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> 1. <i>Text book of Medical lab Technology, Praful B Godkar, IIIrd edition</i> 2. <i>Text book of Medical Lab Technology, Ramnik Sood, Jaypee Publishers</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Medical Lab Technology by K.L. Mukherjee,</i> 2. <i>Practical Haematology, Dacie & Lewis, 11th edition</i> 3. <i>De gruchy's Clinical Hematology in Medical Practice</i> 1. https://www.hematology.org/education 2. https://www.vet.cornell.edu/animal-health-diagnostic-center/laboratories/clinical-pathology 	

Course Code: BML-S-104	Discipline Specific Course -2 (DSC-2) BMLT- Semester-I <u>Fundamentals of Biochemistry-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the role and responsibilities of medical lab technologist	
CO2.	Understanding principle, working and maintenance of various laboratory instruments	
CO3.	Understanding different types of solutions and their preparations	
CO4.	Applying appropriate methods for collection, handling and processing of different body fluids	
CO5.	Analyzing body fluids on the basis of physical, chemical and microscopic examinations	
Course Content:		
Unit-1:	Introduction to Clinical Biochemistry and role of Medical Lab Technologist , ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents. Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning & care and maintenance	8 Hours
Unit-2:	Principle, working, care & maintenance and calibration of Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel Balch equation, pH paper, pH meter, method of pH measurement.	7 Hours
Unit-3:	Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins	6 Hours
Unit-4:	Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample.	8 Hours

Unit-5:	Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs. urine for protein and their clinical significance.	7Hours
<u>Text Books:</u>	<i>1. Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Practical Biochemistry, Singh & Sahni</i> 2. <i>Biochemistry, Voet & Voet, 4th edition, John Wiley & sons</i> 3. <i>Biochemistry, U Satyanarayan</i> 1. https://www.elsevier.com/books/essentials-of-medical-biochemistry/bhagavan/978-0-12-416687-5 2. https://iubmb.onlinelibrary.wiley.com/journal/15393429 	

<u>Course Code:</u> BML-S-105	<u>Core Course -3 (CC-3)</u> BMLT- Semester-I <u>Preventive Medicine & Community Healthcare</u>	L-3 T-0 P-0 C-3
<u>Course Outcomes:</u>	On completion of the course, the students will be :	
CO1.	Understanding the Concept of Community Health, preventive Medicine & Family Welfare.	
CO2.	Understanding the Nutrition and major Nutritional disorders and their prevention	
CO3.	Describing epidemiology and aetiology of communicable disease	
CO4.	Applying National health policy programmes, Universal Immunization and Vaccines schedules	
CO5.	Analyzing population related problems and its effect on growth and development	
<u>Course Content:</u>		
Unit-1:	Definition and concepts of health, important public health acts, health problems of developed and developing countries, environment and health. Nutrition and detection of nutritional disorders, manifestations and prevention of such disorders role of regular exercise and yoga in prevention and management of various diseases.	8 Hours
Unit-2:	Epidemiology and diseases, Basic emergency care and first aid Epidemiology, aetiology, pathogenesis and control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhoea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS	7 Hours
Unit-3:	National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal and national immunization programs, and vaccine schedules.	6 Hours
Unit-4:	Population, problems of population growth, birth rates, death rates and fertility rates, MMR, CPR, Reproductive and child health. Hygiene and sanitation	8 Hours
Unit-5:	Family welfare and planning, Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA,, FAO, ILO	7Hours
<u>Text Books:</u>	1. Textbook of Preventive Social Medicine ,K.Parks, Sunder Lal,	
<u>Reference Books:</u>	1. Park & Park, Preventive & Social Medicine 2. https://www.hindawi.com/journals/apm/contents/	

<u>Course Code:</u> BML-S-106	Discipline Specific Course -3 (DSC-3) BMLT- Semester-I Fundamentals of Microbiology-I	L-3 T-0 P-2 C-4
<u>Course Outcomes:</u>	On completion of the course, the students will be :	
CO1.	Understanding theories and concepts of microorganisms.	
CO2.	Understanding microscope, its components and maintenance	
CO3.	Describing the morphology of eukaryotic and prokaryotic cells	
CO4.	Applying microscopy to study basic features of microorganisms	
CO5.	Analyzing different stains and staining techniques	
<u>Course Content:</u>		
Unit-1:	Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner and others. Lab organization, Laboratory Safety measures in Microbiology, Occurrence of lab infections, route of infections in laboratory, Universal precautions	8 Hours
Unit-2:	Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care and maintenance of microscope	7 Hours
Unit-3:	Prokaryotic and eukaryotic cells, bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes.	6 Hours
Unit-4:	Introduction and basic features of bacteria, viruses, fungi, protozoa Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls	8 Hours
Unit-5:	Introduction and principles of staining, dye and stain, staining methods such as Gram, AFB, Albert's, Capsule staining, bacterial wall, spirochetes Aseptic techniques in microbiology	7Hours
<u>Text Books:</u>	<i>1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier</i> 2. <i>Willey JM, Sherwood LM, and Woolverton CJ. (2013)</i> <ol style="list-style-type: none"> 1. http://www.ppup.ac.in/e-Content/_edetails.php?id=2017 2. http://ecoursesonline.iasri.res.in/course/view.php?id=108 	

Course Code: TMUGE101	<u>Ability Enhancement Core Course -6 (AECC-1)</u> BMLT- Semester-I <u>Englishcommunication-I</u>	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering and understanding of the basic of English grammar and vocabulary.	
CO2.	Understanding of the basic Communication process.	
CO3.	Applying correct vocabulary and tenses in sentences construction.	
CO4.	Analyzing communication needs and developing communication strategies using both verbal & non-verbal method.	
CO5.	Drafting applications in correct format for common issues.	
CO6.	Developing self-confidence.	
Course Content:		
Unit-1:	Introductory Sessions <ul style="list-style-type: none"> • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons of fear of failure, strategies to overcome Fear of Failure. • Importance of English Language in present scenario (Practice: Self-introduction session) 	6 Hours
Unit-2:	Basics of Grammar <ul style="list-style-type: none"> • Parts of Speech • Tense • Subject and Predicate • Vocabulary: Synonym and Antonym (Practice: Conversation Practice) 	12 Hours
Unit-3:	Basics of Communication <ul style="list-style-type: none"> • Communication : Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds (Practice: Pronunciation drill and building positive body language) 	8 Hours
Unit-4:	Application writing <ul style="list-style-type: none"> • Format & Style of Application Writing 	8 Hours

	<ul style="list-style-type: none"> Practice of Application writing on common issues 	
Unit-5:	Value based text reading: Short Story (Non- detailed study) <ul style="list-style-type: none"> Gift of Magi – O. Henry 	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> <i>Kumar, Sanjay. & Pushp Lata. "Communication Skills" New Delhi: Oxford University Press.</i> <i>Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster.</i> <i>Harris, Thomas. A. "I am ok, You are ok" New York: Harper and Row</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> <i>Goleman, Daniel. "Emotional Intelligence" Bantam Book.</i> <i>Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.</i> 	

Note: Course Outcomes of following practical's are covered in their respective theory courses

Course Code: BML-S-151	Skill Enhancement Course-1 (SEC-1) BMLT- Semester-I LAB: <u>Human Anatomy-I</u>	P-2 C-1
Course Content:		
1.	Demonstration of Major organs through models and permanent slides.	
2.	Demonstration of parts of circulatory system from models.	
3.	Demonstration of parts of respiratory system from models.	
4.	Demonstration of digestive system from models.	
5.	Demonstration of excretory system from models.	
6.	Demonstration of nervous system from models.	
7.	Structure of eye and ear	
8.	Demonstration of structural differences between skeletal, smooth and cardiac muscles.	
9.	Demonstration of various bones	
10.	Demonstration of various joints	
11.	Demonstration of various parts of male & female reproductive system from models	

Course Code: BML-S-152	Skill Enhancement Course-2 (SEC-2) BMLT- Semester-I LAB: Human Physiology-I	P-2 C-1
Course Content:		
1.	To measure pulse rate	
2.	To measure blood pressure	
3.	Demonstration of ECG	
4.	To perform Hemoglobin by Sahli's Method	
5.	To perform Hemoglobin by CMG method.	
6.	Haemoglobin by CMG method	
7.	To perform Total RBC count.	
8.	To perform total leucocyte count.	
9.	To perform differential leucocyte count.	
10.	To perform PCV	
11.	To calculate Red cell indices.	

Course Code: BML-S-153	Skill Enhancement Course-3 (SEC-3) BMLT- Semester-I LAB: Basic Hematology & Clinical Pathology-I	P-2 C-1
Course Content:		
1.	To learn general laboratory safety rules.	
2.	To demonstrate glass wares, apparatus and plastic wares used in laboratory.	
3.	To prepare EDTA, Sod. Citrate & Sod. Fluoride anticoagulants and bulbs/vials used in laboratory.	
4.	Demonstration of Vaccutainer.	
5.	To demonstrate method of blood collection.	
6.	To separate serum and plasma.	
7.	Demonstration of microscope	
8.	Determination of Hemoglobin by various methods.	
9.	Determination of TLC	
10.	Preparation of thick and thin smear	
11.	Determination of DLC	
12.	Determination of Total RBC	
13.	Determination of total platelet count	
14.	Determination of absolute leucocyte count	

Course Code: BML-S-154	Skill Enhancement Course-4 (SEC-4) BMLT- Semester-I LAB: Fundamentals of Biochemistry-I	P-2 C-1
Course Content:		
1.	To study general laboratory safety rules.	
2.	To demonstrate glass wares, apparatus and plastic wares used in laboratory.	
3.	Collection of blood sample	
4.	To separate serum and plasma.	
5.	Preparation of different percentage solutions	
6.	Preparation of normal and molar solutions.(0.1 N NaOH, 0.2N HCl,0.1 M H ₂ SO ₄)	
7.	Demonstration of photocolormeter	
8.	Demonstration of spectrophotometer	
9.	Demonstration of pH meter	
10.	Deproteinization of blood sample	

<u>Course Code:</u> BML-S-156	Skill Enhancement Course-5 (SEC-5) BMLT- Semester-I LAB: Fundamentals of Microbiology-I	P-2 C-1
Course Content:		
1.	To demonstrate safe code practice for microbiology laboratory.	
2.	To demonstrate glassware used in microbiology.	
3.	To demonstrate working and handling of Microscope.	
4.	To demonstrate method of sterilization by autoclave.	
5.	To demonstrate method of sterilization by Hot air oven.	
6.	To perform Gram staining	
7.	To perform Acid fast staining (Zeihl Neelsen staining)	
8.	To perform Indian ink staining	
9.	To perform Albert's staining	

<u>Course Code:</u> BML-S-201	<u>Core Course -4(CC-4)</u> BMLT- Semester-II <u>Human Anatomy-II</u>	L-3 T-0 P-0 C-3
<u>Course Outcomes:</u>	On completion of the course, the students will be :	
CO1.	Understanding basic anatomy of different organ and organ system	
CO2.	Understanding endocrine system of body and their functions	
CO3.	Describing the major structures of human body.	
CO4.	Analyze various organ systems and its related disorders	
CO5.	Applying a holistic approach to human health and medical research.	
<u>Course Content:</u>		
Unit-1:	Cardiovascular system: Basic anatomy of heart and important blood vessels Brief introduction about Lymphatic System	8 Hours
Unit-2:	The Nervous System: Basic anatomy of brain and spinal cord, meninges and cerebrospinal fluid, Cranial Nerves	7 Hours
Unit-3:	Endocrine System: Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal	6 Hours
Unit-4:	Special Senses: Basic anatomy of eye, ear and nose	8 Hours
Unit-5:	Genitourinary system: Basic anatomy of kidney and associated organs, male reproductive organs, female reproductive organs	7Hours
<u>Text Books:</u>	<i>1. Textbook of Medical Physiology, Guyton and Hall</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Anatomy & Physiology, Ross & Wilson</i> 2. <i>Human Anatomy, B D Chaurasia</i> 3. <i>Principles of Anatomy and Physiology, Gerard J.Tortora and Bryan H.Derrickson</i> 4. https://www.science.gov/topicpages/e/e-learning+human+anatomy 5. https://www.digitalteacher.in/human-anatomy 	

Course Code: BML-S-202	Core Course -5 (CC-5) BMLT- Semester-II Human Physiology-II	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the mechanism of action of different organ systems	
CO2.	Understanding electrolytes with respect to alkalosis and acidosis.	
CO3.	Describing reproductive system and sexual characteristics	
CO4.	Analyzing special senses and functions	
CO5.	Evaluating abnormalities and various physical conditions.	
Course Content:		
Unit-1:	Organs of Excretory System: Kidneys, Nephron, Mechanism of Excretion, Urine formation (Glomerular filtration and Tubular reabsorption) , Electrolytes: their balances and imbalances Introduction of acidosis and alkalosis	8 Hours
Unit-2:	Muscle nerve physiology, types of muscles, their gross structural and functional difference with reference to properties	7 Hours
Unit-3:	Nervous system- general organization of CNS, function of important structure and spinal cord, neuron, nerve impulse, type of nerves according to function, Autonomic nervous system- organization & function Special senses-general organization & functions	6 Hours
Unit-4:	Endocrine System: Brief introduction about endocrine glands and their secretion, common endocrinological disorder such as diabetes mellitus, hyper & hypothyroidism, dwarfism, gigantism, tetany.	8 Hours
Unit-5:	Reproductive System: male & female reproductive organs, sex hormones, secondary sexual characteristics, puberty, spermatogenesis, oogenesis, menstrual cycle, pregnancy, menopause, contraceptive measures.	7Hours
Text Books:	<i>1. Textbook of Medical Physiology, Guyton and Hall</i>	
Reference Books:	<ol style="list-style-type: none"> 1. <i>Anatomy & Physiology, Ross & Wilson</i> 2. <i>Human Anatomy, B D Chaurasia</i> 3. <i>Principles of Anatomy and Physiology, Gerard J. Tortora and Bryan H. Derrickson</i> 4. http://www.rapidlearningcenter.com/biology/human-physiology/human-physiology.html 5. https://www.adinstruments.com/lt/human-physiology 	

Course Code: BML-S-203	Discipline Specific Course -4 (DSC-4) BMLT- Semester-II <u>Basic Haematology & Clinical Pathology-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1	Understanding the blood banking techniques & the principle on which these are based.	
CO2	Understanding of basic mechanism of coagulation & its related disorders	
CO3	Describing immuno-haematology and blood banking technology	
CO4.	Applying of technique for routine investigations in clinical haematology laboratory	
CO5.	Analyzing the cause of disease by examining CSF, Sputum, Semen, Stool	
Course Content:		
Unit-1:	Erythrocyte sedimentation rate, manual and automated method, factor affecting ESR, packed cell volume, red cell indices (MCV, MCH, MCHC), Physiological and pathological variations in value	8 Hours
Unit-2:	Complete blood count, determination by automated method and significance of each parameter, Reticulocyte count, routine examination of CSF, semen, sputum and stool.	7 Hours
Unit-3:	Mechanism of coagulation, coagulation factors, Bleeding time, clotting time, platelet count, protamine sulphate test, clot retraction test	6 Hours
Unit-4:	Introduction to immunohematology and blood banking technology, antigen, antibody, complements, ABO & Rh blood group system, method of determination, other blood group system, Donor selection, blood collection, anticoagulants, additive systems, blood bags, its labeling , storage and transportation	8 Hours
Unit-5:	Uses, care & maintenance and calibration of Coulter counter, coagulometer, automatic ESR analyzer, urine analyzer, point of care testing. Pre and Post analytical variables, automation in hematology	7Hours
Text Books:	<ol style="list-style-type: none"> <i>Text book of Medical lab Technology, Praful B Godkar, IIIrd edition</i> <i>Text book of Medical Lab Technology, Ramnik Sood, Jaypee Publishers</i> 	
Reference Books:	<ol style="list-style-type: none"> <i>Practical Haematology, Dacie & Lewis, 11th edition</i> https://www.emjreviews.com/innovations/article/e-learning-in-pathology-education-a-narrative-review-and-personal-perspective 	

Course Code: BML-S-204	Discipline Specific Course -5 (DSC-5) BMLT- Semester-II <u>Fundamentals of Biochemistry-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1	Understanding the concepts and theories of biomolecules	
CO2.	Understanding the chemistry of carbohydrates, proteins, lipids and amino acids.	
CO3.	Describing the mechanism of enzyme action and identify the classes and factors affecting action	
CO4.	Analyzing different diseases associated with abnormalities of biomolecules	
CO5.	Evaluating the biochemical test results.	
Course Content:		
Unit-1:	Chemistry of Carbohydrates: Classification, function, importance, structure, digestion & absorption, test of carbohydrates	8 Hours
Unit-2:	Amino Acids & Proteins: Classification, Structure, peptides and polypeptides, Properties ,Biological functions, digestion and absorption, test of proteins	7 Hours
Unit-3:	Enzymes: Definition, properties Classification of enzyme, Cofactor & Coenzymes, general mode of action of enzymes, units for measuring enzyme activity, factors affecting enzyme activity, factor responsible for abnormal enzyme secretion Nucleic acids: Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases	6 Hours
Unit-4:	Chemistry of lipids: Introduction, definition, classification, biomedical importance, digestion and absorption. Fatty acids: Essential and non-essential fatty acids, saturated and unsaturated fatty acids, naming of fatty acids. Brief introduction of lipoproteins, Biological membrane	8 Hours
Unit-5:	Vitamins: classification, function and disease associated with vitamins. Minerals and ions: Micro and macro minerals, requirement, function and biological importance of Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Sodium and Potassium	7Hours
Text Books:	<i>1. Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i>	
Reference Books:	<i>Practical Biochemistry, Singh & Sahni</i> <i>Biochemistry, Voet & Voet, 4th edition, John Wiley & sons</i> https://www.sciencedirect.com/book/9780702051401/clinical-biochemistry-metabolic-and-clinical-aspects	

Course Code: BML-S-205	<u>Skill Enhancement Course -6 (SEC-6)</u> BMLT- Semester-II <u>Fundamentals of Computer</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the fundamental concepts of computers with the present level of knowledge of the student	
CO2	Understanding the concepts of hardware, software and memories associated with it	
CO3.	Describing binary, hexadecimal, and octal number system and their arithmetic	
CO4.	Understanding the MS OFFICE and its applications.	
CO5.	Applying MS office programs to create personal and academic documents.	
Course Content:		
Unit-1:	Introduction and Definition of Computer: Computer Generation, Characteristics of Computer, Advantages and Limitations of a computer, Classification of computers, Functional components of a computer system (Input, CPU, Storage and Output Unit), Types of memory (Primary and Secondary) Memory Hierarchy. Hardware: a) Input Devices- Keyboard, Mouse, Scanner, Bar Code Reader b) Output Devices – Visual Display Unit (VDU), Printers, Plotters etc. Software: Introduction, types of software with examples, Introduction to languages, Compiler, Interpreter and Assembler. Number System: Decimal, Octal, Binary and Hexadecimal Conversions, BCD, ASCII and EBCDIC Codes.	8 Hours
Unit-2:	MS – DOS: Getting Started on DOS with Booting the System, Internal Commands: CHDIR(CD),CLS, COPY, DATE, DEL(ERASE), DIR, CHARACTER, EXIT,MKDIR(MD), REM, RENAME(REN), RMDIR(RD), TIME, TYPE, VER, VOL, External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT,HELP, LABEL, MORE, REPLACE, RESTORE, SORT, TREE, UNDELETE, UNFORMAT,XCOPY.	7 Hours
Unit-3:	MS Word: Starting MS WORD, Creating and formatting a document, Changing fonts and point size, Table Creation and operations, Autocorrect, Auto text, spell Check, Word Art, Inserting objects, Page setup, Page Preview, Printing a document, Mail Merge.	6 Hours

Unit-4:	MS Excel: Starting Excel, Work sheet, cell inserting Data into Rows/ Columns, Alignment, Text wrapping , Sorting data, Auto Sum, Use of functions, Cell Referencing form, Generating graphs, Worksheet data and charts with WORD, Creating Hyperlink to a WORD document, Page set up, Print Preview, Printing Worksheets.	8 Hours
Unit-5:	MS-POWERPOINT: Starting MS–Power Point,, Creating a presentation using auto content Wizard, Blank Presentation, creating, saving and printing a presentation, Adding a slide to presentation, Navigating through a presentation, slide sorter, slide show, editing slides, Using Clipart, Word art gallery, Adding Transition and Animation effects, setting timings for slide show, preparing note pages, preparing audience handouts, printing presentation documents.	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> 1. <i>Sinha P.K., Computer Fundamentals, BPB Publishing.</i> 2. <i>Bill Bruck., The Essentials Office 2000 Book, BPBPublishing.</i> 3. <i>Leon A. & Leon M., Introductions to Computers, Vikas Publications</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Peter Norton_s, Introductions to Computers, Tata McGrawHill.</i> 2. <i>Price Michael, Office in Easy Steps, TMHPublication.</i> 	

Course Code: BML-S-206	Discipline Specific Course -6(DSC-6) BMLT- Semester-II <u>Fundamentals of Microbiology-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the concept of infections and its transmission	
CO2	Understanding the types and properties of disinfectant and sterilization	
CO3.	Describing Segregation, Treatment, Disposal of biomedical waste	
CO4.	Applying safety measures used in laboratory	
CO5.	Analyzing specimen collection sites for epidemiological investigations,	
Course Content:		
Unit-1:	General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators. Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal	8 Hours
Unit-2:	Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. Use and abuse of disinfectants. Precautions while using the disinfectants.	7 Hours
Unit-3:	Principle, working, use, care & maintenance of Laminar air flow, Centrifuge, Autoclave, hot air Oven, Incubator, Colony Counter, Muffle Furnace, Mac-intos Field-jar etc. Sterility testing of I/v fluids, Collection, transportation and processing of I/v fluids for bacterial contamination, Recording the result and interpretation	6 Hours
Unit-4:	Normal bacterial flora of the body, pathogenic microorganisms Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection	8 Hours

Unit-5:	Hospital acquired infection, Specimen collection from patients, clinics and hospitals, Specimen collection for epidemiological investigations, role of microbiology laboratory in control of nosocomial infection	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> 1. <i>Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication</i> 2. <i>Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Wiley JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education</i> 2. <i>Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.</i> 3. https://openstax.org/details/books/microbiology 4. https://onlinecourses.swayam2.ac.in/cec19_bt11/preview 	

Course Code: TMUGE201	<u>Ability Enhancement Core Course (AECC-2)</u> BMLT- Semester-II <u>English Communication- II</u>	L-2 T-0 P-1 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering & understanding the basics of English Grammar and Vocabulary	
CO2.	Understanding the basics of Listening, Speaking & Writing Skills	
CO3.	Understanding principles of letter drafting and various types of formats.	
CO4.	Applying correct vocabulary and grammar in sentence construction while writing and delivering presentations	
CO5.	Analyzing different types of listening, role of Audience & Locale in presentation	
CO6.	Creating Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	F u n c t i o n a l Grammar <ul style="list-style-type: none"> ➤ Prefix, suffix and One words substitution ➤ Modals ➤ Concord 	6 Hours
Unit-2:	Listening Skills <ul style="list-style-type: none"> ➤ Difference between listening & hearing, Process and Types of Listening ➤ Importance and Barriers to listening 	7 Hours
Unit-3:	Writing Skills <ul style="list-style-type: none"> ➤ Official letter and email writing ➤ Essentials of a paragraph, ➤ Developing a paragraph: Structure and methods ➤ Paragraph writing (100-120 words) 	6 Hours
Unit-4:	Strategies & Structure of Oral Presentation <ul style="list-style-type: none"> ➤ Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language ➤ Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. ➤ Modes of speech delivery and 5 W's of presentation 	8 Hours

Unit-5:	Value based text reading: Short Essay (Non- detailed study) ➤ How should one Read a book? – Virginia Woolf	7Hours
<u>Text Books:</u>	1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi.	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. Nesfield J.C. “<i>English Grammar Composition & Usage</i>” Macmillan Publishers 2. Sood Madan “<i>The Business letters</i>” GoodwillPublishing House, New Delhi 3. Kumar Sanjay &Pushplata “<i>Communication Skills</i>” Oxford University Press, New Delhi. 	

Note: Course Outcomes of following practical's are covered in their respective theory courses^{3 4}

<u>Course Code:</u> BML-S-251	<u>Skill Enhancement</u> <u>Course -7 (SEC-7)</u> BMLT- Semester-II LAB: <u>Human Physiology-II</u>	P-2 C-1
Course Content:		
1.	To perform total platelet count.	
2.	To perform bleeding time.	
3.	To perform clotting time.	
4.	To study about CSF examination.	
5.	To study about intrauterine contraceptive devices.	
6.	To demonstrate microscopic structure of bones with permanent slides.	
7.	To demonstrate microscopic structure of muscles with permanent slides.	

<u>Course Code:</u> BML-S-252	<p style="text-align: center;"><u>Skill Enhancement</u> <u>Course -8 (SEC-8)</u> BMLT- Semester-II LAB: <u>Basic Haematology & Clinical Pathology-II</u></p>	P-2 C-1
Course Content:		
1.	To perform ESR by Various methods.	
2.	To perform PCV	
3.	To determine red cell indices	
4.	To perform routine stool examination	
5.	To perform bleeding time	
6.	To perform clotting time	
7.	To perform blood grouping by slide method	
8.	To perform blood grouping by tube method	
9.	To demonstrate cell counter	
10.	To demonstrate coagulometer.	

<u>Course Code:</u> BML-S-253	<u>Skill Enhancement</u> <u>Course -9 (SEC-9)</u> BMLT- Semester-II LAB: <u>Fundamentals of Biochemistry-II</u>	P-2 C-1
Course Content:		
1.	To identify carbohydrates in given solution by various methods.	
2.	To determine protein by Biuret method.	
3.	To perform protein test by various methods.	
4.	Physical examination of urine	
5.	Urine sugar determination by Benedict's method.	
6.	Protein by heat and acetic method	
7.	Bile salt, Bile pigments and Urobilinogen determination	
8.	Determination of Ketone bodies	
9.	Determination of various parameters of urine by uristick method.	
10.	Preparation of hemolysate	

<u>Course Code:</u> BML-S-254	<u>Skill Enhancement</u> <u>Course -10(SEC-10)</u> BMLT- Semester-II LAB : <u>Fundamentals of Computer</u>	P-2 C-1
Course Content:		
1.	Using basic DOS commands.	
2.	Using external DOS commands	
3.	Creating a email account	
4.	Using web browser for searching and surfing.	
5.	Creating and formatting a document in MS office	
6.	Using autocorrect, auto text and spell check operation in MS office .	
7.	Create tables in MS Word.	
8.	Inserting different kinds of object in MS word.	
9.	Use main merge options in MS office.	
10.	Create a Excel work sheet with following options rows and columns alignment..	
11.	Using excel formulas.	
12.	Create a graph with available data in MS excel.	
13.	Create a PPT presentation using auto content wizard.	
14.	Use Clip art animation effects and word art galleries in presentations.	
15.	Using transition and setting timings for slide show.	
16.	Use MS access to create data base and tables.	

<u>Course Code:</u> BML-S-256	<p style="text-align: center;"><u>Skill Enhancement</u> <u>Course -11 (SEC-11)</u> BMLT- Semester-II</p> <p style="text-align: center;">LAB: <u>Fundamentals of Microbiology-II</u></p>	P-2 C-1
Course Content:		
1.	To demonstrate techniques for cleaning of glassware's.	
2.	To demonstrate working and maintenance of laminar air flow	
3.	Preparation of culture media plates and broth	
4.	To demonstrate biomedical waste management	
5.	To demonstrate hot air oven and sterilization method.	
6.	To demonstrate the use of disinfectants and preparation of working dilution of various disinfectants.	
7.	To demonstrate incubator and preservation of cultures.	
8.	To demonstrate sterilization method by filtration.	
9.	To perform Rideal–Walker phenol coefficient test.	
10.	To perform Kelsey-Sykes test	

Course Code: BML-S- 301	Discipline Specific Course -7(DSC-7) BMLT- Semester-III <u>Clinical Haematology-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the concept of haematopoiesis, functions & disorders of blood cells, coagulation mechanism & its disorders.	
CO2.	Understanding the normal & abnormal morphology of blood cells.	
CO3.	Describing about anemia, causes, classification & pathogenesis.	
CO4.	Applying specific diagnostic test used to identifying different types of anemia.	
CO5.	Applying the technique to preparation & staining of blood film for microscopic examination.	
Course Content:		
Unit-1:	<p>RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3-BPG and oxygen dissociation curve.</p> <p>Anaemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management, Iron deficiency anaemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test</p> <p>Megaloblastic anaemia, pernicious anaemia, pathogenesis, laboratory investigations</p>	6 Hours
Unit-2:	<p>Haemoglobin, its synthesis and types, normal and abnormal hemoglobins, extra vascular and intravascular hemolysis.</p> <p>Haemolytic anaemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD</p>	7 Hours
Unit-3:	<p>Leukopoiesis ,Stages of Leukocyte Maturation, Features of Cell Identification, leucocytosis and leucocytopenia ,neutrophilia ,eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on blood cellparameter</p>	8Hours
Unit-4:	<p>Overview of hemostasis and coagulation, Stages of platelets development, Primary and Secondaryhemostasis,</p>	8 Hours

	Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis	
Unit-5:	General blood picture, estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin, Vit. B12, Folic acid, FIGLU test, Schilling test, Parietal cell antibodies, G-6-PD, Osmotic fragility test, Heinz bodies, Perls Prussian staining, Platelet count, Platelet aggregation test, PT, INR, APTT, Mixing experiments in PT and APTT, Thrombin time.	7Hours
<u>Text Books:</u>	<i>1. Text Book of Pathology, Harshmohan, 6th Edition</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Haematology, Mckenzie, 3rd Edition</i> 2. <i>Compendium of Trasfusion medicine, DrRNMakroo</i> 1. http://www.mefos.unios.hr/index.php/de/diplomski-ml-eng-1/mandatory-courses/clinical-haematology 2. https://www.blood-academy.com/ 	

Course Code: BML-S-302	Discipline Specific Course -8(DSC-8) BMLT- Semester-III <u>Clinical Biochemistry-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the concept of metabolism of carbohydrates, protein and lipid.	
CO2.	Understanding Diabetes, its types, clinical features and diabetic profile test.	
CO3.	Describing digestion and absorption and transportation of biomolecules.	
CO4.	Applying principles and applications of the analytical instruments used in the routine clinical laboratory	
CO5.	Evaluating the concentration of proteins and lipid profile test along with their risk factors	
Course Content:		
Unit-1:	Basics of Metabolism, metabolism of Carbohydrates, Glycolysis, bioenergetics, regulation of blood sugar, Introduction and significance of gluconeogenesis, glycogenesis, glycogenolysis, HMP Pathway, Role of G-6-PD	6 Hours
Unit-2:	Fate of Pyruvate, TCA cycle and its significance, Electron transport Chain Diabetes, types, clinical features, diabetic profile test, HbA1C, GTT, Types of sugar, Hyperglycemia and Hypoglycemia, Ketone bodies, Introduction of carbohydrate metabolism	7 Hours
Unit-3:	Digestion and Absorption of Proteins, Metabolism of Proteins , Formation of ammonia, Transamination, Deamination, Urea Cycle, Significance of Urea, Estimation of total protein, Albumin ,Globulin and A/G ratio, Aminoaciduria, 24 hrs of urinary proteins.	8Hours
Unit-4:	Digestion and absorption of fatty acids, Metabolism of fatty acids, Beta oxidation of fatty acids, Ketone bodies and ketosis, Cholesterol, Plasma lipids, Lipoproteins, Lipid profile Test, Triglycerides, HDL, VLDL, LDL, Risk factors, Hyperlipidemia and Dyslipidemia	8 Hours

Unit-5:	Principle, application, calibration and maintenance of photcolorimeter, spectrophotometer, Blood Chemistry analyzer, Flame photometer, Turbidimetry	7Hours
<u>Text Books:</u>	<i>1. Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Biochemistry, USatyanarayan</i> 2. <i>Medical Biochemistry, Raja Bin</i> 1. https://journals.sagepub.com/doi/full/10.1177/0004563214541364 2. https://www.jaypeebrothers.com/pgDetails.aspx?book_id=9789386150196 	

Course Code: BML-S-303	Discipline Specific Course -9(DSC-9) BMLT- Semester-III <u>Clinical Microbiology-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding composition and preparations of various liquids and solids Culture Media	
CO2.	Understanding theories and applying skills related to growth and Nutrition of Bacteria-	
CO3.	Describing the concept of Culture and Sensitivity for treatment.	
CO4.	Applying various Biochemical test used in Microbiology on patients sample from Clinic and Hospital	
CO5.	Analyzing specimen of aerobes and anaerobes by inoculation of Culture Media	
Course Content:		
Unit-1:	Cultural Media: Classification, Liquid and solid Medias, Synthetic media, Selective media, differential media, transport media containers for medias, distribution of medias in tubes, bottles and Petri dishes. Composition and preparation of cultural Medias, role of ingredients of culture media, Precautions during media preparation	6 Hours
Unit-2:	Inoculation of culture media, culturing of aerobes and anaerobes Growth and Nutrition of Bacteria: various phases of growth, typical growth curve, Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic Pressure, Oxygen and Carbon Di Oxide on microbial growth.	7 Hours
Unit-3:	Pure culture isolation and preservation: Streaking, serial dilution and plating methods, cultivation, maintenance and preservation/stocking of pure cultures, cultivation of aerobic and anaerobic bacteria.	8Hours
Unit-4:	Culturing of microorganisms and identification, Biochemical test such as Catalase, Citrate utilization test, Coagulase test, Indole test, Oxidase test, Urease test, MR-VP test, TSI slants and others biochemical test	8 Hours

Unit-5:	<p>Antimicrobial sensitivity test, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculums, Control bacterial strains, Choice of antibiotics</p> <p>MIC and MBC: Concepts and methods for determination various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method.</p>	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> 1. <i>Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication</i> 2. <i>Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education</i> 2. <i>Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.</i> 3. https://www.clinicalmicrobiologyandinfection.com/issue/S1198-743X(16)X0016-X 4. https://www.cdc.gov/labtraining/training-courses/basic-microbiology/index.html 	

<u>Course Code:</u> BML-S-304	Discipline Specific Course -10(DSC-10) BMLT- Semester-III <u>Immunology & Serology-I</u>	L-2 T-0 P-0 C-2
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the basic concepts of immunology and immune response mechanism.	
CO2.	Understanding the discoveries and innovation done by various scientist in field of immunology & serology and about antigen antibody.	
CO3.	Applying scientific approach and technique to the serological sample for investigating the antigen or antibody.	
CO4.	Applying various technique like ELISA, RIA to the samples for the diagnostic report.	
CO5.	Evaluating normal & abnormal reports by antigen antibody detection using various techniques.	
Course Content:		
Unit-1:	Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity, primary and secondary immune response. Cell and organs of immune system, Phagocytosis	5Hours
Unit-2:	Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell Epitopes, T dependent and T independent antigens. Antibodies: structure, function and properties of the antibodies, different classes, subclasses and biological activities of antibodies, concepts of antibody diversity, isotype, allotype, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody	5Hours
Unit-3:	Mechanism of humoral and cell mediated immune response. Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans, Antigen presenting cells, antigen processing and presentation Complement system and complement fixation test.	5Hours
Unit-4:	Laboratory tests for demonstration of antigen – antibody reaction such as agglutination, precipitation, precipitation	5Hours

	in gels, ELISA, RIA, Immunofluorescence assay, WIDAL, ASO, CRP, RA, RPR, TPHA	
Unit-5:	Rheumatological diseases, etiology and pathogenesis and lab investigations	4Hours
<u>Text Books:</u>	<i>1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.</i> 2. <i>Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinburgh.</i> 3. <i>Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication</i> https://teachmemedicine.org/immunology-course-content/ http://www.cukashmir.ac.in/whats-new/e-Content-for-various-Programmes-offered-by-the-University.aspx 	3

Course Code: BML-S-305	Discipline Specific Course -11(DSC-11) BMLT- Semester-III <u>Histopathology & Histotechniques-I</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the Concept of Fixation & different types of fixative used in laboratory.	
CO2.	Understanding the section cutting techniques & develop the ability to prepare slide used for microscopy.	
CO3.	Describing the functions, types, location & structure of cells & tissues.	
CO4.	Applying the techniques for usage, care & maintenance of equipment's used.	
CO5.	Analyzing the basic steps of tissue processing.	
Course Content:		
Unit-1:	Introduction of histopathology, cytology & histotechniques, laboratory organization, care & maintenance of equipments used in histotechnology lab ,Safety measures in histotechnology lab Reception, Recording, Labeling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology	6 Hours
Unit-2:	Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor . Decalcification, decalcification methods, types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties	7 Hours
Unit-3:	Microtome, its type and working, various type of microtome, Microtome knives, its type and knife sharpening, Section cutting, fault and remedies, Section adhesive	8Hours
Unit-4:	Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant,	8 Hours

	accelerators, accentuators, metachromasia, metachromatic dyes	
Unit-5:	Progressive, regressive, vital, supravital staining, types of hematoxylin, Haematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> 1. <i>Clinical Diagnosis & Management, Henry</i> 2. <i>Histopathology & Histotechniques, Bancroft,</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Diagnostic Cytology, Koss& Koss</i> 2. <i>Cytopathology, Bibbo</i> 3. <i>Diagnostic Cytology, Naib</i> 1. https://www.slideshare.net/DrSyedAsif/histotechnique 2. https://www.histology-world.com/testbank/tech2.htm 	

Course Code: BML-S-307	<u>Ability Enhancement</u> <u>Core Course (AECC-3)</u> BMLT- Semester-III <u>Environmental Sciences</u>	L-4 T-0 P-0 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding basic concepts in the context of ecological and environmental sciences.	
CO2.	Understanding and describing biodiversity and also summarize bio geographical distribution of India.	
CO3.	Describing concepts and methods to apply in environmental communication and public awareness.	
CO4.	Applying the ethical and cultural conduct in environmental activities.	
CO5.	Analyzing the ideas about energy resources in today's scenario and discussing about alternate energy sources.	
Course Content:		
Unit-1:	<p>Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.</p> <p>Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid & Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.</p>	10Hours
Unit-2:	<p>Natural Resources: Renewable & Non-Renewable resources; Land resources and land use change; Land degradation, Soil erosion & desertification. Deforestation: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. Energy Resources: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Casestudies.</p> <p>Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India</p>	10 Hours
Unit-3:	<p>Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case</p>	10Hours

	Studies	
Unit-4:	Environmental policies & practices: Climate change & Global Warming (Green house Effect), Ozone Layer -Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context	9 Hours
Unit-5:	Human Communities & Environment: Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case studies.	9Hours
<u>Text Books:</u>	1. "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. "Biodiversity and Conservation", Bryant, P. J., Hypertext Book 2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication 3. http://odl.teriuniversity.ac.in/course/category.php?id=3 4. https://www.edx.org/learn/environmental-science 	

Course Code: TMUGE301	<u>Ability Enhancement Core Course (AECC-4)</u> BMLT- Semester-III <u>English Communication-III</u>	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering and understanding the English grammar and vocabulary	
CO2.	Understanding the art of public speaking and strategies of reading comprehension.	
CO3.	Applying correct vocabulary and sentence construction during public speaking or professional writing.	
CO4.	Analysing different types of sentences like simple, compound and complex.	
CO5.	Creating skills for Drafting notice, agenda and minutes of the meeting.	
Course Content:		
Unit-1:	English Grammar & and Vocabulary Correction of Common Errors (with recap of English Grammar with its usage in practical context.) Synthesis : Simple , complex and compound sentence Commonly used Idioms & phrases (Progressive learning whole semester)	5 Hours
Unit-2:	Speaking Skills Art of public speaking Common conversation Extempore Power Point Presentation (PPT) Skills: Nuances of presenting PPTs	5Hours
Unit-3:	Comprehension Skills Strategies of Reading comprehension: Fours' How to solve a Comprehension (Short unseen passage: 150-200words)	5Hours
Unit-4:	Professional Writing Preparing Notice,Agenda& Minutes of theMeeting	5 Hours

Unit-5:	Value based text reading: Short story The Barber's Trade Union – Mulk RajAnand	4Hours
<u>Text Books:</u>	Singh R.P., An Anthology of Short stories, O.U.P. New Delhi	
<u>Reference Books:</u>	Allen, W. " <i>Living English Structure</i> " Pearson Education, NewDelh	

<u>Course Code:</u> TMUGS-301	<u>Value Added Course(VAC-1)</u> BMLT - Semester-III <u>Managing Self</u>	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analysing self and devising a strategy for self-growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	Personal Development: Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	10 Hours
Unit-2:	Professional Development: Goal setting and action planning Effective and assertive communication Decision making	8 Hours

	<p>Time management</p> <p>Presentation Skills</p> <p>Happiness, risk taking and facing unknown</p>	
Unit-3:	<p>CareerDevelopment:</p> <p>Resume Building</p> <p>Occupational Research</p> <p>Group discussion (GD) and Personal Interviews</p>	12 Hours
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napoleon, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub 5. https://www.hloom.com/resumes/creative-templates/ 6. https://www.mbauniverse.com/group-discussion/topic.php 7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 8. Burne, Eric, Games People Play (2010), Penguin UK 9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression <p>* Latest editions of all the suggested books are recommended.</p>	

Note: Course Outcomes of following practical's are covered in their respective theory courses ⁵⁵

<u>Course Code:</u> BML-S-351	<u>Skill Enhancement</u> <u>Course -12 (SEC-12)</u> BMLT-Semester-III LAB: <u>Clinical Haematology-I</u>	P-2 C-1
1.	Determination of haemoglobin by various methods.	
2.	Determination of Total RBC count.	
3.	Determination of PCV	
4.	Determination of red cell indices	
5.	Demonstration of hypochromic microcytic slide.	
6.	General blood picture	
7.	Determination of G-6-PD	
8.	Differential Leucocyte Count.	
9.	Absolute leucocyte count	
10.	Demonstration of toxic granulation of neutrophil	
11.	To perform PT and Calculate INR	
12.	To perform APTT	
13.	To perform sickling test	
14.	Determination of Plasma Hemoglobin	
15.	To perform reticulocyte count	

<u>Course Code:</u> BML-S- 352	<u>Skill Enhancement</u> <u>Course -13 (SEC-13)</u> BMLT-Semester-III LAB: Clinical Biochemistry-I	P-2 C-1
1.	To determine glucose conc. By GOD-POD method.	
2.	To determine HbA1C by ion exchange method.	
3.	To determine protein conc. by Biuret method.	
4.	To determine Albumin by BCG method and calculation of Globulin & A/G ratio.	
5.	To determine Urea by DAM/ urease method.	
6.	To determine creatinine by alkaline picrate method.	
7.	To determine uric acid	
8.	To determine total cholesterol by CHOD-POD method.	
9.	To determine triglyceride method	
10.	To determine HDL-Cholesterol.	
11.	To determine LDL, VLDL and risk factor.	
12.	To perform urine sugar by Benedict's/uristik method.	
13.	To perform urine ketone	
14.	Demonstration of semi auto analyzer	
15.	Demonstration of flame photometer	

<u>Course Code:</u> BML-S- 353	<u>Skill Enhancement</u> <u>Course -14 (SEC-14)</u> BMLT-Semester-III LAB :Clinical Microbiology –I & Immunology-I	P-2 C-1
1.	Preparation of culture media- Nutrient agar, Macconkey agar, Blood agar media and Chocolate agar	
2.	Inoculation of different culture methods- Streaking method and Spreading method	
3.	Isolation of pure cultures	
4.	Cultivation of anaerobic bacteria	
5.	Antibiotic sensitivity test	
6.	Processing of culture growth for biochemical tests and identification of microorganisms.	
7.	Biochemical tests for species identification	
8.	To perform RA test	
9.	To perform WIDAL test	
10.	To perform RPR test.	
11.	To perform CRP test	

<u>Course Code:</u> BML-S- 354	<u>Skill Enhancement</u> <u>Course -15 (SEC-15)</u> BMLT- Semester-III LAB: Histopathology & Histotechniques-I	P-2 C-1
1.	Demonstration of glassware's and equipment used in histopathology lab.	
2.	To prepare alcohol of different concentration.	
3.	To prepare formalin from stock solution.	
4.	To sharp knife by honing and stropping.	
5.	Grossing of tissue	
6.	To perform tissue processing by manual method.	
7.	To perform section cutting of paraffin embedded tissue.	
8.	To fix the smear on glass slide.	
9.	To perform hematoxylin and eosin staining.	
10.	Mounting and preservation of slide	

<p><u>Course Code:</u> BML-S-355</p>	<p style="text-align: center;"><u>Skill Enhancement Course -16 (SEC-16)</u></p> <p style="text-align: center;">BMLT- Semester-III</p> <p style="text-align: center;"><u>Clinical Training</u></p>
	<p>Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centers to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections.</p>

Course Code: BML-S-401	Discipline Specific Course -12(DSC-12) BMLT- Semester-IV <u>Clinical Haematology-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understand the etiology, pathogenesis, clinical features and laboratory investigations of anemia.	
CO2.	Understanding leukemia, its causes, classification & laboratory investigations.	
CO3.	Understanding the etiology, classification, pathogenesis of thalassemia	
CO4.	Describing the concepts of Bone marrow examination including the method of processing & staining.	
CO5.	Analyzing clinical features and laboratory investigations of thalassemia.	
CO6.	Applying the specific techniques used for diagnosis of haemoglobinopathies.	
Course Content:		
Unit-1:	Aplastic anaemia, Anaemia of chronic disorders, Sideroblasticaemia, Haemolytic Anaemia, etiology, pathogenesis, clinical features, laboratory investigations, Bone marrow examination, composition & functions, aspiration techniques, processing and staining	6 Hours
Unit-2:	Hemoglobinopathies, qualitative and quantitative Sickle cell anaemia, sickle cell trait, etiology, pathogenesis, clinical features, and laboratory investigations, Disease management and prognosis, Sickling test Thalassemia, classification, etiology, pathogenesis, clinical features, laboratory investigations, haemoglobin electrophoresis	7 Hours
Unit-3:	Leukemia and its classification, WHO and FAB classification, AML, ALL, CML, CLL, its etiology, clinical features, laboratory investigations	8Hours

	Cytochemistry involved in diagnosis of various types of leukemia.	
Unit-4:	Qualitative and quantitative disorders of platelets, hyper coaguable test, Disorders of secondary hemostasis, hemophilia and its lab diagnosis, Von-Willebrand disease, Disseminated intravascular coagulation, thrombosis, Disorder of fibrinogen, test for bleeding & coagulation disorders, correction studies for factor deficiency, quantitative factor assay	8 Hours
Unit-5:	LE cells, its demonstration and significance, lupus anticoagulants, Blood parasites, Malaria, Trypanosomes, Filariasis, Leishmania	7Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> 1. <i>Text Book of Pathology, Harshmohan, 6th Edition</i> 2. <i>Text book of Pathology, Robbins, 3rd edition,</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Compendium of Trasfusion medicine, Dr R NMakroo</i> 2. <i>Atlas of Haematology – George, A McDonald, T CCodde</i> 3. <i>Clinical Haematology, Hoffbrand</i> 4. https://www.sciencedirect.com/book/9780323357623/hematology 5. https://www.nu.edu/ourprograms/college-of-professional-studies/healthsciences/courses/cls410/ 	

Course Code: BML-S- 402	Discipline Specific Course -13(DSC-13) BMLT- Semester-IV <u>Clinical Biochemistry-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding various type of function test and metabolic acidosis & alkalosis	
CO2.	Understanding tumor markers and their applications	
CO3.	Applying basic procedures of different parameters used to assess organ function test	
CO4.	Analyzing buffer systems of body and related disorders	
CO5.	Evaluating the results of diagnosis of organ function in Biochemistry Laboratory	
Course Content:		
Unit-1:	Liver function tests: Introduction, bile pigment metabolism, jaundice and its types, Estimation of Bilirubin, Bile salt, Bile pigments, urobilinogen, SGPT/ALT, SGOT/AST, ALP, GGT, Viral Hepatitis	6 Hours
Unit-2:	Renal Function Test: Introduction, Glomerular filtration rate, renal threshold, Urea, Creatinine, Uric Acid, Sodium, Potassium, Creatinine Clearance test, Urea clearance test, examination of renal calculi	7 Hours
Unit-3:	Cardiac Function test: Introduction, myocardial infarction, CHD, Biochemical markers of Heart diseases, Role of laboratory in monitoring heart diseases	8Hours
Unit-4:	Gastric function Test: Introduction, gastric secretions, total and free acid, stimulation test, physical & chemical examination of gastric secretions. Tumour markers: Introduction, types, applications	8 Hours

Unit-5:	Acid base balance, action of buffer system, Hb buffers, respiratory and metabolic acidosis, respiratory and metabolic alkalosis, arterial blood gas analysis, blood gas analyzer	7Hours
<u>Text Books:</u>	<i>1. Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i>	
<u>Reference Books:</u>	<i>1. Clinical Chemistry, Teitz</i> <i>2. Clinical Chemistry, Bishop</i> <i>1. http://med-mu.com/wp-content/uploads/2018/06/DM-Vasudevan-Textbook-of-Biochemistry-For-Medical-Students</i>	

Course Code: BML-S- 403	Discipline Specific Course -14(DSC-14) BMLT- Semester-IV <u>Clinical Microbiology-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the concepts of antibiotics and antimicrobial agents	
CO2.	Understanding the ethics and legality in use of laboratory animals	
CO3.	Describing preservation of Microorganism by periodic subculture, cold storage deep freezing and lyophilisation methods.	
CO4	Applying the methods of quality assessment for determination of microbial load in water.	
CO5.	Analyzing various samples for microbial examinations	
CO6.	Evaluating water quality for PH, salinity ,alkalinity , dissolved oxygen etc.	
Course Content:		
Unit-1:	Collection, transport, processing, storage of various samples for microbiological analysis such as urine, blood, pus, sputum, skin scraping, stool, CSF etc.	6 Hours
Unit-2:	Preparation of container and swabs for collections of specimens for microbial examinations. Preservation of Micro-organisms: Periodic subculture method, cold storage, freezing, deep freezing, lyophilisation methods. Total and viable counts of bacteria. Flowchart of lab diagnostic procedures, documentation of specimen in laboratory.	7 Hours
Unit-3:	Antimicrobial agents and Antibiotics: Introduction, mechanism of action, classification and uses Antibiotic susceptibility testing in bacteriology	8Hours

	Introduction of Automation in Microbiology laboratory, BACTEC System, BACTALERT, VIDAS Introduction of nucleic acid techniques & PCR with special reference to diagnostic microbiology	
Unit-4:	Microbiological examination and analysis of water quality-pH, salinity, alkalinity, dissolved oxygen, carbonates, nitrate, silicate, phosphate, COD and BOD Determination of microbial load in water, fecal indicator organisms-coliform bacteria, fecal enterococci, Methods of mineral quality assessment-MPN test, membrane filtration technique Microbiological examination of food.	8 Hours
Unit-5:	Care and handling of laboratory animals, fluid, diet, cleanliness, cages, ventilation, temperature, humidity, handling of animals, prevention of diseases, ethics and legality in use of laboratory animals Quality control in microbiology lab, sample accountability, reporting results, format of microbiological report, internal and external quality control, preanalytical, analytical and post analytical variables	7Hours
<u>Text Books:</u>	<i>1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier</i> 2. <i>Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education</i> 3. https://learn.canvas.net/courses/2215/ 4. https://microbiologyinfo.com/top-and-best-microbiology-books/ 	

Course Code: BML-S- 404	Discipline Specific Course -15(DSC-15) BMLT- Semester-IV <u>Immunology & Serology-II</u>	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding immunological disorders and their significance	
CO2.	Understanding various auto immune disorders and their markers	
CO3.	Applying scientific approach and technique to the serological sample for investigating the antigen, antibody and tumor markers	
CO4.	Analyzing the compatibility of tissue for transplantation, antigen antibody detection in sample to diagnose any immunological or autoimmune disorders using various techniques.	
CO5.	Evaluating serum sample for any immunological disorders.	
Course Content:		
Unit-1:	Western blotting, Immunodiffusion, Immuno electrophoresis, Hypersensitivity and its types Introduction to Allergy and its laboratory test	5 Hours
Unit-2:	Introduction of transplant immunology, graft rejection, tissue typing for kidney and bone marrow transplant, Laboratory test for transplant.	5 Hours
Unit-3:	Autoimmune disorders, pathogenesis, organ specific and systemic autoimmune disorders and its markers such parietal cell antibody, anti sperm antibody, lupus anticoagulants, anti mitochondrial antibody, ANA, ds DNA, HLA-B27, ASMA, anti CCP	5Hours
Unit-4:	Immunological disorders: primary and secondary immunodeficiency, SCID, AIDS, Tumor, types of tumors, Various tumor Markers, their significance and method of estimation.	5Hours
Unit-5:	Vaccines, classification and applications, Active and passive immunization, Immunoprophylaxis schedule in neonates, children and in	4Hours

	pregnancy	
<u>Text Books:</u>	<i>1. Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> <i>1. Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.</i> <i>2. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinburgh.</i> <i>3. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.</i> <i>4. https://jcm.asm.org/content/43/1/49</i> <i>5. https://www.publichealthontario.ca/en/laboratory-services/test-information-index/hepatitis-e-serology</i> 	

Course Code: BML-S-405	Discipline Specific Course -16(DSC-16) BMLT- Semester-IV <u>Histopathology & Histotechniques-II</u>	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the principle, working, processing & staining of tissue used for electron and fluorescence microscope.	
CO2.	Understanding the concept of immunohistochemistry, principle, types and its applications.	
CO3.	Describing terminology & characteristics of malignant cell.	
CO4.	Applying staining techniques used for demonstration of minerals and pigments.	
CO5.	Applying theories & staining of carbohydrates.	
CO6.	Analyzing minerals and pigments in tissue samples in context to microorganisms and lipids	
Course Content:		
Unit-1:	Staining of carbohydrates: preparation of Schiff reagent, PAS staining, Alcian blue, staining of glycogen, Amyloid, other staining method Connective tissue & its staining: Trichrome staining, verhoeff stain, WeigertResorcin stain, Gordon's and Sweet stain, Gomori's method, von Geison stain, PTAH stain	5Hours
Unit-2:	Demonstration of minerals and pigments in tissue sample, Demonstration and identification of lipids, Demonstration of enzymes, diagnostic application and the demonstration of phosphatases, dehydrogenases, oxidases and peroxidises	5Hours
Unit-3:	Demonstration of microorganism on tissue specimens, Bacteria, AFB, Actinomyces, spirochetes, fungi Processing and staining of bone marrow sample. Fixation, Processing and section cutting of bones Neuropathology lab specimen handling	5Hours
Unit-4:	Demonstration of sex chromatin, Museum techniques	5Hours

	Electron microscopy: Principle and working, fixation, processing and staining of tissue Fluorescence Microscope: Principle and working.	
Unit-5:	Immunohistochemistry: principle, types, applications, antigen retrieval, APAAP, PAP Staining, Quality control in histopathology	4Hours
<u>Text Books:</u>	<i>1. Histopathology & Histotechniques, Bancroft,</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Cytopathology, Bibbo</i> 2. <i>Diagnostic Cytology, Naib</i> 1. https://webpath.med.utah.edu/HISTHTML/HISTOTCH/HISTOTCH.html 2. https://www.histology-world.com/testbank/tech1.htm 	

<u>Course Code:</u> BML-S- 407	<u>Core Course – 6(CC- 6)</u> BMLT- Semester-IV <u>General Pathology</u>	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding physiology and pathology of cell and organelles	
CO2.	Describing inflammation and mechanism of phagocytosis	
CO3.	Understanding the concept of cell injury mechanism, its disorders and laboratory testing.	
CO4.	Analyzing modes of infections, prevention and control with suitable examples like Dengue ,tumor, nutritional excess and imbalances etc.	
CO5.	Analyzing protein malnutrition and disease associated with it	
CO6.	Evaluating the role and effect of metals in deficiency diseases	
Course Content:		
Unit-1:	Introduction & History of pathology, Basic definitions and familiarization with the common terms used in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, Introduction of hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis	6 Hours
Unit-2	General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, Phagocytosis and its mechanism	7 Hours
Unit-3:	Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperemia, congestion, hemorrhage, hemostasis, thrombosis, embolism, infarction, shock and hypertension.	8Hours
Unit-4:	Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Aetiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease. Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue	8 Hours

Unit-5:	Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, General introduction of oncogenes, tumor suppressor genes, DNA repair genes	7Hours
<u>Text Books:</u>	<i>Text Book of Pathology, Harshmohan, 6th Edition</i>	
<u>Reference Books:</u>	<i>Text book of Pathology, Robbins, 3rd edition</i> 2. https://teachmemedicine.org/pathology/ 3. https://en.wikipedia.org/wiki/Pathology	

Course Code: TMUGE401	<u>Ability Enhancement Core</u> <u>Course (AECC-5)</u> BMLT- Semester-IV <u>English Communication-IV</u>	L-2 T-0 P-2 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the essentials of effective listening and speaking.	
CO3.	Understanding the corporate expectations and professional ethics.	
CO4.	Applying correct vocabulary and sentence construction during professional writing or job interviews.	
CO5.	Analyzing different types of interviews.	
CO6	Developing the skills to create resume, C.V. or cover letter.	
Course Content:		
Unit-1:	Vocabulary & Grammar (12hours) <ul style="list-style-type: none"> ➤ Homophones and Homonyms ➤ Correction of Common Errors (with recap of English Grammar with its usage in practical context.) ➤ Transformation of sentences 	12Hours s
Unit-2:	Essence of Effective listening & speaking (05hours) <ul style="list-style-type: none"> ➤ Listening short conversation/ recording (TED talks/ Speeches by eminent personalities) <p><i>Critical Review of these abovementioned</i></p>	5 Hours

	<ul style="list-style-type: none"> ➤ Impromptu 	
Unit-3:	<p>Professional Writing (08Hours)</p> <ul style="list-style-type: none"> ➤ Proposal: Significance, Types, Structure&AIDA ➤ Report Writing: Significance, Types, Structure& Steps towards Report writing 	8Hours
Unit-4:	<p>Job Oriented Skills (10Hours)</p> <ul style="list-style-type: none"> ➤ Cover Letter ➤ Preparing Resume and Curriculum-Vitae ➤ Interview: Types of Interview, Tips for preparing for Interview and Mock Interview ➤ Corporate Expectation & Professional ethics: Skills expected in corporate world 	10 Hours
Unit-5:	<p>Value based text reading: Short story (05 hours)</p> <ul style="list-style-type: none"> ➤ A Bookish Topic – R.K.Narayan 	5Hours
<u>Text Books:</u>	Singh R.P., An Anthology of Short stories, O.U.P. New Delhi	
<u>Reference Books:</u>	<ul style="list-style-type: none"> • Raman Meenakshi & Sharma Sangeeta, “<i>Technical Communication-Principles & Practice</i>” • 	

Course Code: TMUGS-401	<u>Value Added Course(VAC-2)</u> BMLT - Semester-IV <u>Managing Work and Others</u>	L-2 T-1 P-0 C-0
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	Intrapersonal Skills: Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	8 Hours
Unit-2:	Interpersonal Skills: Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	12 Hours
Unit-3:	Interview Techniques: Job Seeking Group discussion (GD) Personal Interview	10 Hours
Reference Books:	<ol style="list-style-type: none"> Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education Burne, Eric, Games People Play (2010), Penguin UK Carnegie, Dale, How to win friends and influence people (2004), RHUK Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 	

	<ol style="list-style-type: none">5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com6. https://www.hloom.com/resumes/creative-templates/7. https://www.mbauniverse.com/group-discussion/topic.php8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression <p>* Latest editions of all the suggested books are recommended.</p>	
--	---	--

Note: Course Outcomes of following practical's are covered in their respective theory courses

<u>Course Code:</u> BML-S-451	<u>Skill Enhancement</u> <u>Course -17 (SEC-17)</u> <u>BMLT- Semester-IV</u> <u>LAB: <u>Clinical Haematology-II</u></u>	P-2 C-1
1.	Staining of bone marrow	
2.	To perform sickling test.	
3.	To determine fetal haemoglobin	
4.	To perform Heinz bodies	
5.	Demonstration of leukemic slides	
6.	To perform LAP scoring	
7.	To determine total platelet count	
8.	To perform PT	
9.	To perform APTT	
10.	To perform thrombin time.	
11.	To perform D-dimer test.	
12.	To determine fibrinogen conc.	
13.	General blood Picture	
14.	To demonstrate malarial slide	
15.	Haemoglobin electrophoresis	
16.	Demonstration of hemo parasites like trypanosomes , Filaria, Malaria	

<u>Course Code:</u> BML-S-452	<u>Skill Enhancement</u> <u>Course -18 (SEC-18)</u> BMLT-Semester-IV LAB: Clinical Biochemistry-II	P-2 C-1
1.	To determine total, direct and indirect bilirubin.	
2.	To determine SGOT conc.	
3.	To determine SGPT conc.	
4.	To determine ALP conc.	
5.	To determine total and free acidity.	
6.	To perform CPK test	
7.	To perform CK-MB test.	
8.	To determine serum sodium conc.	
9.	To determine serum potassium conc.	
10.	To determine uric acid conc.	
11.	To determine phosphorus conc.	

<u>Course Code:</u> BML-S-453	<u>Skill Enhancement</u> <u>Course -19 (SEC-19)</u> BMLT-Semester-IV LAB: Clinical Microbiology-II	P-2 C-1
1.	Demonstration of Kirby-Bauer Method	
2.	Collection and processing of microbiological specimens like urine, saliva, blood, sputum etc.	
3.	Preparation of swabs	
4.	To Demonstrate culture and subculture method	
5.	To perform Microbiological examination of water	
6.	To perform MPN Test	
7.	To demonstrate Membrane filtration method	
8.	Total coliform bacteria testing	

<u>Course Code:</u> BML-S-454	<u>Skill Enhancement</u> <u>Course -20 (SEC-20)</u> BMLT-Semester-IV LAB: Immunology & Serology-II	P-2 C-1
1.	To perform HIV Tridot test.	
2.	To perform radial Immunodiffusion test.	
3.	To perform immune precipitation method.	
4.	To perform HBs Ag rapid test.	
5.	To perform ASO test	
6.	To perform ELISA test.	
7.	To perform TB IgG & IgM test	
8.	To perform Dengue IgG & IgM test	
9.	To perform typhidot test.	
10.	Introduction of Allergy panel	
11.	Demonstration of Montoux test	

<u>Course Code:</u> BML-S-455	<u>Skill Enhancement</u> <u>Course -21 (SEC-21)</u> BMLT-Semester-IV LAB: Histopathology & Histotechniques-II	P-2 C-1
1.	Grossing of tissue	
2.	To perform tissue processing by manual method.	
3.	To perform section cutting of paraffin embedded tissue.	
4.	To fix the smear on glass slide.	
5.	To perform hematoxylin and eosin staining.	
6.	To perform PAS staining.	
7.	To perform AFB staining.	

<p><u>Course Code:</u> BML-S-456</p>	<p style="text-align: center;"><u>Skill Enhancement Course -22</u> <u>(SEC-22)</u> BMLT- Semester-IV</p> <p style="text-align: center;">Clinical Training</p>
	<p>Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centers to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections.</p>

Course Code: BML-S-501	Discipline Specific Course -17(DSC-17) BMLT- Semester-V <u>Immunoematology & Blood Banking</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the basic concepts of blood groups, blood collection and describing the blood banking technique & its use.	
CO2.	Describing the basics about stem cell banking and bone marrow transplantation.	
CO3.	Applying scientific approach and technique for screening blood in blood bank and segregate their component for recipient.	
CO4.	Analyzing blood sample for infectious transfusion transmitted disease before transfusion, quality in blood bank.	
CO5.	Evaluating a donor for donating blood based on donor selection criteria.	
Course Content:		
Unit-1:	Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method,	7 Hours
Unit-2:	Other blood group system such as Lewis, MNS, Kell, Duffy etc Anticoagulants and preservative used in blood bank Donor selection criteria, Blood collection and processing	6 Hours
Unit-3:	Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination	8 Hours
Unit-4:	Blood components and its preparation, preservation, storage and transportation Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN Introduction of stem cell banking and bone marrow transplantation.	8 Hours
Unit-5:	Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis Quality control of reagents, equipments, blood components used in transfusion medicine. Role of NACO, Indian Red Cross Society, DGHS and blood transfusion services.	7 Hours
Text Books:	<i>1. Text book of Medical lab Technology, Praful B Godkar, IIIrd edition</i>	

	<i>2. Text book of Medical Lab Technology, Ramnik Sood, Jaypee Publishers</i>	
<u>Reference Books:</u>	<i>1. Compendium of Trasfusion medicine, Dr R N Makroo</i> <i>2. https://server3.ehospital.gov.in/ebloodbank/bloodlogin.jsp</i> <i>3. https://www.who.int/bloodsafety/Manual_on_Management,Maintenance_and_Use_of_Blood_Cold_Chain_Equipment.pdf</i>	

<u>Course Code:</u> BML-S-502	<u>Core Course -7(CC-7)</u> BMLT- Semester-V <u>Clinical Enzymology & Automation</u>	L-3 T-0 P-2 C-4
<u>Course Outcomes:</u>	On completion of the course, the students will be :	
CO1.	Describing concepts and theories of enzymes	
CO2.	Understanding Enzyme kinetics, physiological significances and enzyme Inhibition.	
CO3	Applying Automation, principle, working and maintenance of various clinical chemistry analysers, point of care testing	
CO4.	Analysing enzyme activity, factors affecting enzyme level in serum/ plasma.	
CO5.	Evaluating enzyme concentration in different samples	
<u>Course Content:</u>		
Unit-1:	Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity	6 Hours
Unit-2:	Coenzyme: Classification, various types and function, structure of NAD ⁺ , NADP ⁺ , FAD and FMN, PPP Units for measuring enzyme activity, factors affecting enzyme level in serum/ plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes	7 Hours
Unit-3:	Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme	8 Hours
Unit-4:	Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK-MB, LDH, Troponin, Myoglobin, Amylase, Lipase, ACP.	8 Hours
Unit-5:	Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management, Introduction of HIS and LIS.	7 Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> <i>Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i> <i>Text book of Biochemistry, M N Chatterjea, Rana Shinde</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> <i>Biochemistry, Voet & Voet, 4th edition, John Wiley & sons</i> <i>Biochemistry, U Satyanarayan</i> https://onlinecourses.swayam2.ac.in/cec20_bt20/preview https://portlandpress.com/essaysbiochem/article/doi/10.1042/bse0590001/88345/Enzymes-principles-and-biotechnological 	

Course Code: BML-S-503	Discipline Specific Course -18(DSC-18) BMLT- Semester-V Medical Microbiology-I	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the various phases of bacterial growth.	
CO2.	Describing morphology and pathogenicity of gram positive and gram negative bacteria	
CO3.	Applying the various techniques of media preparation	
CO4.	Analysing the various serological and Antibiotic sensitivity techniques used for microbiological analysis.	
CO5.	Analysing clinical features and lab diagnosis of different bacteria	
Course Content:		
Unit-1:	Study of Gram Positive Bacteria: morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis of Staphylococcus, Streptococcus, Pneumococcus, Clostridium	7 Hours
Unit-2:	Study of Gram Positive Bacteria: morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis of Bacillus, Corynebacterium Study of Mycobacterium tuberculosis: morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis, atypical Mycobacteria,	8 Hours
Unit-3:	Study of gram negative bacteria: morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis of enterobacteriaceae, Escherichia coli, Klebsiella Salmonella, Shigella,	8 Hours
Unit-4:	Study of gram negative bacteria: morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis of Vibrio, Pseudomonas, Spirocheates, Neisseria, Hemophilus, Yersinia pestis	6 Hours
Unit-5:	Morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis of Chlamydia, Rickettsiaceae, Leptospira, Bordetella, Helicobacter pylori, spirochetes.	7 Hours
Text Books:	<i>1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication</i>	
Reference Books:	<ol style="list-style-type: none"> 1. Willey JM, Sherwood LM, and Woolverton CJ. (2013) 2. https://jcm.asm.org/content/54/5/1203 3. https://www.microbiologyresearch.org/content/journal/jmm 	

Course Code: BML-S-504	Discipline Specific Course -19(DSC-19) BMLT- Semester-V	L-3 T-0 P-2 C-4
	Parasitology	
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the basic about parasite & host parasite relationship	
CO2.	Describing the pathogenesis and lifecycle of parasite	
CO3.	Applying diagnostic technique for screening of parasitic disease	
CO4.	Analyzing the sample for any infection and its reporting	
CO5.	Evaluating parasitological samples using diagnostic techniques.	
Course Content:		
Unit-1:	Introduction of parasites, host, zoonosis, host parasites relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection, lab diagnosis	6 Hours
Unit-2:	Protozoology: Entamoeba histolytica, Malarial Parasites, Leishmania, Trypanosomes, their morphology, life cycle, pathogenesis, clinical features and lab diagnosis	8 Hours
Unit-3:	Helminthology: Introduction and classification, Taenia solium, Taenia Saginata, Fasciola, Ascaris, Wuchereria bancrofti their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.	8 Hours
Unit-4:	Hookworm, Trichuris. Dracunculus their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.	7 Hours
Unit-5:	Diagnostic methods in Parasitology: Introduction, Examination of stool, urine, blood, Culture methods, Immunological diagnosis and serology	7 Hours
Text Books:	<ol style="list-style-type: none"> 1. Anand Narayan and Panikar, Textbook of Microbiology 2. Karykatee and Damle, Textbook of Parasitology 	
Reference Books:	<ol style="list-style-type: none"> 1. C P Baweja, Medical Microbiology 2. Arora & Arora, Medical Parasitology 1. https://www.andcollege.du.ac.in/?q=econtent/zoology 2. https://www.umh.es/contenido/Universidad:/asi_g_1932_M1/datos_en.html?destino=impresora 	

Course Code: BML-S-505	Discipline Specific Course -20(DSC-20) BMLT- Semester-V Diagnostic Cytology	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding concepts of aspiration and exfoliative cytology	
CO2.	Understanding the importance of diagnosis of Sex Chromatin Tumour markers & Immunocytochemistry.	
CO3.	Applying appropriate techniques for collection and processing of different samples	
CO4.	Analysing the processing of Cytological Specimen: Fixation, blocking & mounting.	
CO5.	Evaluating different samples through pap staining	
Unit-1:	Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stains, Microscopy: Light, compound, phase contrast, fluorescence	6Hours
Unit-2:	Instruments and equipment's used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique, Staining such as PAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping	8Hours
Unit-3:	Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure	8Hours
Unit-4:	Pap staining, Progressive & Regressive, Hormonal cytology in different age groups, Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample	7Hours
Unit-5:	Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device	7Hours
Text Books:	1. Text Book of Histopathology & Histotechniques, C FA Culling	
Reference Books:	1. Clinical Diagnosis & Management, Henry 2. Histopathology & Histotechniques, Bancroft, 1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3507055/ 2. https://www.unmc.edu/elearning/egallery/tag/cytology/	

Course Code: BML-S-506	<u>Compulsory Specified Course -1 (CSC -1)</u> <u>BMLT- Semester-V</u> <u>Principles of Laboratory Management</u>	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding ethical principles and accreditation for clinical laboratories	
CO2.	Applying all general & clinical safety measures to reduce the risk of infection.	
CO3.	Applying methods for interpretation and release of examination results for quality assurance	
CO4.	Evaluating the validating, instrument calibration & importance of medical audit (NABL) to enhance the quality of laboratory.	
CO5.	Creating pre & post exposure guidelines of some infectious diseases	
Course Content:		
Unit-1:	Ethical Principles and standards for a clinical laboratory professional duty to the patient, duty to colleagues and other professionals, Good Laboratory Practice (GLP) ,Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation	7 Hours
Unit-2:	Awareness/Safety in a clinical laboratory, General safety precautions. HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis Patient management for clinical samples collection, transportation and preservation, Sample accountability, Purpose of accountability, Methods of accountability	6 Hours
Unit-3:	Sample analysis: Introduction, factors affecting sample analysis, reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from referral laboratories, release of examination results, alteration in reports	6 Hours
Unit-4:	Quality Management system: Introduction, Quality assurance, Quality control system, Internal and External quality control, quality control chart Biomedical Introduction and importance of calibration and Validation of Clinical Laboratory instrument Ethics in Medical laboratory Practice, Ethics in relation to Pre-Examination procedures, Examination procedures, reporting of results, preserving medical records Procurement of equipment and Inventory Control,	6 Hours
Unit-5:	Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation	6 Hours

<u>Text Books:</u>	1. <i>Clinical Chemistry, Teitz</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none"> 1. <i>Medical Laboratories Management- Cost effective methods by Sangeeta Sharma, Rachna Agarwal, Sujata Chaturvedi and Rajiv Thakur</i> 2. <i>Clinical diagnosis and management by laboratory methods, John Bernard Henry</i> 3. https://iopscience.iop.org/article/10.1088/1742-6596/1361/1/012068/pdf 4. https://web.iima.ac.in/exed/programme-details.php?id=NDcx 	

Note: Course Outcomes of following practical's are covered in their respective theory courses ⁹⁰

<p><u>Course Code:</u> BML-S- 551</p>	<p><u>Skill Enhancement</u> <u>Course -23</u> <u>(SEC-23)</u> BMLT- Semester-V</p> <p><u>LAB: Immunohematology & Blood Banking</u></p>	<p>P-2 C-1</p>
	<ol style="list-style-type: none"> 1. Demonstration of apparatus and equipment's used in blood banking. 2. To prepare different percent of cell suspension. 3. To perform ABO & Rh blood grouping by slide and tube method. 4. To perform forward & reverse grouping. 5. To perform Cross match. 6. To perform Coomb's test. 7. To perform Rh titre 8. To perform Transfusion transmissible marker. 9. Preparation of various blood components and their quality control 	

<u>Course Code:</u> BML-S- 552	<p style="text-align: center;"><u>Skill Enhancement</u> <u>Course -24</u> <u>(SEC-24)</u> <u>BMLT- Semester-V</u> LAB: Clinical Enzymology & Automation</p>	P-2 C-1
	<ol style="list-style-type: none"> 1. To perform enzyme estimation of LFT 2. To perform enzyme estimation of Cardiac profile 3. Determination of Troponin I 4. To perform enzyme estimation of Pancreatic disorder 5. To perform estimation of ACP. 6. Antenatal profile 7. Estimation of bicarbonate 8. Arterial blood gas analysis 9. Determination of Calcium 10. Creatinine and urea clearance test 	

<u>Course Code:</u> BML-S- 553	<u>Skill Enhancement</u> <u>Course -2 (SEC-25)</u> <u>BMLT- Semester-V</u> LAB: Medical Microbiology-I	P-2 C-1
	<ol style="list-style-type: none"> 1. Culture methods of bacteria- Streaking method, Spreading method, Dilution method 2. Preparation of slants and stabs 3. Preparation of Media, nutrient agar, MacConkey agar, blood agar, chocolate agar, Robertson cooked meat medium, Muller Hilton agar 4. Culturing of various sample 5. AST and reporting 6. Biochemical test to differentiate between Staphylococcus and Streptococcus 	

<p><u>Course Code:</u> BML-S- 554</p>	<p align="center"><u>Skill Enhancement</u> <u>Course -26</u> <u>(SEC-26)</u> <u>BMLT- Semester-V</u> <u>LAB :Parasitology</u></p>	<p align="center">P-2 C-1</p>
	<ol style="list-style-type: none"> 1. Leishman staining for malarial parasites 2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm 3. Saline wet mount for observing ova and eggs of parasites. 4. Iodine wet mount for observing ova and eggs of parasites. 5. Concentration of stool samples by floatation method 6. Zinc sulphate conc. Method for stool sample 7. Demonstration of various parasites by permanent slides. 8. Concentration of stool sample by sedimentation method 9. Serological diagnosis of Leishmania 10. Aldehyde Chopra test for Kala Azar 11. Malaria card test 	

<p><u>Course Code:</u> BML-S- 555</p>	<p style="text-align: center;"><u>Skill Enhancement</u> <u>Course -27</u> <u>(SEC-27)</u> BMLT- Semester-V LAB :<u>Diagnostic Cytology</u></p>	<p>P-2 C-1</p>
	<ol style="list-style-type: none"> 1. Preparation of various cytological fixatives 2. Preparation of various stains used in cytology 3. Preparation of smear 4. To perform PAP staining 5. To perform Giemsa staining on fluid sample 6. To prepare cell suspension 7. Processing of various fluid samples 	

<p><u>Course Code:</u> BML-S-556</p>	<p align="center"><u>Skill Enhancement Course -28</u> <u>(SEC-28) BMLT- Semester-V</u></p> <hr/> <p align="center"><u>Clinical Training</u></p>
	<p>Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centers to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections.</p>

Course Code: BML-S-601	<u>Core Course -8 (CC-8)</u> BMLT- Semester-VI <u>Clinical Endocrinology & Toxicology</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the secretion, function & regulation of hormones.	
CO2	Understanding about drug abuse and all investigation for drug screening	
CO3.	Analyzing thyroid function test and disorder associated with its dysfunctions	
CO4.	Analyzing infertility profile with its hyper and hypo secretions	
CO5.	Evaluating the toxic effect of alcohol, lead, zinc & mercury in the human body.	
Course Content:		
Unit-1:	Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action	6 Hours
Unit-2:	Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T ₃ , T ₄ , TSH, FT ₃ , FT ₄ , TBG, Disorder associated with thyroid dysfunction.	8 Hours
Unit-3:	Infertility profile: LH, FSH, TSH, Estrogen, Progesterone, Total Testosterone, Free testosterone, DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test	8 Hours
Unit-4:	Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion	7 Hours
Unit-5:	Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.	7 Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> <i>Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i> <i>Text book of Biochemistry, M N Chatterjea, Rana Shinde</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> <i>Clinical Chemistry, Bishop</i> https://www.endotext.org/ https://uscmcd.sc.libguides.com/c.php?g=377955&p=2558549 	

Course Code: BML-S-604	Discipline Specific Course -21(DSC-21) BMLT- Semester- VI <u>Medical Microbiology-II</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the pathogenesis and prevention of microorganisms	
CO2.	Describing various antigen antibody reactions	
CO3.	Applying different laboratory tests for diagnosis of microorganisms	
CO4.	Applying the knowledge gained to various laboratory procedures	
CO5.	Analysing various microbiological and serological techniques for isolation of pathogenic microorganism	
CO6.	Evaluating samples through various culture techniques used for growing microorganisms	
Course Content:		
Unit-1:	Causes, pathogenesis, clinical features, lab diagnosis and prevention of tuberculosis, leprosy, typhoid, malaria, syphilis, cholera, diphtheria, tetanus, plague, SARS, Bird flu, meningitis, , brucellosis, influenza, pneumonia	7 Hours
Unit-2:	Laboratory diagnosis of septicaemia, bacteraemia, urinary tract infection, upper and lower respiratory tract infection, pyrexia of unknown origin, genital tract infection	6 Hours
Unit-3:	Introduction of Mycology: Definition, general characteristics and classification Cutaneous mycoses, subcutaneous Systemic mycoses, Opportunistic mycoses Culture media for fungi, KOH & LCB preparation and laboratory test for fungus	8 Hours
Unit-4:	Introduction of Antigen Antibody Reactions, specificity, affinity, avidity, types of reaction, agglutination, precipitation, precipitation in gel, ELISA, RIA, FIA, Flow Cytometry	8 Hours
Unit-5:	Introduction of bacterial genetics, DNA and RNA as genetic material, Structure and organization of prokaryotic DNA, Extrachromosomal genetic elements –Plasmids and transposons. Overview of Replication, transcription and translation	7 Hours
Text Books:	<i>1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication</i>	
Reference Books:	<ol style="list-style-type: none"> 1. <i>Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and</i> 2. https://www.researchgate.net/publication/5690086_A_gaming_approach_to_learning_medical_microbiology_Students'_experiences_of_flow 3. https://www.pcc.edu/ccog/?fa=ccog&subject=MLT&course=113 	

Course Code: BML-S-605	Discipline Specific Course -22(DSC-22) BMLT- Semester-VI <u>Clinical Virology</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Describing the nature and properties of various pathogenic viruses	
CO2.	Understanding the concept of viral taxonomy and their modes of transmission	
CO4.	Applying various serological techniques used for detection of virus.	
	Applying general principles of viral vaccination for quality health care	
CO5.	Analysing various rapid serological techniques for diagnosis of pathogenic virus.	
CO6.	Evaluating viral diseases through specific rapid card tests used for the detection	
Course Content:		
Unit-1:	Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses	7 Hours
Unit-2:	Isolation, purification and cultivation of viruses Viral taxonomy: Classification and nomenclature of different groups of viruses	6 Hours
Unit-3:	Modes of viral transmission: Persistent, non-persistent, vertical and horizontal Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions	7 Hours
Unit-4:	Poxviruses, Herpesviruses, hepatitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxo viruses, TORCH profile, Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis	8 Hours
Unit-5:	Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination	8 Hours
Text Books:	<i>1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of</i>	

	<i>Microbiology. 8th edition, University Press Publication</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none">1. <i>Goering R., Dockrell H., Zuckerman M. and Wakelin D.(2007) Mims' Medical Microbiology. 4th edition.Elsevier</i>2. <i>Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. andMietzner, T.A. (2013)</i> https://booksite.elsevier.com/brochures/Virology/content.html https://jvi.asm.org/content/93/	

Course Code: BML-S-606	<u>Compulsory Specified Course -2 (CSC -2)</u> MLT- Semester- VI <u>Biostatistics & Research Methodology</u>	L-3 T-0 P-0 C-3
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding research methodology and basic statistical concepts	
CO2.	Applying perspectives for training development related to organisational setups	
CO3.	Applying statistical methods for representation of data	
CO4.	Analyzing data on the basis of different statistical methods	
	Evaluating data on the basis of statistical analysis	
CO5.	Evaluating quality management system in diagnostic laboratory	
Course Content:		
Unit-1:	Research Methodology – Definition of research, Characteristics of research, Steps involved in research process, Types of Research methods and methodology, Terminology used in quality control such as sensitivity, specificity, accuracy, precision, positive and negative predictive value.	6 Hours
Unit-2:	Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical, Measures of central tendency, Arithmetic mean, mode, median; Measures of dispersion, Range, mean deviation, variation, standard deviation, Standard error, Chi-square test	6 Hours
Unit-3:	Introduction and significance of Student's t-distribution: test for single mean, difference of means and paired t- test, F-distribution, one-way and two-way analysis of variance (ANOVA). Small sample test based on t-test, Z- test and F test; Confidence Interval; Distribution-free test	7 Hours
Unit-4:	Global Perspective in the field of Clinical Laboratory Science, Development, Training, Types of Laboratory, Concept of Lab Design, Organizational Set up of NABL, CAP	6 Hours
Unit-5:	Total Quality Management System General Requirements for Standardization & Calibration of Clinical Laboratories: Introduction, Scope & Need of standardization, Quality Management requirement: testing & Calibration Procedures, Total Quality Assurance, Quality Control Charts & Systems. Quality Audit: Internal & External Audit, Accreditation & Certification NABL, ISO, CAP	7 Hours

<u>Text Books:</u>	<ol style="list-style-type: none">1. <i>Research Methodology & Biostatistics by CR Kothari</i>2. <i>Research Methodology & Biostatistics by Vinod Kumar Bais</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none">1. <i>Biostatistical Analysis (2012) 4th ed., Zar, J.H. Pearson Publication U.S.A.</i>2. https://elearningbiostatistics.com/3. https://www.who.int/ihr/lyon/surveillance/biostatistics/en/	

Course Code: BML-S-607	<u>Discipline Specific</u> <u>Elective Course (DSEC)</u> BMLT- Semester - VI Advance Diagnostic Techniques	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Understanding the concept of immunoassay and their applications in clinical diagnosis	
CO2.	Describing radioisotopes , instruments for measurement and applications in clinical biochemistry	
CO3.	Applying chromatographic techniques to different biological samples	
CO4.	Analyzing different centrifugation techniques and their significance	
CO5.	Analyzing biomolecules on the basis of electrophoresis and its applications in clinical diagnosis	
Course Content:		
Unit-1:	Chromatography; principle, types and applications. Paper Chromatography, Thin layer chromatography, High performance liquid chromatography (HPLC), Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.	7 Hours
Unit-2:	Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), Agarose gel electrophoresis, buffer systems in electrophoresis. Electrophoresis of proteins and nucleic acids, hemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.	8 Hours
Unit-3:	Centrifugation, fixed angle and swinging bucket rotors, Relative centrifugal force(RCF) and Sedimentation coefficient, differential centrifugation, density gradient centrifugation and Ultra centrifugation.	6 Hours
Unit-4:	Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry	7 Hours
Unit-5:	Immunoassay: Enzyme-linked immunoassay (ELISA), Radioimmunoassay (RIA), fluorescent immunoassay (FIA), fluorescence-activated cell sorting (FACS), and their applications in clinical diagnosis. Nano biosensors: concept and applications	8Hours
<u>Text Books:</u>	<ol style="list-style-type: none"> <i>Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i> <i>Text book of Biochemistry, M N Chatterjea, Rana Shinde</i> 	
<u>Reference Books:</u>	<ol style="list-style-type: none"> <i>Clinical Chemistry, Bishop</i> https://cmr.asm.org/content/20/3/511/figures-only https://www.health.harvard.edu/diagnostic-tests-and-medical-procedures 	

Course Code: BML-S-608	<u>Discipline Specific Elective Course (DSEC)</u> BMLT- Semester- VI <u>Diagnostic MolecularBiology</u>	L-3 T-0 P-2 C-4
Course Outcomes:	On completion of the course, the students will be :	
CO1.	Describing nucleic acids, and their synthesis	
CO2.	Understanding the process of protein synthesis	
CO3.	Understanding the PCR, RT PCR, reverse transcriptase PCR & Nested PCR.	
CO4.	Applying the techniques of Flow cytometry, stem cell banking, Prenatal Diagnosis by Diagnostic Molecular Biology.	
CO5.	Analyzing DNA, RNA, Protein and chromosomes by Blotting techniques and Karyotyping.	
CO6.	Analyzing blood volume, red cell volume and plasma volume, red cell life span, platelet life span by Radioisotopes.	
Course Content:		
Unit-1:	Deoxyribonucleic Acid (DNA) Replication: Replication, DNA Damage (Types and agent of mutation) Repair mechanisms	7 Hours
Unit-2:	Transcription: Introduction of Transcription & Stage of Transcription Translation: Introduction of Translation & Steps of Translation	7 Hours
Unit-3:	Nucleic acid amplification testing, Polymerase chain reaction (PCR) Principle, Types, applications, Chromatography, its principle, types and applications. Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), Agarose gel electrophoresis, buffer systems in electrophoresis. Applications o electrophoresis in clinical diagnosis.	6 Hours
Unit-4:	Blotting techniques, southern blotting and Western blotting Introduction to chromosomes, its structure and disorder, Karyotyping, Fluorescence in situ hybridization (FISH) . Immunoassay: Radioimmunoassay(RIA) ,Enzyme-linked immunoassay (ELISA), fluorescent immunoassay(FIA), and their applications in clinical diagnosis.	8 Hours
Unit-5:	Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of radioactive material Introduction and applications of Flow cytometry, Fluorescence-activated cell sorting (FACS), Stem cell banking, Prenatal Diagnosis	8 Hours
Text Books:	<i>1. Text book of Biochemistry, D M Vasudevan, Jaypee Publishers</i>	

	<i>2. Text book of Biochemistry, M N Chatterjea, Rana Shinde</i>	
<u>Reference Books:</u>	<ol style="list-style-type: none">1. <i>Clinical Chemistry, Teitz</i>2. <i>Clinical Chemistry, Bishop</i>3. <i>Laboratory Procedure of Biotechnology, Sambrook</i> <ol style="list-style-type: none">1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1390793/2. https://www.cdc.gov/labtraining/training-courses/basic-molecular-biology/index.html	

Note: Course Outcomes of following practical's are covered in their respective theory courses

<p><u>Course Code:</u> BML-S- 651</p>	<p><u>Skill Enhancement</u> <u>Course -29</u> <u>(SEC-29)</u> BMLT- Semester-VI</p> <p><u>LAB :Clinical Endocrinology & Toxicology</u></p>	<p>P-2 C-1</p>
	<ol style="list-style-type: none"> 1. To determine T₃ conc. in serumsample. 2. To determine T₄ conc. in serumsample. 3. To determine TSH conc. in serum sample. 4. To determine LH conc. in serum sample. 5. To determine FSH conc. in serum sample. 6. To determine Prolactin conc. in serum sample. 7. To determine TSH conc. in serum sample. 8. To perform TRIPLE test. 9. Demonstration of male and female infertility test. 10. Beta HCG 	

<p><u>Course Code:</u> BML-S- 654</p>	<p style="text-align: center;"><u>Skill Enhancement</u> <u>Course -30</u> <u>(SEC-30)</u> BMLT- Semester- VI LAB: <u>Medical Microbiology-II</u></p>	<p>P-2 C-1</p>
	<ol style="list-style-type: none"> 1. To perform AFB staining and MTB IgG & IgM. 2. To perform WIDAL and Typhoid test. 3. To perform Malaria identification by microscopy and card method. 4. To perform RPR test. 5. Microscopic examination of urine sample. 6. Culture of urine sample for UTI 7. Preparation of culture media for fungi. 8. KOH and LBC preparation 9. Culture of skin scrapping 10. To perform Ouchterlony double immune diffusion test. 	

<p><u>Course Code:</u> BML-S- 655</p>	<p align="center"><u>Skill Enhancement</u> <u>Course -31</u> <u>(SEC-31)</u> BMLT-Semester-VI <u>LAB: Clinical Virology</u></p>	<p align="center">P-2 C-1</p>
	<ol style="list-style-type: none"> 1. To perform HBsAg/ Australia Ag by rapid method 2. To perform HBsAg byELISA 3. To perform HIV Tridot method. 4. To perform HIV byELISA 5. To perform Dengue IgG/IgM 6. To perform TORCH profile 7. Demonstration of PCR HBV 8. Demonstration of PCR HIV Viral load 	

<p><u>Course Code:</u> BML-S-656</p>	<p style="text-align: center;"><u>Skill Enhancement Course -32</u> <u>(SEC-32) BMLT- Semester-VI</u></p> <p style="text-align: center;"><u>Clinical Training</u></p>
	<p>Students shall be deputed to various labs of Pathology department wherein they shall undergo practical training of handling patients, collection and processing of blood, urine, sputum stool and body fluids samples. Identification of patient's particulars based on CR number, Lab Number and transfer of samples from collection centers to different labs. Process of performing various tests in different labs. Each student is required to maintain a logbook of the various posting. Student's performance shall be evaluated on continuous basis by the faculty posted in various sections.</p>

<p><u>Course Code:</u> BML-S- 657</p>	<p align="center">Discipline Specific Elective Course (DSEC) BMLT- Semester-VI LAB: <u>Advance Diagnostic Techniques</u></p>	<p>P-2 C-1</p>
	<ol style="list-style-type: none"> 1. To perform separation of amino acids by paper chromatography 2. To perform separation of amino acids by thin layer chromatography 3. To perform separation of DNA by Agarose gel electrophoresis. 4. Separation of protein by PAGE 5. Separation of protein by paper electrophoresis 6. Separation of haemoglobin <p>1.</p>	

<p><u>Course Code:</u> BML-S- 658</p>	<p align="center">Discipline Specific Elective Course (DSEC) BMLT- Semester-VI LAB: <u>Diagnostic Molecular Biology</u></p>	<p>P-2 C-1</p>
	<ol style="list-style-type: none"> 1. Isolation of DNA 2. Separation of DNA by Agarose gel electrophoresis 3. Demonstration of PCR. 4. HIV test by Western Blotting 5. To perform karyotyping 6. Demonstration of PCR mycobacterium pathogen 7. Demonstration of PCR HIV 8. Separation of Nucleic acid 	

