SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC u/s (2f) of UGC Act 1956]

SYLLABUS FOR
Bachelor in Medical Lab Technology
With CO and PO Mapping
School of Paramedical & Allied Health Sciences

(W.E.F 2024-2025)

BACHELOR IN MEDICAL MICROBIOLOGY

OUTCOME BASED EDUCATION

Programme outcome (POs)

Students will be able to

PO 1	Apply knowledge and technical skills associated with Medical Microbiology for delivering quality clinical investigations support.
PO2	Recognize routine clinical laboratory procedures within acceptable quality control parameters in medical microbiology lab (serology, virology, bacteriology, Immunology, Molecular microbiology).
PO3	Communicate technical skills, social behaviour and professional awareness for functioning effectively.
PO4	Apply problem solving techniques in identification and correction of pre analytical, post analytical & analytical variables.
PO5	Demonstrate an understanding of essential basic pathological process including cell death problems.
PO6	Identification of common pathogenic bacterial agents and associated disease, their specific mechanisms.
PO7	Develop an understanding of the patterns of clinical procedures of diagnosis of Microbial infections & infestations.
PO8	Demonstrate an understanding pathogenic viruses and associated diseases.
PO9	Function as a leader or team member in diverse professionals and medical research areas.
PO10	Apply knowledge about skills and tools associated with recombinant DNA technology, immunology and molecular biology.
PO11	Work on career enhancement by adapting to professional and social needs engaged in lifelong learning.
PO12	Practice professional and ethical responsibilities with high degree of credibility, integrity and social concern.

SHRI GURU RAM RAI UNIVERSITY DEHRADUN, (UTTARAKHAND)
REGULATION OF THE UNIVERSITY FOR THE AWARD OF THE DEGREE OF BACHELOR OF MEDICAL LAB TECHNOLOGY

An exercise of the powers conferred by section of S.G.R.R University Act, the academic Council of the Shri Guru Ram Rai University, Dehradun Uttarakhand hereby makes the following regulations: -

SHORT TITLE AND COMMENCEMNT

These regulations shall be called "THE REGULATIONS FOR THE BACHELOR OF SCIENCE – MEDICAL LAB TECHNOLOGY OF THE SHRI GURU RAM RAI UNIVERSITY, DEHRADUN, UTTARAKHAND''.

I. These Regulations and the syllabus shall come into force from the2001-2002 academic session onwards.
II. The regulations framed are subject to modification from time to time by the standing Academic Board of the University.

A) Graduate Allied Health Science curriculum is oriented towards training students to help the responsibilities of physician of first contact who is capable of looking after the Preventive, promotive, curative and rehabilitative aspects of medicine.

B) With wide range of career opportunities available today, an Allied Health Science graduate has a wide choice of career opportunities. The training though broad based and flexible should aim to provide an educational experience of the essentials required for health in our country.

C) To undertake the responsibilities of service situations which is a changing condition and of various types. It is essential to provide adequate placement training tailored to the needs of such services as to enable the Allied Health Science graduates to become effective instruments of implementation of those requirements. To avail of opportunities and be able to conduct professional requirements the graduate shall endeavour to have required basic training in different aspects of medical care.

D) The importance of the community aspects of health care and of rural health care service is to be recognized including rehabilitation. The aspect of education and training of Allied Health Science graduates should be adequately recognized in the prescribed curriculum. Its importance has been systematically upgraded over the past years and adequate exposure to such experiences should be available throughout all phases of education and training. This has to be further emphasized and intensified by providing exposure to field practice areas and training during the internship period. The aim of the period of training

during internship is to enable the fresh graduates to function efficiently under such settings.

E) As such all the basic concepts of modern scientific medical education allied with allied health sciences are to be adequately dealt with particularly the Physiotherapy and Physiotherapy areas.

F) There must be enough experience o be provided for self-learning. The methods and techniques that would ensure this must become a part of teaching-learning process.

G) The Allied Health Science graduate of modern scientific medicine shall endeavour to become capable of functioning independently under the supervision of a physician in both urban and rural environment. He / She shall endeavour to give emphasis on fundamental aspects of the subject taught and on common problems on health and disease.

H) The importance of social factors in relation to the problem of health and disease should receive proper emphasis throughout the course and to achieve this purpose, the educational process should also be community based particularly for occupational therapy and physiotherapy.

I) Adequate emphasis is to be place on cultivating logical and scientific habits of thought, clarity of expression and independence of judgment, ability to collect and analyse information and to correlate them.

J) The educational process should be placed in a Laboratory/practical background as an evolving process and not merely as an acquisition of a large number of disjointed facts without a proper perspective.

K) Lectures alone are generally not adequate as a method of training and are a poor means of transferring/acquiring information and even less effective at skill development and in generating the appropriate attitudes. Every effort should be made to encourage the use of active methods related to demonstration and on first-hand experience, Students will be encouraged to learn in small groups through peer interactions so as to gain maximal experience. While the curriculum objectives often refer to areas of knowledge or science, they are best taught in a setting of clinical relevance and hands on experience for students who assimilate and make this knowledge apart of their own working skills.

L) The Allied Health Science graduate medical education in clinical subjects should be based primarily on outpatient teaching, other medical and surgical departments and within the community including peripheral health care institutions. The outpatient departments should be suitably planned to provide training to graduates in small groups and demonstration subjects of all the appropriate technique.

M) Clinics should be organized in small groups of preferably not more than 10 students so that a teacher can give personal attention to each student will a view to improve his skill and competence in handling of the patients.

N) Proper records of the work should be maintained which will form the basis for the students' internal assessment and should be available to the inspectors/examiners at the time of inspection/examination of the college.

O) Maximal efforts have to be made to encourage integrated teaching between traditional subjects areas using a problem based learning approach starting with clinical and exploring the relevance of various pre-clinical disciplines in both understanding and resolution of the problem. Every attempt be made to de-emphasize compartmentalization of disciplines so as to achieve both horizontal and vertical integration in different phases.

P) Every attempt is to be made to encourage students to participate in group discussions and seminars to enable them to develop personality, character, expression and other faculties which are necessary for Allied Health Science graduate to function either in solo practice or as a team leader when he begins his independent career. A discussion group should not have more than 20 students.

Q) Faculty members should avail of modern educational technology while teaching the students and to attain this objective.

R) To derive maximum advantage out of this, the vacation period to students in one calendar year should not exceed one month, during the 4 years of Bachelor of Allied Health Science Courses, which includes BPT, BOT, B.Sc (MLT), B.Sc (Medical Microbiology), B.Sc (RD&IT), B.Sc (Nursing), B pharm. etc

OBJECTIVES OF ALLIED HEALTH SCIENCE GRADUATE TRAINING PROGRAMME:

NATIONAL GOALS: At the end of undergraduate program, the Allied Health Science student shall endeavour to be able to:

a) Recognize 'health for all' as national goal and health right of all citizens and by undergoing training for Allied Health Science profession fulfil his/her social obligations towards realization of this goal; learn every aspect of National policies of health and devote himself/herself to its practical implementation.

b) To help to achieve competence in practice of holistic medicine encompassing promotive, preventive, curative and rehabilitative aspects of diseases particularly with Physiotherapy and Occupational Therapy;

c) Develop scientific temper, acquire educational experience for proficiency in profession and promote healthy living; particularly in the field of rehabilitation.

d) Become exemplary citizen by observation of medical ethics and fulfilling social and professional obligations, so as to respond to national aspirations.

INSTITUTIONAL GOALS:

In consonance with the national goals each Allied Health Science Institution should evolve institutional goals define the kind of trained manpower (or professional) they intend to produce. The undergraduate students coming out of an Allied Health Science institute should:

Be competent in therapeutic techniques of common health problems of the individual and the community, associated with or concerned with Physiotherapy commensurate with his/her position as a member of the health team at the primary, secondary or tertiary levels using his her clinical /technical skills based on history, physical examination and relevant investigation techniques and as per the advice of the attending physician.

Be competent to practice preventive, promotive, curative and rehabilitative medicine in respect to the all the applicable and encountered health problems with Occupational Therapy and Physiotherapy;

To help to appreciate rationale for different therapeutic modalities pertaining to the subjects of Physiotherapy.

To be able to appreciate the socio-psychological, cultural, economic and environmental factors affecting health and develop human attitude towards the patients in discharging one's professional responsibilities (Occupational Therapy and Physiotherapy;)

Possess the attitude for continued self-learning and to seek further expertise or to pursue research in any chosen area of Occupational Therapy and Physiotherapy;

Acquire basic management skills in the area of human resources, materials and resource management related to health care delivery;

Be able to identify community health problems and learn to work to resolve these by designing, instituting corrective steps and evaluating outcome of such measures (Occupational Therapy and Physiotherapy); in community rehabilitation.

Be able to work as a leading partner in health care teams and acquire proficiency in communication skills;

Be competent to work in a variety of health care settings.

Have personal characteristics and attitude required for professional life such as personal integrity, sense of responsibility and dependability and ability to relate to or show concern for other individuals.

ADMISSION, SELECTION, MIGRATION AND TRAINING
ADMISSION TO THE B.Sc. Medical Lab Technology COURSE

ELIGIBILITY CRITERIA

No Candidate shall be allowed to be admitted to the B.Sc. Medical Microbiology until:-

a) He/she has completed the age of 17 years on or before first day of July of the year commencing the prescribed academic session of the said course:

b) He/she has passed qualifying examination as under:

The Indian School Certificate Examination which is equivalent to 10+2 higher Secondary examination after a period of 12 years study, the last two years of Study comprising of Physics, Chemistry, Biology and Mathematics or any other elective subjects with English at a level not less than the core course for English as prescribed by the National Council for Educational Research and Training after the introduction of the 10+2+3 years educational structure as recommended by the National Committee on education.

OR

The Intermediate examination in Science of an Indian University/Board or other recognized examining body with Physics, Chemistry and Biology which shall include a Practical test in these subjects and also English as a compulsory subject.

OR

The Pre-Professional or medical examination with Physics, Chemistry and Biology, after passing their higher secondary school examination, or the pre-university or an equivalent examination. The pre-Professional /pre-medical examination shall include a practical test in Physics, Chemistry and biology and also English as a compulsory subject.

OR

The first year of the three years degree course of a recognized University, with Physics, Chemistry and Biology, including a Practical test in these subjects provided the examination is a "University Examination" and candidate has passed 10+2 with English at a level not less than a core course.

OR

B.Sc. examination of an Indian University, provide that he/she has passed the B.Sc. examination with not less than two of the following subjects-Physics, Chemistry, Biology (Botany, Zoology) and further that he/she has passed the earlier qualifying examination with the following subjects-Physics, Chemistry, Biology and English (10+2 level).

OR

Any other examination which in scope and standard is found to be equivalent to the intermediate science examination of an Indian University/Board, taking Physics, Chemistry, Biology including a Practical test in each of these subjects and English.

Note: 10+2 with vocational training in Nursing/Medical Lab technology/Medical Microbiology are also eligible and 10+2 with Diploma in Medical Microbiology are also eligible for the respective course. Marks obtained in Mathematics are not to be considered for admission to the B.Sc. MLT Course. After the 10+2 course is introduced, the integrated courses should be abolished.

MIGRATION /TRANSFER OF CANDIDATES

Migration / Transfer of candidates from one recognized Institution to another Institution of this University or from another University will not generally be considered.

However, under extra ordinary circumstances, the Vice-Chancellor shall have the powers to place any migration / transfer he deems fit in the Governing Council and get its approval for grant of permission for migration / transfer to candidates undergoing courses of study in affiliated Institutions of this University.

TRAINING PERIOD AND TIME DISTRIBUTION

1) Every student shall undergo a period of certified study extending over. Three and a half academic years Or Six semesters, plus 6 months internship from the date of commencement of his study for these subjects comprising the B.Sc Medical Lab technology curriculum to the date of completion of examination and followed by compulsory rotating internship. Each academic year shall consist of 180days each Semesters of 90 days teaching of 8 hours each day college working time, including one hour of lunch.
2) The period of three & half year is divided into 6 SEMESTER FOLLOWED BY 6 MONTHS INTERNSHIP as follows:-

B.Sc Medical Lab technology: Three Year (6 Semester) Programme with 6 months internship.				
Basic Structure: Distribution of Courses				
S. No	**Type of Course**	**Total Courses**	**Credits per course (hour)**	**Total Credits**
1	Core Course (CC)	08	4	32
2	Ability-Enhancement Compulsory Course (AECC)	03	2	06
3	Discipline Specific Course (DSC)	32	4	128
4	Skill Enhancement Course (SEC)	20	1	20
5	Discipline Specific Elective Course (DSEC)	02	2	04
6.	FC (Foundation Course)	01	2	02
	TOTAL CREDIT	61		168 (Excluding AECC & FC).

DISTRIBUTION OF MARKS TO VARIOUS DISCIPLINES

BMLT Ist Semester

S.No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1.	CC-1	BMLT-101	Human Anatomy & Physiology-I	4			4	40	60	100
2.	DSC-1	BMLT - 102	Basic Pathology-I	4			4	40	60	100
3.	DSC-2	BMLT - 103	Clinical Biochemistry-I	4			4	40	60	100
4.	CC-2	BMLT - 104	Preventive Medicine & Community HealthCare-I	4			4	40	60	100
5.	DSC-3	BMLT - 105	Microbial Biology -I	4			4	40	60	100
6.	DSC-4	BMLT - 106	Fundamentals Of Microbial Biology-I	4			4	40	60	100
7.	AECC-1	BMLT - 107	English Communication Skills	2			2			
8.	FC	FC-101	Remedial Biology	2			2			
9.	SEC-1	BMLT - P-108	Lab course based on CC-1			2	1	40	60	100
10.	SEC-2	BMLT - P-109	Lab course based on DSC- 2			2	1	40	60	100
11.	SEC-3	BMLT - P-110	Lab course based on DSC -3 & 4			2	1	40	60	100
							29			900

BMLT IInd Semester

S.No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1.	CC-3	BMLT-201	Human Anatomy & Physiology-II	4			4	40	60	100
2.	DSC-5	BMLT -202	Basic Pathology-II	4			4	40	60	100
3.	DSC-6	BMLT -203	Clinical Biochemistry-II	4			4	40	60	100
4.	CC-4	BMLT -204	Preventive Medicine & Community HealthCare-II	4			4	40	60	100
5.	DSC-7	BMLT-205	Microbial Biology -I	4			4	40	60	100
6.	DSC-8	BMLT-206	Fundamentals Of Microbial Biology-I	4			4	40	60	100
7.	AECC-2	BMLT-207	Professional ethics in Health care	2			2			
8.	SEC-4	BMLT-P-208	Lab course based on DSC-6			2	1	40	60	100
9.	SEC-5	BMLT-P-209	Lab course based on DSC 6			2	1	40	60	100
10.	SEC-6	BMLT-P-210	Lab course based on DSC 7 & 8			2	1	40	60	100
							29			900

BMLT IIIrd Semester

S.No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1.	DSC-9	BMLT-301	Separative & Instrumentation Technique-I	4			4	40	60	100
2.	DSC-10	BMLT-302	Metabolic & Blood Chemistry-I	4			4	40	60	100
3.	DSC-11	BMLT-303	Bacterial Pathogens & Associated Diseases-I	4			4	40	60	100
4.	DSC-12	BMLT-304	Lab Diagnosis of Bacterial Pathogens-I	4			4	40	60	100
5.	DSC-13	BMLT-305	Hematology & Clinical Pathology-I	4			4	40	60	100
6.	DSC-14	BMLT-306	Histopathology & Cytology Techniques-I	4			4	40	60	100
7.	AECC-3	BMLT-307	Environmental Science	2			2			
8.	SEC-07	BMLT-308	Lab course based on DSC 9& 10			2	1	40	60	100
9.	SEC-08	BMLT-309	Lab course based on DSC 11& 12			2	1	40	60	100
10.	SEC-09	BMLT-310	Lab course based on DSC 13 & 14			2	1	40	60	100
							29			900

BMLT IVth Semester

S.No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1.	DSC-15	BMLT-401	Separative & Instrumentation Technique-II	4			4	40	60	100
2.	DSC-16	BMLT-402	Metabolic & Blood Chemistry-II	4			4	40	60	100
3.	DSC-17	BMLT-403	Bacterial Pathogens & Associated Diseases-II	4			4	40	60	100
4.	DSC-18	BMLT-404	Lab Diagnosis of Bacterial Pathogens-II	4			4	40	60	100
5.	DSC-19	BMLT-405	Hematology & Clinical Pathology-II	4			4	40	60	100
6.	DSC-20	BMLT-406	Histopathology & Cytology Techniques-II	4			4	40	60	100
8.	SEC-10	BMLT-407	Lab course based on DSC 15 &16			2	1	40	60	100
9.	SEC-11	BMLT-408	Lab course based on DSC 17 &18			2	1	40	60	100
10.	SEC-12	BMLT-P-409	Lab course based on DSC 19& 20			2	1	40	60	100
							29			900

BMLT Vth Semester

S.No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1.	DSC-21	BMLT-501	Biostatistics & Quality Control	4			4	40	60	100
2.	DSC-22	BMLT-502	Diagnostic Enzymology-I	4			4	40	60	100
3.	DSC-23	BMLT-503	Pathogenic Viruses & Misc. Microbes-I	4			4	40	60	100
4.	DSC-24	BMLT-504	Applied Microbiology & Advanced Tech.-I	4			4	40	60	100
5.	DSC-25	BMLT-505	Immunopathology & Transfusion Medicine-I	4			4	40	60	100
6.	DSC-26	BMLT-506	Histopathology & Cytology-I	4			4	40	60	100
8.	DSEC-13	BMLT-507	Elective Course* 1.Microbial Genetics-I 2. Basic Bioinformatics	2			2	40	60	100
9.	SEC-13	BMLT-508	Lab course based on DSC 21 & 22			2	1	40	60	100
10.	SEC-14	BMLT-509	Lab course based on DSC 23 &24			2	1	40	60	100
16.	SEC-15	BMLT-510	Lab course based on DSC 25, 26 & DSEC 1			2	1	40	60	100
17.	SEC-16	BMLT-511	Clinical Posting*			2	1	40	60	100
							30			1100

BMLT VIth Semester

S.No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1.	DSC-27	BMLT-601	Endocrinology & Toxicology	4			4	40	60	100
2.	DSC-28	BMLT-602	Diagnostic Enzymology-II	4			4	40	60	100
3.	DSC-29	BMLT-603	Pathogenic Viruses & Misc. Microbes-II	4			4	40	60	100
4.	DSC-30	BMLT-604	Applied Microbiology & Advanced Tech.-II	4			4	40	60	100
5.	DSC-31	BMLT-605	Immunopathology & Transfusion Medicine-II	4			4	40	60	100
6.	DSC-32	BMLT-606	Histopathology & Cytology-II	4			4	40	60	100
7.	DSEC-2	BMLT-607	Elective Course* 1.Microbial Genetics –II 2.Advanced Bioinformatics	2			2	40	60	100
8.	SEC-17	BMLT-608	Lab course based on DSC 27 & 28			2	1	40	60	100
9.	SEC-18	BMLT-609	Lab course based on DSC 29 &30			2	1	40	60	100
10.	SEC-19	BMLT-610	Lab course based on DSC 31 & 32			2	1	40	60	100
14.	SEC-20		Clinical Posting			2	1	40	60	100
							30			1100

Note: Results of all University examination shall be declared before the start of teaching for next semesters.

Note: Course structure (Teaching duration) will be of 4 hrs. /week for theory & 2 hrs. /week for practical for each paper.

1. The minimum pass marks will be 40% in individual subjects in theory and practical and 50% in aggregate
2. The theory and practical papers will be of equal weightage with 40%insessional and 60% in final University Examination.
3. The division will be determined on the basis of the aggregate of the marks of all the course/subjects prescribed for the degree as under:
   (i) Passed with honours will be rewarded on 75% and above only in first attempt.
   (ii) First Division will be marked on 60% and above.
   (iii) Second Division will be marked on 50% and above but less than 60%

Compartments/Supplementary/Back Paper

(i) A student who obtain 40% of the marks individually but has failed in two papers shall be permitted to appear in those papers only at the two consecutive examinations and if

he/she passes at either of those examination he/she will be deemed to have passed the examination and will be promoted to higher class (aggregate marks should be 50%)

(ii) A student (s) appearing in back paper/supplementary shall be eligible to join the next higher class provisionally however any student who fails to pass Ist year would not be admitted in 3rd year course.

Theory Examination: All the paper in each year carrying 100 marks out of which 30 marks will be internal assessment and 70 marks for external assessment based on the question paper sent by the University the paper will be 3 hrs. Each paper will have 8 questions out of which the candidate will have to attempt 5 questions.

The practical examination will be held with the final Examination. The Practical and Viva Voice in each subject will carry 30% marks as internal & 70% marks as external assessment (according to examination scheme) prescribed for the year.

PHASE DISTRIBUTION AND TIMING OF EXAMINATION:

1. Ist End Semester examinations at the end of Ist sem
2. IInd End Semester Examination at the end of IInd sem.
3. IIIrd End Semester Examination at the end of IIIrd sem.
4. IVth End Semester examinations at the end of IVth sem
5. Vth End Semester Examination at the end of Vth sem.
6. VIth End Semester Examination at the end of VIth sem.
7. Six months Internship after VIth End Semester Examination

EXAMINATION CRITERIA:

A student should obtain 40% of the marks individually in each paper, including Internal and external, whereas a requirement of total of aggregate marks should be 50% and will be considered to be passed the semester examination and will be promoted to next semester.

There shall be two internal examination and one end semester examination in each semester system.
All the examination criteria have been under the norms and regulation of SGRR University

THEORY & PRACTICAL EXAMINATION: All the theory and practical examination papers of every semester carrying 100 marks out of which 40 marks will be internal assessment and 60 marks for external assessment.

ATTENDANCE: 75% of attendance in each subject is compulsory for appearing in the internal as well as external examination.

INTERNAL ASSESSMENT

(a) It shall be based on day-to-day assessment (see note), evaluation of student assignment, preparation for seminar. Clinical case presentation etc.

(b) Two Sessional examinations should be conducted in each semester and compulsory to appear in the examination.

(c) Day to day records should be given importance during internal assessment.

(d) Student must secure at least 40% marks for internal Assessment in Particular subject in order to eligible to appear in final university examination.

(e) 75% attendance is must for Internal Examination.

Note: Internal Assessment shall be different ways in which students' participation in learning process is evaluated. Some examples are as follows-

(i) Preparation of subject for student's seminar.
(ii) Preparation of a clinical case for discussion.
(iii) Clinical case study problem solving exercise.
(iv) Proficiency in carrying out a practical or a skill in small research project.
(v) Multiple choice questions (MCQ) test after completion of a system/ teaching. Each item tested shall be objectively assessed and recorded. Some of the items can be assigned as homework'/Vacation work.

EXTERNAL ASSESSMENT

Theory Papers will be prepared by examiners as prescribed. Nature of question will be short answer type / objective type/Long answer type and marks for each part indicated separately.
Practical/ clinical will be conducted in the laboratories or hospital wards. Objective will be to assess proficiency in skills Conduct of experiment, interpretation of data and logical conclusion. Clinical cases should preferably include for assessment. Emphasis should be on candidate's capability in eliciting physical signs and their interpretation. Viva/ Oral evaluation is compulsory in theory/ practical/case study.

Clinical cases/ practical shall take into account common diseases, which the student is likely to come in contact in practice.
During evaluation (both external and internal) it shall be ascertained if the candidate has acquired the skills.

DURATION OF EXAMINATION

(i) Internal examination should be based on written paper and are of One-hour duration.
(ii) External End Semester theory examination should be based on written paper and are of Three-hour duration.
(iii) A clinical / practical examination in any subject for student shall not be for more than a day.

GENERAL
If Candidate obtains an aggregate of 75 percent in all the subject of any professional Examination, be will be declared to have passed that Examination with Honors, provided he/she passes in all subject in the first attempt.
INTERNSHIP
General

Internship is a phase of training wherein a graduate is expected to conduct actual practice of Medical Microbiology and acquire skills under supervision so that he/she may become capable of functioning independently.

SPECIFIC OBJECTIVE

At the end of internship training the graduate shall be able to:

(i) Perform all the diagnostic techniques

(ii) Use discretely the essential laboratory services

(iii) Manage all type of clinical diagnostic methods

(iv) Demonstrate skills in handling the modern equipment in Medical Microbiology

(v) Develop leadership qualities to function effectively as a reader of the laboratory environment

(vi) Render service to the laboratory set up and to communicate effectively with the Doctors and the hospital management.

INTERNSHIP TIME DISTRIBUTION

Main Objective**:** Development of skill and competency in data processing, reporting and maintenance of records, Laboratory investigations. Total Period of Internship: 6 Months

1.	Serology	1 month
2.	Bacteriology	1 month
3.	Sample Collection	15 days
4.	Haematology	15 days
5.	Clinical Biochemistry	15 Days
6.	Immunology	1 month
7.	Molecular Biology	1 month
8.	Mycology	15 days

OTHER DETAILS

(i) All parts of internship shall be done as for as possible in the Hospitals of Medical College

(ii) Every Candidate will be required after passing the final B.Sc (Medical Microbiology) Examination to undergo compulsory rotator internship to the satisfaction of the college Authorities and University concerned for a period of six months so as to eligible for the award of the degree of Bachelor of Science in Medical Microbiology.

(iii) The University shall issue a provisional B.Sc Pass Certificate on passing the final examination.

(iv) The State medical faculty and council for allied health profession will grant provisional registration will be for a period of I year. In the event of shortage or unsatisfactory work, the period of provisional registration and the compulsory rotating internship may be suitably extended by the appropriate authorities.

(v) The intern shall be entrusted with Laboratory responsibilities under direct supervision of Senior Medical Officer/Technician. They shall not be working independently.

(vi) Interns will not issue certified Laboratory reports or other related documents under their signature.

ASSESSMENT OF INTERNSHIP

(i) The interns 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 the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and the end of the training, Based on the record work and date of evaluation the Director/Principal shall

issue 'Certificate of Satisfactory Completion' of training following which the University shall award the B.Sc (Medical Microbiology) Degree of declare the candidate eligible for the same.

(ii) Satisfactory completion shall be determined on the basis of the following:

(a) Proficiency of knowledge required for each Laboratory Techniques

(b) The Competency in skills expected to manage each Laboratory Technique. Competency for performance of self-performance of having assistant in procedures of having observed

(c) Responsibility Punctuality work up of Laboratory Techniques involvement in procedure, follow of reports.

(d) Capacity to work in a team (behaviour with colleagues, nursing staff and relationship with Medical and Paramedical).

(e) Initiating, Participation in discussions, research aptitude.

(f) Full registration shall only be given by the State Medical faculty and council for Allied Health Professor on the award of BMLTDegree by the University on its declaration that the candidate is eligible for it.

VACATION

There shall be a minimum 30 days vacations every year or as per session requirement settled by the University.

MEDIUM OF INSTRUCTION

English shall be the Medium of Instructions for all the subjects of study and for examinations of the Bachelor of Medical Microbiology course.

CONDONATIONS OF LACK OF ATTENDANCE

As per the existing rules & regulations of the Shri Guru Ram Rai University.

SUBMISSION OF RECORD NOTE BOOKS

At the time of practical examination, each candidate shall submit to the examiners the records books duly certified by the Head of the School as a bonafide record of work done by the candidate.

CLASSIFICATION OF SUCCESSFUL CANDIDATES REVALUATION OF ANSWER PAPERS

The regulations as prescribed by the University for other Undergraduate Course shall be applicable.

AWARD OF MEDALS AND PRIZES

The University shall award at its convocation medals and prizes to outstanding candidates, as and when Instituted by the donors as per the schedule prescribed for the award.

UNIVERSITY RANKING

First, Second and third University ranks may be awarded to candidates, who have passed all the examinations in the first appearance and taking into consideration the aggregate marks obtained in all the subjects, in which the candidate had been examined during the entire course of study.

CURRICULUM (SUBJECT WISE)

SYLLABUS FOR MEDICAL MICROBIOLOGY

GOAL

The broad goal of teaching of B.Sc (Medical Microbiology) students in Allied Medical Science aims at providing comprehensive knowledge of structure, function and pathological changes of the organs and the basis for understanding the clinical correlation of diseases and the pathological basis for the disease presentation specially with respect to Physical Pathology.

Objectives:

(A) Knowledge:

At the end of course, student shall be able to comprehend the normal dispositions, clinically relevant interrelationship, functional Anatomy of various structures in the body. Correlate the

structures with the functions as pre requisite for understanding the alter state in various disease processes specially with respect to Physical Pathology & Microbiological diagnosis.

(B) Skills:

At the end of the course, student shall be able to identify and locate all the structures of the body and mark the topography of the living Anatomy, identify the organs and tissues. Understand the principles of karyotyping, Understand clinical bases of common clinical procedures of diagnosis of Microbial infections and infestations.

(C) Integration:

From the integrated teaching of other basic sciences, students shall be able to comprehend the regulation and integration of the functions of the organs and systems in the body and thus interpret the pathological, bimolecular & microbiological basis of diseases including advanced diagnostic technology.

BMLT Ist Semester

Course Name	**:** Human Anatomy & Physiology-**I**
Course Code	**:** BMLT-101
Semester /Year	**:** 1st Semester

	L	**T**	**P**	**C**
	04		01	05

L - Lecture T – Tutorial P – Practical C – Credit

Course Contents **4hrs/Week**

Unit I: Introduction to Anatomy and Physiology: Definition and scope of anatomy and physiology. Levels of structural organization. Anatomical terminology. Body planes, sections, and directional terms.

Unit 2: The Cell: Overview of cell structure and function. Cellular organelles and their functions. Cell membrane structure and transport mechanisms. Cell cycle, mitosis, and meiosis.

Unit 3: Tissues: Classification and characteristics of epithelial tissue. Connective tissue types and functions. Muscle tissue types and characteristics. Nervous tissue structure and function.

Unit 4: Integumentary System: Structure and function of the skin. Skin layers & Accessory structures. Skin functions and disorders.

Unit 5: Skeletal System and Muscular System: Bone structure, function, development and growth. Classification of bones. Joints: Types and functions. Overview of muscle tissue types. Anatomy of skeletal muscles. Mechanism of muscle contraction. Major muscles of the body and their functions.

Text Books:

Text Book of Human Anatomy B D Chourasia's V Edition

Reference Books:

Atlas of Human Anatomy by Frank H. Netter VII Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Comprehend Basic Anatomical and Physiological Concepts.
CO2	Understand Cellular Structure and Function.
CO3	Classify and Describe Different Tissue Types.
CO4	Analyse the Structure and Function of the Integumentary System.
CO5	Explain the Skeletal System and Its Components.
CO6	Develop Understanding about the Muscular System and Muscle Physiology.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	2	1	-	-	-	-	-	-
CO2	-	-	-	1	2	2	1	1	-	-	-	-
CO3	1	-	-	-	1	1	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-
CO6	1	2	-	1	1	-	2	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

BMLT Ist Semester

Course Name	**Basic Pathology -I**
Course Code	BMLT-102
Semester /Year	1st Semester

	L	T	P	C
	04		01	05

L - Lecture T – Tutorial P – Practical C – Credit

Course Contents **4hrs/Week**

Unit I: Introduction to hematology. Laboratory organization & Safety measures. Formation, Composition and functions of blood. Anticoagulants, mode of action of anticoagulants and their merits & demerits.

Unit 2: Collection, preservation, transport and handling and disposal of blood samples.Basic haematology and estimation of haematocrit values, physiological variations, normal and absolute values and quality assurance in haematology.

Unit 3: Romanowsky dyes, preparation and staining procedures of blood smears, Morphology of blood cells and their identifications.

Unit 4: Haemo-globinometry: Various methods errors involved and standardization of instruments.

Unit 5: Haemo-cytometry: Procedure of cell count, visual as well an electronic, red cells, leucocyte and platelet count. Errors involved and mean to minimize such errors.

TB1. Text Book of Pathology Harsh Mohan VIII Edition

TB2. Text Book of Pathology Dr. A K Mandal

Reference Books:

RB1. Clinical Pathology Hematology & Blood Banking IV Edition

Nanda Maheshwari

RB2. Exam Oriented Pathology

K Mukhopadhyay

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe the basic concepts of hematology,
CO2	Explain the modes of action, merits, and demerits of various anticoagulants used in hematology.
CO3	Demonstrate the proper techniques in haematology.
CO4	Analyze and interpret blood smears using Romanowsky dyes, identifying the morphology of different blood cells and understanding the staining procedures.
CO5	Evaluate and standardize instruments and methods used in hemoglobinometry, identifying potential errors and ensuring accurate measurements.
CO6	Design and implement procedures for hemocytometry.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	1	3	-	2	-	-	-	-	-
CO2	1	1	-	1	3	-	-	-	-	-	-	-
CO3	1	2	-	-	2	-	-	-	-	-	-	-
CO4	-	1	-	-	-	-	-	-	-	-	-	-
CO5	-	2	-	-	1	2	1	-	-	-	-	-
CO6	-	1	-	2	3	-	1	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

BMLT Ist Semester

Course Name	Clinical Biochemistry-I
Course Code	BMLT-103
Year/ Semester	1st Semester

	L	T	P	C
	04		01	05

L - Lecture T – Tutorial P – Practical C – Credit

Course Contents **4hrs/Week**

Unit I: Introduction to Clinical Biochemistry and role of medical Lab Technologist, ethics responsibility, safely measure and hazards in clinical biochemistry lab and first aid in laboratory accidents.

Unit 2: Basic awareness of laboratory in respect to equipments & glassware's. (Unit of measurements and calibration of volumetric apparatus. Colorimetry, spectrophotometer, flame-photometry, (Principles Instrumentations & applications)

Unit 3: Preparation and storage of reagents, standard solutions, buffer solutions and pH determination. Biophysics, techniques – osmosis, dialysis, surface tension, sedimentation and viscosity – principles & applications.

Unit 4: Henderson – Hassalbach equation and its clinical applications. Acid base disturbances and their clinical significance. Acid-base- buffer and pH – simple calculations. Concept of clinical sensitivity and specificity and factors affecting the clinical results.

Unit 5: Collection of blood specimens avoiding Haemolysis, de- proteinization & separation of serum /Plasma. Biochemical composition of body fluids and their physiological variations.

Text Book of Biochemistry DM Vasudevan IX Edition

Reference Books: U Satyanarayana & U Chakrapani

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define the fundamental concepts of clinical biochemistry.
CO2	Explain the principles and applications of instrumentation in biochemistry.
CO3	Apply Biophysical techniques in biochemistry laboratory.
CO4	Analyze and apply the Henderson-Hasselbalch equation to clinical scenarios.
CO5	Evaluate the clinical sensitivity and specificity of biochemical tests and assess the factors affecting clinical results.
CO6	Design and implement procedures for the collection of blood specimens.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	-	-	-	-	-	-	-	2	2
CO4	-	1	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	2	2
CO6	-	-	-	-	-	-	-	-	-	-	2	2

BMLT Ist Semester

Course Name	Preventive Medicine & Health care-I
Course Code	BMLT-104
Year/ Semester	Ist Semester

	L	T	P	C
	4		**1**	**5**

Course Contents **4 hrs/Week**

Unit 1: Water, air and noise pollution: Removal of water hardness, purification of water and standards of water quality. Air and noise pollution and their prevention. Housing and air conditioning.

Unit 2: Hygiene and Sanitation: Sanitation barriers, excreta disposal and disposal of hospital waste, Incineration and disinfection.

Unit 3: Infections and control: Microbial pathogenicity, source and spread of infections in community, Pathogenesis toxogenicity, invasiveness, variations and Virulence. Host factors controlling infections. Source of infections to men, mode of spread and their control by physical & chemical agents.

Unit 4: Epidemiology: Epidemiology, surveillance and control of community infections. Role of laboratory in community and hospital infections. Emergence of drug resistance. Methods of prevention & control- isolation of patients, quarantine & incubation periods of various infectious diseases. Management of patients in infectious disease hospital (IDH).

Unit 5: Prophylactic Immunization: Rationale of immunization, immune response and duration of immunity controlled studies of prophylactic Vaccines and hazards of immunization. Various national immunization programs and vaccine schedules.

Text Books:

Text Book of Preventive & Social Medicine by K Park

Reference Books:

RB3. Review of Preventive & Social Medicine

Vivek Jain XIII Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe the fundamental concepts of water, air, and noise pollution.
CO2	Explain the principles of hygiene and sanitation.
CO3	Demonstrate the application of knowledge about microbial pathogenicity.
CO4	Analyze epidemiological data related to community infections, including the role of surveillance, the emergence of drug resistance, and the impact of various preventive measures.
CO5	Evaluate the effectiveness of prophylactic immunization, national immunization programs and vaccine schedules.
CO6	Implement strategies for the prevention and control of infections in community and hospital settings.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

BMLT Ist Semester

Course Name	Microbial Biology-I
Course Code	BMLT-105
Year/ Semester	1st Semester

	L	T	P	C
	4		**1**	**5**

Course Contents **4hrs/Week**

Unit 1: Microbiology & Medicine: Introduction to Medical Microbiology. Discovery of micro-organisms. Contribution of Robert Koch, Antony Van Leeuwenhoek, Louis Pasteur, Border, Paul Ehrlich, Alexander Fleming. Metchnikoff, Needham, Tyndall Jensen, Joseph Lister, Karl Landsteiner etc. Scope & relevance and safety measures of Medical Microbiology. Role of medical microbiology in identification and management of various infectious diseases.

Unit 2: Morphology & Nature of Bacteria: Anatomy of bacterial cell, intracellular components and their functions bacterial reproduction, morphological study of bacteria and its appendages-flagella, fimbriae, pili, capsule, spore and cysts.

Unit 3: Classification and identification of bacteria: Biological groups, morphological and biological classification, DNA composition as a basis of classification system of identification- morphology, staining reactions, cultural characters, biochemical reactions & antigenic characters etc.

Unit 4: Sterilization and disinfection: Various physical methods of sterilization- heat, UV radiations, ionizing radiations, character affecting sterilizations, autoclave control and its compounds. Alcohol, halogen heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound, Use and abuse of disinfectants.

Unit 5: Introduction to Virology, Mycology & Parasitology: Characteristics, morphology, and pathogenesis.

Text Books: Text Book of Microbiology by Dr. C P Baveja VIII Edition
TB3. Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat
Reference Books: Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Introduce the key figures in the history of medical microbiology and their contributions.
CO2	Explain the anatomy of bacterial cells, including intracellular components.
CO3	Apply knowledge of bacterial morphology and classification to identify bacteria
CO4	Analyze various sterilization and disinfection methods and Evaluate their effectiveness and limitations in different scenarios.
CO5	Measure the role of medical microbiology in the identification and management of infectious diseases
CO6	Formulate strategies for identifying and managing infectious diseases, integrating knowledge from microbiology, virology, mycology, and parasitology.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	2	2	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-
CO6	1	-	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

BMLT Ist Semester

Course Name	Fundamentals Of Microbial Biology-I
Course Code	BMLT-106
Year/ Semester	1st Semester

	L	T	P	C
	4		1	5

Course Contents **4hrs/Week**

Unit I: Microscopy: Study of Compound microscope-magnification, numerical aperture, resolution and compounds of microscope. Dark ground illumination care of microscope and common difficulties. Micrometry Study of Phase contrast, interference, fluorescent an electron microscope. Preparation of smear for electron microscope.

Unit 2: Study of pH in Microbiology: Methods for measurements pH meter, Preparation dilution and chemistry of suspension fluids. Oxidation – reduction (redox) potential.

Unit 3: Preparation of Stains: Making of films, staining methods, mounting media, Grams stain- preparation of stain and staining methods. Special stains for AFB, diphtheria spores, capsule, intra cytoplasmic lipids, polysaccharides nuclear material, Fields Stain for amoebae, fungi and ricketssiae.

Unit 4: Study of instruments used in Medical Microbiology: General instruments: Distillation plant, Centrifuge Machine, Analytical Balance, Hotplate, Magnetic Stirrer, water Bath, Automatic Dispensers and diluters. Deidonizer etc.

Unit 5: Microbiological Instruments: Autoclave, Incubator, Hot air oven, Laminar Air Flow, Colony Counter. Muffle furnace. Refrigerator, inoculators, Macintosh field- jar etc.

Text Books: Text Book of Microbiology by Dr. C P Baveja Edition

TB4. Text Book of Microbiology

Apurba S Sastry & Sandhya Bhat

Reference Books:

RB4. Prescott's Microbiology

Joanne Willey, Kathleen Sandman XI Edition

RB5. Essentials of Microbiology & Immunology

S K Mohanty & K Sai Leela & Dipti Pattanaik

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify the fundamentals types of microscopes such as phase contrast, interference, fluorescent, and electron microscopes.
CO2	Understand the care and maintenance of microscopes and common challenges associated with their use.
CO3	Apply knowledge of instrumentation techniques devised for measurements in microbiology.
CO4	Analyse the effectiveness of different stains in visualizing microbial structures.
CO5	Evaluate the function and usage of general and microbiological instruments in medical microbiology
CO6	Develop effective procedures for using and maintaining microbiological instruments

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology Ist Semester

Course Name	English communication Skills
Course Code	BMLT-107
Year/ Semester	1st Semester

	L	T	P	C
	2			**2**

Course Contents **2 hrs/Week**

Unit 1: Introduction to Communication: Definition and importance of communication. Types of communication (verbal and non-verbal). Barriers to effective communication. Overcoming communication barriers.

Unit 2: Listening & Speaking Skills: Importance of listening. Types of listening (active and passive). Barriers to effective listening. Techniques to improve listening skills. Components of effective speaking. Pronunciation and phonetics. Stress, intonation, and rhythm. Public speaking and presentation skills. Group discussions and debates.

Unit 3: Reading & Writing skills: Importance of reading. Intensive and extensive reading. Reading comprehension strategies. Critical reading and analysis. Sentence structure and grammar. Paragraph, Essay, Report writing. Email and business correspondence. Technical writing basics.

Unit 4: Interpersonal Communication: Building and maintaining relationships. Conflict resolution. Negotiation skills. Teamwork and collaboration.

Unit 5: Professional Communication: Resume and cover letter writing. Interview skills. Professional etiquette and workplace communication. Presentation and meeting skills.

Text Books:

1. "Business Communication: Process and Product" by Mary Ellen Guffey and Dana Loewy. 2018. Edition 9th. Publisher Cengage Learning.
2. Technical Communication: A Practical Approach" by William S. Pfeiffer and Kaye E. Adkins.2012. Edition 8th. Pearson.

Reference Books:

1. English Grammar in Use" by Raymond Murphy. 5thEdition 2019. Cambridge University Press.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe the fundamental concepts of communication.

CO2	Explain the importance of listening and speaking skills.
CO3	Apply reading and writing skills in various contexts, including intensive and extensive reading, reading comprehension strategies, and critical analysis
CO4	Analyse interpersonal communication skills.
CO5	Evaluate professional communication techniques.
CO6	Design and implement effective communication strategies.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology Ist Semester

Course Name	Remedial Biology
Course Code	FC-101
Year/ Semester	1st Semester

	L	T	P	C
	2			**2**

UNIT-I

Introduction to Biology

Definition and Scope of Biology

- What is Biology?
- Branches of Biology (e.g., Botany, Zoology, Microbiology, Ecology)
- Importance of Biology in Science and Society

UNIT-II

Cell Biology

Cell Structure and Function

- Cell Theory
- Prokaryotic vs. Eukaryotic Cells
- Organelles and their Functions (e.g., Nucleus, Mitochondria, Ribosomes, Endoplasmic Reticulum, Golgi Apparatus)

Cell Membrane and Transport

- Structure of the Plasma Membrane
- Passive Transport (Diffusion, Osmosis)
- Active Transport (Pump Mechanisms, Endocytosis, Exocytosis)

Cell Cycle and Division

- Mitosis and its Phases
- Meiosis and its Phases
- Regulation of the Cell Cycle

UNIT-III

Genetics

Mendelian Genetics

- Principles of Inheritance (Dominant and Recessive Traits)
- Punnett Squares
- Genetic Crosses (Monohybrid, Dihybrid)

Molecular Genetics

- DNA Structure and Function

- RNA and Protein Synthesis (Transcription, Translation)

Genetic Variation and Heredity

- Mutations and Their Effects
- Genetic Linkage and Recombination

UNIT-IV

Evolutionary Biology

Theory of Evolution

- Charles Darwin and Natural Selection
- Evidence for Evolution (Fossil Record, Comparative Anatomy, Embryology, Molecular Biology)

UNIT-V

Anatomy and Physiology

Human Anatomy and Physiology

- Basic Human Body Systems (Integumentary, Skeletal, Muscular, Nervous, Endocrine, Cardiovascular, Respiratory, Digestive, Urinary, Reproductive)

Functional Relationships

- How Systems Interact (Homeostasis, Feedback Mechanisms)

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Understand the Scope and Importance of Biology.
CO2	Describe Cell Structure and Function.
CO3	Understand Cell Membrane Dynamics and Transport Mechanisms.
CO4	Explain Cell Cycle and Division Processes.
CO5	Apply Principles of Genetics and Genetic Variation.
CO6	Discuss Evolutionary Theory and Evidence.

B.Sc Medical Lab Technology Ist Semester

Course code	**:** BMLT-P-108
Course Name	**:** Lab course based on Paper CC 1 & CC 2
Semester/Year	**: 1st Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

S. No	Practical
1.	Identify and label body planes, sections, and directional terms on diagrams and models.
2.	Use models to identify and describe the levels from cellular to organismal.
3.	Prepare slides of animal cells, identify cellular organelles, and sketch observations.
4.	Perform osmosis and diffusion experiments using dialysis tubing and different solutions.
5.	Examine prepared slides of mitotic and meiotic cells, identify different stages, and draw labelled diagrams.
6.	Use skin models and slides to identify epidermis, dermis, and accessory structures like hair follicles and sweat glands.
7.	Examine bone models and real bones to identify and classify them into long, short, flat, and irregular bones.
8.	Use joint models to identify and describe different joint types, such as synovial, fibrous, and cartilaginous joints.
9.	Use muscle models and diagrams to locate and name major muscles, and learn about their roles in movement.
10.	Tour of the hematology lab, identification of safety equipment, and demonstration of safety protocols (e.g., handling of sharps, use of PPE).
11.	Microscopic examination of blood smears to identify different blood cells, discussion on blood components and their functions.
12.	Experiment with different anticoagulants (e.g., EDTA, heparin) to observe their effects on blood samples, discussion on their applications in various tests.
13.	Demonstration and practice of venipuncture, proper labeling, and preservation techniques, discussion on disposal of blood samples following safety protocols.
14.	Prepare blood smears, stain them using Wright's or Giemsa stain, and examine under a microscope to observe the morphology of blood cells.
15.	Perform haemoglobin estimation using cyanmethemoglobin method and hemoglobinometer, discuss sources of errors and standardization of instruments.
16.	Examine stained blood smears to identify various blood cells (e.g., RBCs, WBCs, platelets), discuss their characteristics and functions.
17.	Conduct repeated cell counts to assess reproducibility, implement quality control measures, and discuss the importance of quality assurance in clinical hematology.

* Course Outcomes of the above practical is covered their respective theory course.

B.Sc Medical Lab Technology Ist Semester

Course code	**:** BMLT-P-109
Course Name	**:** Lab course based on paper CC 3
Semester/Year	**: 1st Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

S. No	Practical
1.	Tour of the clinical biochemistry lab to identify safety equipment, demonstration of proper handling and disposal of hazardous materials, practice emergency procedures, and first aid training for laboratory accidents.
2.	Hands-on sessions to identify and use various laboratory equipment and glassware, including pipettes, burettes, and beakers.
3.	Prepare various reagents and solutions, determine and adjust pH, and store them properly.
4.	Use pH meters and indicators to determine and adjust the pH of different solutions.
5.	To make 1.0 M solution of NaCl.
6.	To identify abnormal constituents of the urine
7.	To identify normal constituents of the urine
8.	Demonstration of colorimeter.
9.	To identify the type of carbohydrate in the given sample
10.	To identify protein and amino acid in the given sample.

* Course Outcomes of the above practical is covered their respective theory course.

B.Sc Medical Lab Technology 2nd Semester

Course Name	Lab Course based on DSC 1 & DSC 2
Course Code	BMLT-P-110
Year/ Semester	1st Semester

	L	T	P	C
			02	01

L - Lecture T – Tutorial P – Practical C – Credit

Credit hours
2hrs/Week

S.No	Practical
1.	Introduction to laboratory safety measures.
2.	Demonstrate sterilization techniques using autoclaves, dry heat ovens, and UV radiation, test the effectiveness using biological indicators.
3.	Use staining techniques to observe flagella, fimbriae, and pili under a microscope, and discuss their roles in bacterial motility and adhesion.
4.	Inoculate bacteria on different culture media using different isolation techniques.
5.	Observe growth patterns and documentation in laboratory file.
6.	To perform biochemical tests (e.g., catalase, oxidase, fermentation tests), and interpret the results.
7.	To Perform Gram staining, acid-fast staining, and spore staining, observe the results under a microscope, and classify bacteria based on staining characteristics.
8.	Observe fungal specimens under a microscope, identify structures like hyphae, spores, and conidia and discuss fungal infections and their clinical significance.
9.	Examine slides of common parasites (e.g., protozoa, helminths), identify morphological features and discuss the life cycles and pathogenicity of selected parasites.

* Course Outcomes of the above practical is covered their respective theory course.

B.Sc Medical Lab Technology 2nd Semester

Course Name	**:** Human Anatomy & Physiology-**II**
Course Code	**:** BMLT-201
Semester /Year	**:** IInd Semester

	L	T	P	C
	04		01	05

L - Lecture T – Tutorial P – Practical C – Credit

Course Contents **4hrs/Week**

Unit 1: Nervous System & Endocrine system: Organization of the nervous system in detail. Structure and function of neurons and neuroglia. Nerve impulse transmission. Overview of the endocrine system (major glands). Hormones: Types and functions Hormonal regulation and feedback mechanisms.

Unit 2: Cardiovascular System: Composition and functions of blood. Heart anatomy and physiology. Blood vessels: Arteries, veins, and capillaries. Circulatory pathways. Cardiac cycle and cardiac output. Blood pressure regulation.

Unit 3: Respiratory System: Anatomy of the respiratory system, Mechanics of breathing. Gas exchange in the lungs and tissues. Regulation of respiration. Respiratory volumes and capacities.

Unit 4: Digestive system & Urinary System: Anatomy of the digestive tract. Digestive processes and enzymes. Nutrient absorption and metabolism. Anatomy of the kidneys and urinary tract. Regulation of fluid and electrolyte balance. Acid-base balance.

Unit 5: Reproductive System & Immune System: Male and Female reproductive system: Anatomy and functions. Hormonal regulation of reproduction. Overview of the immune system. Innate immunity: Physical and chemical barriers. Adaptive immunity: B and T cells. Immune response: Primary and secondary. Vaccination and immune disorders.

Text Books:

Text Book of Human Anatomy B D Chourasia's V Edition

Reference Books:

Atlas Of Human Anatomy by Frank H. Netter VII Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe the organization and function of the nervous and endocrine systems.
CO2	Explain the composition and functions of blood, the anatomy and physiology of the heart, the structure of blood vessels, circulatory pathways, the cardiac cycle, cardiac output, and the regulation of blood pressure.

CO3	Illustrate the anatomy of the respiratory system, the mechanics of breathing, the processes of gas exchange in the lungs and tissues, the regulation of respiration, and the various respiratory volumes and capacities.
CO4	Analyse the anatomy of the digestive tract and urinary system.
CO5	Describe the anatomy and functions of the male and female reproductive systems, hormonal regulation of reproduction, and the overview of the immune system including innate and adaptive immunity, immune responses, vaccination, and immune disorders.
CO6	Integrate knowledge of the different body systems to understand their interrelations and how they contribute to maintaining homeostasis and overall health.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	2	1	-	-	-	-	-	-
CO2	-	-	-	1	2	2	1	1	-	-	-	-
CO3	1	-	-	-	1	1	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-
CO6	1	2	-	1	1	-	2	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 2nd Semester

Course Name	**Basic Pathology -II**
Course Code	BMLT-202
Semester /Year	IInd Semester

	L	T	P	C
	04		01	05

L - Lecture T – Tutorial P – Practical C – Credit

Course Contents **4hrs/Week**

Unit 1: Pathology of Inflammation in response to microbial invasion. Pathology of localized and systemic infections. Various routes of transport of Microbes to the human body and methods of defense. Invasive techniques for the diagnosis of acute and chronic microbial infections.

Unit 2: Pathology of specific chronic infective disorders: Tuberculosis, Leprosy, Syphilis, SABE (Subacute bacterial endocarditis) and Rheumatological disorders.

Unit 3: Study of microbes responsible for the pathogenesis of tumours and their oncogenesis.

Unit 4: Immuno-histopathology &Immuno-histochemistry (Basic Principles, Procedures and applications).

Unit 5: Introduction to blood banking technology: Regulatory and Ethical Considerations**:** National and international guidelines. Ethical issues in blood banking. Quality Control and Assurance. Record Keeping and Documentation.

TB5. Text Book of Pathology Harsh Mohan VIII Edition

TB6. Text Book of Pathology Dr. A K Mandal

Reference Books:

RB6. Clinical Pathology Hematology & Blood Banking IV Edition
Nanda Maheshwari

RB7. Exam Oriented Pathology
K Mukhopadhyay

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Explain the pathology of inflammation in response to microbial invasion.
CO2	Analyse the pathology of specific chronic infective disorders.

CO3	Identify the microbes responsible for the pathogenesis of tumors and understand the mechanisms of oncogenesis.
CO4	Describe the basic principles, procedures, and applications of immuno-histopathology and immuno-histochemistry.
CO5	Understand the fundamentals of blood banking technology, including regulatory and ethical considerations, national and international guidelines, and ethical issues in blood banking.
CO6	Implement quality control and assurance practices in blood banking, along with effective record keeping and documentation.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	1	3	-	2	-	-	-	-	-
CO2	1	1	-	1	3	-	-	-	-	-	-	-
CO3	1	2	-	-	2	-	-	-	-	-	-	-
CO4	-	1	-	-	-	-	-	-	-	-	-	-
CO5	-	2	-	-	1	2	1	-	-	-	-	-
CO6	-	1	-	2	3	-	1	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 2nd Semester

Course Name	Clinical Biochemistry-II
Course Code	BMLT-203
Year/ Semester	IInd Semester

	L	T	P	C
	04		01	05

L - Lecture T – Tutorial P – Practical C – Credit

Course Contents **4hrs/Week**

Unit 1: Physical and Biochemical Examination of Urine Samples: Qualitative tests of inorganic Urinary ingredients: Chlorides, phosphate, sulphur compounds, sodium, Potassium, calcium and magnesium and their clinical significance.

Unit 2: Qualitative tests for glycosuria, pentosuria, galactosuria, proteinuria, microalbuminuria and Bence Jones Proteinuria and their clinical significance. Qualitative test of urine for uric acid, urea and creatinine. Quantitative estimation of 24 hours urine for albumin and their clinical significance.

Unit 3: Carbohydrates: Structure, classification and their function in biological system. Lipids: General structure of Fatty Acids and classification of Lipids.

Unit 4: Proteins: Classification, structural organization and function of proteins. Enzymes: Definition, classification of Enzyme, concept of active sites and general mode of action of enzymes.

Unit 5: Nucleic acids: Structure function and types of DNA and RNA. Nucleotides, Nucleosides, Nitrogen bases and role of Nucleic Acid.

Text Book of Biochemistry DM Vasudevan IX Edition

Reference Books: U Satyanarayana & U Chakrapani

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Perform qualitative tests to identify inorganic urinary ingredients.
CO2	Conduct qualitative tests for glycosuria, pentosuria, galactosuria, proteinuria, microalbuminuria, and Bence Jones proteinuria, and analyse their clinical significance.
CO3	Describe the structure, classification, and function of carbohydrates and lipids in system, including the general structure of fatty acids and lipid classification.
CO4	Explain the classification, structural organization, and function of proteins, as well sites, and general mode of action of enzymes.
CO5	Describe the structure, function, and types of nucleic acids (DNA and RNA), incl and understand the role of nucleic acids in biological systems.
CO6	Integrate knowledge of biochemical testing and molecular biology to understand the interrelationship between various biochemical compounds and their roles in diagnosing and monitoring clinical conditions.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	2	1	-	-	-	-	-	-	-	2	2
CO4	-	1	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	2	2
CO6	-	-	-	-	-	-	-	-	-	-	2	2

B.Sc Medical Lab Technology 2nd Semester

Course Name	Preventive Medicine & Health care-II
Course Code	BMLT- 204
Year/ Semester	**2nd** Semester

	L	T	P	C
	4		**1**	**5**

Course Contents **4 hrs/Week**

Unit 1: Bacteriology of water, milk, food and air: Bacteriological examination of water-collection of specimens, presumptive coliform count, cloak room test, colony count and interpretation of results, Bacterial examination of sewage and sewage effluents. Bacteriological examination and control of swimming bath, membrane filter technique and isolation of pathogens.

Unit 2: Bacteriological examination milk, bacterial standards and various tests for pasteurized milk. Bacterial examination of ice-cream, shellfish and canned foods, milk bottles, crockery and cutlery. Examination of food stuff in cases of outbreak of food poisoning, Bacteriological examination of air and environments dust.

Unit 3: Health care by balance diet and yoga: Normal constituents of diet, various diet programs, balance diet and factors responsible for etiology of various nutritional disorders. Carcinogens in food. Role of regular exercise & yoga in prevention & management of various diseases.

Unit 4: Health Planning & Management: Health planning, Planning Cycle, Malaria eradication & various other National Health policy & programs.

Unit 5: Reproductive, Family planning & Child Health Care Programs.

Text Books:

Text Book of Preventive & Social Medicine by K Park

Reference Books:

RB8. Review of Preventive & Social Medicine

Vivek Jain XIII Edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Conduct and interpret bacteriological examinations of water, including specimen collection, coliform count, cloak room test, colony count, and analysis of results.
CO2	Perform bacteriological tests on milk, including bacterial standards.
CO3	Analyse the components of a balanced diet, identify factors responsible for nutritional disorders, and understand the role of carcinogens in food.
CO4	Explain the principles of health planning and management.
CO5	Understand reproductive health, family planning methods, and child health care programs, and analyse their implementation and impact on public health.
CO6	Integrate knowledge of bacteriological examination techniques, nutritional science, and health planning to develop comprehensive strategies for improving public health and managing diseases.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 2nd Semester

Course Name	Microbial Biology-II
Course Code	BMLT- 205
Year/ Semester	IInd Semester

	L	T	P	C
	4		1	5

Course Contents **4hrs/Week**

Unit 1: Cultivation of bacteria: Isolation of pure culture and its preservation. Cultural Media: Classification in detail.

Unit 2: Pure Culture: Maintenance & Preservation of pure cultures. Collection, transport processing & storage of clinical samples for Microbiological Analysis.

Unit 3: Growth and Nutrition of Bacteria: Typical growth curve, various phases of growth, physiology of bacteria-catabolism and anabolism, Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors. Vitamins, temperature, pH Osmotic pressure. Oxygen and Carbon Dioxide on microbial growth.

Unit 4: Introduction & scope of Immunology: Immunological principles, antigens, antibodies and antigen antibody reaction: Antigen and antigenic specificity antigenic determinate, general properties of antigens, immunoglobulin's, their structure and functions, Types of immunity and its determinants. Tissue involved in immune response. Structure and function of immune response.

Unit 5: Antimicrobial agents and antibiotic: Disinfectants, antiseptics, chemotherapeutic agents, chemotherapeutic index, development of chemotherapy, antibiotics and effect of antibiotics on protein, nucleic acid and cytoplasmic membrane. Future development of chemotherapy.

Text Books: Text Book of Microbiology by Dr. C P Baveja VIII Edition
TB7. Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat
Reference Books: Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Demonstrate the techniques for isolation, cultivation, and preservation of pure bacterial cultures, and classify various cultural media in detail.
CO2	Explain the methods for maintaining and preserving pure cultures, and outline the procedures for the collection, transport, processing, and storage of clinical samples for microbiological analysis.
CO3	Describe the growth and nutrition of bacteria.
CO4	Understand the basic principles of immunology.
CO5	Identify and evaluate the various antimicrobial agents and antibiotics
CO6	Integrate knowledge of mechanism of antibiotic action and associated factors.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	2	2	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-
CO6	1	-	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 2nd Semester

Course Name	Fundamentals Of Microbial Biology-II
Course Code	BMLT-206
Year/ Semester	IInd Semester

	L	T	P	C
	4		**1**	**5**

Course Contents **4hrs/Week**

Unit 1: Safety measures in Microbiology Laboratory: Occurrence of lab infections, route of infection in laboratory, safety measures precautions in use of Pathogens in teaching lab organization, management, recording of results and quality control in Medical Microbiology.

Unit 2: Instruments used in immunology: Electrophoresis, immunodiffusion, starplate, chromatography, ELISA reader, Transilluminator, Western Blotting, Immunofluorescence, automatic washer and RIA equipment etc.

Unit 3: Growth measurement techniques: Optical density, Colony counting, Dry weight measurement.

Unit 4: Clinical Microbiology Diagnostics: Blood culture systems, automated urine analysis, Molecular diagnostics in clinical microbiology, Point-of-care testing (POCT) devices.

Unit 5: Automated microbial identification systems and Advanced Instrumentation: MALDI-TOF, VITEK systems. Advanced imaging techniques: Atomic force microscopy (AFM), Super-resolution microscopy, High-throughput screening techniques.

Text Books: Text Book of Microbiology by Dr. C P Baveja Edition

TB8. Text Book of Microbiology

Apurba S Sastry & Sandhya Bhat

Reference Books:

RB9. Prescott's Microbiology

Joanne Willey ,Kathleen Sandman XI Edition

RB10. Essentials of Microbiology & Immunology

S K Mohanty & K Sai Leela & Dipti Pattanaik

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify and describe the functions of various instruments used in immunology.

CO2	Explain safety measures and precautions necessary in microbiology laboratories.
CO3	Apply growth measurement techniques.
CO4	Utilize clinical microbiology diagnostics.
CO5	Demonstrate the use of automated microbial identification systems.
CO6	Integrate knowledge of immunological instruments.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 2nd Semester

Course Name	Professional Ethics in Healthcare sector
Course Code	BMLT-207
Year/ Semester	IInd Semester

	L	T	P	C
	2			**2**

Course Contents **2 hrs/Week**

Unit 1: Introduction to Healthcare Ethics: Definition and importance of ethics in healthcare. Historical development of medical ethics. Key ethical theories and principles (e.g., autonomy, beneficence, non-maleficence, justice). Relationship between ethics, law, and professional standards.

Unit 2: Ethical Decision Making in Healthcare: Frameworks for ethical decision making. Informed consent and patient autonomy. Confidentiality and privacy. Case studies on ethical dilemmas and resolutions.

Unit 3: Professional Responsibility and Accountability: Roles and responsibilities of healthcare professionals. Codes of conduct and professional standards. Ethical issues in patient care. Reporting and managing medical errors.

Unit 4: Ethical Issues in Medical Research: Ethical principles in research involving human subjects. Informed consent in research. Institutional Review Boards (IRBs). Ethical issues in clinical trials.

Unit 5: Technology and Innovation in Healthcare Ethics: Ethical implications of medical technologies. Telemedicine and digital health ethics. Privacy and data protection in healthcare. Ethical considerations in genetic testing and biotechnology.

Text Books:

1. "Principles of Biomedical Ethics" by Tom L. Beauchamp and James F. Childress.2019. 8th Edition
2. Medical Ethics: Accounts of Ground-Breaking Cases" by Gregory Pence. 2020. 8th Edition

Reference Books:

a. "Clinical Ethics: A Practical Approach to Ethical Decisions in Clinical Medicine" by Albert R. Jonsen, Mark Siegler, and William J. Winslade.2020. 8th Edition.
b. "Ethical Issues in Modern Medicine: Contemporary Readings in Bioethics" by Bonnie Steinbock, Alex John London, and John Arras. 2012. 8th Edition.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Understand and explain the foundational concepts of healthcare ethics and their importance in clinical practice.
CO2	Apply ethical theories and principles to analyse and resolve ethical dilemmas in healthcare settings.
CO3	Demonstrate awareness of professional responsibilities, including adherence to codes of conduct and professional standards in healthcare.
CO4	Evaluate ethical issues related to end-of-life care and medical research, and propose ethical solutions.
CO5	Analyse the impact of cultural beliefs and global perspectives on healthcare ethics, and develop culturally competent strategies.
CO6	Assess ethical implications of emerging technologies and public health interventions, and formulate ethically sound practices.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 2nd Semester

Course code	**:** BMLT-P-208
Course Name	**:** Lab course based on CC 5 & CC 6
Semester/Year	**: 2nd Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

S. No	Practical
1.	Create diagrams or models to represent the central and peripheral nervous systems.
2.	Use microscopes to observe prepared slides of neurons and neuroglia, label and describe their parts and functions, create diagrams illustrating synapse formation and signal transmission.
3.	Identify major endocrine glands using anatomical models, discuss the types and functions of hormones produced by each gland, create flowcharts illustrating hormonal feedback mechanisms.
4.	Prepare and examine blood smears under a microscope to identify different blood cells, perform hematocrit and hemoglobin tests, discuss the functions of blood components.
5.	Use anatomical models and diagrams to study arteries, veins, and capillaries,
6.	Use anatomical models and dissections to examine the structures of the respiratory tract (nose, pharynx, larynx, trachea, bronchi, lungs), create diagrams illustrating respiratory anatomy.
7.	Measure respiratory volumes and capacities using spirometry,
8.	Use models to study urine formation and regulation of fluid and electrolyte balance.
9.	To perform Hemoglobin by Sahli's method.
10.	To perform Hemoglobin by CMG method.
11.	To perform Total RBC count.
12.	To perform total leucocyte count.
13.	To perform differential leucocyte count.

* Course Outcomes of the above practical is covered their respective theory course.

B.Sc Medical Lab Technology 2nd Semester

Course code	**:** BMLT-P-209
Course Name	**:** Lab course based on CC 7
Semester/Year	**: 2nd Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

S. No	Practical
1.	Identify the presence of abnormal sugars in urine.
2.	Detect abnormal proteins in urine.
3.	Measure metabolic by products in urine
4.	Create models of DNA and RNA molecules, extract DNA from biological samples.
5.	Demonstration of colorimeter
6.	To identify the type of carbohydrate in the given sample
7.	To identify between protein and amino acid.

* Course Outcomes of the above practical is covered their respective theory course

B.Sc Medical Lab Technology 3rd Semester

Course code	:	BMLT—301
Course Name	:	Seperative & Instrumentation Technique -I
Semester/Year	:	3rd Sem

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Chromatography: Thin layer chromatography, gas liquid chromatography.

Unit-2

Electrophoresis-Paper and gel electrophoresis for haemoglobin, urinary proteins, serum CSF & LDH.

Unit-3

Atomic absorption spectroscopy.

Unit-4

Immunochemical, Immunoprecipitation, Immunofixation and radial immunodiffusion test.

Unit-5

Osmometry: Principle, procedure and applications.

Text Books

Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.

Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi

Reference Books

Styrer. Biochemistry. 9th edition. MacMillan

Harper. Illustrated Biochemistry. 32nd Edition. McGraw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To highlights the basics of separative and instrumental techniques applied in clinical Biochemistry and medical lab technology.
CO2	To extend the knowledge on chromatographical techniques.
CO3	To articulate fundamental aspects of atomic absorption spectroscopy.
CO4	To explain the various immuno-techniques.
CO5	To evaluate the applications of osmometry.
CO6	To develop an understanding of immunodiffusion.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-

CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT—302
Course Name	**:** Metabolic & Blood Chemistry -I
Semester/Year	**:** 3rd Sem

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Carbohydrate metabolism, glycolysis, TCA, HMP Shunt pathway, gluconeogenesis and their clinical importance, glucose tolerance test (GTT).

Unit-2

Protein metabolism-urea cycle and its biomedical significance, transamination and deamination.

Unit-3

Lipid metabolism, Beta-oxidation of fatty acids, ketone bodies, metabolic changes in liver and adipose tissues during starvation, lipid profile..

Unit-4

Principle, assay procedures and clinical significance of following: Glucose, proteins, A.G, urea, BUN, uric acid, creatinine cholesterol, Bilirubin (Direct & Indirect)

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever. Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi..

Reference Books Styrer. Biochemistry. 9th edition. MacMillan
Harper. Illustrated Biochemistry. 32nd Edition. Mc Graw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To explain the functions of carbohydrate metabolism and its significance.
CO2	To extend the knowledge protein metabolism and its importance.
CO3	To understand lipid metabolism cascades.
CO4	To understand the assay and clinical significance of biological analytes
CO5	To analyze different metabolic disorders.
CO6	To discuss about the importance of GTT.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 3rd Semester

Course code	: BMLT—303
Course Name	: **Bacterial Pathogens & Associated Diseases-I**
Semester/Year	: **3rd Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Normal microflora of human body: Skin, Respiratory system and Genitourinary tracts.

Unit-2

Source of infection, mode of spread and portal of entry.

Unit-3

Description, Pathogenicity, mode of infection, incubation period and toxigenicity of: -

Staphylococous *Neisseria*
Streptococus *Bordetella*
Pneumococcus *Haemophilus*

Unit-4

Host Parasite interaction in bacterial infections.

1. Corynebacterium, Erysipelothrix, listeria
2. Mycobacteria
3. Atypical Mycobacteria

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition
Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.

Reference Books

Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To memorize the basic concepts of endocrinology.
CO2	To extend the knowledge on Hypothalamus and pituitary organs and their assessment.
CO3	To apply the concept of Thyroid anatomy and the diagnosis of various disorders.
CO4	To explain the concept of Adrenal gland and its assessment.

CO5	To evaluate the Gastrointestinal and pancreatic hormones and their role in disease diagnosis.
CO6	To develop an understanding hormone and its action.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT—304
Course Name	**: Lab Diagnosis of Bacterial Pathogens-I**
Semester/Year	**: 3rd Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

UNIT-1

The role of laboratory in the diagnosis and control of infection: Management and quality control of medical microbiology laboratory.

a) Specimen collection from patients, clinics and hospitals.

b) Specimen collection for epidemiological investigations.

c) Training of medical microbiologist to handle epidemics.

Unit-2

Morphology, Staining, Cultural Character of Bacteria. Selective cultural media, identification by special tests, biochemical reactions and sero-typing of:

a) Grams positive Cocci: - Cluster forming, chain forming and diplo cocci.

UNIT-3

a) Neisseria, Bordetella and haemophilus. Pathogenesis and Pathology of infections.

UNIT-4

Isolation of pure culture and its preservation. Morphology, Staining Cultural Character, Selective cultural media, identification by special tests, biochemical reactions and serotyping of: -

1. Corynebacterium

2. Mycobacterium 3. Atypical Mycobacterium

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition
Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.
Reference Books
Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To memorize the basic concepts of endocrinology.
CO2	To extend the knowledge on Hypothalamus and pituitary organs and their assessment.
CO3	To apply the concept of Thyroid anatomy and the diagnosis of various disorders.
CO4	To explain the concept of Adrenal gland and its assessment.
CO5	To evaluate the Gastrointestinal and pancreatic hormones and their role in disease diagnosis.
CO6	To develop an understanding hormone and its action.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	1	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	1	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	2	-	-	3
CO6	-	-	-	-	-		-	-	-	-	-	-

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT—305
Course Name	**: Hematology & Clinical Pathology-I**
Semester/Year	**: 3rd Sem**

	L	**T**	**P**	**C**
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Coagulation: Mechanism of coagulation, coagulation regulation hyper coagulable states, coagulation disorders.

Unit-2

Bleeding disorders: Various types, vascular abnormalities, role of platelets in haemostasis, Platelet disorders, thrombosis and thrombus haemorrhagic disorders.

Unit-3

Anaemias: Definition, various types of anaemia, causes of anaemia, changes in the blood morphology due to anaemia.

Unit-4

Leucocytosis, neutropenia & pancytopenia their causes & significance, Infectious mononucleosis.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition
Text Book of Pathology by Dr. A K Mandal

Reference Books

Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari
Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	On completion of the course, the students will be:
CO1	To describe the coagulation disorders with its mechanism.
CO2	To extend the knowledge on bleeding disorders.
CO3	To illustrate different types of anemias.
CO4	To compare the causes and significance of Leucocytosis and neutropenia.
CO5	To evaluate the pancytopenia.
CO6	To develop an understanding on Infectious mononucleosis.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT—306
Course Name	**: Histopathology & Cytology Techniques-I**
Semester/Year	**: 3rd Sem**

	L	**T**	**P**	**C**

	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1
Reception recording and labelling of histology specimens.

Unit-2
Fixation and various fixatives.

Unit-3
Processing of histological tissues for Paraffin embedding. Embedding and embedding media.

Unit-4
Decalcification – various methods.

Unit-5
Microtomes – various types their working principle and maintenance. Section cutting- faults and remedies. Microtome knives and knife sharpening.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition
Text Book of Pathology by Dr. A K Mandal

Reference Books
Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari
Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	On completion of the course, the students will be:
CO1	To identify the various histopathological steps in recording and labelling the specimens.
CO2	To extend the knowledge on fixation and its different types.
CO3	To illustrate the processing of histological tissues.
CO4	To compare the different decalcification methods.
CO5	To evaluate the importance of microtomes.
CO6	To develop an understanding on section cutting.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Note: Course Out comes of following practical is covered in their respective theory course

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT P-301
Course Name	**:** Lab course based on
Semester/Year	**: 3rd Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:	
1	Demonstration of Paper electrophoresis.
2.	Demonstration of Paper chromatography.
3.	To estimation of blood glucose by GOD-POD method
4.	To estimation of blood urea by urease method
5.	To estimation of serum creatinine by alkaline picrate method method

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT P-303
Course Name	**:** Lab course based on
Semester/Year	**: 3rd Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:	
1	Safety rules of working in microbiology lab.
2.	Isolation of bacterial pathogens from different clinical specimens.
3.	Identification of bacteria by Gram's Staining.
4.	Characterization of bacterial isolates using biochemical test.
5.	Isolation of bacterial isolates in pure form and it's preservation.

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 3rd Semester

Course code	**:** BMLT P-305
Course Name	**:** Lab course based on
Semester/Year	**: 3rd Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:	
1	Determination of PCV and ESR.
2.	Determination of red cell indices.
3.	Demonstration of microcytic hypochromic slide.
4.	To study of general blood picture.
5.	To perform differential leucocyte count.
6.	To perform PT and Calculate INR
7.	To perform APTT

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 4th Semester

Course code	**:**	**BMLT 401**
Course Name	**:**	**Seperative & Instrumentation Technique-II**
Semester/Year	**:**	**4th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Semi auto-analyser, diluters & dry chemistry analyser: Principle, Procedure and applications.

Unit-2

Principal Procedure and Application of Coulter counters.

Unit-3

Principal Procedure and Application of Enzyme Linked Immunosorbent Assay (ELISA) Reader.

Unit-4

Principal Procedure and Application of Radio-Immunoassay (RIA).

Unit-5

Principal Procedure and Application of Polymerase chain reaction (PCR).

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.

Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi

Reference Books

Styrer. Biochemistry. 9th edition. MacMillan

Harper. Illustrated Biochemistry. 32nd Edition. McGraw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To highlights the basics of semi auto-analyzers in clinical Biochemistry and medical lab technology.
CO2	To extend the knowledge on Coulter counters.
CO3	To articulate fundamental aspects of ELISA.
CO4	To explain the principle of RIA.
CO5	To evaluate the applications of PCR.
CO6	To develop an understanding of dry chemistry analysers.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	-	-	1	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 4th Semester

Course code	**:**	**BMLT 402**
Course Name	**:**	**Metabolic & Blood Chemistry-II**
Semester/Year	**:**	**4th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Electrolytes: Quantitative estimation of sodium, potassium, calcium, chloride, and their clinical significance.

Unit-2

Acid base balance test, insulin tolerance test.

Unit-3

Urea and creatinine clearance tests and their significance.

Unit-4

Renal function tests and their clinical interpretation.

Unit-5

Glycosylated Hb & Liver function tests. Principle technique and clinical significance.

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.

Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi..

Reference Books

Styrer. Biochemistry. 9th edition. MacMillan

Harper. Illustrated Biochemistry. 32nd Edition. Mc Graw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To explain the clinical significance of electrolytes.
CO2	To extend the knowledge acid base balance.
CO3	To understand urea and creatinine tests.
CO4	To understand the renal function tests and its significance.
CO5	To analyze the importance of glycosylated Hb & liver function tests.
CO6	To discuss about insulin tolerance test

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 4th Semester

Course code	**:**	**BMLT 403**
Course Name	**:**	**Bacterial Pathogens & Associated Diseases-II**
Semester/Year	**:**	**4th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Pathogenic properties of bacteria (colonization of surfaces, invasion of tissue, production of exo and indo toxins).

Unit-2

Anti-bacterial defence of the host. Description, Pathogenicity, mode of infection, incubation period and toxigenicity of:

1. *Corynebacterium,*
2. *Erysipelothrix,*
3. *listeria*
4. *Anthrax bacillus*
5. *Brucella*
6. *Yersenia, Pasteurella & francisella*

Unit-3

Physiology & Biochemistry of bacteria: Protein, Carbohydrate, lipids and nucleic acid as antigens.

Unit-4

Description, Pathogenicity, mode of infection, incubation period and toxigenicity of:

Salmonella . *Pseudomonas, Loeffleralla*
Shigella *Vibrio*
Proteus *Clostridia*

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition
Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.

Reference Books

Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To memorize the pathogenic properties of bacteria.
CO2	To extend the knowledge on host anti-bacterial defenses.
CO3	To apply the concept of Thyroid anatomy and the diagnosis of various disorders.
CO4	To explain the pathogenecity of various bacteria.
CO5	To evaluate the toxigenecity of different bacteria.

CO6	To develop an understanding on bacterial incubation period.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 4th Semester

Course code	**:**	**BMLT 404**
Course Name	**:**	**Lab Diagnosis of Bacterial Pathogens-II**
Semester/Year	**:**	**3rd Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Isolation of pure culture and its preservation.

Unit-2

Morphology, Staining Cultural Character, Selective cultural media, identification by special tests, biochemical reactions and serotyping of: -

1.Corynebacterium
2.Mycobacterium
3.Atypical Mycobacterium
4. Anthrax bacillus
5. Brucella
6. Yersenia and Pasteurella.

Pathogenesis and Pathology of infections caused by 2 (1 to 6)

Unit-3

Microbial drug sensitivity tests and its clinical interpretation: Morphology, Staining, Cultural Character, Selective cultural media, identification by special tests, biochemical reactions and serotyping of: -

1.Salmonella
2.Shigella
3.Proteus
4.Pseudomonas
5. Vibrio
6. Escherichia coli.
7. Clostridia

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition
Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.

Reference Books

Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To memorize the basic concepts of pure culture and its preservation.
CO2	To extend the knowledge on staining cultural characters of various bacteria.
CO3	To apply the concept of microbial drug sensitivity test and its interpretation.
CO4	To explain the concept of serotyping of different bacteria.
CO5	To evaluate the identificational properties of bacteria.
CO6	To develop an understanding pathogenesis of infection.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	-	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 4th Semester

Course code	**:**	**BMLT 405**
Course Name	**:**	**Hematology & Clinical Pathology-II**
Semester/Year	**:**	**4thSem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Haematological malignancies: Various types of malignancies such as leukaemia Lymphomas including multiple myeloma. Their identification & clinical features. Lab investigations in haematological malignancies.

Unit-2

Haematological Changes in systematic disorders. Their microscopic picture with identification and clinical features.

Unit-3

Haematological aspects of paediatric and Geriatric age groups. Haematological disorders in pregnancy and their blood picture. Haematological changes in AIDS.

Unit-4

Various parasites in blood and their clinical significance. Lab Investigations and methods of identification.

Unit-5

Organization, Planning and management of blood bank. Donor selection and its various aspects. Selection of blood and the guidelines for transfusion practice. Quality control and safety and basic management of blood bank.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition

Text Book of Pathology by Dr. A K Mandal

Reference Books

Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari

Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	**On completion of the course, the students will be:**
Course Outcomes:	**On completion of the course, the students will be:**
CO1	To describe the haematological malignancies and their clinical features.
CO2	To extend the knowledge on haematological changes in systematic disorders.
CO3	To illustrate different types of haematological changes in various pathlogical conditions.

CO4	To compare the parasites in blood.
CO5	To evaluate the blood bank working.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 4th Semester

Course code	**:**	**BMLT 406**
Course Name	**:**	**Histopathology & Cytology Techniques-II**
Semester/Year	**:**	**4th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Dye chemistry theory and practice of staining.

Unit-2

Routine Staining procedures H and E mounting and mounting media.

Unit-3

Solvents mordents aDSCelerators and aDSCentuators.

Unit-4

Uses of controls in various staining procedures.

Unit-5

Special staining procedures for Connective tissues Carbohydrates Amyloids and pigments Meta Chroma Sia and Meta chromatic dyes. Museum techniques.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition

Text Book of Pathology by Dr. A K Mandal

Reference Books

Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari

Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To understand dry chemistry theory.
CO2	To extend the knowledge on Staining procedures.
CO3	To illustrate the Solvents mordents.
CO4	To compare the different staining procedures for Connective tissues.
CO5	To evaluate the importance of museum techniques.
CO6	To develop an understanding on mounting.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Note: Course Out comes of following practical is covered in their respective theory course

B.Sc Medical Lab Technology 4th Semester

Course code	:	BMLT P-401P
Course Name	:	Lab course based on
Semester/Year	:	**4th Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:		
1	Demonstration of ELISA.	
2.	Demonstration of RIA.	
3.	Demonstration of PCR	
4.	Demonstration of autoanalyzer	
5.	Demonstration of immunodiffusion	
6.	Demonstration of ELISA.	
7.	To estimation of serum uric acid by uricase method	
8.	To estimation of serum total cholesterol by CHOD-POD method	

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 4th Semester

Course code	:	BMLT P-403P
Course Name	:	Lab course based on
Semester/Year	:	**4th Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:	
1	To perform drug susceptibility testing.
2.	To perform urine/ Pus culture.
3.	To perform motility Test by hanging drop method.
4.	Isolation of pathogens from hospital, Ward, Instrument, Hospital bed, patient wounds and cotton pads and their biochemical characterization.
5.	To perform acid fast staining

Note: Experiments are subject to availability of chemicals/instruments.

Course code	:	BMLT P-405P
Course Name	:	Lab course based on
Semester/Year	:	**3rd Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:		
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 and section cutting of tissue.	
7.	To perform hematoxylin and eosin staining.	

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 5th Semester

Course code	:	**BMLT 501**
Course Name	:	**Biostatistics & Quality control**
Semester/Year	:	**5th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Basic biostatistics for clinical quality control.

Unit-2

Standard deviation, standard error, coefficient of variation, normal distribution, t-test and chi-square test.

Unit-3

Establishment and maintenance of quality control for laboratory tests based upon medical usefulness.

Unit-4

Terminology of quality control and quality control charts.

Unit-5

Normal ranges of various bio-metabolites and their confidence limits. Automation: Handling of automatic analysers, organization and management of hospital laboratory.

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.

Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi

Reference Books

Styrer. Biochemistry. 9th edition. MacMillan

Harper. Illustrated Biochemistry. 32nd Edition. McGraw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To outline knowledge and concepts of biostatistics for evaluation.
CO2	To extend the knowledge on statistical methods.
CO3	To articulate fundamental aspects of quality control.
CO4	To explain the quality control terminology.
CO5	To evaluate the applications of automation.
CO6	To develop an understanding of automatic analysers.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-

CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 5th Semester

Course code	**: BMLT 502**
Course Name	**: Diagnostic Enzymology-I**
Semester/Year	**: 5th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Principles of enzyme activity determination. Units for expressing enzyme activity. Factors affecting enzyme activity. Mechanisms responsible for abnormal enzyme levels, Enzyme Inhibition, types of inhibitors of enzyme.

Unit-2

Isoenzymes –serum CPK, CK-MB, LDH, SGOT (AST), SGPT (ALT), cholinesterase, amylase, alpha amylase, lipase.

Unit-3

Alkaline and acid phosphatases.

Unit-4

Fructosamine test in semen.

Unit-5

Analysis of renal biliary and prostatic stones.

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.

Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi..

Reference Books

Styrer. Biochemistry. 9th edition. MacMillan

Harper. Illustrated Biochemistry. 32nd Edition. Mc Graw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
Course Outcomes:	**On completion of the course, the students will be:**
CO1	To highlight the basics of clinical techniques and tests applied in Clinical Biochemistry Lab.
CO2	To summarize fundamental aspects of enzymology, regulatory factors, and mechanism affecting enzyme activity.
CO3	To determine the clinical importance of Isoenzymes and interpretation.
CO4	To attribute the importance of advanced tests in clinical Lab like Fructosamine test in semen.
CO5	To analyze the importance of renal biliary and prostatic stones.

CO6	To discuss about Alkaline and acid phosphatases.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 5th Semester

Course code	**:**	**BMLT 503**
Course Name	**:**	**Pathegonic Viruses & Misc. Microbes-I**
Semester/Year	**:**	**5th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Misc. microbes: Actinomyces, Nocardia, Donovania, Treponema, Chlamydia, Rickettsia, Mycoplasma and pathogenic fungi. Pathogenesis, Pathology and lab diagnosis.

Unit-2

Pox-viruses: Smallpox, VaDSCinia, Molluscum contagiosum.

Herpes Virus: H Simplex, Chickenpox-Zoster, CMV, IMN and Burkitt's Lymphomas

Unit-3

Adenoviruses: Pharyngeal infections Respiratory infections and conjunctival infections.

Unit-4

Orthomyxoviruses (Influenza Types A, B, C, etc,): Influenza.

Paramyxovirus: Respiratory infections, mumps and measles.

Unit-5

Miscellaneous Viruses: Rubella, Corona viruses: Rubella common cold lymphocytic choriomeningitis.

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition

Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.

Reference Books

Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition

Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To memorize the pathogenic properties of bacteria.
CO2	To extend the knowledge on host anti-bacterial defenses.
CO3	To apply the concept of Thyroid anatomy and the diagnosis of various disorders.
CO4	To explain the pathogenecity of various bacteria.
CO5	To evaluate the toxigenecity of different bacteria.
CO6	To develop an understanding on bacterial incubation period.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-

CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 5th Semester

Course code	**:**	**BMLT 504**
Course Name	**:**	**Applied Microbiology & Advanced Tech.-I**
Semester/Year	**:**	**5th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Preparation of container and swabs for collections of specimens for microbial examinations.

Unit-2

Portal regulation and transport of specimen.

Flowchart of lab diagnostic procedures.

Unit-3

Documentation of specimen in laboratory.

Preservation of Micro-organisms: Periods subculture method, cold storage, freezing, deep freezing, lyophilization methods. Total and viable counts of bacteria.

Unit-4

Human parasitology: Protozoa, Rhizopoda and helminths.

Unit-5

Immunology and sero-diagnosis.

Prophylactic mass immunization

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition

Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.

Reference Books

Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition

Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To examine the microbial specimens, their collection technique and lab diagnostic procedures.
CO2	To describe the process of documentation and preservation of microorganisms.
CO3	To apply the preservation techniques of bacterial specimen.
CO4	To explain the concept of lyophilization.
CO5	To evaluate the human parasitology.
CO6	To develop an understanding immunization.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	-	-	1	-	-	-	2	-	-	-	-	-

CO3	1	-	1	-	-	-	-	-	-	1	2	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	2	-	3	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 5th Semester

Course code	:	**BMLT 505**
Course Name	:	**Immunopathology & Transfusion Medicine-I**
Semester/Year	:	**5th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Introduction and antigens.

Cells and organs of the immune system.

Unit-2

Immunoglobulin and antibodies.

Humoral & Cellular immune response.

Unit-3

Detection of various allergic agents and immunopathology of allergy.

Rheumatological diseases: Pathogenesis and Lab diagnosis.

Unit-4

Infection, inflammation and the immune system.

Cancer immunology & Tumour markers.

Unit-5

Tissue typing for kidney transplant & bone marrow transplant.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition

Text Book of Pathology by Dr. A K Mandal

Reference Books

Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari

Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To describe the cells and organs of immune system.
CO2	To extend the knowledge Immunoglobulins.
CO3	To illustrate different types of allergic agents.
CO4	To compare the infection and inflammation.
CO5	To evaluate the working of tissue typing.
CO6	To develop an understanding on antigens.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-

CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Co

B.Sc Medical Lab Technology 5th Semester

Course code	**:**	**BMLT 506**
Course Name	**:**	**Histopathology & Cytology-I**
Semester/Year	**:**	**5th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Types of tissue seen in histopathology i.e., Connective tissue, epithelial tissue, glandular, Begin malignant Tumour tissue, Bone tissue etc.

Unit-2

Handling of fresh histological specimen (Tissues) cryo/frozen sections of fresh and fixed tissues, freezing drying.

Unit-3

Lipids, identifications and demonstration.

Micro-organism in the tissue-various staining, techniques for their demonstration and identifications.

Unit-4

Nucleic acids DNA and RNA special stains and procedures.

Unit-5

Cytoplasmic constituents and their demonstration.

Tissues requiring special treatment i.e. eyeball B.M. biopsy, undecalcified bones.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition

Text Book of Pathology by Dr. A K Mandal

Reference Books

Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari

Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To understand tissue types in histopathology.
CO2	To extend the knowledge on handling of histological specimen.
CO3	To illustrate the staining methods.
CO4	To compare the different nucleic acid staining procedures.
CO5	To evaluate the importance of Cytoplasmic constituents.
CO6	To develop an understanding on Tissues requiring special treatment.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-

CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest

B.Sc Medical Lab Technology 6th Semester

Course Name	Microbial Genetics-I
Course Code	BMLT-507
Year/ Semester	5th Semester

	L	T	P	C
	2		**1**	**3**

Course Content

Unit 1**:** Introduction to Microbial Genetics**:** Overview of microbial genetics. Genetic organization in bacteria, archaea, and fungi. Plasmids, transposons, and integrons. Horizontal gene transfer (HGT) mechanisms.

Unit 2: DNA Replication, Mutation, and Repair**:** DNA replication. Types of mutations and mutagenic agents. DNA repair mechanisms (mismatch repair, excision repair, SOS response). Mutation detection and analysis techniques.

Unit 3: Genetic Recombination and Transfer: Mechanisms of genetic recombination (homologous and site-specific recombination). Transformation, transduction, and conjugation. Mapping bacterial genes by conjugation and transduction. CRISPR-Cas systems in bacteria and archaea.

Unit 4: Molecular Techniques in Microbial Genetics**:** Polymerase Chain Reaction (PCR) and its variants. DNA sequencing methods. Gene cloning and recombinant DNA technology. Use of reporter genes and gene knockouts in functional studies.

Unit 5: Mobile Genetic Elements and Genomics**:** Types and roles of mobile genetic elements. Mechanisms of transposition. Impact of mobile genetic elements on genome evolution. Comparative genomics and functional genomics.

Text Books:

1. Molecular Genetics of Bacteria by Larry Snyder and Wendy Champness.2013 4th Edition.
2. Microbial Genetics by Stanley R. Maloy, John E. Cronan, and David Freifelder.1994 2nd edition.
3. Brock Biology of Microorganisms by Michael T. Madigan, Kelly S. Bender, Daniel H..Buckley, W. Matthew Sattley, and David A. Stahl. 2017 15th edition.
4. Genetics: Analysis and Principles by Robert J. Brooker. 2017 6th Edition.
5. Fundamental Bacterial Genetics by Nancy Trun and Janine Trempy. 2003 Ist edition.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To understand the genetic organization of prokaryotes.
CO2	To explore the replication mechanisms in microorganisms.
CO3	To apply genetic tools and techniques for the study of microorganisms.
CO4	To analyse the role of genetic elements in microbial adaptation and evolution.
CO5	To understand the principles of comparative and functional genomics.
CO6	To study the role of mobile elements in microbial genetics.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	2	-	-
CO4	-	2	-	-	-	-	-	-	-	-	1	2
CO5	-	-	-	-	-	-	-	-	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	2	2	3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Note: Course Out comes of following practical is covered in their respective theory course

B.Sc Medical Lab Technology 5th Semester

Course code	:	BMLT P-501
Course Name	:	Lab course based on
Semester/Year	:	**5th Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:	
1	Demonstration of cortisol estimation
2.	Demonstration of growth hormone estimation
3.	Demonstration of CSF analysis
4.	Demonstration of 17-hydroxyprogesterone estimation
5.	Demonstration of ACTH estimation
6.	Demonstration of semi auto analyzer

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 5th Semester

Course code	:	BMLT P-503
Course Name	:	Lab course based on
Semester/Year	:	**5th Semester**

	L	T	P	C
	-	-	02	01

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:		
1	To perform widal test. a) Qualitative b) Quantitative	
2.	To perform HIV tri dot.	
3.	To perform dengue test.	

4.	To identify the parasites by permanent slides.	
5.	To prepare swabs for specimen collection.	

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 5th Semester

Course code	:	BMLT P-505P
Course Name	:	Lab course based on
Semester/Year	:	**5th Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:		
1	To perform coomb's test (Direct & Indirect).	
2.	To perform cross matching (Major & Minor).	
3.	To study weak D- antigen by given sample.	
4.	To study of general blood picture for hemolytic anemia.	
5.	To perform field stain for malaria parasite.	
6.	To study of LE cell	
7.	Grossing of tissue	
8.	To perform tissue processing and section cutting by manual method.	

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 6th Semester

Course code	**:**	**BMLT 601**
Course Name	**:**	**Endocrinology & Toxicology**
Semester/Year	**:**	**6th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:

Unit-1

Toxicology: Alcohol, heavy metals (Zinc, Hg etc.) salicylates, drug abuse, screening and drug interference with laboratory findings.

Unit-2

Endocrinology: Hormones, classification and their mechanism of action.

Unit-3

Estimation of growth hormone, ACTH and their clinical significance.

Unit-4

Estimation of sex hormone binding globulin, aldosterone, parathormone and their clinical significance.

Unit-5

Estimation of cortisol and 17 – hydroxyprogesterone and their clinical significance.

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.

Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi

Reference Books

Styrer. Biochemistry. 9th edition. MacMillan

Harper. Illustrated Biochemistry. 32nd Edition. McGraw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To outline knowledge and concepts of toxicology.

CO2	To extend the knowledge on hormones.
CO3	To articulate fundamental aspects of endocrinology.
CO4	To explain the clinical significance of hormones.
CO5	To evaluate the importance of drug abuse.
CO6	To develop an understanding of drug screening.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 6th Semester

Course code	**:**	**BMLT 602**
Course Name	**:**	**Diagnostic Enzymology-II**
Semester/Year	**:**	**6th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Unit-1
Tests for foetal well-being by amniotic fluid. Analysis for alpha-foetoprotein and their clinical significance.

Unit-2
Gastric analysis, free and total acidity, pentagastrin test, histamine and caffeine stimulation tests.

Unit-3
Thyroid function test: T3, T4, TSH, Free T3, Free T4, protein bound iodine (PBI) thyroglobulin and LATES.

Unit-4
Infertility profile: TSH, FSH, LH, testosterone, oestrogen, prolactin and DHEA sulphate.

Text Books Satyanarayan and Chakrapani, 2021. Text Book Of Biochemistry. 6 edition. Elsiever.
Vasudevan and Sree kumari, 1995. Text Book of Biochemistry for Medical Students. Edition 1, Jaypee Brothers, New Delhi..

Reference Books
Styrer. Biochemistry. 9th edition. MacMillan
Harper. Illustrated Biochemistry. 32nd Edition. Mc Graw Hill.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To highlight the basics of amniotic fluid analysis.
CO2	To summarize fundamental aspects of gastric analysis profile.
CO3	To determine the clinical importance of thyroid function tests.
CO4	To attribute the importance of alpha-foetoprotein analysis.
CO5	To analyze the importance of infertility profile.
CO6	To discuss about LATES.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-

CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlat

B.Sc Medical Lab Technology 6th Semester

Course code	**: BMLT 603**
Course Name	**: Pathogenic Viruses & Misc. Microbes-II**
Semester/Year	**: 6th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Unit-1
Picorna Viruses: Entero viruses poliomyelitis Aseptic meningitis and Epidemic Myalgia, Rhinoviruses-common cold.

Unit-2
Hepatitis Viruses: Infectious and Serum Hepatitis.

Unit-3
Arbo Viruses: Encephalitis Yellow fever, Dengue fever.
Rhabdo Viruses: Rabies

Unit-4
Slow and oncogenic Viruses: Scrapie Kuru and animal virus tumours.
Unit-5
Cell Culture and observation of effect of viruses on cell: Technique, procedure and interpretation of results.

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition
Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.
Reference Books
Prescott's Microbiology by Joanne Willey, Kathleen Sandman XI Edition
Essentials of Microbiology & amp; Immunology by S K Mohanty & K Sai Leela & Dipti Pattanaik

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To memorize the pathogenic properties of viruses.
CO2	To extend the knowledge on Hepatitis Viruses.
CO3	To relate the concept of Arbo and Rhabdo viruses.
CO4	To explain the pathogenecity of Slow and oncogenic Viruses.
CO5	To evaluate the cell culture techniques of different viruses.
CO6	To develop an understanding on viral effect on cell.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	-	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	1	1	-	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 6th Semester

Course code	**: BMLT 604**
Course Name	**: Applied Microbiology & Advanced Tech.-II**
Semester/Year	**: 6th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Unit-1
Nosocomial infection and sterility testing of I.V. fluids and processing of various samples for various hospital infections.

Unit-2
Pathology, Lab-diagnosis and control of common infections and infestations.

Unit-3
Cell, tissue and organ culture.
Specific serological methods of diagnosis.

Unit-4
Test for bacterial sensitivity to antimicrobial agents and their interpretation.
Specific culture and drug sensitivity methods.

Unit-5
Advanced diagnostic techniques in Medical Microbiology: Torch profile, mycodot, IgG, IgA, IgM and IgE testing, Australia Ag (HBsAg) etc.

Text Books Text Book of Microbiology by Dr. C P Baveja VIII Edition
Text Book of Microbiology by Apurba S Sastry & Sandhya Bhat.

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To examine the different viral infections.
CO2	To describe the process lab diagnosis.
CO3	To apply the techniques of cell culture.
CO4	To explain the concept of bacterial sensitivity towards antimicrobial agents.
CO5	To evaluate the advanced diagnostic techniques.
CO6	To develop an understanding on torch profile.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	2	2	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	1	-	1	-	-	-	-	-	-	-	1	-
CO4	1	1	-	-	-	-	-	-	-	2	-	1

CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	1	2	-	-

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

B.Sc Medical Lab Technology 6th Semester

Course code	**:**	**BMLT 605**
Course Name	**:**	**Immunopathology & Transfusion Medicine-II**
Semester/Year	**:**	**6th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Unit-1
Laboratory tests for demonstration of antigen-antibody reaction and cell mediated immunity.

Unit-2
Laboratory investigations in megaloblastic anaemias (Iron deficiency, megaloblastic, haemolytic).

Unit-3
Pathogenesis and laboratory investigation in Leukaemia's.

Unit-4
Laboratory investigation in coagulation disorder, bleeding disorder, disseminated intravascular coagulation (DIC), Platelet functions etc.

Unit-5
Cytogenetics in haematology.
Radioisotopes and their applications

Text Books Text Book of Pathology by Harsh Mohan VIII Edition
Text Book of Pathology by Dr. A K Mandal
Reference Books
Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari
Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To describe the laboratory tests for antigen-antibody reactions.
CO2	To extend the knowledge lab tests for anemias.
CO3	To illustrate different types of lab investigations for Leukemia.
CO4	To compare the coagulation and bleeding disorders.
CO5	To evaluate the principle of cytogenetics in hematology.
CO6	To develop an understanding on radioisotopes and their applications.

B.Sc Medical Lab Technology 6th Semester

Course code	**:**	**BMLT 606**
Course Name	**:**	**Histopathology & Cytology-II**
Semester/Year	**:**	**6th Sem**

	L	T	P	C
	2	**-**	**01**	**02**

L - Lecture T – Tutorial P – Practical C – Credit

Unit-1
Neuropathological techniques.
Enzyme histochemistry demonstration of phosphates, dehydrogenases, oxidase and peroxidases. etc.

Unit-2
Electron microscope, working principles, components and allied techniques for electron microscopy, ultra-microtomy.

Unit-3
Immunohistochemistry.
Cervical cytology-basis of detection of malignant and pre-malignant lesions.

Unit-4
Hormonal assessment with cytological techniques.
Demonstration of sex chromatin.

Unit-5
Cytoplasmic constituents and their demonstration.
Aspiration cytology principles indication and utility of the techniques with special emphasis on role of cytotechnician in FNAC clinics.

Text Books Text Book of Pathology by Harsh Mohan VIII Edition
Text Book of Pathology by Dr. A K Mandal

Reference Books
Clinical Pathology Haematology & Blood Banking IV Edition Nanda Maheshwari
Exam Oriented Pathology by K Mukhopadhyay

Course Outcomes:	**On completion of the course, the students will be:**
CO1	To understand enzyme histochemistry.
CO2	To extend the knowledge on working of electron microscope.
CO3	To illustrate the immunohistochemistry.
CO4	To compare the different hormonal assessment procedures.
CO5	To evaluate the importance of Cytoplasmic constituents.
CO6	To develop an understanding on aspiration cytology.

B.Sc Medical Lab Technology 6th Semester

Course Name	Microbial Genetics-II
Course Code	BMLT-607
Year/ Semester	6th Semester

	L	T	P	C
	4		**1**	**5**

Course Content

Unit 1: Microbial Genomics and Systems Biology**:** Structure and function of microbial genomes. Meta-genomics and its applications. Systems biology approaches in microbiology. Microbial gene networks and synthetic biology

Unit 2: Bacteriophage Genetics: Genetic Mapping of Phage Genomes. Recombination in Bacteriophages. Mutations and Phage Evolution.

Unit 3: Molecular Mechanisms of Bacteriophage Infection: Host Recognition and Attachment. DNA Injection Mechanisms. Host Manipulation and Phage Gene Expression.

Unit 4: Microbial genetics in antibiotic resistance. Genetic basis of pathogenicity and virulence factors.

Unit 5: Applications of Microbial Genetics**:** Genetic manipulation of microbes for industrial and medical applications. Microbial genetics in biotechnology: production of biofuels, bioremediation, and pharmaceuticals.

Text Books:

1. Molecular Genetics of Bacteria by Larry Snyder and Wendy Champness.2013 4th Edition.
2. Microbial Genetics by Stanley R. Maloy, John E. Cronan, and David Freifelder.1994 2nd edition.
3. Brock Biology of Microorganisms by Michael T. Madigan, Kelly S. Bender, Daniel H..Buckley, W. Matthew Sattley, and David A. Stahl. 2017 15th edition.
4. Genetics: Analysis and Principles by Robert J. Brooker. 2017 6th Edition.
5. Fundamental Bacterial Genetics by Nancy Trun and Janine Trempy. 2003 Ist edition.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	To understand the microbial genomics and system.
CO2	To explore the genetic mapping of bacteriophage.
CO3	To apply genetic tools and techniques for the study of bacteriophage.
CO4	To analyse the role of microbial genetics in antibiotic resistance.
CO5	To understand the application of microbial genetics.
CO6	To study the production of biofuels as product.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	2	-	-
CO4	-	2	-	-	-	-	-	-	-	-	1	2
CO5	-	-	-	-	-	-	-	-	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	2	2	3

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Note: Course Out comes of following practical is covered in their respective theory course

B.Sc Medical Lab Technology 6th Semester

Course code	:	BMLT P-601
Course Name	:	Lab course based on
Semester/Year	:	**6th Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:	
1	Estimation of serum Triglycerides by end point reaction enzymatic method
2.	To estimation of serum bilirubin by jendrassic and grof method
3.	To estimation of serum SGPT activity by (transaminases) by UV – kinetic method
4.	To estimation of serum SGOT activity by (transaminases) by UV – kinetic method
5.	To estimation of serum ALP activity by P - nitrophenyl phosphate (PNP) method
6.	To estimation of serum Total Protein by biuret method
7.	Estimation of serum Albumin by bromocresol green (BCG) method.

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 6th Semester

Course code	:	BMLT P-603
Course Name	:	Lab course based on
Semester/Year	:	**6th Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:		

1	To perform Drug Susceptibility testing.	
2.	To isolate actinomycetes on characteristic culture media.	
3.	To isolate pathogenic fungi on SDA.	
4.	To perform Drug Susceptibility testing using MIC assay.	
5.	To isolate and identify nosocomial pathogens from hospitals	

Note: Experiments are subject to availability of chemicals/instruments.

B.Sc Medical Lab Technology 6th Semester

Course code	**:** BMLT P-605
Course Name	**:** Lab course based on
Semester/Year	**: 6th Semester**

	L	T	P	C
	-	**-**	**02**	**01**

L - Lecture T – Tutorial P – Practical C – Credit

Course Content:		
1	To perform van gieson staining.	
2.	To perform gram's staining.	
3.	To perform hematoxylin and eosin staining.	
4.	To perform PAS staining.	
5.	To perform AFB staining.	
6.	To perform PAP staining.	
7.	To perform sudan staining.	
8.	To demonstrate FNAC technique.	

Note: Experiments are subject to availability of chemicals/instruments.

BMLT2nd Semester

Course Name	Lab Course Based on DSC 3&4
Course Code	BMLT-P-210
Year/ Semester	2nd Semester

	L	T	P	C
			02	01

L - Lecture T – Tutorial P – Practical C – Credit

Credit hours **2hrs/Week**

S.No	Practical
1.	Isolate and obtain pure cultures of bacteria.

2.	To preserve bacterial cultures using different techniques.
3.	Prepare and classify different types of cultural media: selective and differential media.
4.	Observe Growth pattern of bacterial cultures and recording of result.
5.	To perform Simple staining, Gram staining, Spore staining, Capsule staining to identify and differentiate bacterial species.
6.	To perform Antimicrobial susceptibility test.

* Course Outcomes of the above practical is covered their respective theory course.