MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)
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CHOICE BASED CREDIT SYSTEM

(CBCS)

(with effect from 2018-19 to 2022-23 Batches)

Curriculum for

B.Sc. Medical Laboratory Technology

Amended upto AC-46/2023, Dated 28/04/2023

Amended History

1. Approved as per BOM -52/2018 [Resolution No.3.10.1.], Dated 13/01/2018.
2. Approved as per BOM-53/2018 [Resolution No.4.4.2.], Dated 19/05/2018.
3. As Amended in BOM -53/2018 [Resolution No.4.5.1.], Dated 19/05/2018.
4. As Amended in BOM -55/2018 [Resolution No.4.13], Dated 27/11/2018.
5. As Amended in BOM -57/2019 [Resolution No.3.1.4.2], Dated 26/04/2019.
6. As Amended in BOM -59/2019 [Resolution No.3.2.3.8.], Dated 11/11/2019.
7. As Amended in BOM-63/2021 [Resolution No.4.3.1.2.], [Resolution No.4.3.1.3.] Dated 17/02/2021.
8. As Amended in AC-41/2021 [Resolution No. 3.5]; dated 27/08/2021.
9. As Amended In AC-42/2022 [Resolution No. 4.1], [Resolution No. 10.4.i & ii].
10. As Amended In AC - 46/2023 [Resolution No. 6.7]; Dated 28/04/2023.

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester I

Code No.	Core Subjects	Credits/Week				Hrs/Semester				Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Total hrs.	Internal Assessment	Semester Exam	Total
Theory												
BMLT 101 L	Human Anatomy Part I	3	-	-	**3**	45	-	-	**45**	20	80	**100**
BMLT 102 L	Human Physiology Part I	3	-	-	**3**	45	-	-	**45**	20	80	**100**
BMLT 103 L	General Biochemistry Nutrition	3	1	-	**4**	45	15	-	**60**	20	80	**100**
BMLT 104 L	Introduction to National Health Care System (Multidisciplinary/ Interdisciplinary)	3	-	-	**3**	45	-	-	**45**	20	80	**100**
Practical												
BMLT 101 P	Human Anatomy Part I	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 102 P	Human Physiology Part I	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 103 P	General Biochemistry	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 105 P	Community Orientation & Clinical Visit (Including related practicals to the Parent course)	-	-	8	-	-	-	120	**120**	-	-	-
Ability Enhancement Elective Course												
AEC 001 L	English & Communication skills	3	-	-	**3**	45	-	-	**45**	100	-	**100**
AEC 002 L	Envioronmental Sciences											
Total		**15**	**1**	**20**	**16**	**225**	**15**	**300**	**540**	**180**	**320**	**500**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester II

Code No.	Core Subjects	Credits/Week				Hrs/Semester				Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Total hrs.	Internal Assessment	Semester Exam	Total
Theory												
BMLT 106 L	Human Anatomy Part II	2	-	-	**2**	30	-	-	**30**	10	40	**50**
BMLT 107 L	Human Physiology Part II	2	-	-	**2**	30	-	-	**30**	10	40	**50**
BMLT 108 L	General Microbiology	3	-	-	**3**	45	-	-	**45**	20	80	**100**
BMLT 109 L	Basic Pathology & Hematology	3	1	-	**4**	45	15	-	**60**	20	80	**100**
BMLT 110 L	Introduction to Quality and Patient safety (Multidisciplinary/Interdisciplinary)	3	-	-	**3**	45	-	-	**45**	20	80	**100**
Practical												
BMLT 106 P	Human Anatomy Part II	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 107 P	Human Physiology Part II	-	-	2	-	-	-	30	**30**	-	-	-
BMLT 108 P	General Microbiology	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 109 P	Basic Pathology & Hematology	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 111 P	Community Orientation & Clinical Visit (Including related practicals to the parent course)	-	-	8	-	-	-	120	**120**	-	-	-
Skill Enhancement Elective Course												
SEC 001 L	Medical Bioethics & IPR	3	-	-	**3**	45	-	-	**45**	100	-	**100**
SEC 002 L	Human Rights & Professional Values											
Total		**16**	**1**	**22**	**17**	**240**	**15**	**330**	**585**	**180**	**320**	**500**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester III

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory														
BMLT 112 L	Fundamental of Biochemistry - I	2	-	-	-	**2**	30	-	-	-	**30**	20	80	**100**
BMLT 113 L	Fundamentals of Microbiology-I	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 114 L	Hematology and Clinical Pathology - I	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 115 CP	MLT Directed Clinical Education -I	-	-	-	30	**10**	-	-	-	450	**450**	50	-	**50**
Practical														
BMLT 112 P	Fundamental of Biochemistry - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 113 P	Fundamentals of Microbiology-I	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 114 P	Hematology and Clinical Pathology - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
Generic Elective Course														
GEC 001 L	Pursuit of Inner Self Excellence (POIS)	3	-	-	-	**3**	45	-	-	-	**45**	100	-	**100**
GEC 002 L	Organisational Behaviour													
Total		**9**	**2**	**6**	**30**	**24**	**135**	**30**	**90**	**450**	**705**	**240**	**360**	**600**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester IV

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory														
BMLT 116 L	Fundamental of Biochemistry - II	2	-	-	-	**2**	30	-	-	-	**30**	20	80	**100**
BMLT 117 L	Fundamentals of Microbiology-II	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 118 L	Hematology and Clinical Pathology - II	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 119 CP	MLT Directed Clinical Education -II	-	-	-	30	**10**	-	-	-	450	**450**	50	-	**50**
Practical														
BMLT 116 P	Fundamental of Biochemistry - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 117 P	Fundamentals of Microbiology-II	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 118 P	Hematology and Clinical Pathology - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
Ability Enhancement Elective Course														
AEC 003 L	Computer and Applications	3	-	-	-	**3**	45	-	-	-	**45**	100	-	**100**
AEC 004 L	Biostatistics and Research Methodology													
Total		**9**	**2**	**6**	**30**	**24**	**135**	**30**	**90**	**450**	**705**	**240**	**360**	**600**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester V

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing /Rotation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory														
BMLT 120 L	Clinical Biochemistry - I	2	-	-	-	**2**	30	-	-	-	**30**	20	80	**100**
BMLT 121 L	Medical Microbiology-I	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 122 L	Blood Bank and General Pathology - I	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 123 CP	MLT Directed Clinical Education-III	-	-	-	30	**10**	-	-	-	450	**450**	50	-	50
Practical														
BMLT 120 P	Clinical Biochemistry - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 121 P	Medical Microbiology-I	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 122 P	Blood Bank and General Pathology - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
Core Elective Course														
CEC 005 L	Basics of Clinical Skill Learning	3	-	-	-	**3**	45	-	-	-	**45**	100	-	**100**
CEC 006 L	Hospital Operation Management													
Total		**9**	**2**	**6**	**30**	**24**	**135**	**30**	**90**	**450**	**705**	**240**	**360**	**600**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester VI

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation	Total hrs.	Internal Assessment	Semester Exam	Total
Theory														
BMLT 124 L	Clinical Biochemistry - II	2	-	-	-	**2**	30	-	-	-	**30**	20	80	**100**
BMLT 125 L	Medical Microbiology-II	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 126 L	Blood Bank and General Pathology - II	2	1	-	-	**3**	30	15	-	-	**45**	20	80	**100**
BMLT 127 CP	MLT Directed Clinical Education -IV	-	-	-	30	**10**	-	-	-	450	**450**	50	-	**50**
Practical														
BMLT 124 P	Clinical Biochemistry - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 125 P	Medical Microbiology-II	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
BMLT 126 P	Blood Bank and General Pathology - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40	**50**
Total		**6**	**2**	**6**	**30**	**21**	**90**	**30**	**90**	**450**	**660**	**140**	**360**	**500**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology (Internship)

Semester VII & Semester VIII

Code No.	Core Subjects	Credits/Week				Hrs/Semester				
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation	Total hrs.
	Sem VII (Internship)	-	-	-	720	-	-	-	720	**720**
	Sem VIII (Internship)				720				720	**720**
Total		**0**	**0**	**0**	**1440**	**0**	**0**	**0**	**1440**	**1440**

B.Sc. Allied Health Sciences

DIRECTOR'S DESK

In 2007 the school of Biomedical Sciences was established with a mission of building up well qualified Allied Health Care professionals. The faculty set out to design an ideal biomedical graduate program which met the demands and expectations of the education system of our country. The college has been amending its perspective plan, which means extensive preparations for taking over the construction of the academic system including designing of courses, adopting the semester system over the existing pattern of annual system, continuous internal assessment and active industrial visits/Hospital Visits as the part of curriculum and implementing Credit base choice system to all the courses offered.

The School offers 7 UG Courses viz; B.Sc. Operation Theatre and Anaesthesia technology, Dialysis Technology, Medical Radiology &Imaging Technology, Medical Laboratory Technology, Perfusion Technology, Cardiac Care Technology and Optometry.

The college adopts the national qualification frame work for the degree programs in terms of duration and levels of studies. The curricula is updated to make our education comparable to and compatible and in accordance with those of others and also to facilitate the mobility of our graduates for further studies and for employment both within and outside the country. The programs designed are the perfect embodiment of the vision, mission and core values of the college and are designed in such a way that students are commensurate to face the global employment opportunities.

ABOUT MGM SCHOOL OF BIOMEDICAL SCIENCES

Mission

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of health sciences though meaningful and ethical research.

Vision

By the year 2020, MGM Institute of Health Sciences aims to be top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at an affordable cost. As a research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing diseases. In doing so, it will maintain the highest ethical standards.

About – School of Biomedical Sciences

MGM School of Biomedical Sciences is formed under the aegis of MGM IHS with the vision of offering basic Allied Science and Medical courses for students who aspire to pursue their career in the Allied Health Sciences, teaching as well as research.

School of Biomedical Sciences is dedicated to the providing the highest quality education in basic medical sciences by offering a dynamic study environment with well equipped labs. The school encompasses 21 courses each with its own distinct, specialized body of knowledge and skill. This includes 7 UG courses and 14 PG courses. The college at its growing years started with mere 100 students has recorded exponential growth and is now a full-fledged educational and research institution with the student strength reaching approximately 581 at present.

Our consistent theme throughout is to encourage students to become engaged, be active learners and to promote medical research so that ultimately they acquire knowledge, skills, and understanding so as to provide well qualified and trained professionals in Allied Health Sciences to improve the quality of life.

As there is increased need to deliver high quality, timely and easily accessible patient care system the collaborative efforts among physicians, nurses and allied health providers become ever more essential for an effective patient care. Thus the role of allied health professionals in ever-evolving medical system is very important in providing high-quality patient care.

Last but by no means least, School of Biomedical Sciences envisions to continuously grow and reform. Reformations are essential to any growing institution as it fulfills our bold aspirations of providing the best for the students, for us to serve long into the future and to get ourselves updated to changing and evolving trends in the health care systems.

Name of the Degree: B.Sc. Medical Laboratory Technology

Duration of Study: The duration of the study for B.Sc. Medical Laboratory Technology will be of 4 years (3 years Academics +1 year Internship).

Program pattern:

- First Semester: July
- Second Semester: January
- Third Semester: July
- Fourth Semester: January
- Fifth Semester-July
- Sixth Semester-January

Eligibility Criteria:

- He/she has passed the Higher Secondary (10+2) with Science (PCB) or equivalent examination recognized by any Indian University or a duly constituted Board with pass marks in Physics, Chemistry, and Biology.
- Minimum percentage of marks: 45% aggregate.

Medium of Instruction:

- English shall be the Medium of Instruction for all the Subjects of study and for examinations.

For any query visit the website: www.mgmsbsnm.edu.in

Preamble

India is one of the rising countries in providing medical and para medical facilities for the patients. core There are all most more than 200 medical colleges and equivalent paramedical institutions which have potential to provide skill training to millions of youth through their own facilities and/or by establishing extension centres in collaboration with government medical colleges (AIIMS, NIMHANS etc.,) and Research Centres (ICMR, DBT,BARC, NIRRH, etc.,) or Vocational Skill Knowledge providers, NGOs. The high quality of medical care we enjoy today is built upon years of effort by Physicians, Nurses, Physiotherapist, Research Scholars and other medical professionals investigating the causes of and potential treatments for disease. The tireless effort of countless medical professionals has made many life-threatening diseases and conditions a faded memory**.**

India faces an acute shortage of over 64 lakh skilled human resource in the health sector.Although occupational classifications vary across the globe, little has been done in India to estimate the need and to measure the competency of health care providers beyond the doctors and nurses. As Indian government aims for Universal Health Coverage, the lack of skilled human resource may prove to be the biggest impediment in its path to achieve targeted goals. The benefits of having AHPs in the healthcare system are still unexplored in India.

Allied and healthcare professionals (AHPs) includes individuals involved with the delivery of health or healthcare related services, with qualification and competence in therapeutic, diagnostic, curative, preventive and/or rehabilitative interventions. They work in multidisciplinary health teams in varied healthcare settings including doctors (physicians and specialist), nurses and public health officials to promote, protect, treat and/or manage a person('s) physical, mental, social, emotional, environmental health and holistic well-being.'

This prompted the Ministry of Health and Family Welfare to envisage the creation of national guidelines for education and career pathways of allied and healthcare professionals, with a structured curriculum based on skills and competencies which is competence enough to face the challenges. The curriculum represents a conscious and systematic selection of knowledge, skills and values: a selection that shapes the way teaching, learning and assessment processes are organized.

MGM School Of Bio-Medical Sciences (Declared Under Section 3 Of The UGC Act, 1956) Accredited By NAAC with "A" Grade, Kamothe, Navi Mumbai, MGM University Regulations on "Choice Based Credit System - 2017"

Our MGMSBS institute is established with the goal to achieve the same and to initiate the patient's care at the hospital for a high level of health and medical services, which are unusually complex, scientifically advanced, and costly in nature, to meet his special needs. Allied health professionals are very crucial part of evolving health care system as they support diagnosis, recovery, and quality of life. The scope of allied health professionals is profound as they provide direct patient care in virtually at every step. They provide critical care support in intensive care units, deliver scientific support in clinical laboratories, offer numerous rehabilitation services, manage and provide data critical to seamless patient care and diagnosis, operate sophisticated diagnostic equipment and contribute to broader public health outcomes.

In addition, the practice of the faculty is important to the community as teaching students are in the forefront of the knowledge of medical sciences and at MGMSBS.

MGMSBS is at par with any other MCI recognised medical colleges with the following available resources:

- Well equipped with physical facilities such as spacious and well furnished class rooms ,laboratories ,Skill centres ,Library and Hostels for enriching knowledge and to serve rural community and slums dwellers through this knowledge.
- We have qualified and trained faculty who can foster research in different discipline and well versed to scientifically formulate, implement and monitor community oriented programs and projects especially where the level of involvement in adoption of innovative and appropriate technologies involved.

Students of MGMSBS will be of tremendous help in making meaningful contribution to community and rural development. The involvement of allied health in implementing the Scheme of Community Development through Paramedics is need of the time.

The Chairman, University Grants Commission (UGC) has in his letter D.O.No.F.1- 1/2015 (CM) dated 8th January, 2015 has communicated the decision of the Ministry of Human Resources Development to implement Choice Based Credit System (CBCS) from the academic session 2015-2016 in all Indian Universities to enhance academic standards and quality in higher education through innovation and

improvements in curriculum, teaching learning process, examination and evaluation systems. UGC, subsequently, in its notification No.F.1-1/2015 (Sec.) dated 10/4/15 has provided a set of, Model curricula and syllabi for CBCS programmes under the Faculties of Arts, Humanities and Sciences providing the academic flexibility for Universities.

MGMSBS has taken the proactive lead in bringing about the academic reform of introducing CBCS for semester wise pattern for the B.Sc. Allied Health Science courses and MS.c Courses

CBCS – Definition and benefits: Choice Based Credit System is a flexible system of learning. The distinguishing features of CBCS are the following:

- It permits students to learn at their own pace.
- The electives are selected from a wide range of elective courses offered by the other University Departments.
- Undergo additional courses and acquire more than the required number of credits.
- Adopt an inter-disciplinary and intra-disciplinary approach in learning.
- Make best use of the available expertise of the faculty across the departments or disciplines
- Has an inbuilt evaluation system to assess the analytical and creativity skills of students in addition to the conventional domain knowledge assessment pattern.

Definitions of Key Words:

i. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.Choice Based Credit System (CBCS).

ii. The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).

iii. **Course**: Usually referred to, as “papers” is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ outreach activities/ project work/ viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.

iv. **Credit Based Semester System (CBSS):** Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students.

v. **Credit:** A unit by which the course work is interpreted. It functions the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

vi. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the sum total of the credit points obtained by the student in various courses in all semesters and the sum of the total credits of all courses in all the semesters.

vii. **Grade Point:** It is a numerical marking allotted to each letter grade on a 10-point scale.

viii. **Letter Grade:** It is an appreciated point of the student's performance in a selected course. Grades are denoted by letters O, A+, A, B, C and RA x. Programme: An educational programme leading to award of a Degree certificate.

ix. **Semester Grade Point Average (SGPA):** It is index of performance of all performance of work in a semester. Its total credit points obtained by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

x. **Semester:** Each semester will consist of minimum of 180 working days. The odd semester may be scheduled from June/ July to December and even semester from December/ January to June.

Semester System and Choice Based Credit System:

The semester system initiates the teaching-learning process and screws longitudinal and latitudinal mobility of students in learning. The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based

credit system provides a sun shone‟ type approach in which the students can take choice of courses, learn and adopt an interdisciplinary approach of learning.

Semesters:

An academic year consists of two semesters:

	UG	**PG**
Odd Semester 1st semester	July – December	July – December
Odd Semester 3rd, 5thsemesters	June – October/ November	
Even Semester 2nd, 4th, 6thsemesters	December –April	December - June

Credits:

Credit defines the coefficient of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/ tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20 week schedule:

a. ***1 credit*** **=** 1 hour of lecture per week
b. ***3 credits*** = 3 hours of instruction per week
   - ✓ Credits will be assigned on the basis of the lectures (L) / tutorials (T) / Clinical Training (CR) / laboratory work (P) / Research Project (RP) and other forms of learning in a 15-20 week schedule L - One credit for one hour lecture per week
c. **P/T -** One credit for every two hours of laboratory or practical
d. **CR -** One credit for every three hours of Clinical training/Clinical rotation/posting

e. **RP** - One credit for every two hours of Research Project per week – Max Credit 20- 25

	Lecture - L	**Tutorial - T**	**Practical - P**	**Clinical Training/ Rotation– CT/CR**	**Research Project– RP***
1 Credit	1 Hour	2 Hours	2 Hours	3 Hours	2 Hours
RP*	Maximum Credit 20 – 25 / Semester				

Types of Courses: Courses in a programme may be of three kinds:

- **Core Course**
- **Elective Course**

Core Course: A course, which should compulsorily be studied by a candidate as a basic requirement is termed as a Core course. There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a basic requirement to complete programme of respective study.

Elective Course: A course which can be chosen from a very specific or advanced the subject of study or which provides an extended scope or which enables an exposure to some other domain or expertise the candidates ability is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses offered by the main subject of study are referred to as Discipline Specific Elective. The University / Institute may also offer discipline related Elective courses of interdisciplinary nature. An elective may be "Discipline Specific Electives (DSE)" gazing on those courses which add intellectual efficiency to the students.

Dissertation / Project: An Elective/Core course designed to acquire special / advanced knowledge, such as supplement study / support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher / faculty member is called dissertation / project.

Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa and such electives may also be referred to as Generic Elective.

Assigning Credit Hours per Course: While there is flexibility for the departments in allocation of credits to various courses offered, the general formula would be:

All core course should be restricted to a maximum of 4 credits.

- All electives should be restricted to a maximum of 3 credits.
- All ability enhancement course should be restricted to a maximum of 2 credits.
- Projects should be restricted to a maximum of 20-25 credits.

Programme Outcome:

After completing this programme, learner will be able to:

- Evaluate the basic principles of haematology as it relates to red blood cell development, maturation and red blood cell normality of the disease states and associate correct laboratory values to the condition.
- List the requirements mandated by the occupational exposure to blood borne pathogens, hazard communication and other safety protocols applicable to the haematology laboratory.
- Explain the function of the parts of the microscope and operate according to proper microscope procedures and to correlate laboratory findings to common disease processes in immunology.
- To mandate the occupational exposure to blood borne pathogens, hazard communication and other safety protocols applicable to the immunology laboratory.
- To analyse the components that make up a valid quality assurance program in Clinical Chemistry.
- Manages and differentiates foundational knowledge of theory and principles related to laboratory medicine.
- To collaborate with the patient and other health care professionals in providing quality patient care.
- To formulate the relationships of basic physiology to disease processes to normal and abnormal laboratory result.
- Students are expected to have an understanding of and implement various advanced image processing algorithms and analyse their performance on datasets to make improvements.

Programme Specific Outcome:

- The course will promulgate the students into Medical Lab technologist, academic researchers, microscopic machinist, which could fabricate the Medical Lab specialists.

FIRST YEAR

B.Sc. Medical Laboratory Technology

SEMESTER-I

Code No.	Core Subjects
Theory	
BMLT101L	Human Anatomy Part I
BMLT 102 L	Human Physiology Part I
BMLT103 L	General Biochemistry &Nutrition
BMLT 104 L	Introduction to National HealthCare System (Multidisciplinary/ Interdisciplinary)
Practical	
BMLT 101 P	Human Anatomy Part I
BMLT 102 P	Human Physiology Part I
BMLT103 P	General Biochemistry
BMLT 105 P	Community Orientation & Clinical Visit (Including related practical to the parent course)
Ability Enhancement Elective Course	
AEC 001L	English &Communication Skills
AEC 002L	Environmental Sciences

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Human Anatomy- Part I**
Course Code	**BMLT 101 L**

Teaching Objective	• To introduce the students to the concepts related to General anatomy, Muscular, Respiratory, Circulatory, Digestive and Excretory system
Learning Outcomes	• Comprehend the normal disposition, interrelationships, gross, functional and applied anatomy of various structures in the human body. • Demonstrate and understand the basic anatomy of Respiratory and Circulatory system • Demonstrate and understand the basic anatomy of Digestive and Excretory system

Sr.No.	Topics	No. of Hrs.
1	**Introduction to Anatomy , Terminology, Cell and Cell division, Tissues of body, Skin**	5
2	**Skeletal System** - Classification of bones, Parts of developing long bone and its blood supply, JointsI- Classification of joints, Joints II- Synovial Joint, Appendicular skeleton I- Bones of upper Limb, Appendicular skeleton II- Bones of lower limb, Axial skeleton-I , Axial skeleton-II	8
3	**Muscular System** - Muscle I-Types, Muscle II- Muscle groups and movements, Muscles of Upper limb, Muscles of lower limb, Muscles of Neck, Muscles of back , Muscles of abdomen	7
4	**Joints** – Shoulder, Hip , Knee , Movements and muscle groups producing movements at other joints	4
5	**Respiratory System** - Introduction to Respiratory system, Larynx, Thoracic cage and diaphragm, Lung & Pleura , Trachea &Bronchopulmonary segments , Mediastinum	6
6	**Circulatory System** - Types of blood vessels, Heart& Pericardium, Coronary Circulation, Overview of mediastenum , Blood vessels of Thorax	5
7	**Digestive System** - GIT I- Pharynx, Oesophagus, GIT II-Stomach, GIT III- Small and Large Intestine, GIT IV-Liver &Gall Bladder, GIT V- Spleen, GIT VI-Pancreas , Salivary glands	7
8	**Excretory System** - Kidney, Ureter, Bladder, Urethra, Pelvis dynamic	3
Total		**45hrs**

BMLT 101 P - Human Anatomy Part I- (Demonstration)

Sr.No.	Topics	No of Hrs
1	**Introduction to Anatomy, Terminology, Cell and Cell division, Tissues of body, Skin**	60
2	**Skeletal System** - Classification of bones, Parts of developing long bone and its blood supply, JointsI- Classification of joints, Joints II- Synovial Joint, Appendicular skeleton I- Bones of upper Limb, Appendicular skeleton II- Bones of lower limb, Axial skeleton-I , Axial skeleton-II	
3	**Muscular System** - Muscle I-Types, Muscle II- Muscle groups and movements, Muscles of Upper limb, Muscles of lower limb, Muscles of Neck, Muscles of back , Muscles of abdomen	
4	**Joints** – Shoulder, Hip ,Knee , Movements and muscle groups producing , movements at other joints	
5	**Respiratory System** - Introduction to Respiratory system, Larynx, Thoracic cage and diaphragm, Lung & Pleura , Trachea &Bronchopulmonary segments , Mediastinum	
6	**Circulatory System** - Types of blood vessels, Heart& Pericardium, Coronary Circulation, Overview of mediastenum , Blood vessels of Thorax	
7	**Digestive System** - GIT I- Pharynx, Oesophagus, GIT II-Stomach, GIT III- Small and Large Intestine, GIT IV-Liver &Gall Bladder, GIT V- Spleen, GIT VI-Pancreas , Salivary glands	
8	**Excretory System** - Kidney, Ureter, Bladder, Urethra, Pelvis dynamic	
Total		**60 hrs**

Text Books :

1. Manipal Manual of Anatomy for Allied Health Sciences courses:Madhyastha S.
2. G.J. Tortora& N.P Anagnostakos: Principles of Anatomy and Physiology
3. B.D. Chaurasia: Handbook of General Anatomy

Reference books:

1. B.D. Chaurasia : Volume I-Upper limb & Thorax,
   Volume II- Lower limb, Abdomen & Pelvis
   Volume III- Head, Neck, Face
   Volume IV- Brain-Neuroanatomy
2. Vishram Singh: Textbook of Anatomy Upper limb & Thorax
   Textbook of Anatomy Abdomen & Lower limb
   Textbook of Head neck and Brain
3. Peter L. Williams And Roger Warwick:- Gray's Anatomy - Descriptive and Applied, 36th Ed; Churchill Livingstone.
4. T.S. Ranganathan : Text book of Human Anatomy
5. Inderbirsingh, G P Pal : Human Embryology
6. Textbook of Histology, A practical guide:- J.P Gunasegaran

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Human Physiology Part I**
Course Code	**BMLT 102 L**

Teaching objective	• To teach basic physiological concepts related to General physiology, Haematology, Nerve-Muscle physiology, Cardiovascular ,Digestive & Respiratory physiology
Learning outcomes	• To understand the basic physiological concepts of General physiology • To understand the basic physiological concepts of Hematology • To understand the basic physiological concepts of Nerve-Muscle physiology • To understand the basic physiological concepts of Respiratory physiology • To understand the basic physiological concepts of Cardiovascular physiology

Sr.No.	Topics	No. of Hrs.
1	**General Physiology-** Introduction to physiology, Homeostasis, Transport Across cell membrane	3
2	**Blood - Composition, properties and functions of Blood,** Haemopoesis , Haemogram (RBC, WBC, Platelet count, Hb Concentrations), Blood Groups - ABO and RH grouping, Coagulations & Anticoagulants, Anaemias: Causes, effects & treatment, Body Fluid: Compartments, Composition, Immunity – Lymphoid tissue	10
3	**Cardio vascular system -** Introduction, general organization, functions & importance of CVS , Structure of heart, properties of cardiac muscle, Junctional tissues of heart & their functions, Origin & spread of Cardiac Impulse, cardiac pacemaker, Cardiac cycle & E C G, Heart Rate & its regulation, Cardiac output,Blood Pressure definition & normal values, Physiological needs & variation, regulation of BP	10
4	**Digestive system -** General Introduction, organization, innervations & blood supply of Digestive system, Composition and functions of all Digestive juices,Movements of Digestive System (Intestine), Digestion & Absorption of Carbohydrate, Proteins & Fats	6
5	**Respiratory System -**Physiologic anatomy, functions of respiratory system, non respiratory functions of lung, Mechanism of respiration, Lung Volumes & capacities, Transport of Respiratory GasesO_2, Transport of Respiratory Gases CO_2, Regulation of Respiration.	10
6	**Muscle nerve physiology -** Structure of neuron & types, Structure of skeletal Muscle, sarcomere, Neuromuscular junction& Transmission. Excitation & contraction coupling (Mechanism of muscle contraction)	6
Total		**45 hrs**

BMLT 102 P - Human Physiology Part I (Demonstration)

Sr. No.	Topics	No. of Hrs.
1	Study of Microscope and its use, Collection of Blood and study of Haemocytometer	60
2	Haemoglobinometry	
3	White Blood Cell count	
4	Red Blood Cell count	
5	Determination of Blood Groups	
6	Leishman's staining and Differential WBC Count	
7	Determination of Bleeding Time, Determination of Clotting Time	
8	Pulse & Blood Pressure Recording, Auscultation for Heart Sounds	
9	Artificial Respiration –Demonstration, Spirometry-Demonstration	
Total		**60 hrs**

Textbooks

1. Basics of medical Physiology –D Venkatesh and H.H Sudhakar, 3rd edition.
2. Principles of Physiology – DevasisPramanik, 5th edition.
3. Human Physiology for BDS –Dr A.K. Jain, 5th edition.
4. Textbook of human Physiology for dental students-Indukhurana 2nd edition.
5. Essentials of medical Physiology for dental students –Sembulingum.

Reference books

1. Textbook of Medical Physiology, Guyton , 2nd South Asia Edition.
2. Textbook of Physiology Volume I & II (for MBBS) – Dr. A. K. Jain.
3. Comprehensive textbook of Medical Physiology Volume I & II – Dr. G. K. Pal.

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**General Biochemistry & Nutrition**
Course Code	**BMLT 103 L**

Teaching Objective	At the end of the course, the student demonstrates his knowledge and understanding on: • Structure, function and interrelationship of biomolecules and consequences of deviation from normal. • Integration of the various aspects of metabolism, and their regulatory pathways. • Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data. • to diagnose various nutritional deficiencies • Identify condition and plan for diet • Provide health education base on the client deficiencies
Learning Outcomes	• Define "biochemistry." • Identify the five classes of polymeric biomolecules and their monomeric building blocks. • Explain the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action. • Explain how the metabolism of glucose leads ultimately to the generation of large quantities of ATP. • Describe how fats and amino acids are metabolized, and explain how they can be used for fuel. • Describe the structure of DNA, and explain how it carries genetic information in its base sequence. • Describe DNA replication. • Describe RNA and protein synthesis. • Explain how protein synthesis can be controlled at the level of transcription and translation. • Summarize what is currently known about the biochemical basis of cancer.

Sr. No.	Topics	No. of Hrs.
1	Introduction and scope of biochemistry	1
2	**Chemistry of carbohydrates, proteins, lipids and nucleic acid–** **Chemistry of Carbohydrates**: Definition, Functions, Properties, Outline of classification with eg.(Definition of Monosaccharides, Disaccharides, Polysaccharides and their examples). **Chemistry of Proteins:**Amino acids (total number of amino acids, essential and non essential amino acids) .Definition, Classification of Proteins Structural orgnisation of protein, Denaturation of Proteins. **Chemistry of Lipids:** Definition, functions, Classification (Simple Lipids, Compound Lipids, Derived Lipids.) Essential Fatty Acids. **Chemistry of Nucleic acid**:Nucleosides and Nucleotides, Watson and Crick model of DNA, **RNA**- it's type along with functions	12
3	**Elementary knowledge of enzymes -** Classification, mechanism of enzyme action, Factors affecting activity of enzymes, enzyme specificity, Enzyme inhibition, Isoenzymes and their diagnostic importance.	8
4	**Biological oxidation** - Brief concept of biological oxidation: Definition of Oxidative phospoylation Electron transport chain. Inhibitors and Uncouplers briefly	5
5	**Metabolism of Carbohydrate**:Glycolysis, TCA cycle, Definition and significance of glycogenesis and glycogenolysis. Definition and significance of HMP shunt, definition and significance of gluconeogenesis. Regulation of blood Glucose level, Diabetes Mellitus, Glycosuria.Glucose Tolerance Test. **Metabolism of Proteins**: Transamination, Transmethylation reactions. Urea cycle, Functions of glycine, tyrosine, phenylalanine, tryptophan and Sulphur containing aminoacids. **Metabolism of Lipid:**Outline of beta oxidation with energetic, Ketone bodies (Enumerate) and its importance. Functions of cholesterol and its biomedical significance. Lipid profile and its diagnostic importance. Fatty liver, lipotropic factor, atherosclerosis. **Metabolism of Nucleic acid**:Purine catabolism (Formation of uric acid), Gout	14
6	**Vitamins and Minerals-** RDA, Sources, functions and deficiency manifestations of Fat soluble vitamins. RDA, sources, functions and deficiency manifestations of Water soluble vitamins. RDA, Sources, functions and deficiency manifestations of Calcium, Phosphorous, Iron, Iodine	5
7	**Principle and applications of :**Colorimeters, pH Meter	5
8	**Pre examination Skills -** Collection and preservation of samples (Anticoagulants), transportation & separation of biological specimens, Sample rejection criteria, Disposal of biological Waste materials.	5
9	**Nutrition:** History of Nutrition, Nutrition as a science, Food groups, RDA, Balanced diet, diet planning, Assessment of nutritional status, **Energy:** Units of energy, Measurements of energy and value of food, Energy expenditure, Total energy/calorie requirement for different age groups and diseases, Satiety value, Energy imbalance- obesity, starvation, Limitations of the daily food guide, Role of essential nutrients in the balanced diet	5
Total		**60 hrs**

BMLT 103 P – General Biochemistry (Demonstration)

Sr. No.	Topics	No. of Hrs
1	Introduction to Personnel protective equipments used in laboratory and their importance (LCD)	60
2	Handling of colorimeters – operation and maintenance (LCD)	
3	Serum electrolytes measurement (only demo)	
4	Demonstration of semi automated / fully automated blood analyser	
5	Demonstration of tests for carbohydrates (Monosacchrides, disaccharides and polysaccharides)	
6	Precipitation Reactions of protein (only demonstration)	
7	Test on bile salts (only demonstration)	
8	Tests on Normal constituents of Urin (only demo)	
9	Tests on Abnormal constituents of Urin (only demo)	
Total		**60 hrs**

Textbooks:

1. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by PrafulGhodkar
2. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by PrafulGhodkar
3. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
4.Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5.Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Essentials of Biochemistry, Second Edition, Dr.(Prof) Satyanarayana
7. Essentials of Biochemistry, 2nd Edition, Dr. PankajaNaik
8. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson &Walker

Reference books:

1. An Introduction to Chemistry, 8th Edition by Mark Bishop
2. Clinical Chemistry made easy, 1stEidtion by Hughes
3. Tietz Fundamentals of Clinical Chemistry , 7th Edition by Carl Burtis

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Introduction to National Health Care System (Multidisciplinary/Interdisciplinary)**
Course Code	**BMLT 104 L**

Teaching Objective	• To teach the measures of the health services and high-quality health care • To understand whether the health care delivery system is providing high-quality health care and whether quality is changing over time. • To provide to National Health Programme- Background objectives, action plan, targets, operations,in various National Heath Programme. • To introduce the AYUSH System of medicines.
Learning Outcomes	• The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world.

Sr. No.	Topics	No. of Hrs.
1	**Introduction to healthcare delivery system -** Healthcare delivery system in India at primary, secondary and tertiary car; Community participation in healthcare delivery system; Health system in developed countries; Private / Govt Sector; National Health Mission; National Health Policy; Issues in Health Care Delivery System in India	10
2	**National Health Programme-** Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.	8
3	**Introduction to AYUSH system of medicine -** Introduction to Ayurveda; Yoga and Naturopathy; Unani; Siddha; Homeopathy; Need for integration of various system of medicine	8
4	**Health Scenario of India-** past, present and future	4
5	**Demography & Vital Statistics-** Demography – its concept; Census & its impact on health policy	5
6	**Epidemiology -** Principles of Epidemiology; Natural History of disease; Methods of Epidemiological studies; Epidemiology of communicable & non-communicable diseases, disease, transmission, host defense immunizing agents, cold chain, immunization, disease, monitoring and surveillance.	10
Total		**45 hrs**

Books:

1. National Health Programs Of India National Policies and Legislations Related to Health: 1 J. Kishore (Author)
2. A Dictionary of Public Health Paperback by J Kishor
3. Health System in India: Crisis & Alternatives , National Coordination Committee, Jan Swasthya Abhiyan
4. In search In Search of the Perfect Health System
5. Central Bureau of Health Intelligence (1998). Health Information of India, Ministry of Health and Family Welfare, New Delhi.
6. Goyal R. C. (1993). Handbook of Hospital Personal Management, Prentice Hall of India, New Delhi, 17–41. Ministry of Health and Family Welfare (1984). National Health Policy, Annual Report (1983–4), Government of India, New Delhi
7. Historical Development of Health Care in India, Dr. Syed Amin Tabish,
8. cultural Competence in Health Care by Wen-Shing Tseng (Author), Jon Streltzer (Author)
9. Do We Care: India's Health System by K. Sujatha Rao (Author)

BMLT 105 P - Community Orientation &Clinical Visit (including related practical's to the parent course) (Total -120 hrs.)

ABILITY ENHANCEMENT ELECTIVE COURSE

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**English and Communication Skills**
Course Code	**AEC 001 L**

Teaching Objective	• This course deals with essential functional English aspects of the of communication skills essential for the health care professionals. • To train the students in oral presentations, expository writing, logical organization and Structural support.
Learning Outcomes	• Able to express better. • Grow personally and professionally and Developconfidence in every field

Sr. No.	Topics	No. of Hrs.
1	**Basics of Grammar** - Vocabulary, Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words	6
2	**Basics of Grammar – Part II** - Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms	6
3	**Writing Skills** - Letter Writing, Email, Essay, Articles, Memos, one word substitutes, note making and Comprehension	3
4	Writing and Reading, Summary writing, Creative writing, news paper reading	3
5	Practical Exercise, Formal speech, Phonetics, semantics and pronunciation	5
6	**Introduction** to communication skills - Communication process, Elements of communication, Barriers of communication and how to overcome them, Nuances for communicating with patients and their attenders in hospitals	6
7	**Speaking** - Importance of speaking efficiently, Voice culture, Preparation of speech. Secrets of good delivery, Audience psychology, handling , Presentation skills, Individual feedback for each student, Conference/Interview technique	4
8	**Listening** - Importance of listening , Self assessment, Action plan execution, Barriers in listening, Good and persuasive listening	4
9	**Reading** - What is efficient and fast reading , Awareness of existing reading habits, Tested techniques for improving speed, Improving concentration and comprehension through systematic study	4
10	**Non Verbal Communication** - Basics of non-verbal communication, Rapport building skills using neuro- linguistic programming (NLP), Communication in Optometry practice	4
Total		**45 hrs**

Text books:

1. Graham Lock, Functional English Grammar: Introduction to second Language Teachers.Cambridge
   University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts,practice and evidence,
   Jones & Bartlett Publications, USA, 2009

Name of the Programme	**B B.Sc. Medical Laboratory Technology**
Name of the Course	**Environmental Sciences**
Course Code	**AEC 002 L**

Teaching Objective	• To understand and define terminology commonly used in environmental science • To teach students to list common and adverse human impacts on biotic communities, soil, water, and air Quality. • To understand the processes that govern the interactions of organisms with the biotic and abiotic. • Understand the relationship between people and the environment; Differentiate between key ecological terms and concepts
Learning Outcomes	• Current environmental issues and highlight the importance of adopting an interdisciplinary approach. • Sample an ecosystem to determine population density and distribution. • Create food webs and analyse possible disruption of feeding relationships.

Sr. No.	Topics	No. of Hrs.
1	**Components of Environment** – Hydrosphere, lithosphere, atmosphere and biosphere – definitions with examples; Interaction of man and environment;	4
2	**Ecosystem** : Basic concepts, components of ecosystem, Tropic levels, food chains and food webs, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, Characteristics of terrestrial fresh water and marine ecosystems,	5
3	**Global Environmental Problems** – Green House Effect, Acid rain, El Nino, Ozone depletion, deforestation, desertification, salination, biodiversity loss; chemical and radiation hazards.	4
4	**Environmental pollution and degradation** – Pollution of air, water and land with reference to their causes, nature of pollutions, impact and control strategies; perspectives of pollution in urban, industrial and rural areas. Habitat Pollution by Chlorinated Hydrocarbons (DDT, PCBs, Dioxin etc, Endocrine disrupting chemicals, Nutrient pollution.	8
5	**Environmental Management** – Concept of health and sanitation, environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases, health hazards due to pesticide and metal pollution, waste treatment, solid waste management, environmental standards and quality monitoring.	6
6	**Environmental Protection Act** – Environmental Laws, national movements, environmental ethics – holistic approach of environmental protection and conservation, IUCN – role in environmental protection. Concept with reference to UN – declaration, aim and objectives of human right policies with reference to India, recent north-south debate on the priorities of implementation, Environmental Protection Agency (EPA)	10
7	**Bioremediation** – Oil spills, Wastewater treatment, chemical degradation, heavy Metals.	8
Total		**45 hrs**

Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
20. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press

FIRST YEAR

B.Sc. Medical Laboratory Technology

SEMESTER- II

Code No.	Core Subjects
Theory	
BMLT 106 L	Human Anatomy Part II
BMLT 107 L	Human Physiology Part II
BMLT 108 L	General Microbiology
BMLT 109 L	Basic Pathology & Hematology
BMLT 110 L	Introduction to Quality and Patient safety
	(Multidisciplinary/Interdisciplinary)
Practical	
BMLT 106 P	Human Anatomy Part II
BMLT 107 P	Human Physiology Part II
BMLT108 P	General Microbiology
BMLT 109 P	Basic Pathology & Hematology
BMLT 111 P	Community Orientation & Clinical Visit (Including related practical's to the parent course)
Skill Enhancement Elective Course	
SEC 001L	Medical Bioethics & IPR
SEC 002L	Human Rights & Professional Values

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Human Anatomy- Part II**
Course Code	**BMLT 106 L**

Teaching Objective	• To teach the students the basic anatomy of Reproductive , Lymphatic Endocrine ,Nervous system and Special senses
Learning Outcomes	• Demonstrate and understand the basic anatomy of Reproductive and Lymphatic system. • Demonstrate and understand the basic anatomy of Endocrine,Nervous system • Demonstrate and understand the basic anatomy of Special senses

Sr. No.	Topics	No. of Hrs.
1	**Reproductive system -** Male- Testis, Spermatic Cord, Female- Ovaries & Fallopian tube, Uterus	6
2	**Lymphatic system -** Lymphoid Organs, Lymph node groups- Cervical, Axillary, Inguinal	5
3	**Endocrine system -** Thyroid, Parathyroid, Adrenal, Pitutary	4
4	**Nervous system -** Introduction to nervous system(Neuron, ANS, PNS) Meninges, Cerebrum I, Cerebrum II, Cerebellum, Blood supply of Brain, Brain stem, Spinal cord, Cranial and peripheral nerves, CSF & Ventricles	12
5	**Sensory system -** Eye (Gross anatomy), Ear	3
Total		**30 hrs**

BMLT 106 P - Human Anatomy Part II (Demonstration)

Sr. No.	Topics	No. of Hrs.
1	**Reproductive system -** Male- Testis, Spermatic Cord, Female- Ovaries & Fallopian tube, Uterus	60
2	**Lymphatic system -** Lymphoid Organs, Lymph node groups- Cervical, Axillary, Inguinal	
3	**Endocrine system -** Thyroid, Parathyroid, Adrenal, Pitutary	
4	**Nervous system -** Introduction to nervous system(Neuron, ANS, PNS) Meninges, Cerebrum I, Cerebrum II, Cerebellum, Blood supply of Brain ,Brain stem, Spinal cord, Cranial and peripheral nerves, CSF & Ventricles	
5	**Sensory system -** Eye (Gross anatomy), Ear	
Total		**60 hrs**

Textbooks:

1. Manipal Manual of Anatomy for Allied Health Sciences courses:Madhyastha S.
2. G.J. Tortora& N.P Anagnostakos: Principles of Anatomy and Physiology
3. B.D. Chaurasia: Handbook of General Anatomy

Reference books:

1. B.D. Chaurasia : Volume I-Upper limb & Thorax,
   Volume II- Lower limb, Abdomen & Pelvis
   Volume III- Head, Neck, Face
   Volume IV- Brain-Neuroanatomy
2. Vishram Singh: Textbook of Anatomy Upper limb & Thorax
   Textbook of Anatomy Abdomen & Lower limb
   Textbook of Head neck and Brain
3. Peter L. Williams And Roger Warwick:- Gray's Anatomy - Descriptive and Applied, 36th Ed; Churchill Livingstone.
4. T.S. Ranganathan : Text book of Human Anatomy
5. Inderbirsingh, G P Pal : Human Embryology
6. Textbook of Histology, A practical guide:- J.P Gunasegaran

Name of the Programme	B.Sc. Medical Laboratory Technology
Name of the Course	Human Physiology Part II
Course Code	BMLT 107 L

Teaching Objective	• To teach basic physiological concepts related to Renal physiology, Endocrinology& Reproductive physiology, CNS, Special senses
Learning Outcomes	• To understand the basic physiological concepts of Renal physiology • To understand the basic physiological concepts of Endocrinology & Reproductive physiology • To understand the basic physiological concepts of CNS, Special senses

Sr. No.	Topics	No. of Hrs.
1	**Nervous system** -Functions of Nervous system , Neuron – Conduction of Impulses, factors affecting, Synapse- transmission, Receptors, Reflexes Ascending tracts, Descending tracts, Functions of various parts of the Brain.Cerebro-Spinal Fluid (CSF): Composition, functions & Circulation, Lumbar Puncture, Autonomic Nervous System (ANS): Functions.	10
2	**Special senses-** Vision: Structure of Eye, functions of different parts, Refractive errors of Eye and correction, Visual Pathway, Colour vision & tests for colour Blindness, Hearing: Structure and function of ear, Mechanism of Hearing, Tests for Hearing (Deafness)	6
3	**Skin -** Structure and function, Body temperature,Regulation of Temperature & fever.	4
4	**Endocrine System -** Short description of various endocrine glands and their functions	2
5	**Reproductive systems -** Structure & Functions of Reproductive system, Male Reproductive System: spermatogenesis, Testosterone, Female reproductive system: Ovulation, Menstrual cycle, Oogenesis, Tests for Ovulation, Oestrogen & Progesterone , Pregnancy test, Parturition. Contraceptives, Lactation: Composition of Milk, advantages of breast Feeding.	4
6	**Excretory System** General Introduction, structure & functions of kidney, Renal circulation, Glomerular filtration & tubular reabsorption, Nephron, Juxta Glomerular Apparatus,Mechanism of Urine formation, Micturition, Cystomatrogram.Diuretics, Artificial Kidney.	4
Total		**30 hrs**

BMLT 107 P - Human Physiology Part II –(Demonstration)

Sr. No.	Topics	No. of Hrs.
1	Recording of body temperature	30
2	Examination of sensory system	
3	Examination of motor system	
4	Examination of Eye	
5	Examination of ear	
Total		**30 hrs**

Textbooks:

1. Basics of medical Physiology –D Venkatesh and H.H Sudhakar, 3rd edition.
2. Principles of Physiology – DevasisPramanik, 5th edition.
3. Human Physiology for BDS –Dr A.K. Jain, 5th edition.
4. Textbook of human Physiology for dental students-Indukhurana 2nd edition.
5. Essentials of medical Physiology for dental students –Sembulingum.

Reference books:

1. Textbook of Medical Physiology, Guyton , 2nd South Asia Edition.
2. Textbook of Physiology Volume I & II (for MBBS) – Dr. A. K. Jain.
3. Comprehensive textbook of Medical Physiology Volume I & II – Dr. G. K. Pal.

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**General Microbiology**
Course Code	**BMLT 108 L**

Teaching Objective	• To introduce basic principles and then applies clinical relevance in four segments of the academic preparation for paramedical: immunology, bacteriology, mycology, and virology. This rigorous course includes many etiological agents responsible for global infectious diseases.
Learning Outcomes	• Upon completion, students should be able to demonstrate knowledge of microorganisms and the disease process as well as aseptic and sterile techniques. • Perform microbiological laboratory procedures according to appropriate safety standards

Sr. No.	Topics	No. of Hrs.
1	**Concepts and Principles of Microbiology -** Historical Perspective, Koch's Postulates, Importance of Microbiology, Microscopy, Classification of Microbes.	4
2	**General Characters of Microbes -** Morphology, staining methods, Bacterial growth & nutrition, Culture media and culture methods +ABS, Collection of specimen, transport and processing, Antimicrobial mechanism and action, Drug Resistance minimization.	6
3	**Sterilization and Disinfection -** Concept of sterilization, Disinfection asepsis,Physical methods of Sterilization, Chemical methods (Disinfection), OT Sterlization, Biological waste and Biosafety & Biohazard.	5
4	**Infection and Infection Control -** Infection, Sources, portal of entry and exit, Standard (Universal) safety Precautions & hand hygiene, Hospital acquired infections & Hospital Infection Control	3
5	**Immunity -** Types Classification, Antigen, Antibody – Definition and types, Ag-Ab reactions – Types and examples, Procedure of Investigation & Confidentiality, Immunoprophylaris – Types of vaccines, cold chain, Immunization Schedule.	6
6	**Systemic Bacteriology (Morphology, diseases caused, specimen collection & lists of laboratory tests) –** Introduction, Gram Positive Cocci & Gram Negative Cocci, Enterobacteraecea & Gram negative bacilli, Mycobacteria, Anaerobic bacteria & Spirochaetes, Zoonotic diseases, Common Bacterial infections of eye.	7
7	**Mycology -** Introduction, Classification, outline of lab diagnosis, List of Fungi causing:Common fungal infections of eyes, Superficial Mycoses, Deep mycoses & opportunistic , Fungi.	3
8	**Virology -** Common Viral infection of eye, Introduction, General Properties, outline of lab diagnosis& Classification, HIV Virus, Hepatitis -B Virus.	4
9	**Parasitology** – Morphology, Life Cycle & Outline of Lab Diagnosis & Classification, Common parasite infection of eye, Protozoa- E, histolytica,Malarial Parasite, General properties, classification, list of diseases caused by:Cestodes and Trematodes, Intestinal Nematodes& Tissue Nematodes, Vectors.	7
Total		**45 hrs**

BMLT 108 P - General Microbiology (Demonstration)

Sr. No.	Topics	No. of Hrs.
1	Concepts and Principles of Microbiology	60
2	General Characters of Microbes	
3	Sterilization and Disinfection	
4	Infection and Infection Control	
5	Immunity	
6	Systemic Bacteriology (Morphology, diseases caused, specimen collection & lists of laboratory test)	
7	Mycology	
8	Virology	
9	Parasitology	
Total		**60 hrs**

Text Book:

1. Text Book of Microbiology for Nursing Students, AnantNarayan Panikar
2. Text Book of Ophthalmology, Khurana

Reference Book:

1. Text Book of Microbiology, Baveja.

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Basic Pathology & Hematology**
Course Code	**BMLT 109 L**

Teaching Objective	• Understand the importance of clinical information in supporting a timely, accurate pathological diagnosis. • Describe normal and disordered hematopoiesis • Develop implement and monitor a personal continuing education strategy and critically appraise sources of pathology related medical information.• Describe mechanisms of oncogenesis&demonstrate an understanding of genetics and cytogenetics pertaining to hematology
Learning Outcomes	• The student should submit the appropriate tissue sections per protocol to demonstrate the lesion and other clinically-relevant information needed for the final pathologic report • To aid hematology in the reference ranges for hemoglobin, hematocrit, erythrocytes, and leukocytes in infants, children and adult.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Pathology	1
2	Working and maintenance of instruments	2
3	General principles of Haematology techniques, blood collection, anticoagulants, fixation, processing, routine staining, Haemoglobin, TLC, DLC, Peripheral smear (CBC report), platelet counts, cell counter working	10
4	Generalprinciplesof Histopathologytechniques collection, fixation, processing & routine staining	3
5	General principles of Cytopathology techniques collection, fixation, processing & routine staining	5
6	General principles of Clinical Pathology techniques samplecollection, processingforroutine test, normal urine & urine examination, urine strip, introductions to body fluids (Distinguish between Transudate and exudate)	10
7	Generalprinciplesof Blood Bank techniques antigen, antibody, ABO & Rh system	5
8	General principles of Autopsy & Museum	4
9	**GeneralPathologyincludingintroductionto :** I)Cell Injury (Reversible, Irreversible cell injury) II)Inflammation(Acute inflammation, cells, Chronic inflammation, granuloma and examples III)Circulatorydisturbances(Thrombosis, Embolism ,Edema- ascetic, pleural, pericardial- effusions, Shock, Allergy, Anaphylaxis-Definition, Morphological features, And distinguishing features) IV)Neoplasia (Definition of Anaplasia, dysplasia, metaplasia and metastasis and difference between benign and malignant lesions)	8

10	**Systemicpathologybasis andmorphologyof common disorders like** I)Anemia(types-Iron deficiency, megaloblastic, Aplastic-Etiology, Pathogenesis Investigation)- II)Leukemia (Acute and chronic, Peripheral smear), AIDS(Definition, Pathogenesis, Mode of transmission, Two Confirmatory test Tridot, Western blot), Hepatitis (Types, Etiology, Mode of spread) III)Malaria-(Mode of spread IV)Tuberculosis-(Primary and secondary tb, Granuloma formation, Mode of transmission, Organs involved	8
11	Maintenance and medicolegal importance of records and specimens, Lab information system(LIMS)	3
12	Biomedical Waste, Universal Safety Precaution(Protocol to be followed after -Needle injury, chemical injury	1
Total		**60 hrs**

BMLT 109 P – Basic Pathology & Hematology (Demonstration)

Sr. No.	Topics	No. of Hrs.
1	Working and maintenance of instruments,	60
2	General principles of Haematology techniques, blood collection, anticoagulants, fixation, processing, routine staining, Haemoglobin, TLC, DLC, Peripheral smear (CBC report), platelet counts, cell counter working	
3	Generalprinciplesof Histopathologytechniques collection, fixation, processing & routine staining	
4	General principles of Cytopathology techniques collection, fixation, processing & routine staining	
5	General principles of Clinical Pathology techniques samplecollection, processingforroutine test, normal urine & urine examination, urine strip, introductions to body fluids (Distinguish between Transudate and exudate)	
6	Generalprinciplesof BloodBanktechniques antigen, antibody, ABO & Rh system	
7	General principles of Autopsy & Museum	
Total		**60 hrs**

Reference Books:

1. A *Handbook of Medical* Laboratory (Lab) Technology: *Editor*) *Second Edition*. *V.H. Talib* (Ed.).
2. Comprehensive Textbook Of Pathology For Nursing: Pathology Clinical Pathology Genetics. Ak Mandal Shramana Choudhury, Published by Avichal Publishing Compnay | Language English
3. Textbook of Medical Laboratory Technology- PrafulB. Godkar, Darshan P. Godkar
4. Medical Laboratory Technology. Methods and Interpretations – RamnikSood (volume 1&2)
5. Medical Laboratory technology a procedure manual for routine diagnostic test – vol – I, II, III. Kanai L. Mukharjee Tata Mc graw hill pub. New Delhi.
6. Practical Pathology P. Chakraborty Gargi Chakraborty New Central Book Agency, Kolkata.
7. Theory & Practice of Histological Techniques John D. Bancroft et.al. Churchill Livingstone Printed in China.
8. Histochemistry in Pathology M.I. Filipe et.al. Churchill Livingstone, London
9. Hand Book of Histopathological & Histochemical Techniques C.F.A. Culling Butterworths Company Ltd. London.
10. A Handbook of Medical Laboratory (Lab) Technology. By V.H Talib.

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Introduction to Quality and Patient safety**
Course Code	**BMLT 110 L**

Teaching Objective	• The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system. • To understand the basics of emergency care and life support skills. • To Manage an emergency including moving a patient • To help prevent harm to workers, property, the environment and the general public. • To provide a broad understanding of the core subject areas of infection prevention and control.•To provide knowledge on the principles of on-site disaster management
Learning Outcomes	• Upon completion, Students should be able to apply healthcare quality improvement and patient safety principles, concepts, and methods at the micro-, meso-, and macro-system levels.

Sr. No.	Topics	No. of Hrs.
1	**Quality assurance and management** – Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Introduction to NABH guidelines	7
2	**Basics of emergency care and life support skills** - Basic life support (BLS), Vital signs and primary assessment, Basic emergency care – first aid and triage, Ventilations including use of bag-valve-masks (BVMs), Choking, rescue breathing methods, One- and Two-rescuer CPR	7
3	**Bio medical waste management and environment safety** -Definition of Biomedical Waste, Waste minimization, BMW – Segregation, collection, transportation, treatment and disposal (including color coding), Liquid BMW, Radioactive waste, Metals/ Chemicals / Drug waste, BMW Management & methods of disinfection, Modern technology for handling BMW, Use of Personal protective equipment (PPE), Monitoring & controlling of cross infection (Protective devices)	8
4	**Infection prevention and control** - Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],Prevention & control of common healthcare associated infections, Components of an effective infection control program, Guidelines (NABH and JCI) for Hospital Infection Control	8
5	**Antibiotic Resistance** - History of Antibiotics, How Resistance Happens and Spreads, Types of resistance- Intrinsic, Acquired, Passive, Trends in Drug Resistance, Actions to Fight Resistance, Bacterial persistence, Antibiotic sensitivity, Consequences of antibiotic resistance	8
6	**Disaster preparedness and management** - Fundamentals of emergency management, Psychological impact management, Resource management, Preparedness and risk reduction, information management, incident command and institutional mechanisms.	7
Total		**45 hrs**

Reference Books:

1. Washington Manual of Patient Safety and Quality Improvement Paperback – 2016 by Fondahn (Author)
2. Understanding Patient Safety, Second Edition by Robert Wachter (Author)
3. Handbook of Healthcare Quality & Patient Safety Author : Girdhar J Gyani, Alexander Thomas
4. Researching Patient Safety and Quality in Healthcare: A Nordic Perspective Karina Aase, Lene Schibevaag
5. Old) Handbook Of Healthcare Quality & Patient Safety by Gyani Girdhar J (Author)
6. Handbook of Healthcare Quality & Patient Safety by .Gyani G J/Thomas A
7. Quality Management in Hospitals by S. K. Jos

BMLT 111 P - Community orientation & clinical visit (including related practicals to the parent course) (Total -120 hrs)

SKILL ENHANCEMENT ELECTIVE COURSE

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Medical Bioethics & IPR**
Course Code	**SEC 001 L**

Teaching Objective	• To introduce the wide range of ethical issues in health care. • To provide basic skills in: A) Approaching ethical issues. B) Analysis and statement of issues. C) Understanding the relevant ethical principles invoked. • Imparting knowledge and skills that will enable students to develop ethical answers to these issues • To acquire acquire specialized knowledge of law and IPR. •The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
Learning Outcomes	• Upon successful completion of the course, students will be able to: Recognize what constitutes an ethical concern in health care •Understanding ethical issues in Health care. • Understand better the complexity and multi-dimensionality of medical ethical concerns and uniqueness of each problem. • Capacity to rationally justify your decision • Develop the ability to reason through difficult medical/clinical ethical issues both orally, in the context of a group of their peers, and through written • The students get awareness of acquiring the patent and copyright for their innovative works. •They also get the knowledge of plagiarism in their innovations which can be questioned legally.

Sr. No.	Topics	No. of Hrs.
1	**Introduction to Bioethics** Bioethical issues related to Healthcare & medicine .	5
2	**Anatomy -** Cadaver ethics, Human dignity, PNDT, Disposal of cadaver, Genetic Counselling	7
3	**Physiology -** Animal ethics, Health policy privacy	7
4	**Biochemistry & Pathology -** Prudence of investigation confidentiality, Patients bill of rights, Disposal of investigative material, Integrity, Blood transfusion	5
5	**Pharmacology -** Rational drug prescribing, Clinical trials, Risk minimization, Animal ethics	5
6	**Microbiology -** Hand wash, Drug resistance minimization, Prudence of investigation confidentiality, Sterilization procedure, Biosafety and bio hazard	5
7	**Medicolegal aspects of medical records**	3
8	**Introduction to Intellectual Property**: Concept of Intellectual Property Kinds of Intellectual Property Patents, CopyrightsDesigns, Trademarks,Geographical Indication, Infringement of IPR, Its protection and Remedies Licensing and its types	8
Total		**45 hrs**

Reference Books:

1. Contemporary issues in bioethics – Beauchamp & walters (B&W) 4th edition.
2. Classic philosophical questions by Gloud (8th Edition)
3. Case book series and booklets by UNESCO Bioethics Core curriculum 2008
4. Encyclopedia of Bioethics 5 vol set, (2003) ISBN-10: 0028657748
5. Intellectual property rights- Ganguli-Tat McGrawhill. (2001) ISBN-10: 0074638602,
6. Intellectual Property Right- Wattal- Oxford Publicatiopn House.(1997) ISBN:0195905024.

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Human Rights &Professional Values**
Course Code	**SEC 002 L**

Teaching Objective	• To understand interaction between society and educational institutions. • To sensitize the citizens so that the norms and values of human rights and duties of education programme are realized. • To encourage research activities. • To encourage research studies concerning the relationship between Human Rights and Duties Education.
Learning Outcomes	•This course will aim at making the learners acquire conceptual clarity and develop respect for norms and values of freedom, equality, fraternity and justice. • It will include awareness of civil society organizations and movements promoting human rights. • This will make the students realize the difference between the values of human rights and their duties

Sr. No.	Topics	No. of Hrs.
1	**Background -** Introduction, Meaning, Nature and Scope, Development of Human Rights, Theories of Rights, Types of Rights	6
2	**Human rights at various level-** Human Rights at Global Level UNO, **Instruments**: U.N. Commission for Human Rights,European Convention on Human Rights.	6
3	**Human rights in India -** Development of Human Rights in India, Human Rights and the Constitution of India, Protection of Human Rights Act 1993- National Human Rights Commission, State Human Rights Commission, Composition Powers and Functions, National Commission for Minorities, SC/ST and Woman	7
4	**Human Rights Violations -**Human Rights Violations against Women, Children, Violations against Minorities SC/ST and Trans-genders, Preventive Measures.	6
5	**Professional values-** Integrity, Objectivity, Professional competence and due care, Confidentiality	6
6	**Personal values-** ethical or moral values, Attitude and behavior- professional behavior, treating people equally	6
7	**Code of conduct-** professional accountability and responsibility, misconduct, Cultural issues in the healthcare environment	8
Total		**45 hrs**

Reference Books:

1. Jagannath Mohanty Teaching of Human sRights New Trends and Innovations Deep & Deep Publications Pvt. Ltd. New Delhi2009
2. Ram Ahuja: Violence Against Women Rawat Publications Jewahar Nager Jaipur.1998.
3. Sivagami Parmasivam Human Rights Salem 2008
4. Hingorani R.C.: Human Rights in India: Oxford and IBA New Delhi.

SECOND YEAR

B.Sc. Medical Laboratory Technology

SEMESTER-III

Code No.	Core Subjects
Theory	
BMLT 112L	Fundamental of Biochemistry - I
BMLT 113 L	Fundamentals of Microbiology-I
BMLT 114 L	Hematology and Clinical Pathology - I
BMLT 115 CP	MLT Directed Clinical Education- I
Practical	
BMLT 112 P	Fundamental of Biochemistry - I
BMLT 113 P	Fundamentals of Microbiology-I
BMLT 114 P	Hematology and Clinical Pathology - I
Generic Elective Course	
GEC 001L	Pursuit of Inner Self Excellence (POIS)
GEC 002L	Organizational Behavior

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Fundamental of Biochemistry - I**
Course Code	**BMLT 112 L**

Teaching Objective	• Induce and students to laboratory and various glassware, equipments and reagent used in analytical and diagnostic section of Biochemistry. • To introduce the concept of quality control •To teach students mechanism of blood pH regulation, composition of various body fluids and basic concept of nutrition.
Learning Outcomes	•Students will have knowledge about various glassware, equipments. •Students will be able to prepare percent, normal, molar solutions. •Analytical skill for examination of body fluids, blood pH and electrolytes.

Sr. No.	Topics	No. of Hrs.
1	**Introduction to Medical Laboratory Technology:** Role and Responsibilities of Laboratory technologist, Phlebotomy procedures, Methods of Specimen collection: CSF, Urine, Ascetic fluid etc, Methods of blood collection and anticoagulants, Laboratory Hazards.	9
2	**Introduction to Laboratory apparatus:** Pipettes- different types (Graduated, volumetric, Pasteur, Automatic etc.,) Calibration of glass pipettes Burettes, Beakers, Petri dishes, Flasks - different types of Volumetric, round bottmed, Erlemeyer Bottles – Reagent bottles – graduated and common, Wash bottles – different type Specimen bottles etc., Measuring cylinders, Tubes – Test tubes, centrifuge tubes, test tube draining rack Tripod stand, Wire gauze, Bunsen burner, Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range, holders Racks – Bottle, Test tube, Different cleaning solutions of glass ware care and cleaning of plastic ware, different cleaning solutions.	9
3	**Instruments:** Oven &Incubators: Use, care and maintenance, Water Distillation plant and water deionisers. Use, care and maintenance**, Safety of measurements, Conventional and SI units**	6
4	Preparation of normal solutions. e.g. IN Na2CO3, O IN Oxalic acid, 0.1 N HCl, 0.1N H2504, 0.66 N H2S04 etc, Percent solutions. Preparation of different solutions – v/v w/v (solids, liquids and acids) Conversion of a percent solution into a molar solution	6
Total		**30 hrs**

BMLT 112 P Fundamental of Biochemistry – I

Sr. No.	Topics	No. of Hrs.
1	Determination of Beer's and Lamberts law	**30**
2	Preparation of Percent solution	
3	Preparation of buffer solution and Determination of PH	
4	Preparation of anticoagulant bulb	
Total		**30 hrs**

Reference Books:

1. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by PrafulGhodkar
2. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by PrafulGhodkar
3. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
4. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Fundamentals of Microbiology-I**
Course Code	**BMLT 113 L**

Teaching Objective	•This subject gives a general insight into the history, basics of microbiology; bacterial genetics, immunology and serology. •To imparts knowledge about equipment used in microbiology, safety precautions •To imparts knowledge about equipment used in microbiology, safety precautions •This paper will provide knowledge of serological techniques, and vaccines.
Learning Outcomes	•Theory and Lab courses provide the student with the study of normal flora andpathogenic microorganisms. Methods for recovery, identification of pathogens, culture techniques, procedures, and antibiotic testing and sterilization techniques. •Get an idea of universal safety precautions.

Sr. No.	Topics	No. of Hrs.
1	**Details Of General Microbiology:** Historical aspects, concepts of disease, Important scientist and their contributions, **Classification Of Living Being**: Kingdom Protista, Differences between pro and eukaryotic cells, Units of measurements of bacteria and viruses, **Microscopy**: Different types of microscopes, use and care of microscope, **Study Of Bacteria**: Wet mount examination, Staining – Gram stain, ZN stain, Albert stain, Capsular stain. Other stains. **Structure And Composition Of Bacterial Cell:** Functions of different parts. (I), Structure, Demonstration	7
2	**Growth and multiplication of bacteria**: Nutritional and other growth requirements. Bacterial growth curve: **Liquid culture media**: Preparation, sterilization. Inoculation and results **Solid media**: Composition Preparation sterilization Inoculation and results, **Culture Methods: Aerobic** and anaerobic Cultures, **Biochemical reaction**s: Preparation and sterilization. Performing tests	6
3	**Sterilization-** Definitions, classification, Sterilization by Physical methods – Dry heat, Filtration, Radiation, Sterilization by Moist heat, All details Sterilization by chemical and gaseous methods	4
4	**Collection, Transport, Storage and Processing of specimens, Antibiotic sensitivity test**: Performing and reporting the test Disc diffusion & Broth dilution method for MIC, **Antibacterial Agents:** Mode of action, classification, list of antibiotic**s**, **Antifungal, Antiviral, Antiparasitic:** Antiprotozoal &Antihelminths	6
5	**Universal safety precautions:** Hospital waste management – Waste segregation methods of disposal**,** Hospital acquired infections. – Definition, organisms causing HAI, prevention Mixtures, Infection control committee – composition, function	3
6	**Bacterial genetics Transfer of Genetic material:** Antibiotic resistance – Mutational & Transfer able – differences.	2

7	**DETAILS OF IMMUNOLOGY AND SEROLOGY**: Infection – types, sources, portals of entry, Immunity – types with eg difference between active & passive, Vaccines and immunization schedule, Antigens – definition, types, Antibodies Definition, Basic Structure Classes and Functions, Complement – Role in immune Response, **Serological reactions:** Performing lab tests.- Agglutination reactions , Precipitation reactions, ELISA, RIA, Immuno-fluoescence	11
8	**Structure and functions of immune system**☹Basics), Antibody mediated immune response (Basics), Cell mediated immune response (Basics), Hypersensitivity Ito IV (Basics)- Types and examples, Autoimmunity (Basics) Definition, examples of Auto Immune Diseases, Transplantation immunity (Basics)– Significance, Tumor immunity (Basics) – Significance	6
Total		**45 hrs**

BMLT 113 P Fundamental of Microbiology – I

Sr. No.	Topics	No. of Hrs.
1	Types of Microscopes	2
2	Morphology of Bacteria	2
3	Gram's Stain	2
4	ZN Stain	2
5	Special Stain- Albert's, Capsule Stain	2
6	Sterilization Dry heat	2
7	Sterilization Moist Heat	2
8	Disinfection	2
9	Culture Media	2
10	Culture Methods	2
11	Biochemical Tests	2
12	Collection of samples, transport, Processing	2
13	Antibiotic Sensitivity Test	2
14	Serological Tests Precipitation, Agglutination	2
15	Immunochromatographic Tests	2
Total		**30 hrs**

Reference Books:

1. Microbiology for Nursing and Allied Sciences. Dr. Arora 2nd Edition
2. Textbook of Microbiology for Nurses Anantnarayan 1st Edition
3. Practical and Applied Microbiology Anuradha De 4th Edition
4. Text Book of Microbiology Anantnarayan 10th Edition
5. TextBook of Microbiology and Parasitology PrafulGodkar 1st Edition
6. Medical Parasitology C. P. Baweja 3rd Edition

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Hematology and Clinical Pathology - I**
Course Code	**BMLT 114 L**

Teaching Objective	• The student should be aware basic principles of hematology like anticoagulants, constituents of blood and acquire skills of blood collection • The student should have knowledge of biomedical waste management, laboratory safety, • The student should be aware of basics of cytology. • The student should be able to perform urine tests ,stain smears in hematology and cytology and do blood grouping
Learning Outcomes	• At the end of the semester the student should be know the basic concepts in hematology and clinical pathology • He should be able to collect blood under guidance • Should perform urine experiments under guidance

Sr. No.	Topics	No. of Hrs.
1	**Introduction to Haematology:** Composition of peripheral blood and features of ideal smear, Erythropiesis and its pathology, Leucopoiesis and its pathology, Thrombopoiesis and its pathology, Manual counting of WBC and Plat lets on naubar chamber, Composition of bone marrow and how to prepare marrow smears, Normal hematological values and physiological variations, Collection of blood for hematological- investigations- best practice in phlebotomy, order of draw, Anticogulants, Preparation of stains and buffers in hematology, Preparation of peripheral blood and bone marrow smears, Examination of peripheral blood smear, Romanowsky stains, Identification of common hemoaparasites, Total RBC count, Total and differential WBC count, Estimation of haemoglobin, Platelet count, Normal Haemostasis,	33
2	**Biological waste management**	3
3	**Universal safety precaution**	3
4	**Clinical Pathology:** Urine examination (Physical, chemical, microscopy)	3
5	**Cytology:** Stains and fixation in cytology	2
6	**Typing and error Spotting of haematology report**	1
Total		**45 hrs**

Reference:

1. Radiographic Imaging, 4th Edition, 1987, D N Chesney, M O Chesney.
2. Principles of Radiographic Imaging, 3rd Edition, 2001, Carlton, Adler.
3. The Science of Photography, Braines H.

BMLT 114 P Hematology and Clinical Pathology - I

Sr. No.	Topics	No. of Hrs.
1	Composition of peripheral blood and features of ideal smear	2
2	Demonstration of automated hematanalyzer (Cell counter)	3
3	Composition of bone marrow and how to prepare marrow smears	4
4	Collection of blood for hematological- investigations- best practice in phlebotomy, order of draw	3
5	Identification of common hemoaparasites	2
6	Total RBC count	2
7	Total and differential WBC count	3
8	Estimation of hemoglobin	3
9	Typing and error spotting of hematology report	2
10	Urine examination (Physical, chemical, microscopy)	4
11	Stains and fixation in cytology	2
Total		**30 hrs**

Reference Books:

1. A Handbook of Medical Technology-second edition, BY V.H. Talib,CBS Publishers
2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

BMLT 115 CP Directed Clinical Education – I CommunityOrientation &Clinical Visit (including related practical's to the parent course)
(Total -450 hrs.)

GENERIC ELECTIVE COURSE

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Pursuit of Inner Self Excellence (POIS)**
Course Code	**GEC 001 L**

Teaching Objective	• To inculcate moral values in students – Self-Discipline , Time Management, Develop attitude of Service with humility, Empathy, Compassion, brotherhood, Respect for teachers, colleagues & society members. • Develop Effective means of communication & presentation skills in students • To develop wisdom in students for deciding their career based on their areas of interest and inner skills. • Introduce techniques for Relaxation, Meditation & Connecting with innerself. • Rejuvenation Techniques which can be used by students to distress themselves • To improve performance of students during various assignments, projects, elocutions, events, quiz, interviews.
Learning Outcomes	• Students will become self dependent, more decisive and develop intuitive ability for their study and career related matter. • Student's ability to present their ideas will be developed. • Enhanced communication skills, public speaking & improved Presentation ability. • Students will be able to explore their inner potential and inner ability to become a successful researcher or technician & hence become more focused. • Students will observe significant reduction in stress level. • With the development of personal attributes like Empathy, Compassion, Service, Love & brotherhood, students will serve the society and industry in better way with teamwork and thus grow professionally.

Sr. No.	Topics	No. of Hrs.
1	**Spiritual Values for human excellence :** The value of human integration; Compassion, universal love and brotherhood (Universal Prayer) ; Heart based living ; Silence and its values, Peace and non-violence in thought, word and deed ; Ancient treasure of values - Shatsampatti , Patanjali's Ashtanga Yoga ,Vedic education - The role of the Acharya , values drawn from various cultures and religious practices - Ubuntu, Buddism, etc.; Why spirituality? Concept – significance ; Thought culture	10

2	**Ways and Means :** Correlation between the values and the subjects ;Different teaching techniques to impart value education; Introduction to Brighter Minds initiative; Principles of Communication; Inspiration from the lives of Masters for spiritual values - Role of the living Master	15
3	**Integrating spiritual values and life:** Relevance of VBSE (Value Based Spiritual Education) in contemporary life ; Significant spiritual values ; Spiritual destiny ; Principles of Self-management; Designing destiny	10
4	**Experiencing through the heart for self-transformation (Heartfulness Meditation):** Who am I? ; Introduction to Relaxation; Why, what and how HFN Meditation?; Journal writing for Self-Observation ; Why, what and how HFN Rejuvenation (Cleaning)? ; Why, what and how HFN connect to Self (Prayer)?; Pursuit of inner self excellence ; Collective Consciousness-concept of *egregore effect;*	10
Total		**45 hrs**

Books:

- The Art of Learning: **A Journey in the Pursuit of Excellence,** Josh Waitzkin, Simon and Schuster, 2007
- Reality at Dawn. By Shri Ram Chandra, Published by ISRC

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Organizational Behavior**
Course Code	**GEC 002 L**

Teaching Objective	• To understand the initial insights into underlying principles and fundamental theories of organizational behavior. • The Student should develop a sense of what falls under the domain of organizational behavior. • He should develop an understanding of academic views on the behavior and motivations of people in organizations and the purposes of organizations. • This course clearly takes an academic and scientific lens with the aim of understanding human behaviour in organizations.
Learning Outcomes	• Describe and apply motivation theories to team and organizational scenarios in order achieve a team's or an organization's goals and objectives. • Explain the effect of personality, attitudes, perceptions and attributions on their own and other's behaviors in team and organizational settings. • Explain types of teams and apply team development, team effectiveness, and group decision making models and techniques. Analyse and apply leadership theories and better understand their own leadership style.

Sr. No.	Topics	No. of Hrs.
1	Organizational Behavior - Definition - Importance - Historical Background - Fundamental concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive	6
2	**Organization Structure and Design** - Authority and Responsibility Relationships - Delegation of Authority and Decentralization - Interdepartmental Coordination - Emerging Trends in Corporate Structure, Strategy and Culture - Impact of Technology on Organizational design - Mechanistic vs Adoptive Structures – Formal and Informal Organization	8
3	Perception Process - Nature & Importance - Perceptual Selectivity - Perceptual Organization - Social Perception - Impression Management	6
4	Learning - Process of Learning - Principles of Learning - Organizational Reward Systems – BehavioralManagement	6
5	Motivation - Motives - Characteristics - Classification of motives - Primary Motives - Secondary motives - Morale - Definition and relationship with productivity - MoraleIndicators	6
6	Leadership - Definition - Importance - Leadership Styles - Models and Theories of LeadershipStyles	7
7	Conflict Management - Traditional vis-a-vis Modern view of conflict - Constructive and Destructive conflict - Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructiveconflict	6
Total		**45 hrs**

Books:

1. Organizational Behavior, 9th Ed. - Stephen Robbins
2. Human Behaviour at work - Davis and Newstorm
3. Organizational Behaviour - Uma Sekaran
4. Organizational Behaviour - Fred Luthans
5. Organizational Behaviour - K.Aswathappa
6. Human Behaviour at Work - Keith Davis
7. Organizational Behaviour - Jit S.Chandran
8. Human Relations & Organizational Behaviour - R.S.Dwivedi
9. Organizational Behaviour - McShane

SECOND YEAR

B.Sc. Medical Laboratory Technology

SEMESTER-IV

Code No.	Core Subjects
Theory	
BMLT 116 L	Fundamental of Biochemistry - II
BMLT 117 L	Fundamentals of Microbiology-II
BMLT 118 L	Hematology and Clinical Pathology - II
BMLT 119 CP	MLT Directed Clinical Education - II
Practical	
BMLT 116 P	Fundamental of Biochemistry - II
BMLT 117 P	Fundamental of Microbiology-II
BMLT 118 P	Hematology and Clinical Pathology - II
Ability Enhancement Elective Course	
AEC 003 L	Computer and Applications
AEC 004 L	Biostatistics and Research Methodology

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Fundamental of Biochemistry - II**
Course Code	**BMLT 116 L**

Teaching Objective	• To introduce the concept of internal quality control in order to inculcate accuracy and precision in formative years of learning. • To introduce various body fluids with their biochemical composition and regulatory mechanism in blood pH.
Learning Outcomes	• Students will basic knowledge about internal quality control system and its use in elimination of error in clinical laboratory. • Students will have adequate knowledge about various body fluids with thie composition and its importance in diagnosis of different disease condition. • They will understand mechanism underlying blood ph regulation with abnormal conditions associated.

Sr. No.	Topics	No. of Hrs.
1	**Quality control:** Accuracy, Precision, Specificity,Sensitivity, Limits of error allowable in laboratory, Percentage error**,** Normal values and Interpretations	6
2	**Acid Base Balance:** Buffer systems, Henderson Hassel back, Respiratory Regulation of Blood PH, Renal mechanism of blood pH, pH Regulation Disturbance in acid Base, Balance Metabolic acidosis, Metabolic acidosis Metabolic alkalosis, Respiratory acidosis, Respiratory alkalosis	6
3	**Nutrition:** Calorific Value Nitrogen Balance Respiratory Quotient Haemoglobin Metabolism Iron Metabolism	12
4	Lab Examination of Body Fluids, Cerebrospinal fluid , Ascetic fluid, Pleural Fluid	6
Total		**30 hrs**

BMLT 116 P: Fundamental of Biochemistry - II

Sr. No.	Topics	No. of Hrs.
1	Estimation sodium and potassium	30
2	Biochemical analysis of pleural Fluid	
3	Biochemical analysis of ascetic Fluid	
4	Estimation of CSF Protein	
5	Estimation of CSF Sugar	
Total		**30 hrs**

Reference Books:

1. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
2. Essentials of Biochemistry, Second Edition, Dr.(Prof) Satyanarayana
3. Essentials of Biochemistry, 2nd Edition, Dr. PankajaNaik
4. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson & Walker

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Fundamentals of Microbiology-II**
Course Code	**BMLT 117 L**

Teaching Objective	• This paper is designed to know occurrence, spread & control of bacterial infections. • This subject will give information about the different types of bacterial cultureprocedures, staining procedures and biochemical tests used for identification of bacteria. The studentswill learn the morphology cultural characteristics, biochemical characteristics & laboratory diagnosisof various bacteria.
Learning Outcomes	• This part is designed to study the details of systemic bacteriology including its morphology, species, lab diagnosis, isolation and identification. • The knowledge of related diseases with its brief clinical features will be gained.

Sr. No.	Topics	No. of Hrs.
1	Introduction to Systemic Bacteriology	2
2	Gram Positive Cocci- Staphylococci, Streptococci, Pneumococci, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	4
3	Gram Negative Cocci- Gonococci, Menigococci, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	3
4	Gram Positive Bacilli- Corynebacteria, Bacillus, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	3
5	Mycobacteria – M.tuberculosis, M. leprae, Atypical Mycobacteria, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	4
6	Anaerobic Bacteria- Clostridium, Nonsporing Anaerobes, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	4
7	Enterobacteriacee – E.coli, Klebsiella, Proteus, Salmonella, Shigella, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	5
8	Vibrio, Pseudomonas& HAI, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	3
9	Pasteurella, HaemophilusBordetella and Brucella, Morphology, Species, Diseases with brief clinical features	3

10	Spirochaetes . T. pallidum, Leptospira, Morphology, Species, Diseases with brief clinical features, Lab diagnosis including Specimen Collection, Transport, Processing, Isolation, Identification, Antibiotic Sensitivity Test	3
11	Rickettsiae, Chlamydiae, Mycoplasma, Morphology, Species, Diseases with brief clinical features	2
12	Actinomycetes, Nocardia, Morphology, Species, Diseases with brief clinical features	3
13	Miscellaneous Bacteria, Morphology, Species, Diseases with brief clinical features	2
14	Microbiology of Air, Water, Food, Milk	4
Total		**45 hrs**

BMLT 117 P: Fundamentals of Microbiology-II

Sr. No.	Topics	No. of Hrs.
1	Microbiological Processing of Specimens, Collection, Transport, Hanging Drop Preparation	2
2	Sterilization, Disinfection	2
3	Preparation of various stains in Microbiology	2
4	Preparation of smear, Gram's Stain	2
5	AFB Stain, Concentration of Sputum	2
6	Special Staining Methods (Albert's Stain, Capsule Stain)	2
7	Preparation of Culture Media (Liquid, Slant Stab, Plates, Biochemicals)	2
8	Media Inoculation (Aerobic & Anaerobic)	2
9	Inoculation and Interpretation of Biochemical Tests	2
10	Antibiiotic Sensitivity Test (Various Methods)	2
11	Detection of MRSA, ESBL, MBL	2
12	Gram Positive Bacteria (Staphylococci, Streptococci, Pneumococci , C. diphtheriae)	2
13	Gram Negative Bacteria (Enterobacterieceae, Vibrio, Pseudomonas)	2
14	Mycobacteria and Anaerobic Bacteria	2
15	Microbiology of Air, Water, Food, Milk- Air and Water sampling methods	2
Total		**30 hrs**

Reference:

1. Merrill's Atlas of Radiographic Positioning & Procedures, 11th Edition, 2007, Frank, long, Smith.
2. Clark's positioning in Radiology, 12th Edition, 2005, Clark.
3. Medical X-ray Techniques in Diagnostic Radiology, Vander Plaals
4. Radiographic Anatomy and Positioning: An integrated approach, 1998, Comuelle, Andrea Gauthier
5. Special Techniques in Orthopedic Radiology, Stripp W

Reference Books:

1. Concise Microbiology C. P. Baweja 1st Edition
2. Practical and Applied Microbiology Anuradha De 4th Edition
3. Text Book of Microbiology Anantnarayan 10th Edition
4. TextBook of Microbiology and Parasitology PrafulGodkar 1st Edition

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Hematology and Clinical Pathology - II**
Course Code	**BMLT 118 L**

Teaching Objective	• Induce and students to laboratory and various glassware, equipments and reagent used in analytical and diagnostic section of Biochemistry. • To introduce the concept of quality control • To teach students mechanism of blood pH regulation, composition of various body fluids and basic concept of nutrition.
Learning Outcomes	• Students will have knowledge about various glassware, equipments. • Students will be able to prepare percent, normal, molar solutions • Analytical skill for examination of body fluids, blood pH and electrolytes.

Sr. No.	Topics	No. of Hrs.
1	**Basic haematology:** Classification of anemias and basics of leukemias, RBC indices and interpretation of hematology reports, Introduction to coagulation and hemostasis, Vaccutainers and anticoagulants	14
2	**Introduction to blood banking:** Grouping and cross matching	4
3	**Clinical pathology:** Urine examination (Physical, chemical, microscopy), Body fluids (Pleural effusion, pericardial effusion, and ascitis), handling of specimen processing and interpretation, CSF handling of specimen processing and interpretation	14
4	**Cytology:** Techniques, fixation, stains	3
5	**Histopathology:** Techniques, procedure, fixatives, stains	6
6	**Safety precautions in Lab**	2
7	**Microscope**	2
Total		**45 hrs**

BMLT 118 P: Hematology and Clinical Pathology - II

Sr. No.	Topics	No. of Hrs.
1	Introduction to coagulation and hemostasis	2
2	Vaccutainers and anticoagulants	4
3	Grouping and cross matching	2
4	Urine examination (Physical, chemical, microscopy)	4
5	Semen handling of specimen processing and interpretation	4
6	CSF handling of specimen processing and interpretation	2
7	Body fluids (Pleural effusion, pericardial effusion, and ascitis) handling of specimen processing and interpretation	4
8	Techniques, procedure, fixatives, stains	4
9	Safety precautions in Lab	2
10	Microscope	2
Total		**30 hrs**

Reference Books:

1. A Handbook of Medical Technology-second edition, BY V.H. Talib,CBS Publishers
2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

BMLT119CP Directed Clinical Education – II Community Orientation &Clinical Visit (including related practical's to the parent course)

(Total -450 hrs.)

ABILITY ENHANCEMENT ELECTIVE COURSE

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Computer and Applications**
Course Code	**AEC 003 L**

Teaching Objective	• Learn IT applications in medicine and allied health care field. • Introduction to health informatics. • Understand the theories and practices adopted in Hospital Information Systems in the light of medical standards, medical data formats and recent trends in Hospital Information Systems.
Learning Outcomes	• Discuss about health informatics and different IT applications in allied health care. • Explain the function of Hospital Information Systems • Analyze medical standards

Sr. No.	Topics	No. of Hrs.
1	Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.	1
2	Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).	3
3	Processor and memory: The Central Processing Unit (CPU), main memory.	4
4	Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.	3
5	Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).	5
6	Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.	5
7	Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.	5
8	Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.	5
9	Introduction of Operating System: introduction, operating system concepts, types of operating system.	4
10	Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of	5

	network.	
11	Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.	4
12	Application of Computers in clinical settings.	1
Total		**45 hrs**

Text books:

(1) Mausner & bahn : Epidemiology-An Introductory text, 2nd Ed.,W.B.Saunders Co.
(2) Richard f. Morton & j. Richard hebd : A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
(3) Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Biostatistics and Research Methodology**
Course Code	**AEC 004 L**

Teaching Objective	• To enable students to present, analyze and interpret data. • To enable students to use concepts of probability in business situations. • To enable students to make inferences from samples drawn from large datasets. • To enable students to apply univariate and multivariate statistical techniques.
Learning Outcomes	• To understand the importance & Methodology for research • To learn in detail about sampling, probability and sampling distribution, significance tests correlation and regression, sample size determination, study design and multivariate analysis.

Sr. No.	Topics	No. of Hrs.
1	Introduction to research methods	5
2	Identifying research problem	5
3	Ethical issues in research	5
4	Research design	5
5	Basic Concepts of Biostatistics	5
6	Types of Data	5
7	Research tools and Data collection methods	5
8	Sampling methods	5
9	Developing a research proposal	5
Total		**45 hrs**

Text books:

(1) Mausner & bahn : Epidemiology-An Introductory text, 2nd Ed.,W.B.Saunders Co.
(2) Richard f. Morton & j. Richard hebd : A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
(3) Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

THIRD YEAR

B.Sc. Medical Laboratory Technology

SEMESTER-V

Code No.	Core Subjects
Theory	
BMLT 120 L	Clinical Biochemistry - I
BMLT 121 L	Medical Microbiology-I
BMLT 122 L	Blood Bank and General Pathology - I
BMLT 123 CP	MLT Directed Clinical Education - III
Practical	
BMLT 120 P	Clinical Biochemistry - I
BMLT 121 P	Medical Microbiology-I
BMLT 122 P	Blood Bank and General Pathology - I
Core Elective Course	
CEC 005 L	Basics of Clinical Skills Learning
CEC 006 L	Hospital Operation Management

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Clinical Biochemistry – I**
Course Code	**BMLT 120 L**

Teaching Objective	• Aware of the principle underlying the organization of a clinical laboratory which includes Lab information system, Autoanalysers in clinical biochemsitry laboratory. • Able to do routine and special investigative procedures in medical laboratory Practice. • Provide a good theoretical and practical education in clinical biochemistry which shall help students to work in the field of medical laboratory technology and science.
Learning Outcomes	• Students will have skills to perform various diagnostic profiles, operation of Lab information sytems and Reporting. • Students will be able to provide accurate laboratory results in a timely manner as well as safeguard experimental controls, calibrate laboratory instruments.

Sr. No.	Topics	No. of Hrs.
1	**Diabetic Profile:**Blood Sugar, Glycosylated hemoglobin, GTT	6
2	**Liver Function Tests:**Based on Metabolic function, Based on Synthetic function, Based on Excretory function, Based on Enzymatic function, Based on Detoxification function, Report writing with reference range	4
3	**Kidney function Tests:**GFR- definition, calculation, Normal GFR, Urea Clearance tests, Creatinine clearance test, Insulin clearance test, Report writing with reference range	5
4	Principle, Application, Types and Maintenance of, Semi auto analyzers, Auoanalysers	6
5	**Automation in clinical biochemistry:**Principles, types & use of Autoanalyser, Blood gas analyzers, Lab information system (Theory and demonstration)	5
6	**Universal Precautions:**Personnel protective equipments and its importance, Biomedical waste management	4
Total		**30 hrs**

BMRIT 120P: Clinical Biochemistry - I

Sr. No.	Topics	No. of Hrs.
1	Renal Function Test Estimation of serum Creatinine Estimation of urinary creatinine Estimation of serum Urea	30
2	Estimation of Blood sugar	
3	Estimation glycosylated hemoglobin demonstration	
4	Arterial Blood gas analysis (Demo)	
5	Liver Function Tests	
Total		**30 hrs**

Reference Books:

1. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by PrafulGhodkar
2. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by PrafulGhodkar
3. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
4. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Essentials of Biochemistry, Second Edition, Dr.(Prof) Satyanarayana
7. Essentials of Biochemistry, 2nd Edition, Dr. PankajaNaik
8. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson & Walker
9. **An Introduction to Chemistry, 8th Edition by Mark Bishop**
10. Clinical Chemistry made easy, 1stEidtion by Hughes
11. Tietz Fundamentals of Clinical Chemistry , 7th Edition by Carl Burtis

Name of the Programme	**B.Sc. Medical Radiology and Imaging Technology**
Name of the Course	**Medical Microbiology-I**
Course Code	**BMLT 121 L**

Teaching Objective	•This paper is designed to know occurrence, spread & control of mycology infections, culture methods required to perform different microbiological tests in clinical microbiology lab. • This paper aims to learn about introduction, general characteristics, life cycle and laboratory diagnosis of various medically important parasites
Learning Outcomes	• Theory and Lab courses provide the student with an introduction to basiclaboratory identification and classification of medically significant isolates in mycology, parasitology. • Laboratory safety, specimen selection and processing, isolation methods, immunologic diagnosis and treatment. • Epidemiology and pathogenesis of mycosis, parasitic and infections are explored

Sr. No	Topics	No. of Hrs.
1	**Introduction to Mycology:**Historical aspects, Incidence of fungal infections, predisposing factors.Differences from bacterial cell. Structure of fungus . Morphological and Systemic classification of fungi.	2
2	**Classification of fungal diseases**. List the fungi causing skin infections, subcutaneous mycoses, systemic mycoses, Opportunistic fungal infectionsOutline of lab diagnosis of fungal infections	2
3	**Fungi causing superficial infection**: Clinical features. Laboratory diagnosis by Direct microscopy, Isolation and identification.of common fungi Trichophyton, Epidermophyton, Microsporum Candida.	2
4	**Fungi causing subcutaneous mycoses**: Clinical features. Laboratory diagnosis by Direct microscopy, Isolation and identification.of common fungi Mycetoma	2
5	**Fungi causing systemic infection:** Laboratory diagnosis by direct microscopy,Isolation and identification. Of common fungiCryptococcus	3
6	**Introduction To Parasitology:** Introduction, various terms, pathogenesis of lesions, classification of parasites, General characters and examples of parasitic species.	3
7	**PROTOZOA**: E. histolytica (in detail),Giardia, Trichomonas , Leishmaniadonovani (Morphology and disease caused only), Malarial Parasites (In details), Toxoplasma gondii , Isospora, Cyclospora, Cryptosporidium Pneumocystis carinii (Morphology and diseases caused only	9
8	**Helminthology**: Introduction, General characters, classification, **Nematodes**:Generalcharacters,Classification, Ascarislumbricoides (Round worms) (In detail),Hookworms , (In details), S. stercoralis, Trichuristrichiura , E.vermicularis (Morphology & disease caused only), Filarial worms (In details), D.medinensis (Morphology and disease caused only)	8

9	**Cestodes**– General characters, Classification, Taeniasaginata , T. solium H. Nana, D. latum. (Morphology and disease caused only), E. granulosus(In Detail)	5
10	**Trematodes**– General character,Classification,Schistosomes , F. hepatica, F. buski, C.sinensis ,P.westermanii (Morphology and disease caused only)	3
11	**System wise Parasitic Infections, CNS, Blood , GIT. Parasitic Diseases In Aids**	3
12	**Diagnostic Procedureseg. Concentration Techniques**	3
Total		**45 hrs**

BMLT 121P:Medical Microbiology-I

Sr. No.	Topics	No. of Hrs.
1	Mycology- Classification of Fungi (Demo)	2
2	KOH Mount, Negative Staining, Germ Tube	2
3	Slide Culture	2
4	Introduction- Parasitology	2
5	Intestinal Protozoa- Stool Examination	2
6	Haemoflagellates	2
7	Malarial Parasites- Smear & Staining, QBC method	2
8	Introduction-Helminthology	2
9	Intestinal Nematodes	2
10	Stool Examination, Concentration Methods	2
11	Tissue Nematodes	2
12	Cestodes	2
13	Stool Examination	2
14	Trematodes	2
15	Entomology	2
Total		**30 hrs**

Reference Books:

1. Medical Parasitology C. P. Baweja 3nd Edition
2. Practical and Applied Microbiology Anuradha De 4th Edition1.
3. TextBook of Microbiology and Parasitology PrafulGodkar 1st Edition
4. Parasitology in relation to Clinical Medicine by K D Chhatterjee

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Blood Bank and General Pathology - I**
Course Code	**BMLT 122L**

Teaching Objective	• The student should be aware basic principles of hematology like anticoagulants, constituents of blood and acquire skills of blood collection • The student should have knowledge of biomedical waste management, laboratory safety, • The student should be aware of basics of cytology. • The student should be able to perform urine tests ,stain smears in hematology and cytology and do blood grouping
Learning Outcomes	• The student should be able to apply the basic knowledge of hematology, histopathology, and cytology in laboratory • The student should perform the techniques and staining procedure in histopathology and cytology • The student should be able to apply the basics of hematology and clinical pathology learnt in 3rd and 4th semester in clinical laboratory.

Sr. No.	Topics	No. of Hrs.
1	**Blood Bank:**Overview of blood banking in blood bank, FDA regulations and record keeping, Donor selection, Principles of ABO/Rh grouping and factors, Adverse donor reactions, Cross matching, Storage of blood components, Component separation, Bleeding of donors and therapeutic phlebotomy, Anticoagulation in blood bank, Anti globulin test - direct and indirect, Autologous transfusion, Equipment maintenance, Transfusion transmitted infection, Introduction to blood components, Investigations of transfusion reactions, Issue of blood components, Preparation of 5% cell suspension	27
2	**Histopathology:** Overview of histopathology, Tissue fixation, processing, decalcification, Microtome's and frozen section, Staining, impregnation and mounting of specimen, Special stains, museum techniques, Fine needle aspiration cytology	8
3	**Haematology:** Estimation of Packed cell volume, Determination of ESR, Estimation of Absolute values, Serum Iron, Serum Ferritin,TIBC, Identification of malarial parasites	4
4	**Clinical Pathology:**Urine Physical, Chemical and microscopic examination, CSF and body fluid examination	6
Total		**45 hrs**

BMLT 122 P: Medical Microbiology-I

Sr. No.	Topics	No. of Hrs.
1	Principles of ABO/Rh grouping and factors	2
2	Cross matching	2
3	Bleeding of donors and therapeutic phlebotomy	2
4	Anti globulin test - direct and indirect	2
5	Investigations of transfusion reactions	2
6	Preparation of 5% cell suspension	2
7	Tissue fixation, processing, decalcification	2
8	Microtomes and frozen section	2
9	Staining, impregnation and mounting of specimesn	2
10	Special stains, museum techniques	2
11	UrinePhysical,Chemicaland microscopic examination	6
12	Laboratory investigation in myocardial infaraction	2
13	CSF and body fluid examination	2
Total		**30 hrs**

Reference Books:

1. A Handbook of Medical Technology-second edition, BY V.H. Talib,CBS Publishers
2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

BMLT 123 CP Directed Clinical Education – II Community Orientation &Clinical Visit (including related practical's to the parent course)

(Total -450 hrs.)

CORE ELECTIVE COURSES

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Basics of Clinical Skill Learning**
Course Code	**CEC 005 L**

Teaching Objective	• To Understand the basic ideas on how to check for Vital Signs of the Patient • This course the Student will learn how to handle the patients and their positioning • They will also learn on the Basics of Nasal-Gastric Tube • The Students will learn on Administration of IV, IV and Medication • Also they will know about Cleanliness in the Asepsis
Learning Outcomes	• After successful accomplishment of the course, the students would be able to Measure Vital Signs, do basic physical Examination of the patients, NG tube basics, Administration of Medicines • The students will learn about Asepsis, and the Cleanliness related to asepsis and on mobility of the patients

Sr. No.	Topics	No. of Hrs.
1	**MEASURING VITAL SIGNS:** Temperature: Axillaries Temperature, Pulse: Sites of pulse, Measurement, Respiratory, Blood Pressure, Pain: Pain Scale	5
2	**PHYSICAL EXAMINATION:**Observation, Auscultation(Chest), Palpation, Percussion, History Taking	10
3	**FEEDING: ENTRAL FEEDING, NG TUBE:**Measurement, Procedure, Care, Removal of Nasal-Gastric Tube, Nasal-Gastric Tube Feeding, and Parentral Nutrition.	10
4	**ADMINISTRATIONS:**Oral, Intravenous, Intramuscular, Subcutaneous, Recapping of Syringe, Loading of Drugs, Calculation of Drugs, Venipuncture, IV Infusion, Cannula, Attachment of IV infusion Set, Fluid Collection, Heparin Lock, Maintenance of IV set, Performing Nebulizer Therapy, Inhaler, Oxygen Therapy (Nasal, prongs, nasal Catheter,Venturi Mask, face mask)	10
5	**ASEPSIS:**Hand wash Techniques,(Medical, Surgical) Universal Precaution, Protecting Equipments: Using Sterile Gloves, Opening a Sterile package and Establishing a Sterile Field, Sterile Dressing Changes, Surgical Attire ,Wound Dressing, Suture Removal, Cleaning and Application of Sterile Dressing, Wearing and Removal of personal protective Equipment	5
6	**MOBILITY AND SUPPORT:**Moving and Positioning, range of Motion exercises (Active & Passive) Assisting for Transfer, Application of Restraints	5
Total		**45 hrs**

Name of the Programme	**B.Sc. Medical LaboratoryTechnology**
Name of the Course	**Hospital Operation Management**
Course Code	**CEC 006 L**

Teaching Objective	• To promote scientific management of hospital and advancement of health care systems so as to make it rational, responsive and cost efficient • To promote the development of high quality of hospital care in the community and the country. • It has to provide a satisfactory environment to the patient and also to the doctors for clinical research.
Learning Outcomes	• Understand and apply resource management concepts (personnel, finance, and material resources) and the processes and strategies needed in specific hospital sectors • Communicate effectively and develop their leadership and teambuilding abilities • Apply modern change management and innovation management concepts to optimize structures • Analyze existing hospital service policies and enhance their alignment within the local and national context

Sr. No.	Topics	No. of Hrs.
1	**MEDICO-LEGAL CASES:** Introduction,Laws associated with Medico-Legal Cases, Three Core Contents in Medico-legal cases w.r.t Doctors, Patient & Profession,	5
2	**CONSIDERATIONS OF ETHICS:** Consent, Confidentiality, Mental Health, End of life and Organ Transportation, Research & Clinical Trials	10
3	**HOSPITAL INFORMATION SYSTEM(HIS):** Hospital Information System Management, software applications in registration, billing, investigations, reporting, medical records management, Security and ethical challenges	10
4	**EQUIPMENT OPERATIONS MANAGEMENT:** Hospital equipment repair and maintenance, types of maintenance, job orders, equipment maintenance log books, AMCS	10
5	**ROLE OF MEDICAL RECORDS IN HEALTH CARE MANAGEMENT:** Computers for Medical records, Developments of computerized medical record information processing system(EMR's), Computer stored (Vs) Manual hand written record, Advantages of EMR (Vs) Manual	10
Total		**45 hrs**

THIRD YEAR

B.Sc. Medical Laboratory Technology

SEMESTER-VI

Code No.	Core Subjects
Theory	
BMLT 124 L	Clinical Biochemistry - II
BMLT 125 L	Medical Microbiology-II
BMLT 126 L	Blood Bank and General Pathology - II
BMLT 127 CP	MLT Directed Clinical Education -IV
Practical	
BMLT 124P	Clinical Biochemistry - II
BMLT 125P	Medical Microbiology-II
BMLT 126 P	Blood Bank and General Pathology - II

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Clinical Biochemistry - II**
Course Code	**BMLT 124L**

Teaching Objective	• To introduce the concept of internal quality control in order to inculcate accuracy and precision in formative years of learning. • To introduce various body fluids with their biochemical composition and regulatory mechanism in blood pH.
Learning Outcomes	• Students will have skills to perform various diagnostic profiles, operation of Lab information sytems and Reporting. • Students will be able to provide accurate laboratory results in a timely manner as well as safeguard experimental controls, calibrate laboratory instruments.

Sr. No.	Topics	No. of Hrs.
1	**Cardiac Profile:**Cardiac enzymes: ALT, AST, LDH, Ck-nac, CK-MB,Cardiac Proteins:TNT, TNI, Myoglobin	7
2	**Hormone profile:**TFT, Reproductive profile, Erythropoietin vitamins (Folic acid, Vitamin B12), Bone profile (Vitamin D, Anti CCP)	7
3	Principle and Application of Nephelometry, Turbodometry	6
4	Principle and Application of Chemiluminescene, Enzyme Immunoassay, PCR	6
5	Principle, Importance and application of Dry Chemistry	4
Total		**30 hrs**

BMLT 124 P Clinical Biochemistry – II

Sr. No.	Topics	No. of Hrs.
1	Lipid Profile, Estimation of serum Cholesterol, Estimation of serum triglycerides, Estimation of serum HDL	30
2	Cardiac markers, Estimation Alanine transaminase, Estimation of Aspartate transaminase, Estimation of CPK –MB (Demonstration), Estimation of TNT	
3	Estimation of Thyroid Profile (Demo)	
4	Estimation of Vitamin D	
5	Estimation of Vitamin B12	
Total		**30 hrs**

Reference Books:

1. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by PrafulGhodkar
2. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by PrafulGhodkar
3. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
4. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Essentials of Biochemistry, Second Edition, Dr.(Prof) Satyanarayana
7. Essentials of Biochemistry, 2nd Edition, Dr. PankajaNaik
8. Principles and Techniques of Biochemistry and Molecular Biology, 5Th Edition, Wilson & Walker
9. **An Introduction to Chemistry, 8th Edition by Mark Bishop**
10. Clinical Chemistry made easy, 1stEidtion by Hughes
11. Tietz Fundamentals of Clinical Chemistry , 7th Edition by Carl Burtis

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Medical Microbiology-II**
Course Code	**BMLT 125L**

Teaching Objective	A graduate student upon successfully qualifying in the BSc (Medical Laboratory) examination should be able to • Demonstrate competence as Medical Laboratory Technician. • To acquire skills in carrying out various tests required for diagnosis. • Interact effectively with the allied departments by rendering services in basic as well as in advanced laboratory investigations. • Carry out tests required for clinical/experimental research under the guidance of Researcher.
Learning Outcomes	• The main aim of this course is to train students in the field of Medical Microbiology. • Theoretical as well as practical training is imparted to the students in various branches of Microbiology namely Bacteriology, Virology, Parasitology, Immunology, serology and Mycology so that they can participate in good patient care and prevention of infectious diseases in the community. • They are introduced to basic and advanced methods used in the field of diagnostic Microbiology.

Sr. No.	Topics	No. of Hrs.
1	**General Properties of viruses –I** Historical aspect, Structure, composition, Resistance of viruses, Virus, multiplication Inclusion bodies, Cultivation of viruses, viral assays, Classification of viruses – DNA and RNAAnd list diseases caused by them.	6
2	**Outline of diagnosis of viral diseases, Virus host interactions**	3
3	Bacteriophage, Pox viruses. Classification & diseases caused, Molluscumcontagiosum (in detail)	3
4	**Herpes viruses** – Chicken pox and Herpes zoster(in detail), **Adeno viruses**– diseases caused, **Picorna viruses**– Classification and list diseases caused, **Polio virus in detail, Orthomyxoviruses**– Classification and list disease caused, **Influenza virus in detail**	6
5	Paramyxoviruses– classification and list diseases caused. **Measles and Mumps in detail**. Arboviruses- Classification and list diseases caused. **Rhabdoviruses –** Rabies (in detail)	6
6	**Hepatitis viruses –** (in detail)**, Human immunodeficiency virus and AIDS – (**in detail)	6
7	Oncogenic viruses – List of viruses only.	2

8	**Molecular biology –** Basic structure of genome of bacteria/viruses.	3
9	**Methods of Molecular studies, Polymerase chain reaction. Hybridization. Gel electrophoresis**	4
10	**NABL accreditation process with quality control, SOP writing.**	3
11	**Bacteriology of air, water, food, milk**	3
Total		**45 hrs**

BMLT 125P:Medical Microbiology-II

Sr. No.	Topics	No. of Hrs.
1	Introduction to Virology	2
2	Lab Diagnosis of Viral Infections	2
3	Viral Culture Methods	2
4	Serological Tests used in Virology	2
5	Viral Vaccines	2
6	Introduction to Molecular Biology	2
7	ELISA Test	2
8	Polymerase Chain Reaction	2
9	Gel Electrophoresis	2
10	NABL Accreditation	2
11	SOP Writing	2
12	Bacteriology of Air, Air sampling	2
13	Bacteriology of Water	2
14	Bactriology of Food	2
15	Bacteriology of Milk	2
Total		**30 hrs**

Reference Books:

1. Concise Microbiology C. P. Baweja 1st Edition
2. Text Book of Microbiology Anantnarayan 10th Edition
3. TextBook of Microbiology and Parasitology PrafulGodkar 1st Edition

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**Blood Bank and General Pathology - II**
Course Code	**BMLT 126 L**

Teaching Objective	• The student should be aware basic principles of hematology like anticoagulants, constituents of blood and acquire skills of blood collection • The student should have knowledge of biomedical waste management, laboratory safety, • The student should be aware of basics of cytology. • The student should be able to perform urine tests ,stain smears in hematology and cytology and do blood grouping
Learning Outcomes	• The student be well versed with the techniques in blood banking like components and FDA regulations • The B.Sc graduate should have sound knowledge and basic skills of working in a pathology lab and blood bank

Sr. No.	Topics	No. of Hrs.
1	**Blood Bank:** Principles of ABO/Rh grouping and factors, Cross matching, Component separation, Bleeding of donors and therapeutic phlebotomy, Antibody titrations, Q.C. of reagents, Q.C. of components, Equipment maintenance, Transfusion transmitted infection, Introduction and blood components, Investigations of transfusion reactions, Apheresis, Biomedical waste management	18
2	**Haematology:** P.S preparation and interpretation, Differential count-staining and identification of cell, Reticulocyte staining and identification, Investigations in Macrocytic anaemia, Investigations of haemolyticanaemia's, Hb and serum electrophoresis and HPLC, Red blood cell indices, Special haematology (Sickling,Osmotic fragility, G6P,deficiency,Cytochemistry), Haemostasis and coagulation, Investigations of hemorrhagic disorders, Automation in Haematology	18
3	**Clinical Pathology:** Urine physical,chemicaland microscopic examination, Sputum(Cytology,Micro,AFB), Interpretation of LFT, Interpretation of RFT, Typing and error checking of pathology reports	9
Total		**45 hrs**

BMLT 126 P: Blood Bank and General Pathology - II

Sr. No.	Topics	No. of Hrs.
1	Principles of ABO/Rh grouping and factors	2
2	Cross matching	2
3	Component separation	2
4	Investigations of transfusion reactions	2
5	Biomedical waste management	2
6	P.S preparation and interpretation	2
7	Differential count-staining and identification of cell	4
8	Reticulocyte staining and identification	2
9	Automation in Hematology	2
10	Urine physical,chemicaland microscopic examination	4
11	Interpretation of LFT	2
12	Interpretation of RFT	2
13	Typing and error checking of pathology reports	2
Total		**30 hrs**

Reference Books:

1. A Handbook of Medical Technology-second edition, BY V.H. Talib,CBS Publishers
2. Textbook of Medical Laboratory Technology, Volume 1, 3rd Edition by Praful Ghodkar
3. Textbook of Medical Laboratory Technology, Volume 2, 3rd Edition by Praful Ghodkar
4. Medical Laboratory Technology (Volume 1): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
5. Medical Laboratory Technology (Volume 2): Procedure Manual for Routine Diagnostic, Kanai Mukharjee
6. Medical Laboratory Technology (Volume 3): Procedure Manual for Routine Diagnostic, Kanai Mukharjee

BMLT 127 CP Directed Clinical Education – II Community Orientation &Clinical Visit (including related practical's to the parent course)

(Total -450 hrs.)

INTERNSHIP

Guidelines:

1. The internship shall commence after the student has completed and passed all subjects up to VI semesters.
2. The internship is compulsory.
3. The duration of the internship shall be one year.
4. The degree of Bachelor in Allied Health Sciences shall be awarded after the satisfactory completion of the internship.

Evaluation of Internees:

Formative Evaluation:

Day to day assessment of the internees during their internship postings should be done by the Head of the Department/Faculty assigned. The objective is that all the interns must acquire necessary minimum skills required for carrying out day to day professional work competently. This can be achieved by maintaining Records/Log Book by all internees. This will not only provide a demonstrable evidence of the processes of training but more importantly of the internee's own acquisition of competence as related to performance.

Summative Evaluation:

It shall be based on the observation of the Sr. Technical staff / Faculty of the department concerned and Record / Log book maintained by the interns. Based on these twoevaluations, the Head of the Department shall issue certificate of satisfactory completion of training, following which the university shall award the degree or declare him/her eligible for it.
To implement the project work uniformly for all the specialties in view of the curriculum and training to be acceptable internationally and the students to get opportunity for higher studies and employment.

Internship Programme:

- 05 days for Orientation Programme
- 105 days in Biochemistry Department
- 105 days in Microbiology Department
- 105 days in Pathology Department
- 30 days in Blood Bank
- 15 days in Community Medicine Department

Checklist - I

Continuous Evaluation of Directed Clinical Education (Clinical Posting) by Faculty in charge

Name of the student: _____ Date:_____

Semester: _____ Name of the faculty/Observer:_____

Core Competencies	Grade
Students will begin to develop critical thinking abilities utilizing the allied health personnel roles of communicator and caregiver. Students will learn principles of professional allied health personnel practice and provide direct care to individuals within a medical surgical setting while recognizing the diverse uniqueness of individuals with health alterations.	Write a grade 1-4 in the boxes below
I. Clinical Teaching	
a. Demonstrate beginning competency in technical skills.	
II. Independent Work by Student guided by faculty	
a. Develop effective communication skills (verbally and through charting) with patients, team members, and family	
b. Identify relevant data for communication in pre and post conferences	
c. Identify intra and inter-professional team member roles and scopes of practice. Establish appropriate relationships with team members.	
d. Identify need for help when appropriate to situation. Delegates level specific skills to appropriate team member.	
III. Hands on practical work by students	
a. Navigate and document clear and concise responses to care in the electronic health record for patient, where appropriate for clinical setting	
b. Protect confidentiality of electronic health records data, information, and knowledge of technology in an ethical manner	
IV. Independent work by student	
a. Maintain a positive attitude and interact with inter-professional team members, faculty, and fellow students in a positive, professional manner. Accept constructive feedback and develop plan of action for improvement.	
b. Demonstrate expected behaviours and complete tasks in a timely manner. Arrive to clinical experiences at assigned times. Maintain professional behaviour and appearance.	
c. Accept individual responsibility and accountability for nursing interventions, outcomes, and other actions. Engage in self evaluation & assumes responsibility for learning.	

***Clinical evaluation tool guidelines for full descriptions of grades 1-4.**

4-exceeds expectations (range of marks –40-50 marks)

3-meets expectations (range of marks –30-40 marks)

2-below expectations (range of marks –25-30 marks)

1-does not meet expectations (range of marks –no marks)

Resolution No. 4.5.1 of BOM-53/2018:

It was accepted to keep 50% as the passing marks for all the elective and core subjects for UG courses under School of Biomedical Sciences.

Resolution No. 4.13 of BOM-55/2018: Resolved as follows:-

(i) Slow learners must be re-designated as potential learners.

(ii) Students scoring less than 35% marks in a particular subjects/course in the 1st formative exam are to be listed as potential learners. These learners must be constantly encouraged to perform better with the help of various remedial measures.

(iii) Students scoring more than 75% marks in a particular subjects/course in the 1st formative exam are to be listed as advanced learners. These learners must be constantly encouraged to participate in various scholarly activities.

Resolution No. 3.1.4.2 of BOM-57/2019:

i. Resolved to include "Gender Sensitization" into UG (from new batch 2019-2020) and PG (from existing batches) curricula. **[Annexure-21]**

ii. Resolved to align the module of "Gender Sensitization" with MCI CBME pattern for MBBS students.

iii. Resolved that Dr. Swati Shiradkar, Prof., Dept. of OBGY., MGM Medical College, Aurangabad will coordinate this activity at both campuses.

Annexure - 21

Gender sensitization for UG (2nd , 3rd , 8th semesters) and PG (3 hours)

INCLUSION OF " GENDER SENSATIZATION" IN CURRICULUM

Introduction :

The health care provider should have a healthy gender attitude, so that discrimination, stigmatization, bias while providing health care will be avoided. The health care provider should also be aware of certain medico legal issues related with sex & gender.

Society particularly youth & adolescents need medically accurate, culturally & agewise appropriate knowledge about sex, gender & sexuality. So we can train the trainers for the same. It is need of the hour to prevent sexual harassment & abuse .

To fulfill these objectives, some suggestions are there for approval of BOS.

Outline

1)For undergraduates :- Three sessions of two hours each, one in 2nd term, one in 3rd term & one in 8th term.

2)For Faculties and postgraduates :- One session of two hrs .

3)For those want to be trainers or interested for their ownself, value added course, which is optional about sex, gender, sexuality & related issues.

Responsibility

ICC of MGM, MCHA , with necessary support from IQAC & respective departments.

Details of undergraduate sessions

1)First session in 2nd term

Aim – To make Students aware about the concept of sexuality & gender**.**

To check accuracy of knowledge they have,

To make them comfortable with their own gender identify & related issues.

To make them aware about ICC & it is functioning.

Mode – Brain storming , Interactive power point presentation experience sharing.

Duration – Around two hours

Evaluation – Feedback from participants.

2)Second session in 3rd / 4th term

Aim – To ensure healthy gender attitude in these students as now they start interacting with patients.

To ensure that the maintain dignity privacy while interacting with patients and relatives, particularly gender related.

To make them aware about importance of confidentiality related with gender issues.

To encourage them to note gender related issues affecting health care & seek solutions.

Mode – focused group discussions on case studies, Role plays & discussion.

Duration – Around two hours.

Evaluation – Feedback from participants.

Third session in 8th term.

Aim – To understand effect of gender attitudes on health care in various subjects.

To develop healthy gender attitude while dealing with these issues.

Mode – Suggested PBL by departments individually. (In collaboration with ICC till faculty sensitization is complete)

Evaluation – Feedback

****

FOR POSTGRADUATES

Session of 2-3 hrs preferably in induction program.

Aim – To introduce medically accurate concept of gender, sex, gender role & sex role.

To ensure healthy gender attitude at workplace.

To understand gender associated concepts on health related issues & avoid such bias wile providing health care.

To make them aware about ICC & it's functioning.

Mode – Interactive PPT

Role plays & discussion

Duration – 2 to 3 hrs

Evaluation – Feedback.

FOR FACULTIES

Session of 2 hours may be during combined activities.

Aim – To ensure clarity of concept abut gender & sex.

To discuss effect of these concept on health related issues.

To identify such gender & sex related issues in indivual subject specialties.

To discuss methodology like PBL for under graduate students when whey are in 7^{th}-8^{th} semester.

Mode – Role play

Focused group discussion

Case studies

Evaluation – Feed back.

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Sdp-Pimple/joshi-obgy

Resolution No.3.2.3.8 of BOM-59/2019: Resolved to approve the list of books for B.Sc. Allied program for subject Microbiology. **[Annexure-24]**

Annexure- 24

Department of Microbiology

List of Books for BSc- Allied Sciences (Annexure I)

Ist Year BSc

1. Textbook of Microbiology for Nurses by Ananthnarayan & Paniker- 2nd Edition, University Press
   ISBN 978-81-7371-997-4
2. Practical & Applied Microbiology by Anuradha De- 5th Edition, National Publication,
   ISBN 978-93-80206-35-6

2nd & 3rd Year BSc

1. Microbiology for MLT Students by Arora , 2018, ISBN 9789386827579
2. Textbook of Medical Microbiology and Parasitology by Praful Godkar ISBN 9789381496336
3. Practical & Applied Microbiology by Anuradha De- 5th Edition, National Publication,
   ISBN 978-93-80206-35-6

Dr. S. Samant

Member, BOS (Biomedical sciences)

Co-ordinator, MSc Medical courses

Dr. A. D. Urhekar
Professor & HOD
Dept. of Microbiology

Resolution No.3.2.3.8 of BOM-59/2019: Resolved to approve the list of books for B.Sc. Allied program for subject Microbiology. **[Annexure-24]**

Annexure- 24

Department of Microbiology

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1. Microbiology for MLT Students by Arora , 2018, ISBN 9789386827579
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Dr. S. Samant

Member, BOS (Biomedical sciences)

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Dr. A. D. Urhekar
Professor & HOD
Dept. of Microbiology

Resolution No. 4.3.1.2 of BOM-63/2021: Resolved to include topics related to COVID 19 in UG {B.Sc. AT & OT (BOTAT 108L), B.Sc. MLT(BMLT 108 L), B.Sc. MRIT (BMRIT 108L), B.Sc. MDT-(BMDT 108L), B.Sc. CCT (BCCT 108L), B.Sc.PT (BPT 108L), B.Optometry (BOPTOM 108L) Programs for Batch AY 2020-21 (Semester II)} & B.Sc. Medical Laboratory Technology SEMESTER-VI in subject of Medical Microbiology-II (BMLT 125 L) & Medical Microbiology-II (BMLT 125 P) for Batch AY 2020-21. **[Annexure-7]**
Further Dr. N.N. Kadam, Hon'ble Pro Vice Chancellor suggested to add topics under "Newer Infectious Diseases" as the main topic.

Annexure-07 of BOM-63/2021 dt 17.02.2021

To include Covid-19 topics in health professional curriculum as per the BOM Resolution No. 3.7 of BOM-62/2020

a) B.Sc. Allied (in 2nd semester) common for all UG Programs (B.Sc. AT&OT, B.Sc. MLT, B.Sc. MRIT, B.Sc. MDT, B.Sc. CCT, B.Sc. PT, B.Optometry):

Approved syllabus	Name of the subject	Existing content	Proposed changes
Common Syllabus for First year B.Sc. Allied Health Sciences - (B.Sc. AT&OT, B.Sc. MLT, B.Sc. MRIT, B.Sc. MDT, B.Sc. CCT, B.Sc. PT, B.Optometry) (Sem 2)	**General Microbiology** **(BOPTOM 108L BOTAT 108L BMLT 108 L BMDT 108L BMRIT 108L BPT 108L BCCT 108L)**	**Sr. no. 8 Virology -** Common Viral infection of eye, Introduction, General Properties, outline of lab diagnosis& Classification, HIV Virus, Hepatitis -B Virus.	**Sr. no. 8 Introduction to Virology-** Common Viral infection of eye, Introduction, General Properties, outline of lab diagnosis& Classification, HIV Virus, Hepatitis -B Virus, **COVID 19- Morphology, Mode of Transmission, Collection and Transport of Specimens, Different Diagnostic Tests, Precautions to be taken by HCW**,

b) **B.Sc. (MLT) Sem VI** :

Approved syllabus	**Name of the subject**	**Existing content**	**Proposed changes**
B.Sc. Medical Laboratory Technology **SEMESTER-VI**	**Medical Microbiology-II BMLT 125L**	**Sr. no. 1** **General Properties of viruses –I** Historical aspect, Structure, composition, Resistance of viruses, Virus, multiplication Inclusion bodies, Cultivation of viruses, viral assays, Classification of viruses – DNA and RNA and list diseases caused by them	**Sr. no. 1** **General Properties of viruses –I** Historical aspect, Structure, composition, Resistance of viruses, Virus, multiplication Inclusion bodies, Cultivation of viruses, viral assays, Classification of viruses – DNA and RNAAnd list diseases caused by them, **COVID 19 - details of Morphology, Mode of Transmission, Collection and Transport of Specimens, Different Diagnostic Tests in details, Precautions to be taken by HCW,**
B.Sc. Medical Laboratory Technology	**Medical Microbiology-II**	**Sr. no. 2** Lab Diagnosis of Viral Infections	**Sr. no. 2** Lab Diagnosis of Viral Infections,

SEMESTER-VI	**BMLT 125P**		**with Special reference to COVID 19 - Collection of Specimen** **Diagnostic Tests** **Demonstration of Doffing and Donning**

Resolution No. 4.3.1.3 of BOM-63/2021: Accorded post facto approval for changes in the index of UG (B.Sc. AT & OT, B.Sc. MLT, B.Sc. MRIT, B.Sc. MDT, B.Sc. CCT, B.Sc.PT, B. Optometry) and PG 2 year (M.Sc. Medical Biotechnology, M.Sc. Medical Genetics, M.Sc. Biostatistics, M.Sc. Molecular Biology, M.Sc. MRIT, M.Sc. CCT, M.Sc. Clinical Nutrition, M.Sc. Clinical Embryology, Master in Hospital Administration, Master of Public Health, and M.Optometry). **[Annexure-8A, 8B]**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester I

Code No.	Core Subjects	Credits/Week				Hrs/Semester				Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Total (hrs.)	Internal Assement (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory												
BMLT 101 L	Human Anatomy Part I	3	-	-	**3**	45	-	-	**45**	20	80 (UEX)	**100**
BMLT102 L	Human Physiology Part I	3	-	-	**3**	45	-	-	**45**	20	80 (UEX)	**100**
BMLT 103 L	General Biochemistry Nutrition	3	1	-	**4**	45	15	-	**60**	20	80 (UEX)	**100**
BMLT 104 L	Introduction to National Health	3	-	-	**3**	45	-	-	**45**	20	80 (UEX)	**100**
Practical												
BMLT 101 P	Human Anatomy Part I	-	-	4	-	-	-	60	**60**	-	-	-
BMLT102 P	Human Physiology Part I	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 103 P	General Biochemistry	-	-	4	-	-	-	60	**60**	-	-	-
BMLT105 P	Community Orientation & Clinical Visit (Including related practicals to the Parent course)	-	-	8	-	-	-	120	**120**	-	-	-
Ability Enhancement Elective Course												
AEC 001 L	English & Communication skills	3	-	-	**3**	45	-	-	**45**	-	100 (INT)	**100**
AEC 002 L	Envioronmental Sciences											
Total		**15**	**1**	**20**	**16**	**225**	**15**	**300**	**540**	**80**	**420**	**500**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester II

Code No.	Core Subjects	Credits/Week				Hrs/Semester				Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Total (hrs.)	Internal Assessment (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory												
BMLT 106 L	Human Anatomy Part II	2	-	-	**2**	30	-	-	**30**	10	40 (UEX)	**50**
BMLT 107 L	Human Physiology Part II	2	-	-	**2**	30	-	-	**30**	10	40 (UEX)	**50**
BMLT 108 L	General Microbiology	3	-	-	**3**	45	-	-	**45**	20	80 (UEX)	**100**
BMLT 109 L	Basic Pathology & Hematology	3	1	-	**4**	45	15	-	**60**	20	80 (UEX)	**100**
BMLT 110 L	Introduction to Quality and Patient safety (Multidisciplinary/Interdisciplinary)	3	-	-	**3**	45	-	-	**45**	20	80 (UEX)	**100**
Practical												
BMLT 106 P	Human Anatomy Part II	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 107 P	Human Physiology Part II	-	-	2	-	-	-	30	**30**	-	-	-
BMLT 108 P	General Microbiology	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 109 P	Basic Pathology & Hematology	-	-	4	-	-	-	60	**60**	-	-	-
BMLT 111 P	Community Orientation & Clinical Visit (Including related practicals to the parent course)	-	-	8	-	-	-	120	**120**	-	-	-
Skill Enhancement Elective Course												
SEC 001 L	Medical Bioethics & IPR	3	-	-	**3**	45	-	-	**45**		100 (INT)	**100**
SEC 002 L	Human Rights & Professional Values											
Total		**16**	**1**	**22**	**17**	**240**	**15**	**330**	**585**	**80**	**420**	**500**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester III

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assessment (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory														
BMLT 112 L	Fundamental of Biochemistry - I	2	-	-	-	**2**	30	-	-	-	**30**	20	80 (UEX)	**100**
BMLT 113 L	Fundamentals of Microbiology-I	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 114 L	Hematology and Clinical Pathology - I	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 115 CP	MLT Directed Clinical Education -I	-	-	-	30	**10**	-	-	-	450	**450**	-	50 (INT)	**50**
Practical														
BMLT 112 P	Fundamental of Biochemistry - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 113 P	Fundamentals of Microbiology-I	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 114 P	Hematology and Clinical Pathology - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
Generic Elective Course														
GEC 001 L	Pursuit of Inner Self Excellence (POIS)	3	-	-	-	**3**	45	-	-	-	**45**	-	100 (INT)	**100**
GEC 002 L	Organisational Behaviour													
Total		**9**	**2**	**6**	**30**	**24**	**135**	**30**	**90**	**450**	**705**	**90**	**510**	**600**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester IV

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assessment (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory														
BMLT 116 L	Fundamental of Biochemistry - II	2	-	-	-	**2**	30	-	-	-	**30**	20	80 (UEX)	**100**
BMLT 117 L	Fundamentals of Microbiology-II	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 118 L	Hematology and Clinical Pathology - II	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 119 CP	MLT Directed Clinical Education -II	-	-	-	30	**10**	-	-	-	450	**450**	-	50 (INT)	**50**
Practical														
BMLT 116 P	Fundamental of Biochemistry - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 117 P	Fundamentals of Microbiology-II	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 118 P	Hematology and Clinical Pathology - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
Ability Enhancement Elective Course														
AEC 003 L	Computer and Applications	3	-	-	-	**3**	45	-	-	-	**45**	-	100 (INT)	**100**
AEC 004 L	Biostatistics and Research Methodology													
Total		**9**	**2**	**6**	**30**	**24**	**135**	**30**	**90**	**450**	**705**	**90**	**510**	**600**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester V

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assessment (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory														
BMLT 120 L	Clinical Biochemistry - I	2	-	-	-	**2**	30	-	-	-	**30**	20	80 (UEX)	**100**
BMLT 121 L	Medical Microbiology-I	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 122 L	Blood Bank and General Pathology - I	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 123 CP	MLT Directed Clinical Education-III	-	-	-	30	**10**	-	-	-	450	**450**	-	50 (INT)	**50**
Practical														
BMLT 120 P	Clinical Biochemistry - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 121 P	Medical Microbiology-I	-	-	2	-	**1**	-	-	30	0	**30**	10	40 (UEX)	**50**
BMLT 122 P	Blood Bank and General Pathology - I	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
Core Elective Course														
CEC 005 L	Basics of Clinical Skill Learning	3	-	-	-	**3**	45	-	-	-	**45**	-	100 (INT)	**100**
CEC 006 L	Hospital Operation Management													
Total		**9**	**2**	**6**	**30**	**24**	**135**	**30**	**90**	**450**	**705**	**90**	**510**	**600**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester VI

Code No.	Core Subjects	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assessment (IA)	University semester Exam (UEX)/ Internal Semester Exam (INT)	Total
Theory														
BMLT 124 L	Clinical Biochemistry - II	2	-	-	-	**2**	30	-	-	-	**30**	20	80 (UEX)	**100**
BMLT 125 L	Medical Microbiology-II	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 126 L	Blood Bank and General Pathology - II	2	1	-	-	**3**	30	15	-	-	**45**	20	80 (UEX)	**100**
BMLT 127 CP	MLT Directed Clinical Education -IV	-	-	-	30	**10**	-	-	-	450	**450**	-	50 (INT)	**50**
Practical														
BMLT 124 P	Clinical Biochemistry - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 125 P	Medical Microbiology-II	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
BMLT 126 P	Blood Bank and General Pathology - II	-	-	2	-	**1**	-	-	30	-	**30**	10	40 (UEX)	**50**
Total		**6**	**2**	**6**	**30**	**21**	**90**	**30**	**90**	**450**	**660**	**90**	**410**	**500**

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology (Internship)

Semester VII & Semester VIII

Code No.	Core Subjects	Credits/Week				Hrs/Semester				
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/Rotation (CP)	Total hrs.
	Sem VII (Internship)	-	-	-	720	-	-	-	720	**720**
	Sem VIII (Internship)				720				720	**720**
Total		**0**	**0**	**0**	**1440**	**0**	**0**	**0**	**1440**	**1440**

Resolution No. 3.5 of AC-41/2021: Resolved to incorporate the changes as per the decision of the CBCS committee in UG B.Sc Medical Laboratory Technology with effect from the batch admitted in 2020-21 onwards

12.1 : Minutes of CBCS meeting held on 3.02.2021 I. Courses titled as elective, seminar, clinical posting etc. will be evaluated at university level, only:	**Decision taken by CBCS Committee:** Members agreed that all courses (core, elective, seminar, clinical posting etc) in all programs with CBCS curriculum under MGM School of Biomedical Sciences (MGMSBS-UG & PG), MSc Medical Programme under MGM Medical College and MGM School of Physiotherapy (MGMSOP) (BPT & MPT) will be evaluated at the level of the University at the end during semester examination. (Detailed included as 1, 2,3,4 points)
1. Courses which were evaluated at constituent units titled as elective, seminar, clinical posting etc. will be evaluated at university level for UG & PG of MGMSBS, Navi Mumbai:	MGM School of Biomedical Sciences (MGMSBS-UG) :First year B.Sc. (Semester I & Semester II) (core-1.1 & 1.2) and (elective-1.3) common for all seven programs **(B.Sc. DT, B.Sc. AT & OT, B.Sc. CCT, B.Optometry, B.Sc. PT, B.Sc. MRIT, B.Sc. MLT)** which were having 100 marks previously will be changed to 50 marks (40 marks university Semester End Exam-(SEE) and 10 marks Internal Assessment – (IA) as per below format - 1.4) w.e.f AY 20-21. (**Annexure 1**) Clinical Directed posting allotted 50 marks will be assessed as university end semester exam w.e.f AY 20-21. **(Annexure 1.1)** **(request to add** **a) evaluation pattern of seminar - 50 marks– BSc Dialysis- sem IV** **b) Boptometrysem III – course : geometrical optics and visual optics I/II** **sem IV – optometric instrumentation** **10 IA + 40 SEE – format submitted)**
	2.1 Courses which were evaluated at constituent units titled as elective, seminar, clinical posting etc. will be evaluated at university level. Members agreed that all courses (core, elective, seminar, clinical posting etc) in all programs with CBCS curriculum under MGM School of Biomedical Sciences (MGMSBS- PG), will be evaluated at the level of the University end semester examination w.e.f. AY 2020-21. ***** For PG program (M.Sc. 2 year including allied program, MHA, MPH) having courses like seminar/education tour & Industrial visit which were allotted **50 marks** will be assessed as university end semester exam. a. Amended 10 marks in seminar **(Annexure-2.1A)** b. Amended 20 marks for Educational Tour/Field Work/Hospital Visit/ Industrial Visit **(Annexure-2.1B)** c. 50 marks for Clinical Directed Posting (no change) **(Annexure-2.1C)** **(request to add the evaluation pattern for MPH – sem I,II, III)** **MOptometry – Sem I – evaluation pattern to be added)** **2.2** PG Courses which were evaluated at constituent units titled as elective carrying 100 marks as only similar to that of core courses, will be evaluated at university level. Similar pattern which is being followed for core Subjects (IA - 20 Marks + university exam - 80 marks) will be followed.**(Annexure-2.2)**

Resolution No. 4.1 of Academic Council (AC-42/2022): Resolved to accord post facto approval to have English & Communication Skill (AEC 001 L) & Environmental Sciences (AEC 002 L) as compulsory course and will have 4 credits each (60 hours) which needs to be reflected in the University marksheet of 1st semester B.Sc. Allied Health Sciences programs w.e.f. Academic Year 2022-23 onwards. There will be no changes in the content of the syllabus. Act in accordance with CBCS rules and regulation.

Further resolved to approve amended index & number of hours (without any change in the content of the syllabus) from batch 2022-23 onwards for English & Communication Skill (AEC 001 L) & Environmental Sciences (AEC 002 L) for B.Sc. Cardiac Care Technology, B.Sc. Medical Dialysis Technology, B.Sc. Operation Theater & Anesthesia Technology, B.Sc. Perfusion Technology, B.Sc. Medical Laboratory Technology, B.Sc. Medical Radiology & Imaging Technology, B. Optometry. [ANNEXURE-42]

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester I													
Code No.	Core Course	Credits/Week				Hrs/Semester				Marks			
		Lecture (L)	Tutorial (T)	Practical (P)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total	
Theory													
BMLT 101 L	Human Anatomy Part I	3	-	-	**3**	45	-	-	**45**	**10**	**40**	**50**	
BMLT102 L	Human Physiology Part I	3	-	-	**3**	45	-	-	**45**	**10**	**40**	**50**	
BMLT 103 L	General Biochemistry Nutrition	3	1	-	**4**	45	15	-	**60**	**10**	**40**	**50**	
BMLT 104 L	Introduction to National Health Care System (Multidisciplinary/ Interdisciplinary)	3	-	-	**3**	45	-	-	**45**	**10**	**40**	**50**	
Practical													
BMLT 101 P	Human Anatomy Part I	-	-	4	-	-	-	60	**60**	-	-	**-**	
BMLT102 P	Human Physiology Part I	-	-	4	-	-	-	60	**60**	-	-	**-**	
BMLT 103 P	General Biochemistry Nutrition	-	-	4	-	-	-	60	**60**	-	-	**-**	
BMLT105 P	Community Orientation & Clinical Visit (Including related practicals to the Parent course)	-	-	8	-	-	-	120	**120**	-	-	-	
Ability Enhancement Compulsory Course													
AEC 001 L	English & Communication skills	4	-	-	4	60	-	-	**60**	**10**	**40**	**50**	
AEC 002 L	Envioronmental Sciences	4	-	-	4	60	-	-	**60**	**10**	**40**	**50**	
Total		**20**	**1**	**20**	**21**	**300**	**15**	**300**	**615**	**60**	**240**	**300**	

ABILITY ENHANCEMENT COMPULSORY COURSE

Name of the Programme	**B.Sc. Medical Laboratory Technology**
Name of the Course	**English and Communication Skills**
Course Code	**AEC 001 L**

Teaching Objective	• This course deals with essential functional English aspects of the of communication skills essential for the health care professionals. • To train the students in oral presentations, expository writing, logical organization and Structural support.
Learning Outcomes	• Able to express better. • Grow personally and professionally and Developconfidence in every field

Sr. No.	Topics	No. of Hrs.
1	**Basics of Grammar** - Vocabulary, Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words	10
2	**Basics of Grammar – Part II** - Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms	10
3	**Writing Skills** - Letter Writing, Email, Essay, Articles, Memos, one word substitutes, note making and Comprehension	5
4	Writing and Reading, Summary writing, Creative writing, news paper reading	5
5	Practical Exercise, Formal speech, Phonetics, semantics and pronunciation	5
6	**Introduction** to communication skills - Communication process, Elements of communication, Barriers of communication and how to overcome them, Nuances for communicating with patients and their attenders in hospitals	6
7	**Speaking** - Importance of speaking efficiently, Voice culture, Preparation of speech. Secrets of good delivery, Audience psychology, handling , Presentation skills, Individual feedback for each student, Conference/Interview technique	5
8	**Listening** - Importance of listening , Self assessment, Action plan execution, Barriers in listening, Good and persuasive listening	5
9	**Reading** - What is efficient and fast reading , Awareness of existing reading habits, Tested techniques for improving speed, Improving concentration and comprehension through systematic study	5
10	**Non Verbal Communication** - Basics of non-verbal communication, Rapport building skills using neuro- linguistic programming (NLP), Communication in Optometry practice	4
Total		**60 hrs**

Text books:

1. Graham Lock, Functional English Grammar: Introduction to second Language Teachers.Cambridge
   University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts,practice and evidence,
   Jones & Bartlett Publications, USA, 2009

Name of the Programme	**B B.Sc. Medical Laboratory Technology**
Name of the Course	**Environmental Sciences**
Course Code	**AEC 002L**

Teaching Objective	• To understand and define terminology commonly used in environmental science • To teach students to list common and adverse human impacts on biotic communities, soil, water, and air Quality. • To understand the processes that govern the interactions of organisms with the biotic and abiotic. • Understand the relationship between people and the environment; Differentiate between key ecological terms and concepts
Learning Outcomes	• Current environmental issues and highlight the importance of adopting an interdisciplinary approach. • Sample an ecosystem to determine population density and distribution. • Create food webs and analyse possible disruption of feeding relationships.

Sr. No.	Topics	No. of Hrs.
1	**Components of Environment** – Hydrosphere, lithosphere, atmosphere and biosphere – definitions with examples; Interaction of man and environment;	8
2	**Ecosystem** : Basic concepts, components of ecosystem, Tropic levels, food chains and food webs, Ecological pyramids, ecosystem functions, Energy flow in ecological systems, Characteristics of terrestrial fresh water and marine ecosystems,	8
3	**Global Environmental Problems** – Green House Effect, Acid rain, El Nino, Ozone depletion, deforestation, desertification, salination, biodiversity loss; chemical and radiation hazards.	8
4	**Environmental pollution and degradation** – Pollution of air, water and land with reference to their causes, nature of pollutions, impact and control strategies; perspectives of pollution in urban, industrial and rural areas. Habitat Pollution by Chlorinated Hydrocarbons (DDT, PCBs, Dioxin etc, Endocrine disrupting chemicals, Nutrient pollution.	8
5	**Environmental Management** – Concept of health and sanitation, environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases, health hazards due to pesticide and metal pollution, waste treatment, solid waste management, environmental standards and quality monitoring.	10
6	**Environmental Protection Act** – Environmental Laws, national movements, environmental ethics – holistic approach of environmental protection and conservation, IUCN – role in environmental protection. Concept with reference to UN – declaration, aim and objectives of human right policies with reference to India, recent north-south debate on the priorities of implementation, Environmental Protection Agency (EPA)	10
7	**Bioremediation** – Oil spills, Wastewater treatment, chemical degradation, heavy Metals.	8
Total		**60 hrs**

Books:

1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
7. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
8. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
14. Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
17. Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
19. Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.

20 World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press

Resolution No. 10.4 i of Academic Council (AC-42/2022):

i) "Resolved to accept "50% eligibility in internal assessment" pattern for all the CBCS programs (UG & PG) running under the constituent units of MGMIHS.(MGM School of Biomedical Sciences, MGM School of Physiotherapy, MGM Medical College (M.Sc. Medical 3 year courses).

This will be applicable to all existing batches (for remaining regular examinations) and forthcoming batches from June 2022 onwards"

Resolution No. 10.4 ii of Academic Council (AC-42/2022)

ii) Resolved to accept the amendment in the existing internal assessment eligibility criteria which will include CIA w.e.f Academic Year 2022-23 onwards for CBCS pattern 1st year (SEM I & II) of UG programs under MGMSBS.

Proposed :

Internal Examination Pattern (Theory) B.Sc. First Year (AY 2022-23) onwards :

20 marks

Question type	No. of questions	Questions to be answered	Question X marks	Total marks
Short answers	5	4	4 x 3 marks each	12 marks
CIA	1. Seminar / poster (4 marks) 2. Assignments/open book test (4 marks)			8 marks
Total				**20 marks**

Note: 20 marks to be converted to 10 marks weightage for submission to the university.

Resolution No.6.7 of Academic Council (AC-46/2023): Resolved to incorporate credits in internship as per NEP 2020 & National Credit Framework for UG programme (B.Sc. Medical Laboratory Technology, B.Sc. Medical Radiology & Imaging Technology, B.Sc. Operation Theatre & Anaesthesia Technology, B.Sc. Cardiac Care Technology, B.Sc. Perfusion Technology, B. Optometry, B.Sc. Medical Dialysis Technology, B.Sc. Physician Assistant In Emergency & Trauma Care) from Batch admitted in Academic Year 2020-21 (Sem VII & VIII) onwards [ANNEXURE-49A, 49B, 49C, 49D, 49E, 49F, 49G, 49H].

Annexure-49H of AC-46/2023

OUTLINE OF COURSE CURRICULUM

B.Sc. Medical Laboratory Technology

Semester VII & VIII														
Code No.	Core Course	Credits/Week					Hrs/Semester					Marks		
		Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total Credits (C)	Lecture (L)	Tutorial (T)	Practical (P)	Clinical Posing/ Rotation (CP)	Total (hrs.)	Internal Assement (IA)	Semester End Exam (SEE)	Total
BMLT 128	B.Sc. MLT Internship (Semester VII)	-	-	1	16	**17**	-	-	42	1008	**1050**	**20**	**80**	**100**
BMLT 129	B.Sc. MLT Internship (Semester VIII)	-	-	1	16	**17**	-	-	42	1008	**1050**	**20**	**80**	**100**
Internship is for 12 months (July-December; January-June) after deducting for national holidays/Sick Holidays/ sundays + Examination), (6 days/week;8 Hours/day). Minimum of 21 weeks/semester. Students are encouraged to involve in community outreach activities as part of their clinical postings without absenting himself/herself for the other regular classes.														

Internal Assessment Exam Pattern (IA) for Semester VII & VIII (Internship Program)

Internal exam pattern: Total 20 marks with following breakup

Description	Marks
Internal exam (at department)	10 marks
Viva	5 marks
Log Book	5 marks
Total = 20 Marks	

Scheme of University Semester End Examination (SEE) for Semester VII & VIII (Internship Program)

Practical exam pattern: Total 80 marks with following breakup

Exercise	Description	Marks
Q No 1	Case Study	2 x15=30 M
Q No 2	Station exercise	3 x 5=15 M
Q No 3	VIVA	15 M
QNo 4	Log Book	10 M
QNo 5	Attendance	10 M
Total = 80 Marks		

Attendance (10 marks) of the student. It was decided that weightage be given to attendance as per following scheme

Attendance Percentage	Marks
< 75	Zero
75	5
76-80	6
81-85	7
86-90	8
91-95	9
96-100	10

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