VIDYASAGAR UNIVERSITY

Bachelor of Medical Laboratory Technology
(BMLT)

Revised Syllabus Under CBCS
(w. e. f. 2022-2023)

Vidyasagar University
Midnapore 721102
West Bengal

Vidyasagar University

Midnapore, West Bengal

REGULATION FOR THE BACHELOR OF MEDICAL LABORATORY TECHNOLOGY (BMLT)

1. Title and Commencement:

1.1 These Regulations shall be called The Regulations for 'BACHELOR OF MEDICAL LABORATORY TECHNOLOGY (BMLT), 4 YEAR UNDERGRADUATE DEGREE PROGRAMME (CBCS), 2022-23 UNDER VIDYASAGAR UNIVERSITY'.

1.2 These Regulations shall apply to the students admitted in BMLT from the Academic Year **2022 – 2023** onwards.

2. Degree Nomenclature:

Bachelor of Medical Laboratory Technology (BMLT)

3. Duration of the Degree Programme

3.1 The duration of the Programme is **EIGHT (08)** consecutive **SEMESTERS** of six months each *i. e.,* **FOUR (04) YEARS** including **SIX (06) MONTHS COMPULSORY INTERNSHIP**.

3.2 A candidate shall have to clear all Semesters maximum within **SIX (06) YEARS** from the academic year of his/her first admission and registration to the BMLT Programme under Vidyasagar University failing which enrolment of the candidate shall stand cancelled.

3.3 Odd semester (i.e. 1st, 3rd and 5th Semester) is ordinarily commenced from July to December and even semester (i. e. 2nd, 4th and 6th Semester) is from January to June

3. Definitions

Academic Year: The 'Academic Year' shall ordinarily be formed as per Vidyasagar University rules.

Semester: An academic term consisting of not less than 90 instructional days, excluding days of final theory examinations.

Credit Hour: Each credit hour will be equivalent to one-hour lecture of theory or two hours of laboratory work for practical per week. It is also known as semester credit or credit.

Course: A course is a unit of instruction or a segment of subject to be covered in a semester. It has a specific number, title and credits.

Grade Point of a Course: Each course will be evaluated for 100 marks irrespective of the credits (theory or practical or theory and practical combined as per credits) for awarding grade point. The grade point shall be rounded to the second decimal place.

Credit Point of a Course: The product of credit hours and grade point obtained by the student in each course.

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

Semester Grade Point Average (SGPA): It is a measure of performance of a student in a semester. It is the ratio of total credit points secured by a student in various courses of a semester and the course credits taken during that semester. It shall be expressed up to two decimal points.

Cumulative Grade Point Average (CGPA) : It is a measure of overall cumulative performance of a students' over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal points.

Grade Card or Marksheet: Based on the grade earned, a grade card or marksheet shall be issued after every semester. The grade card shall display the course details (code, title, marks, number of credits, grade secured) along with SGPA and CGPA where applicable.

4. Admission & Registration

4.1 The admission to undergraduate degree programmes in BMLT will be governed by the guidelines of the Vidyasagar University and that of the Department of Higher Education, Govt. of West Bengal as laid down from time to time.

4.2 A candidate who has passed the Higher Secondary (10+2) examination of the West Bengal Council of Higher Secondary Education or/and equivalent examination of any University / Board with **Physics, Chemistry and Biological Sciences/ Nutrition** having 50% marks in aggregate are eligible for admission in BMLT programme satisfying the other admission criteria laid down by the Govt. of West Bengal and Vidyasagar University.

4.3 The last date of admission to the semester-I (first Year) of the BMLT programme should not ordinarily exceed the date from the notified date of commencement of semester-I classes. However, in exceptional cases, a candidate may be admitted after the last date of admission with the permission of the University Authority.

4.4 The selection of students for admission will be done as per the merit list. The merit list will be prepared according to percentage of total marks obtained in the subjects of H.S. (10+2) or its equivalent examinations as stated above or through Entrance Examination or as laid down by Vidyasagar University from time to time.

4.5 The candidate will have to register himself/herself with the University as per university rules.

4.6 The candidate will have to enrol himself/herself at each semester for which he/she is eligible for prosecuting his /her studies on paying the requisite fees.

4.7 A candidate shall be allowed to pursue any one of the degree undergraduate programme of the university at a time, not more than one.

5. Attendance

5.1 A student having at least 75% attendance of scheduled theory and practical classes separately shall be allowed to sit for the concerned Semester Examination subject to the fulfillment of other conditions as laid down in the regulations.

5.2 Relaxation in attendance for NCC, NSS and Co-curricular activities is admissible as per University regulations subject to prior approval of College Authority.

6. Course & Curriculum

6.1 Course of Study: BMLT degree shall be awarded if a student completes 16 core courses/papers in that discipline**,** 2 Ability Enhancement Compulsory Courses (AECC), 2 Skill Enhancement Courses (SEC), 6 courses/papers from a list of Discipline Specific Elective (DSE) and 4 courses/papers from a list of Generic Elective(GE) papers and Compulsory Internship of six months respectively.

The distribution of courses in degree programme of BMLT is as follows:

Type of Course	No. of paper	Credit distribution
Core Course	14	6x16= 96
Discipline specific Elective (DSE) Course	4	6x6=36
Ability Enhancement Compulsory Course (AECC)	2	2x1=02 4x1=04
Generic Elective (GE) Course	4	6x4=24
Skill Enhancement Course (SEC)	2	2x2=04
Internship	1	12
	Total	178

6.2 A student will have to do a project under DSE-6 course in 7th semester. Project work may be done individually or in groups as per the case and group size cannot exceed more than three (03) members. The project synopsis should contain an introduction to the project which clearly

explains the project scope. The project work should be of such nature that it proves to be relevant from the point of view of commercial / management / technology / research.

6.3 Medium of Instruction: Medium of instruction shall be English.

6.4 Credits/work-load

i. Lecture 1 credit = 1 Hour Lecture [1 theory period of one hour duration per week]
ii. Tutorial 1 credit = 1 Hour Tutorial [1 tutorial period of one hour duration per week]
iii. Practical 1 credit = 2 Hours Practical [1 practical period of two hours duration per week]

7. Examination and Evaluation System

7.1 Date of Examination:

Exact dates and the schedule of examination shall be notified by the Controller of Examinations, Vidyasagar University. In the event of any unforeseen exigency the Controller of Examinations shall be competent for any adjustment in the prescribed schedule.

7.2 Schedule of Examination:

The schedule of examinations of BMLT consists of Internal and External Examinations. End Semester Examination (External) shall be conducted at the end of the academic activities of the respective Semester.

7.3 Marks Distribution:

The final marks of each examination paper shall be as per the syllabus.

7.4 Rules for Examinations:

a) All Examinations in BMLT programme shall be held on the compartmental system; each student must pass separately in every paper of the End Semester Examinations. Those who pass in a paper shall not be entitled to sit for exam in that paper again.
b) Non appearance in any paper will count as failure in that paper.
c) Pass marks in all examinations in the BMLT course shall be 50% of the maximum marks in each paper and in case of unit division of any paper the average 50% of that paper will be considered.
d) **End Semester Examination (ESE):**

i. At the end of each semester, there shall be an Examination there-in after called end-semester examination conducted by the University as per the schedule announced by the Controller of Examinations.

ii. A candidate pursuing BMLT programme has to secure minimum of **50% marks (including the marks in Continuous Assessment)** in each paper at the End Semester Examination to

qualify for the next semester. Automatic progression in the higher semester may apply, i.e., after appearing at semester-I examination, he/ she is allowed to continue semester-II study irrespective of the result of semester-I and so on.

iii. The candidates remaining absent in the end semester theory examination will be marked as **ABSENT** and the candidate shall not be eligible to qualify for marks processing. The marks obtained in Internal Assessment shall be retained for the entire duration of his/her enrolment.

iv. A student will be provisionally promoted to next semester if he/she does **not have more than two (02) back/supplementary papers (theoretical)** in the respective pervious odd / even semester Examinations. Each candidate must satisfactorily complete and pass all practical papers of the semester and must obtain at least **50% marks** in each of the practical paper. Fail in practical shall denote the repeat of that paper (both theory and practical).

v. A candidate having supplementary papers maximum upto **two (02)** in a semester may appear in those paper(s) in the concerned next Odd/Even semester's End Semester Examination to clear the supplementary paper.

vi. A candidate shall have to complete each semester examination **within 3 (Three) consecutive chances** including his / her first appearance in the concerned End Semester Examination.

vii. If a candidate does not avail any chance/chances mentioned above within the stipulated period, the chance shall be deemed to have lapsed**.**

viii. If any candidate fails to qualify any semester after **three (03)** chances his/her candidature of the course will be lapsed/ canceled. A special permission may be sought from the concerned University Authority for re-registration/ admission following the admission rules.

ix. **All back (supplementary) papers from 1st Semester to 7th Semester must be cleared before being promoted to 8th semester (i.e. internship)**

x. Student fail to clear 7th Semester Examination shall not be eligible to pursue the Internship Programme.

e) **Special Supplementary Examination:**

A Special supplementary examination will be held for students who fail to qualify in final semester examination i.e. Internship. There will be no Special supplementary examination for any practical paper.

f) **Internal Assessment (IA):**

i. Internal Assessment will be conducted by the internal teacher of the College. It shall be on the basis of tutorials, class tests, seminar presentations, or any combination thereof, evenly distributed over the entire study period. The modalities of such assessment be recorded and documents will be preserved by the respective college and those must be placed before any committee or team constituted by the university for verification.

ii. Marks obtained in the Internal Assessment will be clubbed with marks obtained in the End Semester Examination before awarding the grade. In case of supplementary in a paper, the internal assessment marks will be retained for next examinations with valid chances.

iii. Submission of marks of IA**:** The marks for IA will be clubbed and shall be submitted by the Principals/Teachers-in-Charge/Officer-in-Charge of the colleges to the Controller of Examinations before the commencement of End Semester Examination.

iv. At least 15 days before the date of commencement of final End Semester Examination of BMLT each candidate should submit his /her Internship report for evaluation with requisite fee.

7.5 Eligibility criteria of examination and types of assessment:

A candidate shall be eligible for appearing at any of the semester of examination fulfilling the following essential condition:

1. A student must have at least 75% class attendance (theory and practical separately).
2. Unless a student appears for the internal examination and practical examination, the student should not be permitted to appear for the Semester Final Theory examinations in the course concerned.
3. Student shall have to fill-up the examination form of the University paying the required fees as stipulated by the Vidyasagar University from time to time.
4. Registration is mandatory prior to form fill-up for the 1st Semester Examination.
5. Admit card shall be issued by the Controller of Examinations before the End Semester Examination and is mandatory for appearing at the examination.

7.6 Hour of End Semester Examination:

a. **Theoretical** papers of full marks up to **50,** duration **2** hours.
b. **Theoretical** papers of full marks more than **50,** duration **3** hours.
c. **Practical** papers of full marks up to **50,** duration **3** hours.
d. **Practical** papers of full marks above **50,** duration **5** hour

7.7 Question pattern

Full Marks (Paper)	Questions to attempt	Marks per question	Marks	Question options
40 (Theory)	05	02	10	08
	04	05	20	06
	01	10	10	02
80 (Theory)	10	02	20	15
	06	05	30	08
	03	10	30	05
50 (Practical)	1	15	15	03
	1	15	15	03
	Viva-10, PNB-10			

8.1 Evaluation / Grading System:

a. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

Based on the performance of the students, each student will be awarded Grade in subjects at the end of the semester examination following grading system on the base of TEN (10). On the basis of Cumulative Grade Point Average the student shall be awarded the Division to corroborate with the traditional scoring system.

10 Point scale

Qualification	Letter Grade	% of Marks	Grade Point
Outstanding	O	90-100	10
Excellent	A+	80-89	9
Very Good	A	70-79	8
Good	B+	60-69	7
Average	B	56-59	6
Poor	C	50-55	5
Fail	F	Below 50	0
Absent	Ab	Absent	0

Further there shall be another grade 'I' (with point 0) for students for whom disciplinary action remains pending.

The Semester Grade point Average (SGPA) will be computed in each semester as per the following formula:

$$SGPA = \frac{\sum_{i=1}^{n} {}^{*}C_i G_i}{\sum_{i=1}^{n} C_i}$$

C_i = The number of credits allotted for a particular course.

G_i = This is the Grade points corresponding to the grade awarded for the course

i = 1, 2.., n represent the number of courses in which a student is registered in the concerned semester. The SGPA is rounded off to two decimal places.

The Cumulative Grade Point Average (CGPA) will be computed at the end of semester as per the following formula

$$CGPA = \frac{\sum_{i=1}^{n} {}^{*}C_i S_i}{\sum_{i=1}^{n} {}^{*}C_i}$$

${}^{*}C_i$ is the total credits of the corresponding semesters. S_i is the SGPA of the corresponding semesters.

i = 1, 2,...., n represent the number of the course in which a student is registered in the concerned semester. The CGPA is rounded off to two decimal places.

8.2 Cancellation of results: A candidate may apply to the Controller of Examinations for cancellation of his/her result of any semester for improvement of results within 15 days from the publication of results or issue of mark sheet. There will be no provision for canceling results of any single subject/ paper in any case. In all cases, cancellation of results will be counted as one chance lost. Such candidates shall have to surrender their original mark sheet along with the application for cancellation of results by payment of requisite fee as fixed by the University authority.

8.3 Breach of Discipline: In case of breach of discipline by the examinee during the examination, proper action will be taken as per the university rules notified from time to time.

8.4 Grace Marks: A candidate who fails to obtain 55% or 60% marks in aggregate a maximum of 5 marks shall be awarded as grace mark in the Final semester examination.

9. Post publication Scrutiny of Answer Script (Self Inspection):

A candidate may apply for Self Inspection or RTI of his / her one or more answer scripts irrespective of marks by paying requisite fees. Post publication scrutiny (Self Inspection) does not imply re-examination or re-assessment of scripts but involves verification of scripts and records.

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VIDYASAGAR UNIVERSITY

Curriculum for Bachelor of Medical Laboratory Technology
[Choice Based Credit System (CBCS)]

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							IA	ESE	TOTAL
	Semester-I								
1	I	Core-1	BMLTCC1	CC1T: Human Physiology	6	4-0-0	10	40	50
				CC1P: Human Physiology Lab		0-0-4			50
		Core-2	BMLTCC2	CC2T: Biochemistry and Biophysics	6	4-0-0	10	40	50
				CCP: Biochemistry and Biophysics Lab		0-0-4			50
		GE-1	BMLTGE1	GE1T : Community Medicine **Or** GE1T : Health Programmes in India	6	5-1-0	20	80	100
		AECC-1	BMLTAECC1	Communicative English	2	1-1-0	10	40	50
	Semester –I: total				**20**				**350**
	Semester-II								
	II	Core-3	BMLTCC3	CC3T: Human Anatomy	6	4-0-0	10	40	50
				CC3P: Human Anatomy Lab		0-0-4			50
		Core-4	BMLTCC4	CC4T: Diagnostic Laboratory instrumentation	6	4-0-0	10	40	50
				CC4P: Diagnostic Laboratory instrumentation Lab		0-0-4			50
		GE-2	BMLTGE2	GE2T : Laboratory and Patient safety, Medical Law and Ethics **Or** GE2T : Medical Laboratory Total Quality Management	6	5-1-0	20	80	100
		AECC-2	BMLTAECC2	Environment Science and Health	4	2-0-0	20	80	100
	Semester-II : total				**22**				**400**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							IA	ESE	TOTAL
	Semester-III								
2	**III**	Core-5	BMLTCC5	CC5T: Basic and Clinical Haematology	6	4-0-0	10	40	50
				CC5P: Basic and Clinical Haematology Lab		0-0-4			50
		Core-6	BMLTCC6	CC6T: Medical Microbiology 1: Bacteriology	6	4-0-0	10	40	50
				CC6P:Medical Microbiology 1: Bacteriology Lab		0-0-4			50
		Core-7	BMLTCC7	CC7P: Clinical Immunology and Serology	6	4-0-0	10	40	50
				CC7P: Clinical Immunology and Serology Lab		0-0-4			50
		GE-3	BMLTGE3	GE3T :Pathological Basis of Diseases **Or** GE3T : Medical Lab Diagnostic	6	5-1-0	10	40	50
		SEC-1	BMLTSEC1	SEC1T: Professionalism & human values **Or** SEC1T: Hospital Waste Management	2	2-0	10	40	50
		Semester – III : total			**26**				**400**
	Semester-IV								
	IV	Core-8	BMLT CC8	CC8T: Basic Pathology	6	4-0-0	10	40	50
				CC8P: Basic Pathology Lab		0-0-4			50
		Core-9	BMLTCC9	CC9T: Diagnostic Microbiology 2: Mycology and Virology	6	4-0-0	10	40	50
				CC9P: Diagnostic Microbiology2: Mycology and Virology Lab		0-0-4			50
		Core-10	BMLTCC10	CC10T: Applied Histopathology and Cytopathology	6	4-0-0	10	40	50
				CC10P: Applied Histopathology and Cytopathology Lab		0-0-4			50
		GE-4	BMLTGE4	GE4T : Medical Biotechnology **Or** GE4T : Genetics and Health	6	5-1-0	10	40	50
		SEC-2	BMLTSEC2	SEC2T: Blood Bank and Blood transfusion SEC2T: Immunohematology	2	2-0-0	10	40	50
		Semester – IV : total			**26**				**400**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							IA	ESE	TOTAL
3	V	**Semester-V**							
		Core-11	BMLTCC11	CC11T: Clinical Pathology	6	4-0-0	10	40	50
				CC11P: Clinical Pathology (Practical)		0-0-4			50
		Core-12	BMLTCC12	CC12T: Clinical Biochemistry	6	4-0-0	10	40	50
				CC12P: Clinical Biochemistry (Practical)		0-0-4			50
		DSE-1	BMLTDSE1	DSE1T: Research Methodology **OR** DSE1T: Health Statistics	6	5-1-0	20	80	100
		DSE-2	BMLTDSE2	DSE2T: Forensic Diagnosis **OR** DSE2T: Pharmacology & Toxicology	6	5-1-0	20	80	100
		Semester –V : total			**24**				**400**
	VI								
		Core-13	BMLTCC13	CC13T: Andrology and Endocrinology	6	4-0-0	10	40	50
				CC13P: Andrology and Endocrinology Lab		0-0-4			50
		Core-14	BMLTCC14	CC14T: Clinical Parasitology and Entomology	6	4-0-0	10	40	50
				CC14P: Clinical Parasitology and Entomology Lab		0-0-4			50
		DSE-3	BMLTDSE3	DSE3T: Computer Application **OR** DSE3T : Health Informatics	6	5-1-0	20	80	100
		DSE-4	BMLTDSE4	DSE4T : Epidemiology DSE4T : Community orientation and clinical visit	6	5-1-0	20	80	100
		Semester – VI : total			**24**				**400**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
							IA	ESE	TOTAL
	VII	Core-15	BMLTCC15	CC15T: Immunopathology and Molecular Biology	6	4-0-0	10	40	50
				CC15P: Immunopathology and Molecular Biology Lab		0-0-4		50	50
		Core-16	BMLTCC16	CC16T: Assisted Reproductive Technology and Human Embryology	6	4-0-0	10	40	50
				CC16:P Assisted Reproductive Technology and Human Embryology Lab		0-0-4		50	50
		DSE-5	BMLTDSE5	DSE5T : Onco-pathology OR DSE5T : Cellular and System Pathology	6	5-1-0	20	80	100
		DSE-6	BMLTDSE6	DSE6P : Project Work	6	0-0-12			100
		Semester – VII : total			**24**				**400**
	VIII	**BMLTSIP (P) : Internship**			**12**				**200**
Total in all semester:					**178**				**2950**

CC = Core Course, **AECC** = Ability Enhancement Compulsory Course, **GE** = Generic Elective, **SEC** = Skill Enhancement Course, **DSE** = Discipline Specific Elective, **IA**= Internal Assessment, **ESE**= End Semester Examination, **CT** = Core Theory, **L** = Lecture, **T** = Tutorial, **P** = Practical.

LIST OF CORE COURSES AND ELECTIVES

Core Course (CC)

BMLTCC1T : Human Physiology.
BMLTCC1P : Human Physiology Lab
BMLTCC2T : Biochemistry and Biophysics
BMLTCC2P : Biochemistry and Biophysics Lab
BMLTCC3T : Human Anatomy
BMLTCC3P : Human Anatomy Lab
BMLTCC4T : Diagnostic Laboratory instrumentation
BMLTCC4P : Diagnostic Laboratory instrumentation Lab
BMLTCC5T : Basic and Clinical Haematology
BMLTCC5P : Basic and Clinical Haematology Lab
BMLTCC6T : Diagnostic Microbiology 1: Bacteriology
BMLTCC6P : Diagnostic Microbiology 1: Bacteriology Lab
BMLTCC7T : Clinical Immunology and Serology
BMLTCC7P : Clinical Immunology and Serology Lab
BMLTCC8T : Basic Pathology
BMLTCC8P : Basic Pathology Lab
BMLTCC9T : Diagnostic Microbiology 2: Mycology and Virology
BMLTCC9P : Diagnostic Microbiology2: Mycology and Virology Lab
BMLTCC10T : Applied Histopathology and Cytopathology
BMLTCC10P : Applied Histopathology and Cytopathology Lab
BMLTCC11T : Clinical Pathology
BMLTCC11P : Clinical Pathology Lab
BMLTCC12T : Clinical Biochemistry
BMLTCC12P : Clinical Biochemistry Lab
BMLTCC13T : Andrology and Endocrinology
BMLTCC13P : Andrology and Endocrinology Lab
BMLTCC14T : Clinical Parasitology and Entomology
BMLTCC14P : Clinical Parasitology and Entomology Lab
BMLTCC15T : Immunopathology & Molecular Biology
BMLTCC15P : Immunopathology & Molecular Biology Lab
BMLTCC16T : Assisted Reproductive Technology & Human Embryology
BMLTCC16P : Assisted Reproductive Technology & Human Embryology Lab

Discipline Specific Electives (DSE)

BMLTDSE1T: Research methodology
Or
BMLTDSE1T: Health Statistics
BMLTDSE2T: Forensic diagnosis
Or
BMLTDSE2T: Pharmacology & Toxicology
BMLTDSE3T: Computer Application
Or
BMLTDSE3T: Health Informatics

BMLTDSE4T: Epidemiology
Or
BMLTDSE4T: Community orientation and clinical visit
BMLTDSE5T: Onco-pathology
Or
BMLTDSE5T: Cellular and System Pathology
BMLTDSE6P: Project Work

Skill Enhancement Course (SEC)

BMLTSEC1 (T): Professionalism & human values
Or
BMLTSEC1 (T): Hospital Waste Management

BMLTSEC2 (T): Blood Bank and Blood transfusion
Or
BMLTSEC2 (T): Immunohematology

Generic Electives (GE)

BMLTGE1 (T): Community Health
Or
BMLTGE1 (T): Health Programmes in India
BMLTGE2 (T): Laboratory and Patient safety, Medical Law and Ethics
Or
BMLTGE2 (T): Medical Laboratory Total Quality Management
BMLTGE3 (T): Pathological Basis of Diseases
Or
BMLTGE3 (T): Medical Lab Diagnostic
BMLTGE4 (T): Medical Biotechnology
Or
BMLTGE4 (T): Genetics and Health

Ability Enhancement Compulsory Course (AECC)

BMLTAECC (T): Communication and soft skills- English
BMLTENVS (T): Environment and Health / Occupation and Health

Internship

BMLTSIP (P): Students Industrial Attachment - Internship

Core Course (CC)

Core Course (CC)-01 **Credits: 06**

BMLTCC1T: Human Physiology **Credits: 04**

Course content:

1. General Physiology: Homeostasis: Basic concept, Feedback mechanisms in general, transport across cell membrane.
2. Blood and Body Fluid: Plasma protein, Erythropoiesis & factors affecting erythropoiesis, Anaemia, Jaundice - types. Leucocytes: functions & variation. Thrombocytes - variations, function. Intrinsic& extrinsic pathways of coagulation. Fibrinolytic system. Tests of haemostatic function, like blood glucose, blood pressure, bleeding time, clotting time,Anticoagulants. Bleeding disorders. Blood groups: ABO & Rh system, dangers of blood transfusion.
3. Muscle and Nerve:Structure of skeletal muscle - Molecular mechanism of muscle contraction, neuromuscular junction; Resting potential & Action Potential, synapse structure and signal propagation.
4. Digestive System:Introduction to digestion: Composition, regulation of secretion & functions of saliva, gastric juice & pancreatic juice. Peptic ulcer, Gastritis, movements of small and large intestine, defecation.
5. Excretory System:Formation of Urine: Glomerular filtration rate - definition, normal values, factors influencing G.F.R. Micturition; Role of kidney in the regulation of pH of the blood.
6. Endocrinology:Endocrine function of hypothalamus, anterior pituitary, posterior pituitary, thyroid, adrenal cortex & medulla, pancreatic hormones, PTH,
7. Reproduction:Female reproductive system: Menstrual cycle, functions and hormones of ovary. Ovarian and uterine changes during menstrual cycle. Male reproductive system, spermatogenesis. Hormonal control.
8. Cardio Vascular System:Origin & propagation of cardiac impulse. Cardiac cycle. Heart sounds. Jugular venous pulse, Arterial pulse. ECG. Heart rate, Stroke volume, Cardiac output: factors affecting. Arterial blood pressure: variations, determinants, Regulation of Coronary circulation.
9. Respiratory System:Mechanics of breathing - surfactant, Spirometry: Lung volumes & capacities definition, normal values, significance, Transport of Oxygen & carbon dioxide in the blood. Hypoxia, cyanosis, dyspnoea, periodic breathing. Artificial respiration. Pulmonary function tests.
10. Central Nervous System: Neuronal organization at spinal cord level, Receptors, reflexes, sensations and nerve tracts (Gals and Burdach tract, Pain tract, pyramidal nerve tract), Functions of thalamus, hypothalamus, cerebellum. Cerebral cortex, Pons and medulla, CSF: clinical significance. Autonomic nervous system.
11. Special Senses: Fundamental knowledge of vision, hearing, taste and smell.

Reference Books:

1. C.C. Chatterjee's Human Physiology.
2. Essentials of Medical Physiology. K. Sembulingam, PremaSembulingam.
3. Medical Physiology – Anil Baran Singha Mahapatra.
4. Medical Physiology – Guyton & Hall
5. Medical Physiology – D. Venkatesh, HH Sudhakar.
6. Textbook of Medical Physiology – Indu Khurana
7. Ganong's Review of Medical Physiology
8. Boron &Boulpaep Medical Physiology.

BMLTCC1P: Human Physiology Lab **Credits 02**

Practical:

1. Study of Microscope and its uses
2. Staining of squamous epithelium
3. Collection of blood and study of haemocytometer
4. Determination of RBC count
5. Determination of WBC count
6. Determination of blood groups
7. Leishman's staining and differential leucocyte count
8. Blood pressure recording
9. Auscultation of Heart sounds
10. Acculturation of breath sounds
11. Determination of Erythrocyte Sedimentation rate(ESR)
12. Determination of packed cell volume(PCV)
13. Pulmonary function tests

Reference Books:

1. Practical Physiology –GK Pal.
2. CC Chatterjee's Practical Physiology.

Core Course (CC)-02 **Credits: 06**

BMLTCC2T: Biochemistry and Biophysics **Credits: 04**

Course content:

1. Elementary knowledge of general chemistry: atomic weight, Molecular Weight, equivalent weight, morality and normality.
2. Acid, base and Buffer concept in physiology.
3. Carbohydrates Definition, Source, Classification, Functions and Importance, Physiological importance of major type of carbohydrates.
4. Protein and amino acids – Definition, Source, Classification, essential and non-essential amino acids, Function and Importance of major type of proteins.
5. Lipids - Definition, Source, Classification, Function of major type of lipids. Saturated and Unsaturated type of fatty acids, Essential fatty acids and their importance. Phospholipids and their importance
6. Vitamins and Minerals – Fat-soluble and water-soluble vitamins, Daily requirements, Physiological functions and diseases of vitamin deficiency, minerals – Iron, calcium and Phosphorus. Deficiency and excess of these minerals. Vitamin as co-enzyme, Vitamin D as hormone
7. Bioenergetics, Respiratory chain and biological oxidation
8. Enzymes – Definition, Classification, Mode of action, Factors affecting enzyme action, co-enzyme, co-factor, isoenzyme, Chemical importance of enzyme.
9. Carbohydrate metabolism – Glycolysis, HMP shunt, TCA cycle, Glycogenesis, Glycogenolysis, Neoglucogenesis, Blood sugar level.
10. Lipid metabolism – Fatty acid βoxidation, Ketone bodies, Metabolism of cholesterol, Arteriosclerosis and Obesity.

11. Protein metabolism – Transamination, Transmethylation, Deamination, Urea synthesis.
12. Sodium potassium metabolism and their clinical significance.
13. Inborn error of metabolism- PKU, Galactosemia, MSUP, Glycogen storage disease

Reference Books:

1. Harper's Illustrated Biochemistry.
2. Biochemistry – D. Das
3. Biochemistry – U. Satyanarrayan.
4. Principles of Biochemistry – Lehninger
5. Textbook of Bio physics – Pranab Kumar Banerjee.

BCACC2P: Biochemistry and Biophysics Lab **Credits: 02**

Practical:

1. Preparation of solution. Calculation of normal, molar and percent solutions.
2. Qualitative identification of Carbohydrate, protein, acetone, Bile salt and cholesterol.
3. Principle and operation of Colorimeter
4. Preparation of different buffers used in pathological laboratory and their pH determination
5. Sodium and Potassium estimation in Serum.
6. Quantification of glucose, lactose and sucrose in a specific sample.

Reference Books:

1. Practical Textbook of Biochemistry for Medical Students-DM Vasudevan, Subir Kumar Das, Second edition
2. Practical Mannual of Biochemistry- S.P.Singh, Second edition.

Core Course (CC)-03 Credits 06

BMLTCC3T: Human Anatomy **Credits 04**

Course Content:

1. Cell and Tissue: Structure of cell & cell organelles; Types, structure & location of tissues
2. Cardiovascular System: Basic anatomy of heart and important blood vessels
3. Respiratory System: Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs
4. Digestive System: Basic anatomy of oesophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas
5. Excretory System: Basic anatomy of kidney, General arrangement of urinary system.
6. Nervous System: Basic anatomy of brain and spinal cord.
7. Reproductive System: Basic anatomy of ovary, testis, uterus, prostate, epididymis.
8. Anatomy of superficial vein.

Reference Books:

1. Fundamentals of Human Anatomy, Dr. N Chakraborty and Dr. D Chakraborty.
2. Anatomy, Gray
3. Clinical Anatomy for Medical students, Snell
4. Human Anatomy, Dutta
5. Essentials of Anatomy, Singh.
6. B.D. Chaurasia's Human Anatomy : Regional and Applied

BCACC3P: Human Anatomy Lab **Credits 02**

Practical:

1. Identification of surface land marks of a human body.
2. Study on muscles of trunk, lower and upper extremities and face on a dissected human body.
3. Study on bone on human body with special reference to the origin and insertion of muscles and ligaments.
4. Study on gross anatomy of respiratory, digestive, endocrine, urinary and genital system on a dissected human body.

Reference Books:

1. Human Anatomy Laboratory Manual. ChristineEckel. 3rd edition. 2018.
2. Human Anatomy Lab Manual. Eckel Christine
3. Human Anatomy & Physiology Lab Manual. Marieb Elaine N.

Core Course (CC) - 04 **Credits 06**

BMLTCC4T: Diagnostic Laboratory instrumentation **Credits 04**

Course content:

1. Microscope: Light microscope, Compound microscope, Phase Contrast microscope, Fluorescent, Polarized, Electron Microscope.
2. Colorimeter: Working Principle, components and its application.
3. Spectrophotometer: Working Principle, components and its application.
4. Centrifuges: Working Principle, types and its application g and rpm.
5. Laminar flow: Working Principle, components and its application.
6. Autoclave: Types, Working Principle, and its application.
7. Incubator: Working Principle, types and its application.
8. Blood cell counter: Working Principle, and its application.
9. ELISA, RIA & CLIA: Types, Working Principle, and its application.
10. Semi and full auto-analyser: Working Principle, and its application.
11. Electrophoresis: Types, Working Principle, and its application.
12. HPLC: Types, Working Principle, and its application.
13. Chromatography
14. Bio-safety cabinet

Reference Books:

1. Principles of Laboratory Instruments, SCHOEFF. WILLIAMS
2. Medical Laboratory Technology, K. L. Mukherjee.
3. Textbook of Medical Laboratory Technology, GODKAR

BMLTCC4P: Diagnostic Laboratory instrumentation Lab **Credits 02**

Practical:

1. Demonstration and operation of different microscope (Light microscope, Compound microscope).
2. Demonstration and operation of Colorimeter and spectrophotometer.
3. Demonstration and operation of Centrifuges
4. Demonstration and operation of incubator, hot air oven, laminar flow and autoclave.
5. Demonstration and operation of semiauto analyser and ELISA.

6. Demonstration and operation of blood cell counter.

Reference Books:

1. A Manual of Laboratory & Diagnostic Tests- Frances Fischbach, Marshall Barnett Dunning III, Wolters Kluwer India Pvt. Ltd.; Ninth edition.
2. Fischbach's Manual of Laboratory and Diagnostic Tests- Margaret A. Fischbach RN, JD, Wolters Kluwer India Private Limited; Tenth edition.
3. Medical Laboratory Technology, K. L. Mukherjee.
4. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC)-05 — Credits 06

BMLTCC5T: Basic and Clinical Haematology — Credits 04

Course content:

1. Collection and handling of blood- Standardize procedure, phlebotomy tray, Blood film preparation, differences between capillary and venous blood, Anticoagulant used, Phlebotomy and after care.
2. Introduction to Automation in haematology- Principle, advantages, cautions.
3. Overview of haematopoiesis.
4. Principle of Blood grouping, false positive and false negative reaction. Coomb's test/ Du test
5. Blood component separation- principles, preparation & uses
6. Mandatory blood tests in blood banking with donor's blood.
7. Anaemia-Definition, morphological classification and diagnostic tests
8. Normal & abnormal Hb with special reference to Thalassemia. Hb electrophoresis
9. RBC indices & PCV estimation.
10. Overview of WBC production, morphology, common causes of leucocytosis& leukopenia.
11. Classification & lab diagnosis of Leukaemia, Leukaemia vs leukemoid reaction.
12. Flow cytometry- working principle and application
13. Basic concepts of Haemorrhagic disorders, coagulation disorders.

Reference Books:

1. Hematology: Basic Principles and Practice- Ronald Hoffman and Edward J Benz and Leslie E Silberstein and Helen Heslop and Jeffrey Weitz and John Anastasi
2. Clinical Hematology: Theory and Procedures, Turgeon, Wolters Kluwer, Lippincott Williams & Wilkins, 6th Edition
3. Williams Hematology- KennethKaushansky, Marshall A. Lichtman, Josef T. Prchal, Marcel M. Levi, Linda J. Burns, David C. Linch, McGraw Hill / Medical; 10th edition
4. Essentials of Clinical Haematology- A Manoharan, S Sethuraman. Jaypee Brothers Medical Publishers Private Limited; 1st edition
5. Medical Laboratory Technology, K. L. Mukherjee.
6. Textbook of Medical Laboratory Technology, GODKAR

BMLTCC5P: Basic and Clinical Haematology Lab — Credits 02

Practical:

1. Estimation of Hb by Colorimetric method

2. Total count of RBC, WBC & platelet
3. PCV determination& RBC Indices calculation.
4. ESR estimation
5. Drawing of PBS, Romanowsky's stain, Stain preparation, staining of PBS &recognition of cells & DC.
6. Absolute eosinophil count
7. Training at blood bank and submission of report and discussion
8. ABO blood grouping and Rh typing
9. Coombs test
10. Cross matching
11. Reverse grouping
12. Identification of abnormal cells in PBS
13. MPO, PAS stain, SBB staining of Bone marrow smears for differential diagnosis of leukemia.
14. BT, CT, PT, APTT & INR

Reference Books:

1. Medical Laboratory Technology, K. L. Mukherjee.
2. Textbook of Medical Laboratory Technology, GODKAR
3. Practical Guide to Clinical Haematology- Dr Mirza Asif Baig
4. Practical Manual for Clinical and Applied Haematology- Shadma Siddiqui Chandra Bahadur Singh Dangi

Core Course (CC) -06 — Credits 06

BMLTCC6T: Diagnostic Microbiology 1: Bacteriology — Credits 04

Course content:

1. Bacterial taxonomy; characteristics of bacterial pathogens; Morphology-structure of a typical bacterial cell- size, shape, arrangement; ultra-structures- flagella, pili, cell-wall, cytoplasmic membrane, endospore, capsule, prokaryotic cellular reserve materials
2. Bacterial nutrition, factors influence bacterial growth, microscopic and macroscopic features of bacteria, biochemical identification of medically important bacteria, host microbe interaction, biofilms
3. Control of microbial growth by physical and chemical methods; sterilization, disinfection, sanitization, fumigation, preservation; major groups of antibiotics and their mode of action, antibiotic resistance, antimicrobial susceptibility testing
4. Specimen collection and handing in microbiological laboratory; safety regulation of the laboratory, basic laboratory procedures of diagnostic laboratory.
5. The study of representative medically important bacteria:
    a. Gram-positive cocci: *Staphylococcus, Streptococcus, Enterococcus*
    b. Gram-positive bacilli:*Clostridium, Bacillus, Corynebacterium*
    c. Gram-negative bacilli and coccobacilli: *Enterobacteriaceae, Acinetobacter, Pseudomonas,Vibrio,Haemophillus*
    d. Gram-negative cocci: *Neisseria*
    e. *Mycobacterium*

Reference Books:

1. Diagnostic Bacteriology. Kimberly A. Bishop-Lilly.
2. Review Handbook in Diagnostic Bacteriology. Maria Teresa T. Rodriguez.2018.
3. Diagnostic Bacteriology: A study guide. Margaret A. Bartelt. 1st edition.
4. Medical Laboratory Technology, K. L. Mukherjee.
5. Textbook of Medical Laboratory Technology, GODKAR

BMLTCC6P: Diagnostic Microbiology 1: Bacteriology Lab **Credits 02**

Practical:

1. Sterilization techniques and cleaning of glassware.
2. Preparation of culture media
3. Culture techniques of different clinical specimens
4. Semi-quantitative urine analysis
5. Bacterial culture preservation and transport
6. Biochemical identification of medically important bacteria.
7. Staining techniques: Gram staining, AFB stain, Albert stain, endospore stain
8. Antimicrobial susceptibility testing by disc diffusion.

Reference Books

1. Advanced Techniques in Diagnostic Microbiology. 3rd edition. Yi-Wei Tang, Charles W. Stratton.
2. Practical Bacteriology. Ameer Khusro, J. P. Preetam Raj, P. Agastian, S. Theoder .2017
3. Diagnostic Bacteriology Protocols. Louise O'Connor
4. Medical Laboratory Technology, K. L. Mukherjee.
5. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC) -07 **Credits 06**

BMLTCC7T: Clinical Immunology and Serology **Credits 04**

Course content:

1. Basic concept of Immune system.
2. Types of immunity, cellular, humoral, active, passive, natural, and acquired immunity. Primary and secondary immune organs.
3. Immunoglobins—type, structure and their specific importance.
4. Antibody development and antigen-antibody reaction, type of reaction.
5. Basic concept of immunization. Primary and secondary response of immunization. Vaccination and Booster dose.
6. Basic concept of immunodeficiency diseases.
7. Basic concept ofimmunosuppression - role in organ transplantation.
8. Auto immune disease: Hasimotos disease, myasthenia gravis, RA and Lupus erythromatosus.
9. Basic types of hypersensitivity.
10. Collection and preparation of specimen used in serological laboratory.
11. Principle of sero-diagnostic tests: precipitation, flocculation, agglutination, neutralization and coagulation, immunochemotherapy
12. Serological test for syphilis (STS) and VDRL, CRP, RPR test.
13. WIDAL test for Salmonella typhi.

14. Serodiagnosis test for dengue, AIDS, SARS-CoV, TORCH panel test.
15. Immunological test for pregnancy (direct and indirect).
16. Intradermal hypersensitivity test – Mantoux test.
17. ASO test.

Reference Books:

1. Essentials of Immunology- SK Gupta
2. Immunology &SerologyiIn Laboratory Medicine- Marie Louis Turgeon
3. Kuby Immunology- Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen
4. Clinical Immunology and Serology: A Laboratory Perspective-Christine Stevens
5. Medical Laboratory Technology, K. L. Mukherjee.
6. Textbook of Medical Laboratory Technology, GODKAR

BMLTCC7P: Clinical Immunology and Serology Lab **Credits 02**

Practical:

1. Determination of 'ABO' blood grouping and 'Rh' typing.
2. Antibody measurement by Radial immuno-diffusion (RID) technique.
3. Antigen-Antibody reaction testing by precipitating ring. Ouchterlony test.
4. Quantitative assay of Immunoglobins in plasma(IgG,IgM).
5. Study of precipitation, agglutination and coagulation test.
6. VDRL test, WIDAL test, RPR, ASO test, SARS-CoV2.
7. CRP test, RA test, AIDS test, STS test.
8. Immunological test for pregnancy (direct and indirect).
9. Montouxe test.

Reference Books:

1. Clinical Immunology and Serology A Laboratory Perspective- Stevens Christine Dorresteyn, Linda E. Miller.
2. Clinical Immunology Principles and Practice-Robert R. Rich, Thomas A. Fleisher, William T. Shearer, Harry W. Schroeder, Jr., Anthony J. Frew, and Cornelia M. Wey
3. Medical Laboratory Technology, K. L. Mukherjee.
4. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC) -08 **Credit 06**

BMLTCC8T: Basic Pathology **Credit 04**

Course content:

1. Neoplasia- Definition, Benign vs malignant tumour, commonly used different laboratory tests in diagnosis of malignant lesions.
2. Hemodynamics- Overview, Basic concept of septic shock.
3. History taking and correlation with laboratory diagnosis of AMI, TB, Diabetes, Hypothyroidism and Hyperthyroidism.
4. Composition of urine, collection & preservation of urine

a. Physical examination- Colour, pH & specific gravity

b. Chemical examination – Protein, Sugar, ketone body, bile salt, bile pigment, blood, chyle detection
c. Microscopic examination. - Cells, casts, crystals
5. Detection of micro albumin & 24 hrs urinary total protein estimation
6. Bone Marrow Aspiration & Bone Marrow Biopsy- Procedure, indications, contraindications, preparation of tray, smear, staining, Iron stain in Bone Marrow.
7. Basic concepts of jaundice, types, lab investigations.
8. Apoptosis and necrosis – Definition, basic concepts & types
9. Hyperplasia, Hypertrophy, Atrophy & Metaplasia- Definition & examples.
a. Inflammation- Definition basic feature of acute inflammation cardinal signs.
b. Chronic Inflammation- Basic concept, granuloma with examples.
10. Cell Injury

Reference Books:

1. Basic Pathology. Lakhani Sunil. 2nd ed. Taylor & Francis Ltd.
2. Robbins Basic Pathology. 2017. Vinay Kumar, Abul Abbas, Jon Aster.
3. Textbook of Pathology. Harsh Mohan. 7th edn.
4. Medical Laboratory Technology, K. L. Mukherjee.
5. Textbook of Medical Laboratory Technology, GODKAR

BMLTCC8P: Basic Pathology Lab **Credit 02**

Practical:

1. Supravital staining & Reticulocyte count
2. Urine RE & ME
3. Use of different types of dip sticks
4. Urine- Total protein estimation, Physical and chemical examination of urine.
5. Qualitative test glucose, ketone body, blood, protein in urine.
6. Stool RE, ME
7. Abnormal cell morphology

References Books:

1. Pathology Practical Book. Harsh Mohan. 2013. 3rd edition.
2. Comprehensive Workbook of Practical Pathology: As per the Competency-based Medical Education Curriculum (NMC). ML Gupta. 2021.
3. Medical Laboratory Technology, K. L. Mukherjee.
4. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC) -09 Credit 06

BMLTCC9T: Diagnostic Microbiology 2: Mycology and Virology **Credit 04**

Course content:

1. Fungal taxonomy; morphology, cell structure & reproduction of medically important fungi, sexual and asexual fungal spores, thermal dimorphism.
2. Fungal sample collection techniques from mycoses-suspected patient, laboratory culture for isolation and identification of pathogenic fungi, fungal stains, antifungal agents.
3. Types of mycoses: superficial, cutaneous, subcutaneous, systemic and opportunistic.

4. Laboratory diagnosis of *Candida, Aspergillus, Cryptococcus, Mucor, Blastomyces, Coccidioides, Histoplasma,* Dermatophytes
5. Taxonomy of virus, general properties of viruses, Classification of viruses, Morphology: Virus structure, basic idea of virus culture, important antiviral drugs
6. Medical importance and laboratory diagnosis of hepatitis viruses, herpes simplex, pox, measles, chikungunya, viral hemorrhagic fevers, influenza, coronavirus, HIV.
7. Viroids, virusoids, prions.

Reference Books:

1. Mycology and microbiology.C. Manoharachary , K.V.B.R. Tilak , K.V. Mallaiah & I.K. Kunwar.
2. Textbook of Medical Mycology. Jagdish Chander. 4thedn.
3. A Text book of Mycology. Hait G. 2017.
4. Textbook of Medical Virology, 2nd Edition. Mishra B.
5. Medical Virology. Frank J. Fenner, David O. White.
6. Clinical Virology Manual. 2016. 5thedn. Michael Loeffelholz (Editor), Richard L. Hodinka (Editor), Stephen A. Young (Editor), Benjamin A. Pinksy (Editor)

BMLTCC9P: Diagnostic Microbiology2: Mycology and Virology Lab **Credit 02**

Practical:

1. Induction on fungal culture laboratory and media
2. Nail scraping for fungal identification
3. Techniques of fungal culture and preservation
4. Microscopic observation of fungal structures by KOH preparation and lactophenol cotton blue stain
5. Demonstration on macroscopic morphology of pathogenic fungi
6. Detection of dengue virus and HIV by ELISA.
7. Rapid detection of virus infections by point-of-care test
8. Demonstration on virus culture techniques
9. Demonstration on ultramicroscopic observations of medically important virus

Reference Books:

1. Practical Molecular Virology. Mary K. Collins. 1991.
2. Laboratory Handbook of Medical Mycology. McGinnis, Michael R.
3. Medical Laboratory Technology, K. L. Mukherjee.
4. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC)-10 — Credit 06

BMLTCC10T: Applied Histopathology and Cytopathology **Credit 04**

Course content:

Applied Histopathology

1. Introduction to histopathological techniques
2. Receiving of specimens

3. Different histological fixatives and their uses, Advantages and disadvantages
4. Step of tissue processing and embedding, Section cutting, Mounting
5. Principle, procedure and clinical significance of Haematoxylin &Eosin staining, PAS stain, Trichrome stain.
6. Microtome & its care
7. Decalcification
8. Reticulin stain & its uses
9. Museum specimen preservation & mounting
10. Frozen section
11. IHC basic principles & utility

Cytopathology

1. Preparation of smear in fine needle aspiration cytology
2. Principle of exfoliative cytology, PAP staining
3. Preparation of smear from fluid, Fluid cytology, Imprint cytology, scrape& brush cytology
4. Examination of body fluids including CSF- transudate & exudates
5. Fixation of smears
6. MGG stain/ Leishman-Giemsa staining
7. Papanicolaou staining, principles & uses in cervical smear.Identification of cells in that stain.
8. Cytospin- Basic principles & utility
9. Cell block preparation- basic principles & utility
10. Liquid Based Cytology

Reference Books:

1. Techniques in Histopathology and Cytopathology - Sadhana Vishwakarma
2. Histopathology Techniques and its Management, Ramadas Nayak
3. Basic and Advanced Laboratory Techniques in Histopathology and Cytology- Pranab Dey
4. Practical histopathology- Shafie Abdulkadir Hassan
5. Medical Laboratory Technology, K. L. Mukherjee.
6. Textbook of Medical Laboratory Technology, GODKAR

BCACC10P: Applied Histopathology and Cytopathology Lab **Credit 02**

Practical

1. Tissue collection and fixation.
2. Dehydration of collected tissue sample in the graded alcohol.
3. Embedding & preparation of blocks, Section cutting , use & care of microtome
4. Stain preparation – Haematoxylin, eosin, PAS, Trichrome, ironhaematoxylin.
5. Staining techniques using above stains.
6. Preparation of specimen for cytological evaluation by papaniculasstaining, crystal violet staining.
7. Characterization of benign and malignant cells.

Reference Books:

1. Lab Tech Histopathology & Cytopathology - Dr. N. Murugesh, Dr.Dinesh Kumar Shukla
2. Pathology Practicals and Quick Review-Ana S Pilli
3. Comprehensive Workbook of Practical Pathology- ML Gupta
4. Medical Laboratory Technology, K. L. Mukherjee.
5. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC)-11 — Credit 06

BMLTCC11T: Clinical Pathology — **Credit 04**

Course content:

1. Overview of platelet production common causes of thrombocytopenia.
2. Apoptosis and Necrosis- Definition, basic concepts & types.
3. Collection of urine and stool specimen, types of urine and stool specimen and preservation of urine and stool.
4. Routine examination of urine – physical and Microscopic examination.
5. Chemical test of urine for glucose, protein, Ketone bodies, bilirubin, urobilinogen & blood.
6. Laboratory investigation, Serous fluid, Ascitic fluid,Transudate, Exudate and Gastric juice.
7. Collection and processing of CSF and its laboratory investigation.
8. Routine test for stool and occult blood test.

Reference Books:

1. Essentials of Clinical Pathology- Shirish M. Kawthalkar, Jaypee Brothers Medical Publishers; Second edition
2. Oxford Handbook of Clinical Pathology- james Carton
3. The Principles of Clinical Pathology- LudolfKrehl

BMLTCC11P: Clinical Pathology Lab — **Credit 02**

Practical:

1. Physical and Microscopic examination of Urine.
2. Bio-chemical estimation of glucose in urine.
3. Bio-chemical estimation of protein and ketone bodies in urine, bile salt, bile pigment, urobilinogen and blood in urine.
4. Laboratory testing of CSF, Serous fluid, Ascitic fluid,Transudate/Exudate,Gastric juice, and Synovial fluid.
5. Collection and processing of CSF and its laboratory investigation.
6. Routine test and microscopical test for stool and occult blood test.

Reference Books:

1. Clinical Pathology: A Practical Manual-Sabitri Sanyal, Aparna Bhattacharya
2. A Laboratory Guide to Clinical Hematology-Valentin Villatoro.

Core Course (CC)-12 — Credit 06

BMLTCC12T: Clinical Biochemistry — **Credit 04**

Course content:

4. Specimens processing for biochemical analysis – preparation of serum specimen, protein free filtrate and urine.
5. Principles of Immuno chemistry – RIA & ELISA.
6. Determination of glucose, urea, creatinine, uric acid, bilirubin, Triglyceride, cholesterol and Phospholipids, LDL,VLDL,HDL, Troponine T test in blood.

7. Liver function tests. (Total protein, Albumin, Globulin ratio, ALP, ALT, AST, conjugated and unconjugated bilirubin)
8. Gastric function tests: Free acidity, Total acidity, total acidity, gastric pH, gastric enzyme analysis.

Reference books:

1. Textbook of Clinical Biochemistry-Ramnik Sood
2. Clinical Biochemistry- Nanda Maheshwari
3. Textbook of Clinical Biochemistry- S.S. Haque
4. Clinical Biochemistry- Nanda Maheswari
5. Medical Laboratory Technology, K. L. Mukherjee.
6. Textbook of Medical Laboratory Technology, GODKAR

BMLTCC12P: Clinical Biochemistry Lab **Credit 02**

Practical:

1. Preparations of plasma, serum, and protein free filtrate from blood for biochemical analysis.
2. LFT: total bilirubin, direct-indirect, SGPT/SGOT, gamma-GT, ALP, total protein in serum, albumin-globulin ratio
3. Lipid profile:serum TG, blood cholesterol and blood Phospholipids
4. RFT: blood urea, blood creatinine,
5. Determination of Blood glucose, HbA1c, serum uric acid, and Ketone bodies.
6. Estimation of Hepatitis – A, B, C, E.
7. Experiment on Glucose tolerance test.
8. Amylase, lipase

Reference books:

1. Practical Clinical Biochemistry Methods and Interpretations- Ranjna Chawla
2. Practical Clinical Biochemistry- Varley Harold, Alan H Gownlock
3. Medical Laboratory Technology, K. L. Mukherjee.
4. Textbook of Medical Laboratory Technology, GODKAR

Core Course (CC) -13 **Credit 06**

BMLTCC13T: Andrology and Endocrinology **Credit 04**

Course content:

1. Information on pituitary-gonadal axis, pituitary –thyroid axis, pituitary – Adrenocortical axis, feedback system. Information on pancreatic hormones.
2. Hormonal disorders in Diabetes mellitus and insipidus, hypertension, goiter, obesity and infertility.
3. Techniques followed in hormone assay – ELISA / RIA cross reaction, inter assay, intra assay variation.
4. Spermatogenesis and its hormonal control, semen physiology, sperm count, sperm motility, sperm morphology, fructose estimation of semen. Sperm viability test.
5. Primary idea on Assisted Reproductive Technology (ART).

6. Acid phosphatase in semen.

Reference books:

1. Williams Textbook of Endocrinology- ShlomoMelmed, Richard J Achus, Allison B Goldfine.
2. Basics of Human Andrology- Anand Kumar, Moma Sharma
3. Endocrinology And Reproductive Biology- K. V. Sastry, Rastogi
4. Harrison's Endocrinology- J. Larry Jameson

BMLTCC13P: Andrology and Endocrinology Lab **Credit 02**

Practical:

1. ELISA program for hormone assay
2. Hormone assay by ELISA reader – Estrogen, Testosterone, thyroid profile, LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.
3. Quality control of hormone assay- Intra assay, Inter assay, Cross reaction
4. Sperm count, sperm motility, sperm morphology.
5. Fructose assay in semen, Acid Phosphatase in semen. Sperm viability test.

Reference books:

1. Andrology Laboratory Manual- Kamini A Rao, Ashok Agarwal, MS Srinivas

2. A Practical Guide to Basic Laboratory Andrology- Lars Björndahl, David Mortimer, Christopher 3. L. R. Barratt, Jose Antonio Castilla, RoelofMenkveld, UlrikKvist, Juan G. Alvarez, Trine B. Haugen

Core Course (CC) -14 **Credit 06**

BMLTCC14T: Clinical Parasitology and Entomology **Credit 04**

Course content:

1. Basic concept of Medical Entomology and Parasitology in relation of this course.
2. Arthropods of medical importance. Arthropods borne disease and their transmission. Principle of arthropod control.
3. Mosquito – Role in this arthropod in disease transmission, Diseases types, Controlling measures.
4. Houseflies – Role in disease transmission and controlling measures. And Sandflies.
5. Flea – Role in disease transmission and controlling measure & itch mite.
6. Filaria – Causes, Symptoms and controlling measures.
7. Taeniasis – Causes, Symptoms and controlling measures.

Reference books:

1. Clinical Parasitology: A handbook for Medical Practitioners and Microbiologists.Harsha Sheorey, John Walker, Beverley-Ann Biggs.
2. Medical Entomology for Students.2012. Mike Service.
3. Entomology in Human and Animal Health. William B. Herms, R.F. Harwood Maurice T. James.
4. Medical Laboratory Technology, K. L. Mukherjee.
5. Textbook of Medical Laboratory Technology, GODKAR

BCACC14P: Clinical Parasitology and Entomology Lab **Credit 02**

Practical:

1. Collection, Presentation & Identification of different disease-causing Arthropods (Housefly, Mosquito etc.)
2. Whole mount preparation of slide of different disease-causing arthropods for their detailed anatomical studies.
3. Identification of different disease-causing Helminth and Protozoan parasites.
4. Identification of different phases of life cycle of arthropods protozoa, helminth, having medical importance for causing disease.
5. Slide identification of microfilaria, Taeniasolium, ascaris, and deferent stages of malaria. 6. Examination of stool for OPV (Ova parasite Cyst)

Reference books:

1. Clinical Parasitology: A Practical Approach Paperback –1997**.** Elizabeth A. Zeibig.
2. A Manual of Practical Entomology. 2001. M. M. Trigunayat.
3. Medical Laboratory Technology, K. L. Mukherjee.

Core Course (CC) -15 Credit 06

BMLTCC15T: Immunopathology & Molecular Biology **Credit 04**

Course content:

1. General principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins.
2. Basic transcription apparatus, Initiation, elongation and termination of transcription,
3. Introduction of translation
4. PCR, Principle, Types, applications, Thermal cycler, qRT PCR
5. Blotting techniques, southern blotting and Western blotting
6. Unit-V: Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span.
7. Stem cell banking
8. Prenatal Diagnosis.

Reference Books:

1. Immunology, Immunopathology and Immunity- Stewart Sell
2. Molecular Biology- Dr. P.S. Verma, Dr. V.K. Agarwal
3. Current progress in Immunopathology- Emma Davos
4. Molecular Biology Concept for Inquiry-Jennifer A Hackket

BMLTCC15P: Immunopathology & Molecular Biology Lab **Credit 02**

Practical:

1. Isolation of nucleic acid
2. Separation of DNA by Agarose gel electrophoresis
3. Demonstration of PCR and qRT PCR.
4. Demonstration of PCR HLAB-27
5. Demonstration of PCRHIV
6. Demonstration of PCRMTB

Reference Books:

1. Manual Of Immunopathological Techniques-Usha, Jaypee Brothers Medical Publishers
2. Practical Manual of Molecular Biology- Dr. Deepak Som

Core Course (CC) -16 — Credit 06

BMLTCC16T: Assisted Reproductive Technology & Human Embryology — Credit 04

Course content:

1. Concept of infertility & sterility.
2. Factors of male & female infertility.
3. General concept of fertilization.
4. ART & different types – AI (IVI, ICI, IUI), IVF, ICSI, GIFT, SUZI, general concept.
5. Testing for status assessment of female reproductive system.
6. Basic concept of human embryology
7. First week of development of zygote- Cleavage, Morulla, Blastula, Implantation, Gastrulation in brief.
8. Organogenesis in brief
9. Placentation
10. Amniocentesis
11. Foetal circulation
12. Foetal respiration.

Reference Books:

1. Textbook of Assisted Reproductive Techniques. David K. Gardner. 5th edn.
2. Regulating Assisted Reproductive Technologies. AmelAlghrani. 1st edn.
3. Human Embryology. 8thedn. Inderbir Singh
4. Textbook of Human Embryology. Y. Sontakke. Kindle Edition.
5. Textbook of Clinical Embryology. Vishram Singh.

BMLTCC16P Assisted Reproductive Technology & Human Embryology Lab — Credit 02

Practical:

1. Hormone assay by ELISA reader – Estrogen, Testosterone, T3 and T4, LH, FSH, PRL, Insulin, Glucagon, Glucocorticoids, GH.
2. Sperm count, sperm motility, sperm morphology, fructose assay in semen, Acid Phosphatase in semen. Sperm viability test.
3. Assessment of acrosome reaction.
4. Antisperm antibody test.
5. Pregnancy test.

Reference Books:

1. Principles & Practice of Assisted Reproductive Technology. Rao Kamini.2014.
2. Manual of Embryo Culture in Human Assisted Reproduction. Cambridge University Press.2021

Discipline Specific Electives (DSE)

Discipline Specific Electives (DSE) - 01 — Credit 06

BMLTDSE1T: Research methodology — **Credit 06**

Course content:

1. Concepts of Research and it's types.
2. Concepts of hypothesis.
3. Basic idea about Project formulation.
4. Sampling-Types.
5. Data collection.
6. Experimental design.

Reference Books:

1. Research Methodology: Methods and Techniques- C. R. Kothari
2. Research Methodology- Panneerselvam R
3. Research Methodology-Jerry Ramonyai

OR

BMLTDSE1T: Health Statistics — **Credit 06**

Course content:

1. Introduction to medical statistics: Definition, role of statistics in health science
2. Sampling: Population, sample, sampling, reasons for sampling, probability and non-probability sampling.
3. Measures of location: Arithmetic mean, median, mode.
4. Measures of variation: Range, variance, standard deviation, coefficient of variation-definition.
5. One way analysis of variance (ANOVA).
6. Correlation and Regression: Concept and properties of correlation coefficient

Reference Books:

1. Applied Statistics in Health Sciences- NSN Rao, NS Murthy
2. Fundamentals of Statistics-S.C. Gupta
3. Research Methodology & Medical Statistics- Dr. Sourav Ballav, Dr. Satish Chand Gupta

Discipline Specific Electives (DSE) - 02 — Credit 06

BMLTDSE 2T: Forensic diagnosis — **Credit 06**

Course content:

1. Medico-legal aspects of a disease, Essential forensic pathology and clinical forensic medicine to include recognition and interpretation of wounds and other injuries. Medical and scientific investigation of fires.
2. Explosions and similar causes of non-natural deaths, Child deaths and child abuse; Investigation of sexual offenses.

3. Principles of forensic toxicology, Drugs and poisons including drugs of abuse and the related law; Alcohol – scientific and legal aspects, Forensic DNA, Basics of Forensic Odontology.
4. Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations.

Reference Books:

1. Forensic Science, Fundamentals & investigations- Bertino& Bertino
2. Advanced Technology in Forensic Investigation- Annamma John

OR

BMLTDSE 2 T: Pharmacology & Toxicology **Credit 04**

Course content:

1. Pharmacodynamics &pharcokinetics
2. Bio-transformation of drug
3. Drug receptor
4. Concept of toxins & toxicology
5. Basic idea about LD_{50}, ED_{50}, safety factor, NOEL
6. Factor affecting toxicity of toxins
7. Pharmacotoxicity

Reference Books:

1. Pharmacology and Toxicology- Dr. A. V. Yadav
2. A Text Book of Pharmacology and Toxicology- P.P. Singh Uppal
3. A Concise Book of Pharmacology- N. Muruesh

Discipline Specific Electives (DSE) - 03 **Credit 06**

BMLTDSE3T: Computer application **Credit 06**

Course content:

1. Study on various components of a personal computer, hardware and software.
2. Computer Applications in pathological laboratory to recording and data presentation.
3. Basic knowledge and utility in multimedia in laboratories.
4. Application of the digital computer in patient maintaining, Basic knowledge on MS-office, Floppy recording, Storage of data in pathological laboratory.

Reference Books:

1. Biomedical Informatics: Computer Applications in Health Care and Biomedicine-Edward H.
2. Shortliffe, James J. Cimino, Michael F. Chiang
3. Biostatistics and Computer Applications, G. N. Rao, N. K Tiwari
4. Medical Informatics: Computer Applications In Health Care-Edward H. Shortliffe

OR

BMLTDSE3 T: Health Informatics **Credit 06**

Course content:

1. General idea about health information system.
2. Idea about data, information and intelligence.
3. Components of health information system and uses.
4. Sources of health information.

Reference Books:

1. Biomedical Informatics: Computer Applications in Health Care and Biomedicine-Edward H.
2. Shortliffe, James J. Cimino, Michael F. Chiang
3. Biostatistics and Computer Applications, G. N. Rao, N. K Tiwari
4. Medical Informatics: Computer Applications In Health Care-Edward H. Shortliffe

Discipline Specific Electives (DSE) - 04 **Credit 06**

BMLTDSE4T: Epidemiology **Credit 06**

Course content:

1. Principles of Epidemiology; Natural History of disease; Methods of Epidemiological studies; Epidemiology of communicable & non-communicable diseases, disease, transmission, host defence immunizing agents, cold chain, immunization, disease, monitoring and surveillance.
2. Fundamentals of Public Health Surveillance.
3. Principles and Methods of Applied Infectious Disease Epidemiology.
4. Methods in Field Epidemiology.

Reference Books:

1. Textbook of Epidemiology. Lex Bouter, Maurice Zeegers, Tinjing Lee .2nd edn.
2. Handbook of Epidemiology. peter adebisi. 2nd edn.
3. Principles of Epidemiology in Public Health Practice. 3rd edn.

OR

BMLTDSE4T: Community orientation and clinical visit **Credit 06**

Course content:

1. Basic principle of community health and its impact on health and disease, structure and functioning of the community health centre.
2. Understanding of the health care system in India with reference to primary, secondary and tertiary level care.
3. National health scenario, demographic, socio-cultural and epidemiological issues.
4. Understanding the national health goals and policies.
5. Obtain patient experiences through patient and family interactions and relate this experience to impact of environment and diseases.

Reference Books:

1. Community-Oriented Health Services-Elias MPOFU
2. Community Organization and Development: An Indian Perspective by Asha Ramagonda Patil

Discipline Specific Electives (DSE) - 05 — Credit 06

BMLTDSE5T: Onco-pathology — **Credit 06**

Course content:

1. Basic concept about Cancer and Tumour.
2. Features of cancer cells.
3. Metastasis
4. Cancer marker detection technique-Marker study

Reference Books:

1. Human Oncology: Pathology and Clinical Characteristics-Harald W. Noltenius
2. Diagnostic Pathology: Molecular Oncology- Mohammad A. Vasef MD, Aaron Auerbach MDMPH
3. Diagnostic Pathology: Molecular Oncology-Mohammed A Vasef, Aaron Auerbach

OR

BMLTDSE5T: Cellular and System Pathology — **Credit 06**

Course content:

1. Cardiovascular Pathology

a) Rheumatic fever and Rheumatic Heart Disease: Pathogenesis and diagnosis.
b) Atherosclerosis, Ischemic Heart Disease and Myocardial Infarction: Pathogenesis and diagnosis.
c) Cardiomyopathy: Pathogenesis and diagnosis.

2. Respiratory Pathology

a) Emphysema: Types, pathogenesis and diagnosis.
b) Occupational lung disorders: anthracosis, silicosis, asbestosis, mesothelioma: pathogenesis and diagnosis.
c) Pulmonary Tuberculosis : Primary and Secondary: pathogenesis and diagnosis.

3. Gastro-Intestinal Tract Pathology

a) Hemolytic Anaemias : Classification, pathogenesis and diagnosis.
b) Thalassemia, sickle cell anaemia: pathogenesis and diagnosis.

4. Urinary Tract Pathology

a) Glomerulonephritis: Classification, pathogenesis and diagnosis.
b) Urolithiasis: pathogenesis and diagnosis.

5. Hepatic Pathology

a) Jaundice: Types, Pathogenesis and Diagnosis.
b) Hepatitis: types, Pathogenesis and diagnosis.
c) Cirrhosis: Pathogenesis and diagnosis.

6. Endocrine Pathology

a) Diabetes Mellitus : Types, Pathogenesis and diagnosis
b) Adrenal diseases : Pathogenesis and diagnosis

Reference Books:

1. Cellular Pathology. Cook D. J. Scion Publishing Ltd.
2. Cell, tissue and disease. Neville Woolf.3 rd edn.
3. Cellular pathology : introduction to techniques and applications.2006. Bloxham, Oxfordshire : Scion publisher.

Discipline Specific Electives (DSE) - 06 **Credit 06**

BMLTDSE6P: Case Study **Credit 06**

Reference Books:

1. Preventive and Social Medicine. K. Park.
2. Textbook of Community Medicine. Piyush Gupta
3. Textbook of community medicine preventive and social medicine. LAL S.2014.

Skill Enhancement Course (SEC)

Skill Enhancement Course (SEC)- 01 **Credit 02**

BMLTSEC1 (T): Professionalism & human values **Credits 02**

Course content:

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
2. Personal values- ethical or moral values
3. Attitude and behaviour- professional behaviour, treating people equally
4. Code of conduct, professional accountability and responsibility, misconduct
5. Differences between professions and importance of team efforts
6. Cultural issues in the healthcare environment

Reference Books:

1. Professional Ethics and Human Values- Govindarajan M, S. Natarajan,V.S. Senthilkumar
2. A Textbook on Professional Ethics and Human Values-R.S. Naagarazan
3. Human Values and Professional Ethics-Subhash Bhalchandra Gogate.

OR

BMLTSEC1 (T): Hospital Waste Management **Credits 02**

Course content:

1. Introduction about health care waste and diseases
2. Infectious waste, geno-toxic waste, waste sharps
3. Biomedical waste categories categorization , composition of biomedical waste
4. Colour coding,sources of health care waste
5. Health impact of biomedical waste-direct and indirect
6. Persons at risk of health care waste, legislation policies for management

Reference Books:

1. Hospital Waste Management Agsar: A Guide for Self-Assessment and Review- Shishir Bashkar
2. Hospital Waste Management and Its Monitoring- Sharma Madhuri
3. Biomedical Waste Management Medico-Legal Contours- Dr. Sonia B. Nagarale, Dr. Vijay D Silva

Skill Enhancement Course (SEC)- 02 **Credit 02**

BMLTSEC2 T: Blood Bank and Blood transfusion **Credit 02**

Course content:

1. Principles of blood grouping.
2. Blood transfusion in total or in fractionated part. Condition of blood transfusion, basic principles followed for such case.

3. Disorders of mismatched blood transfusion, Transmission of diseases in relation to blood transfusion (HIV, Hepatitis, Jaundice, Malaria, Syphilis).
4. Introduction of blood collection and basic concept for storage of blood andit's transportation.
5. Preparation of reagents for blood Banking.
6. Fractionation of blood storage.
7. Donor's selection.
8. Preparation and preservation of various blood components for transfusion

Reference Books:

1. Modern Blood Banking & Transfusion Practices. Denise M. Harmening.2018.
2. The Textbook Of Blood Bank And Transfusion Medicine. Jaypee.2006.
3. Medical Laboratory Technology (2Vols) Methods And Interpretations. Sood, Ramnik (Author)
4. Medical Laboratory Technology.C.R. Maiti
5. Medical Laboratory Technology, K. L. Mukherjee.
6. Textbook of Medical Laboratory Technology, GODKAR

OR

BMLTSEC2 T: Immunohematology **Credit 02**

Course content:

1. Blood group antigen: their importance in blood transfusion.
2. Transfusion reactions - brief introduction
3. Laboratory aspects of Blood Transfusion in total or in fractionated components, Cross matching
4. Disorders of mismatched blood transfusion, General idea about Blood Transfusion related diseases
5. Screening of blood for -AIDS, Hepatitis, Syphilis.
6. Forward matching and reverse matching.

Reference Books:

1. Immunohematology: Principles and Practice- Eva D. Quinley
2. Basic & Applied Concepts of Immunohematology- Kathy D. Blaney , Paula R. Howard
3. Immunohematology : principles and practice-Eva D. Quinley

Generic Electives (GE)

Generic Electives (GE)- 01 **Credit 06**

BMLTGE1T: Community Health **Credit- 06**

Course content:

1. Natural History of Disease: Determinants of health, and disease, host, agent, and environment relationship, levels of prevention to diseases of national importance.
2. Mode of Transmission of Disease: Air – borne, vector and vehicle transmission; Methods of control with examples for control of each mode.
3. Health Services: Brief description of organization of health services at the Centre and state levels; Primary Health Care - Definition, components and principles of primary health care; Health for all indicators; Primary Health Centre - The functions, staffing pattern and the role of laboratory technicians in primary Health Centre.
4. National Programmes of Health and Disease Eradication /Control: Health Programmes Family Welfare Programme, National Programme for water supply and sanitation, Nutritional Programmes, Immunization and universal immunization Programme; Disease control Programmes - Tuberculosis, Malaria, Filaria, S.T.D, Goitre, Cholera and other diarrhoeal diseases.
5. Demography & Population Control: The factors influencing population growth, death rate, birth rate and methods of contraception.
6. Health Education: Definition, principles, objectives, purpose, types and AV aids; Communication - definition, process and types, Behavioural change communication; IEC (Information Education and Communication) - aims, scope, concept and approaches; Role and skill of health professional in Health Education.

Reference Books:

1. Preventive & Social Medicine – K. Park
2. Text Book of Preventive & Social Medicine, Mahajan & Gupta.
3. Text book of Community Nutrition, Suryatapa Das.
4. Textbook of Community Medicine, by Sunder Lal Adarsh Pankaj.
5. Community Medicine – Preventive & Social Medicine by J. S. Mathur.
6. Preventive & Social Medicine By Vivek Jain.
7. Social Preventive Medicine By S. vidya Sagar & B. Janaki Ram.

OR

BMLTGE1T: Health Programmes in India **Credit- 06**

1. Brief idea about National Health Programme-Programme formulation, implementation, monitoring and evaluation.
2. National Vector Borne Disease Control Programme- Malaria, Filaria, Dengue, Chikungunya.
3. National Leprosy Eradication Programme.
4. Revised National Tuberculosis Programme.
5. National AIDS Control Programme.
6. National Programme for Control of Blindness.

7. Iodine Deficiency Disorders Programme.
8. Universal Immunization Programme.

Reference Books:

1. National Health Programs of India National Policies and Legislations Related to Health-J Kishore, Century Publications; 10th edition.
2. Health Policies Programmes in India- Dk Taneja, Jaypee Brothers Medical Publishers; Sixteenth edition

Generic Electives (GE) - 02 — Credit 06

BMLTGE2T: Laboratory and Patient safety, Medical Law and Ethics — Credit- 06

Course content:

1. Laboratory ethics of patient-Safety. Code of good and safe laboratory practice for support staff and responsibilities of the workers regarding Biosafety. ISO rules for laboratory medicine. Laboratory Biosafety Level Criteria (BSL-1-4).
2. Chemical, electrical, fire and radiation safety. Safety organization. General Safety checklist. Safety equipment. Safety signs.
3. Handling, transfer and shipment of specimen. Decontamination and disposal. Treatment and disposal technologies for health- care waste. Responsibility from acquisition of the specimen to the production of data.
4. Medical ethics - Definition - Goal – Scope, Basic principles of medical ethics – Confidentiality
5. Malpractice and negligence - Rational and irrational drug therapy
6. . Autonomy and informed consent - Right of patients
7. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
8. Obtaining an informed consent.
9. Ethics in the profession of Medical Laboratory Science

Reference Books:

1. Medical Law and Ethics-Bonnie F. Fremgen
2. Textbook of Medical Ethics- Erich H. Loewy

OR

BCAGE2T: Medical Laboratory Total Quality Management — Credit- 06

Course content:

1. Quality control of product, chemical reagents, good reliable and authentic report, total quality management framework of laboratory.
2. Quality control chart, Cusum chart, Gaussian curve, Westgard rule. Internal and External factors for quality control. Co-operation and working relationship with other health

professionals. Confidentiality of patient information and test result. Dignity and privacy of patient

3. Good Laboratory Practice (GLP) Regulations and Accreditation
4. Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation
5. Awareness / Safety in a clinical laboratory, General safety precautions, HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis
6. Patient management for clinical samples collection, transportation and preservation
7. Sample accountability, Purpose of accountability, Methods of accountability.

Reference Books:

1. Laboratory quality control and patient safety- Jeremie M. Gras
2. Total Quality Management in Healthcare-D. H. Stamatis
3. Medical Laboratory Technology, K. L. Mukherjee.
4. Textbook of Medical Laboratory Technology, GODKAR

Generic Electives (GE)- 03 — Credit 06

BMLTGE3T: Pathological Basis of Diseases — Credit- 06

Course content:

1. Introduction & History of pathology, Basic definitions and common terms in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis.
2. General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, pathogenesis of inflammatory diseases.
3. Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.
4. Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Etiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease. Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue, malaria, tuberculosis.
5. Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

Reference Books:

1. Pathologic Basis of Disease- Robbins and Cotran
2. Textbook of Pathology for MLT- Dr. A . k. Mondal, Dr. Sharama Choudhary
3. A Short Textbook of Pathology -Tahminur Rahman Sajal
4. Textbook of Pathology-Rajeswari

OR

BMLTGE3T: Medical Lab Diagnostic **Credit- 06**

Course content:

1. Diagnostic test and screening test
2. Quality control of diagnostic test
3. Diagnosis of Diabetes- Diabetic profiles
4. Diagnosis of Hyperlipidemia- Lipid profile
5. Diagnosis of Kidney- Renal profiles
6. Diagnosis of liver function- Liver function test.

Reference Books:

1. Lab Manual on Blood Analysis and Medical Diagnostics. Prakash Gayatri.
2. Textbook of Medical Laboratory Technology. Darshan P. GodkarPraful B. Godkar.
3. Medical Laboratory Technology. Kanai lal Mukherjee.

Generic Electives (GE)- 04 Credit 06

BMLTGE4T: Medical Biotechnology **Credit- 06**

1. Medical biotechnology – definition and application. Molecular tools and applications- restriction enzymes, ligases, polymerases, alkaline phosphatase. Gene Recombination and Gene transfer: Transformation, Episomes, Plasmids and other cloning vectors (Bacteriophage-derived vectors, artificial chromosomes).

2. Gene transfer methods– microinjection, embryonic stem cell, gene transfer, Retrovirus & Gene transfer.
3. Introduction to transgenesis. Transgenic Animals.
4. Animal propagation – Artificial insemination, Animal Clones. Conservation Biology – Embryo transfer techniques. Introduction to Stem Cell Technology and its applications.
5. Genetic modification in Medicine - gene therapy, types of gene therapy, vectors in gene therapy, molecular engineering, human genetic engineering, problems & ethics. Therapeutic products produced by genetic engineering-blood proteins, human hormones, immune modulators and vaccines.

Reference Books:

1. Medical Biotechnology. Pratibha Nallari & V. Venugopal Rao. 1st edn.
2. Medical Biotechnology. Sweta Sharma
3. Medical Biotechnology. Judit Pongracz, Mary Keen.2008.

OR

BMLTGE4T: Genetics and Health **Credit- 06**

Course content:

1. Brief idea about chromosome, gene, genotype and phenotype.
2. Chromosomal Disorders- Relating to autosome and sex chromosomes.
3. Blood groups and disease, Erythroblastosis foetalis
4. Sickle cell anaemia, Thalassaemia, Haemophilia, PKU, Cystic fibrosis.

5. Preventive and social measures of inheritable diseases- Eugenics, euthenics, genetic counselling, Early diagnosis and treatment, Rehabilitation.

Reference Books:

1. Concepts of Genetics-William S. Klug
2. Human Genetics- Gangane
3. Genetics: A Conceptual Approach-Benjamin Pierce
4. The Genetics of Health-Paul Sharad

Ability Enhancement Compulsory Course (AECC)

Ability Enhancement Compulsory Course (AECC) - 01 **Credits: 02**

BMLTAECC(T): Communicative English **Credits: 02**

1. **Communication Skills**
   a) Theory and Types of Communication
   b) Verbal and Non-verbal Communication
   c) Barriers and Strategies
   d) Workplace Communication
   e) Telephone Communication

2. **Speaking Skills**
   a) Inter-personal Communication
   b) Group Discussion
   c) Interview

3. **Reading Skills**
   a) Close Reading
   b) Comprehension
   c) Summary
   d) Paraphrasing
   e) Interpreting Graphs and Charts

4. **Writing Skills**
   a) Report Writing
   b) Making notes
   c) Letter writing
   d) Business Communication

Ability Enhancement Compulsory Course (AECC) - 02 **Credits: 04**

BMLTENVS (T): Environment Science and Health **Credits: 04**

Course content:

1. Basic idea about environment, Relation between environment and health.
2. Water pollution-Water related diseases (biological and chemical), water pollution law, purification of water (large scale and small scale), water quality criteria and standards, surveillance of drinking water quality, controlling measures of water pollution.
3. Air pollution- Sources of air pollutants, types, Health hazards by air pollutants, ventilation and its standards, controlling measures of air pollution, air stress indices- heat stress, cold stress, global warming, humidity.
4. Solid waste disposal system- Methods of disposal, modern sewage treatment- primary and secondary treatment.
5. Hospital waste management- Generation of hospital waste, health hazards of hospital wastes, disposal and treatment of hospital wastes, bio-medical wastes.

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