JAMIA HAMDARD
DEPARTMENT OF PARAMEDICAL SCIENCES
CBCS ENABLED SYLLABUS **B.Sc In Medical Laboratory Techniques**

SYLLABUS FOR BSC.

B.Sc In Medical Laboratory Techniques
Choice Based Credit System (CBCS)

DEPARTMENT OF PARAMEDICAL SCIENCES
JAMIA HAMDARD
Deemed to be University
Accredited in 'A' Grade by NAAC
Declared to be designated as Institute of Eminence (IoE) by MHRD, GOI
NEW DELHI 110062
www.jamiahamdard.edu

PROGRAM NAME: B.Sc In Medical Laboratory Techniques
PROGRAM CODE: 309
ACADEMIC SESSION OF INTRODUCTION OF THE PROGRAMME: (2022-2023)
SCHOOL NAME: SNSAH
DEAPRTMENT NAME: DEPARTMENT OF PARAMEDICAL SCIENCES

JAMIA HAMDARD, NEW DELHI - 110062
Internal Quality Assurance Cell (IQAC)

UGC – LEARNING OUTCOMES-BASED CURRICULUM

JAMIA HAMDARD, NEW DELHI - 110062
Internal Quality Assurance Cell (IQAC)

SCHOOL OF NURSING SCIENCES AND ALLIED HEALTH

Vision Statement (School Level): To create an institute of national and international repute in Paramedic offering state of the art education entailing the finest skills combined with compassionate patient care.

Mission Statements (3 to 4) (School Level):

MS1: To provide the most advanced and comprehensive course offerings to health sciences student possible by employing the most qualified faculty, utilizing the most advanced technology.

MS2: To provide a quality paramedical education and prepare human & competent global paramedic professional

MS3: To provide highest level of quality patient care & can make contribution towards education & research.

DEPARTMENT OF PARAMEDICAL SCIENCES

Vision Statement (Department Level): To construct and develop a world-class, self- sufficient institute for paramedical and other health-related education at the undergraduate, graduate, and doctorate levels of global competence.

Mission Statements (3 to 4) (Department Level):

MS1: To provide a quality paramedical education and prepare humane and competent global Paramedic Professionals capable of rendering highest level of quality patient care and can make contribution towards education and research.

MS 2: To assist students in developing critical thinking and application skills in order to instill a scientific temperament in students so that they can apply their knowledge in interdisciplinary fields such as biochemistry, microbiology, and pathology.

MS 3: To develop strong moral, ethical, and professional standards in students, as well as to enhance their overall personality and inculcates compassion.

Name of the Academic Program B.Sc In Medical Laboratory Techniques

QUALIFICATION DESCRIPTORS (QDs)
Upon the completion of Academic Programmed B.Sc In Medical Laboratory Techniques, students will be able :

QD-1: To grasp the core knowledge of specific subjects covered in Medical Lab techniques through experiential learning.
QD-2: To access, create, analyze knowledge and data, stitch diverse concepts and develop an aptitude for research, academia and industry
QD-3 To develop communication skills though making presentations (oral or written), writing reports and expressing their science ideas through a technical note/design or via an art form;
QD-4 To develop confidence and a curiosity driven quest to work in large teams at national and international platforms and/or execute a research project/task independently and
QD-5 To to extrapolate/draw inferences and direct the acquired knowledge and transferable skills to real-life research questions as well in areas such as industry, management, scientific communication etc

Mapping Qualification Descriptors (QDs) with Mission Statements (MS)

	MS-1	MS-2	MS-3
QD-1	3	2	1
QD-2	2	3	1
QD-3	2	1	3
QD-4	1	3	2
QD-5	3	2	1

SCHOOL OF NURSING SCIENCES AND ALLIED HEALTH
DEPARTMENT OF PARAMEDICAL SCIENCES

B.SC IN MEDICAL LABORATORY TECHNIQUES

PROGRAM LEARNING OUTCOMES (PLOs) (12)

After completing this Course, the students should be able …….

PLO-1 To gain knowledge of principles and processes underlying and design and develop various inter-disciplinary subjects related to Medical Laboratory Techniques.

PLO-2 To identify, formulate and obtain solutions to the challenging problems in the interdisciplinary fields of lab sciences using principles of medical laboratory science.

PLO-3 To Perform routine clinical laboratory procedures within acceptable quality control parameters in Hematology, Chemistry, Immunohematology, and Microbiology under the general supervision of a Clinical Laboratory Scientist or Pathologist.

PLO-4 To apply systematized problem-solving techniques to identify and correct procedural errors, identify instrument malfunctions and seek proper supervisory assistance, and verify the accuracy of laboratory results obtained.

PLO-5 To apply appropriate methodologies for planning and executing experiments related to different aspects of medical laboratory sciences and also analyze and interpret the results of the experiments performed.

PLO-6 To recognize and participate in activities which will provide current knowledge and upgrading of skills in laboratory medicine.

PLO-8 To function effectively as an individual, as a member or as a leader in diverse teams and multi-disciplinary groups.

PLO-9 To develop effective communication skill to ensure accurate and appropriate information transfer

PLO-10 To demonstrate the knowledge and understanding of different aspects of medical laboratory techniques, economic decision-making and apply these to manage individual as well as team-based projects.

PROGRAM SPECIFIC OUTCOMES (PSOs)

After completing this Course, the students should …….

PSO-1- professionally competent and exhibit a sense of commitment to the ethical and humane aspects of patient care.

PSO-2- recognize the role of the medical laboratory technologist in the assurance of quality health care.

PSO-3- Interpret and evaluate patient results and use quality assurance principles and practices to ensure the accuracy and reliability of laboratory information.

PSO-4- Exhibit a sense of commitment to perform a full range of testing in the contemporary medical laboratory encompassing pre-analytical, analytical, and post-analytical components of laboratory services.

Mapping of Program Learning Outcomes (PLOs) With Qualification Descriptors (QDs)

	QD-1	QD-2	QD-3	QD-4	QD-5
PLO-1	**3**	**3**	**2**	**2**	**3**
PLO-2	**3**	**3**	**2**	**2**	**2**
PLO-3	**3**	**3**	**2**	**3**	**3**
PLO-4	**3**	**3**	**1**	**1**	**1**
PLO-5	**3**	**3**	**1**	**1**	**2**
PLO-6	**3**	**3**	**2**	**2**	**3**
PLO-7	**3**	**3**	**2**	**2**	**2**
PLO-8	**2**	**2**	**1**	**2**	**3**
PLO-9	**2**	**2**	**1**	**2**	**3**
PLO-10	**2**	**2**	**1**	**2**	**3**
PSO-1	**3**	**3**	**3**	**3**	**3**
PSO-2	**3**	**2**	**2**	**2**	**2**
PSO-3	**3**	**3**	**2**	**2**	**1**
PSO-4	**3**	**3**	**2**	**2**	**3**

The Course

Highlights of the course are described in the following table:

a.	Name of the Course	BSc. IN MEDICAL LABORATORY TECHNOLOGY
b.	Nature	Regular
c.	Duration	Minimum: Three Years & a half (six months compulsory rotatary internship included) (3 ½ years full time Integrated Program, Lateral entry in third semester for students with two year Diploma)
d.	Medium of Instruction and Examinations	English
e.	**Eligibility Criteria**	
	Educational Requirements	Eligibility for the admission : must have passed in 10+2 or equivalent qualification with any discipline from a recognized institution with 50% aggregates Those in possession of central/state recognized two year diploma will be permitted lateral entry into fourth semester
f.	Commencement of the course	July of every year
h.	Mode of Admission	Admission to the course will be made on the basis of the merit determined by the score of CET conducted by Jamia Hamdard. Students who have appeared in NEET after interview can also be given admission. For admission against the foreign national/NRI/Industry sponsored seats, students will be required to appear only in interview conducted by Jamia Hamdard.
i.	Period of Completion (Span Period)	Not more than 06 years
J.	Fees	As per university norms.
k.	Total Number of Students per year	60 (Additional seats are available for Foreign National) Lateral Entry 35seats
l.	Total number of Semesters and examinations	Six Semesters and Semester Examination in every December and May
m.	Total Theory Papers	14 + 01 assignment+04 qualifying exam
n.	Total credits	47

o.	Minimum Average Pass Marks	50% in each subject, Grade C

Course design

(a) The course work shall be divided into three parts as given below:

Part-I Semester-I July to mid December
Semester-II January to mid May

SUMMER TRAINING mid May to mid July (two months)

Part-II Semester-III July to mid December
Semester-IV January to mid May

Part III Semester V July to mid December
Semester VI Assignment

1year compulsory internship

(b) During an academic year, a candidate shall be enrolled only for one course of study and shall not appear at any other examination of this or any other University.

(c) The semester-wise course outline, total marks allocated to each course, internal assessment and semester examinations marks for all specialization are
Listed.

Detailed course content of the syllabus shall be prescribed by the Board of Studies (BOS) and shall be reviewed periodically.
Every candidate shall have to undergo eight weeks summer training in an organization of repute in India or abroad. The project for the summer training shall be assigned by the organization concerned.

The BOS, depending on circumstances prevailing in the market, may change any paper and increase or decrease the number of optional papers.

1. Attendance

a) All students must attend every lecture delivered, however, to account for the late joining or other such contingencies, the attendance requirement for appearing in the semester examinations shall be a minimum of 75% of the total classes actually held.
b) In order to maintain the attendance record of a course, a roll call will be taken by the teacher in every scheduled lecture.
c) Attendance on account of participation in the prescribed functions of NCC, NSS, Inter-University sports, educational tours/field work assigned by the university to students shall be credited to the aggregate,

provided the attendance record, duly counter signed by the officer in-charge, is sent to the Head of Department within two weeks time after the function/activity.

d) The teacher in-charge will consolidate the attendance record for the lectures for each student. The statements of attendance of students shall be displayed on the Department's Notice Board by the teacher concerned at the beginning of the following month and consolidated attendance before the conclusion of each semester as given in the University Calendar. A copy of the same shall be sent to the Head of Department for record. Notices displayed on the Notice Board shall be deemed to be a proper notification, and no individual notice shall be sent to students.

e) If a student is found to be continuously absent from the classes without information for a period of 30 days, the teacher in charge shall report it to the Head of Department, who will inform the Registrar through the Dean. Registrar will issue a notice to such student, as to why his/ her admission should not be cancelled. The Registrar will take a decision on cancellation of admission within 30 days of issue of the notice. A copy of the order shall be communicated to the student.

f) A student with less than 75% attendance of the lectures in each course shall be detained from appearing in the semester examination of that course. The Dean of Faculty concerned may consider application for the condonation of shortage of attendance up to 5% on account of sickness or any other extra ordinary circumstances, provided the medical certificate duly certified by registered Medical Practitioner, had been submitted within 7 days of the recovery from the illness.

g) A student detained on account of attendance will be re-admitted to the same class in the next academic year on payment of current fees except Enrolment and identity card fees

2. Scheme of Examination

Each theory course shall carry 100 marks. Of these, 75 marks shall be for semester examination and 25 marks for internal assessment.

The candidate shall have to make an oral presentation of his/ her summer training report before a joint session of the faculty and students. Presentation of report shall carry 40 marks. The same report shall be examined by an internal examiner out of 60 marks. The total summer training shall carry 100 marks.

3. Internal Assessment

Internal assessment for 25 marks in respect of theory papers will be based on written tests, assignments, presentations, viva-voice etc.

- The evaluation shall be done by course instructors and marks will be notified within a week of such test.
- There shall be two written tests in each course in a semester. The test will be conducted as per the academic calendar individual faculty member to announce the date for tests or conduct them as per academic calendar.
- The teacher concerned shall maintain records of marks of various components of evaluation for each student and the same will be confidential and notified at the end of the semester.

- The internal assessment marks shall he submitted by head of the Department to the Registrar at the end of the semester.
- A candidate who has to reappear (as an ex-student) in the semester examination of a course will retain the marks of internal assessment.
- A student who will be required to seek re-admission, for whatever reason, will have to appear for internal assessment and tests afresh
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9. Semester Examinations

a) The Semester examinations shall be held at the end of each semester as notified in the academic calendar. There shall be no supplementary examination. Candidates shall appear in the examination of their uncleared papers in the next semester examination of the same paper along with other students of junior batch. Thus, the uncleared papers of Semester - I shall be cleared in Semester- III and those of Semester - II in Semester-IV. Likewise, the examination of uncleared papers of semester V and VI would be taken up by the student next year along with the junior batch.

b) The duration of semester examinations of each theory paper will be 3 hours.

c) The question papers shall be set by either an external or an internal examiner duly appointed by the Board of Studies and approved by the Vice Chancellor.

d) The papers set by the examiners shall be moderated by a panel of moderators constituted by the Board of Studies at the time of approving the panel of examiners.

e) Upon completion of the training, the training report has to be submitted in duplicate immediately on joining the third semester.

f) Evaluation of the summer training report for 60 marks shall be done by a panel comprising an external examiner and teacher in charge on the basis of presentation and viva-voce.

g) Any student who fails to defend his /her training report satisfactorily shall have to undergo training afresh in the following year and defend it in similar manner as laid down in Para 9 (f).

h) All students shall be required to be present at the time of presentation. Their attendance will be taken into account while awarding marks for presentation.

i) Every candidate shall have to prepare a project study / assignment in the Sixth semester. The subject of project/assignment shall be approved on the recommendations of the supervisor(s) and the Head of the Department.

j) A student shall be required to maintain record of periodic progress in the project in a diary. He / she should be in constant touch with his/her supervisor and obtain his/her signature in the diary regularly. There would be continuous appraisal of the project which will carry' 25 marks as a part of internal assessment and remaining 75 marks will be given by external examiner.

k) The minimum pass marks shall be 50% (grade E) in each theory/ assignment and viva-voce (combined examination).

10. Promotion Criteria

a) A student shall be promoted to semester-III if he/she has secured at least 50% marks each in at least 10 subjects out of 14 prescribed in Semester - I and Semester - II taken together.

b) No student shall be promoted to Semester V if he/she has more than 04 uncleared papers of the preceding semesters taken together.

c) After the declaration of the semester-VI results, if a student has any paper uncleared of any semester, he/ she will have to reappear in these papers in concerned semester in next academic year as an ex-student along with the next batch.

d) The degree will be granted only after clearing all the semester examination and completion of six months compulsory internship from the parent institution or in extraordinary circumstances from a government hospital after taking permission from the head of the departments of the concerned hospitals

e) For all the papers labeled as qualifying exams the student needs to clear these papers during the span period to be awarded the degree

11. Span Period

A student must complete all the requirements of degree within a period of Six years from his/ her admission.

SEMESTER I

COURSE DESIGN

School of Nursing Sciences and Allied Health Department of Paramedical Sciences

Name of the Academic Program B.Sc In Medical Laboratory Techniques First Semester

Course Code: 101(Theory) & 103

(Practical) Title of the Course:

Human Anatomy

L-50P-20 **Credits (L=2, P=1): 3**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to

CLO-1- Know the biology concerned with the study of the body structure of organisms and their parts.

CLO-2- Learn the different parts of the human body

CLO-3- Understand the Preservation, and, embalming of body organs

CLO-4- Remember the study of bones, joints, and muscles

CLO-5- Perform to make general slides of tissues & organs

Mapping of Course Outcomes (COs) with Program Learning Outcomes (POs) and Program Specific Outcomes (PSOs)

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CLO1	3	2	3	3	3	3	3	3	3	3	**3**	**3**	**2**	**2**
CLO2	2	3	2	2	2	2	2	2	2	2	**2**	**2**	**2**	**2**
CLO3	3	3	3	2	2	2	2	2	2	2	**2**	**2**	**2**	**3**
CLO4	3	3	2	3	2	2	2	2	3	3	**3**	**3**	**2**	**2**
CLO5	3	3	2	2	3	2	2	2	3	3	**3**	**2**	**2**	**2**

Detailed Syllabus:

UNIT-I **12 Hours**

Introduction to Anatomy Anatomical terms, planes, organization of human body- cell, tissue, organ & organ system. Musculo-skeletal system:
Types of bones, structure & divisions of the skeleton system, name of all the bones and their parts, joints- classification. Structure and types of muscles
Anatomy of the Nervous system
Central nervous system & Peripheral nervous system- different components

UNIT-II **15 Hours**

Anatomy of Circulatory system:
General plan of circulatory system and its components-t- size, location, coverings, chambers, blood supply, nerve supply, the blood vessels General plan of circulation, pulmonary circulation
Name of arteries and veins and their positions Lymphatic system - general plan
Anatomy of the Respiratory system:
Organs of Respiratory System (Brief knowledge of parts and position)

UNIT-III **13 Hours**

Anatomy of the Digestive system:
Anatomy of alimentary tract; Parts of the tract
Accessory glands of digestion; Pancreas, Liver, Gall Bladder
Anatomy of Excretory system Kidneys- location, gross structure, excretory ducts, ureters, urinary bladder, urethra

UNIT-IV **10 Hours**

Reproductive system
Male Reproductive System
Female Reproductive System Anatomy of the endocrine system

Name of all endocrine glands their positions, Hormones and their functions- Pituitary, Thyroid, Parathyroid, Adrenal glands, Gonads & Islets of pancreas

Reference Books:

1. Chaurasia, B D, and Krishna Garg. Human Anatomy: Regional and Applied Dissection and Clinical. New Delhi, India, Cbs Publishers & Distributors, 2010.
2. Chaurasia, B D. B D Chaurasia's Handbook of General Anatomy. Delhi, India; Bangalore,India ; Pune, India, Cbs, 2009.
3. Inderbir Singh, et al. Inderbir Singh's Textbook of Human Histology: With Colour Atlas and Practical Guide. New Delhi Philadelphia, Jaypee, The Health Sciences Publishers, 2016.
4. Gray, Henry. Gray's Anatomy. United States, Medina University Press International, 2020.

Teaching-Learning Strategies

a. Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

b. Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.

c. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: 102(Theory) & 104

(Practical)

Title of the Course: Human Physiology

L-50 P-20

Credits (L=2, P=1): 3

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to.

CLO-1-know how to assess Blood pressure, heart rate, pulse rate, respiratory rate, reflexes.

CLO-2- understand the bleeding time and clotting time

CLO-3-Remember the count of RBC, WBC, Platelet count.

CLO-4- Remember Blood Groups - ABO and RH grouping estimation

CLO-5- Perform Hemoglobin test.

Mapping of Course Outcomes (COs) with Program Learning Outcomes (POs) and Program Specific Outcomes (PSOs)

	PLO 1	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CLO 1	3	2	3	3	3	3	3	3	3	3	**3**	**3**	**2**	**2**
CLO 2	2	3	2	2	2	2	2	2	2	2	**2**	**2**	**2**	**2**
CLO 3	3	3	3	2	2	2	2	2	2	2	**2**	**2**	**2**	**3**
CLO 4	3	3	2	3	2	2	2	2	3	3	**3**	**3**	**2**	**2**
CLO 5	3	3	2	2	3	2	2	2	3	3	**3**	**2**	**2**	**2**

Detailed Syllabus:

UNIT-I **12Hours**

General Physiology Cell, Transport across cell membrane, homeostasis, resting membrane potential, action potential

Blood Composition and functions of Blood RBC, WBC, Platelet count, Hemoglobin Blood Groups - ABO and RH grouping Hemostasis & Anticoagulants

UNIT-II **15 Hours**

Cardio vascular system
Cardiac muscle, Pacemaker & conducting tissue Cardiac Cycle Cardiac output, Heart rate, ECG Arterial blood pressure Respiratory System
Functions of Respiratory system
Mechanism of respiration, lung volumes & capacities

UNIT-III **13 Hours**

Nerve & Muscle physiology
Neuron structure & properties
Neuromuscular junction
Skeletal muscle structure
mechanism of contraction
Cerebrospinal Fluid (CSF):
Composition, functions &
Circulation. Central & autonomic
Nervous system Organization of
CNS Functions of various parts of
Brain, in brief Composition,
functions and circulation of CSF
Differences between sympathetic and parasympathetic division

UNIT-IV **10 Hours**

Digestive system
Functional Anatomy, organization & innervations
Composition and functions of all Digestive juices
Digestion & Absorption of carbohydrates, proteins and fats
Excretory System
Kidneys: Functions, Nephron, Juxta-glomerular Apparatus
Renal circulation
Mechanism of Urine formation
GFR
Endocrine and Reproductive systems Endocrine glands & hormones secreted
Functions of Reproductive system
Male Reproductive System: spermatogenesis, Testosterone.
Female reproductive system: Ovulation, Menstrual cycle.
Pregnancy test

Reference Books:

1. Hall, John E, and Michael E Hall. Guyton and Hall Textbook of Medical Physiology. 14th ed., S.L.,Elsevier - Health Science, 2020.
2. Barrett, Kim E, and William F Ganong. Ganong's Review of Medical Physiology. New York,Mcgraw-Hill Medical ; London, 2012.

Teaching-Learning Strategies in brief

1. Lectures- Class room lectures and use of black/green/white boards. CT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
2. Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.
3. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).
4. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
5. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: 105

Title of the Course: Medical Ethics, Legal aspects and Medical

Terminology L-5 **Credits: NA**

COURSE OUTCOMES (COs)

CLO-1- The goal is to have the knowledge of the subject that is to prepare students for the Ethical, Moral, and Legal responsibilities they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

Mapping of Course Outcomes (COs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	1	1	1	2	1	2	1	1	1	2	**3**	**1**	**1**	**2**

Detailed Syllabus:

25 HOURS

Role Definition and Interaction, Ethical, Moral, and Legal Responsibilities
Medical terminology- The course employs a body systems-oriented, word-analysis approach to learning medical terminology. The goal of the class is to prepare students for the terminology they might encounter in their subsequent coursework, in their clinical rotations and ultimately in their roles as health care professionals.

Reference Books:

1. Printed materials obtained from the Image and Copy Centre
2. Richards, Bernadette, and Jennie Louise. *Medical Law and Ethics: A Problem Based Approach*. Australia, LexisNexis Butterworths, 2014.

Teaching-Learning Strategies in brief

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Assessment methods and weightages in brief

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Course Code: 106

Title of the Course: English

L-25 **Credits: NA**

COURSE LEARNING OUTCOMES (CLOs)

CLO-1-This course is designated to help the students to knw how to acquire a good command over English language for common and medical terminology used in medical practice.
CLO-2-Understand how to speak and write proper English CLO-3-Ability to read and understand English
CLO-4-Ability to understand and practice medical terminology

Mapping of Course Outcomes (COs) with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	1	1	1	2	1	2	1	1	1	2	**3**	**1**	**1**	**2**

Teaching-Learning Strategies in brief

1. Lectures- Class room lectures and use of black/green/white boards. CT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
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Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: 107

Title of the Course: Computer Skills

L-5, P-30 **Credits: NA**

COURSE LEARNING OUTCOMES (CLOs)

CLO-1- At the end of the subject, the student will be able understand and perform computer applications related to medical records and information system.

Mapping of Course Outcomes (COs) with Program learning Outcomes (POs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	1	1	1	2	1	2	1	1	1	2	**3**	**1**	**1**	**2**

Detailed Syllabus: Total Theory and Practical Hours = 5+30
Computer applications related lab technician

Reference Books:

1. Sherman, Jackie. *Basic Computer Skills Made Simple: XP Edition*. Amsterdam; London, Made Simple, 2004.
2. Bernstein, James. *Computers Made Easy: From Dummy to Geek*. United States, James Bernstein, 2020.

Teaching-Learning Strategies in brief

a. Lectures- Class room lectures and use of black/green/white boards. CT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

b. Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.

c. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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SEMESTER II

Course Code: BMLT 201
Title of the Course: - Basic Chemistry
L-30 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 Learn basic concepts of Bioenergetics, mechanisms of oxidative phosphorylation and photophosphorylation.
CLO-2 Understand structure and function of proteins, nucleic acids, carbohydrates, fats, Vitamins-enzymes, etc. and will understand the chemical properties of these bio-molecules and their functions.
CLO-3 Acquire fundamental knowledge on enzymes and their importance in biological reactions.
CLO-4 Explain disciplinary knowledge and understanding of biochemistry, structure and function of biological molecules.
CLO-5 Understand composition and structure of bio membranes, transport mechanisms across biological membranes and will learn the concept and mechanism of ATP synthesis.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	3	3	3	3	3	3	2	2
CLO2	2	3	2	2	2	2	2	2	2	2	2	2	2	2
CLO3	3	3	3	2	2	2	2	2	2	2	2	2	2	3
CLO4	3	3	2	3	2	2	2	2	3	3	3	3	2	2
CLO5	3	3	2	2	3	2	2	2	3	3	3	2	2	2

Detailed Syllabus:

UNIT-I **5 Hours**
Principles of lab work
Role and duties of a laboratory technician
Potential dangers including biohazard material and personal care in the laboratory,
Laboratory waste and disposal

UNIT-II **10 Hours**
Properties and types of water
Review of basic chemistry and simple organic chemistry. Principles of acid-base titration, buffers, indicators Solution preparation units and calculation of concentration
Introduction and General Considerations Solutions Standard Solution, Proffer Solution, Molar

Solution; Normal Solution Preparation of Primary Standards Methods of expressing concentration, Percent, Molarities, Normal Buffer Solutions; Standard Buffers

UNIT-III **10 Hours**

Fundamentals of inorganic chemistry: Atom Definition, structure, characteristics. Atomic Number Neutron Number Atomic Mass Molecular Weight Acid and Base Acid base theories Arrhenius & Lewis Salts Definition and classification Fundamental of Organic ChemistryAldehyle, Ketone, Esters, Phenols, Amines, Colloids

UNIT-IV **5 Hours**

Laboratory Glassware s and Equipment Laboratory glassware and its use Laboratory equipment's and appliances: - Microscope Refrigerator Centrifuge Photometer Balance Spectrophotometer Water bath pH Meter Water Still Flame Photometer Incubator Semi auto analyzers ELISA Reader

Reference Books:

1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).
2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
4. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York).

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Assessment methods and weightages in brief

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Course Code: BMLT 202
Title of the Course: - Pathology-I
L-30 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, …….

CLO-1 The student will demonstrate a working understanding of the pathogenesis of a variety of common and uncommon diseases.

CLO-2 The student will be able to explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities that result.

CLO-3 The student will be able to classify diseases of various body systems and how they manifest clinically and histopathological.

CLO-4 The student will be able to devise likely diagnoses from clinical scenarios by recognizing key manifestations of congenital, hemodynamic, inflammatory, infectious, metabolic, environmental, and neoplastic diseases.

CLO-5 The student will be able to utilize high quality peer-reviewed literature to maintain currency in the management of pathologic conditions.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	2	2
CLO2	2	3	2	2	2	2	2	2	2	2	2	2	2	2
CLO3	3	3	3	2	3	2	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	2	2	3	3	3	3	2	2
CLO5	3	3	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-1 **15 Hours**

Hematology & Blood Banking: Collection of Blood Anti Coagulants Preparation and examination of thin and thick film Staining of blood film – Leishman's stain, Giemsa Stain, Supravital Stain Hemopoiesis – Cell maturation – Myeloid; Lymphoid; Erythroid series, Peripheral blood cells; Mature and immature cells; Significance, Bone Marrow Examination. Normal and abnormal cell morphology RBC; WBC; Platelets; and abnormal cells Normal and abnormal hemoglobin's

UNIT-II **15 Hours**

Coagulation profile; method and principles;
Clot Retraction time; Bleeding Time, Prothrombin time
Blood Groups: Introduction; ABO Blood Groups in heritance of ABO Group; Techniques of Blood Grouping: Slide Method; Tube Method; Clinical Significance; Minor Blood Groups Rh Typing: Techniques of Rh Grouping; Rh-Incompatibility; Erythroblastosis is fetalis (HDN); Rh - Immunization; D4-Antigen.
Transfusion reactions and complications of blood transfusion
Autologous transfusion Reaction; Plasmapheresis (Apheresis) brief mention
Blood Components; Packed red cells; Platelet; Concentrate; Appropriate uses; Granulocyte concentrate; appropriate uses; Fresh Frozen Plasma (FFP); appropriate uses; Factor VIII and Factor IX concentrate
and appropriate uses; Cryoprecipitate and appropriate uses; Albumin; and immune globulin and other products.

Reference Books:

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania
4. Elsevier, 2018.Cross, Simon S. *Underwood's Pathology: A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.\
5. Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh; New York, Elsevier, 2018.

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Assessment methods and weightages in brief

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Course Code: BMLT 203
Title of the Course: - -Microbiology-I
L-25 T-5 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….
CLO-1 To explain disease symptoms with causative agent, isolate and identify pathogens.
CLO-2 Acquire fundamental knowledge of Molecular biology Techniques
CLO-3 Evaluate different type of bacteria and their role in diseases and ability to isolate and cultivate bacteria.
CLO-4 Evaluate different type of virus and their role in diseases and ability to isolate and cultivate bacteria.
CLO-5 Evaluate different type of fungi and their role in diseases and ability to isolate and cultivate bacteria.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-I **25Hours**

Bacteriology

-Introduction to microbes, source of infection, models of spread, bacterial Cell, growth requirements of bacteria, bacteria Cycle.

-Study of microscope; Features, Type of Microscope core of microscope, Phase Contrast and electron microscope

-Sterilization and Disinfection; Definition; Methods of sterilization procedures techniques and uses; Clinical Importance

-Identification of Bacteria : Morphology Principle and staining procedures; Gram s stain; Zieh/Nelson stain; Modified ZN Staining; Albert Stain; Fontana s Method; Lividiti s Method.

-Common Culture Media in Laboratories; Types and Classification: Nutrient Broth; Peptone water; Sugar Media; Hiss s Serum Water; Thioglycolate transport media; Venkata Raman s Media (V R fluid) Agar Media; Nutrient Agar; Blood Agar; Deoxycholate Citrate Agar (DCA); Chocolate Agar; Loffler s Media; Dorsett s egg media; Mac Conkey s media (MC); Lowenstein Jensen s media; Blood Potassium Tellurite Media (BPT); TC B S Media, Bile Salt Agar (BSA) media; Nuelle-Hinton Agar; Sabourauds agar.

-Basic Principles of antibiotic susceptibility method of sensitivity testing

-Systemic microbiology- bacteria ,Gram Positive and Gram Negative Cocci:

-Staphy lococci: Habitat, Morphology; Antigenic classification structure cultural characteristics, biochemical reactions enzymes; Toxins; Pathogenicity serology, sensitivity tests.

- Strepto Cocci: Morphology, Classification, Cultural Characters; Toxins; Biochemical reactions; Toxins enzymes; Pathogenicity serology antibiotic, sensitivity tests; Anaerobic Streptococci; Pathogenicity; Clinical importance,Pneumo Cocci: Morphology, Cultural Characteristics; Biochemical properties; Antigenic structure; Pathogenecity; bacterial sensitivity. Neisseriae: Human Pathogens; Gono Coccus: Morphology cultural characteristics; Biochemical reactions, Pathogenesis, Laboratory diagnosis;

-Meningo Coccus: Morphology cultural characteristics; Biochemical reactions; Pathogenicity; Laboratory diagnosis

-Corynebacterium diphtheriae: Morphology and staining, Cultural Characters Biochemical reactions, Toxins, Pathogenicity, Shick s test, Eleck test, Laboratory diagnosis.

-Mycobacterium Tuberculosis; Mycobacterium Leprae: Mycobacterium Tuberculosis: Morphology; Staining; Cultural characters, BCG Vaccine; Tuberculin test; Pathogenicity; Laboratory diagnosis; AtypicalMycobacterium. Bacterium Leprae Morphology; Pathogenicity; Laboratory diagnosis; Bacteriological index, Morphological index granulavity index (SFG Index); Lepromin tes.

-Enterobacteriacae and related Gram negative organisms:

-Escherichia coli; Klebsiella; Proteus, Pseudomonas; Salmonella; Shigella; Vibrio-ELTOR, and allied organisms .Morphology; Staining; Cultural Characteristics antigenic structure; Pathogenicity; Laboratory diagnosis.

-Pasteurella (Yersenia) and Brucella Morphology, Cultural Characters antigenic structure; Laboratory diagnosis ,Spore Bearing Bacilli: Aerobic and Anaerobic

group of organisms; Morphology; Culture Characters; Pathogenicity Laboratory diagnosis of: Bacillus Anthraces and Anthrax disease Clostridium group of organism Cl. Tetani; Cl. Welchii; Cl. Oedematiens; Cl. Septicum; Cl. Botulinum ,Spirochoetes Treponoma pallidum

UNIT-II **5 Hours**

Bacteriological examination of body fluids and laboratory diagnosis of common infections Urinary tract infection Respiratory infections Genital infections Diarrhea and Dysentery Food Poisoning.

Reference Books

1. Tortora, Gerard J, et al. *Microbiology: An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997.
5. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
7. Cappuccino, James G, and Chad Welsh. *Microbiology: A Laboratory Manual*. 12th ed., New York, Pearson, 2019.
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Assessment methods and weightages in brief

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Course Code: BMLT 204
Title of the Course: -Basic Chemistry Practical
P-50 Credits 2

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to ……
CLO-1 Analyze specimen with the help of diagnostic kits that are used in clinical laboratories
CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.
CLO-3 Able to demonstrate quantitative analysis of biomolecules in clinical biochemistry
CLO-4 Analyze and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.
CLO-5 Able to perform quantitative analysis of specimen

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**
Introduction to apparatus and Instruments of biochemistry
Preparation of solutions, calculation of Molecular Weights and Equivalent Weights, Preparation of Normal solutions, Molar solutions, percent solution and reagents, Dilution techniques
Maintenance of Laboratory Glassware and apparatus
Preparation of different kinds of reagents, solutions and anticoagulants Biohazards and safety measures in lab
Titration of simple acid-base and calculation of Normality Measurement of hydrogen ion concentration

Reference Books

a. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).
b. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
c. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2

d. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York).

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5. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 205
Title of the Course: - Pathology I Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to ……
CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories
CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.
CLO-3 Able to demonstrate quantitative analysis of specimen in clinical pathology.
CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.
CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

-Hands on training in laboratory
-Basic principles in blood banking; organization and planning; documentations; selection of the donor and collection of blood
-Disposal of blood and Laboratory safety
-Estimation Haemoglobin; Sahli s method-
Cyana methaemoglobin method; standardization
-WCB Count; Total; Differential
-RBC Count; Total
-Packed cell volume
-Red cell indices (Absolute values) MCH; MCHC; MCV etc
-Automation and counts; Principles and Advantages
-Absolute Eosinophil count
-Platelet count; Reticulocyte count
-Erythrocyte sedimentation rate (ESR); Methods; Corrected ESR.
-Normal and abnormal cell morphology RBC; WBC; Platelets; and abnormal cells
-Organisation and management of blood banking
-Blood grouping
-ABO, Rh-Selection of donor
-Blood preservation
-Demonstration of blood components
-Compatibility testing; major and minor cross matching
-Coomb' s testing; Direct and indirect testing

Reference Books

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania Elsevier, 2018.
4. Cross, Simon S. *Underwood's Pathology: A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.

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5) Project work: The students are encouraged to carry out small project work

of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 206
Title of the Course: -- Microbiology -I Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students will able to……

CLO-1 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-2 Learn to do analysis of specimen with the help of diagnostic kits that are used in clinical laboratories.

CLO-3 Able to demonstrate quantitative analysis of specimen in clinical microbiology.

CLO-4 Analyze and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

-General requirements for cultivation of microorganisms
-Optical method in specimen examination
-Staining formulae and procedure
-Methods of obtaining pure cultures
-Collection and handling of specimens for microbial examinations
-Formulae and preparation of culture media
-Determination of susceptibility of bacteria to antimicrobial agents
-Bacterial examination of food and water
-Syphilis- dark field exam, VDRL, TPHA
-Gonorrhea-smears, staining and culture

Reference Books

1. Tortora, Gerard J, et al. *Microbiology : An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston ; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997..
5. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
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SEMESTER III

Course Code: BMLT 301
Title of the Course: -Biochemistry I
L-20 T-10 Credits 1

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to …….
CLO-1 To understand structure and function of proteins, nucleic acids, carbohydrates, fats, Vitamins-enzymes, etc. and will understand the chemical properties of these bio-molecules and their functions.
CLO-2 Learn basic concepts of Bioenergetics, mechanisms of oxidative phosphorylation and photophosphorylation.
CLO-3 Understand composition and structure of bio membranes, transport mechanisms across biological membranes and will learn the concept and mechanism of ATP synthesis
CLO-4 Explain disciplinary knowledge and understanding of biochemistry, structure and function of biological molecules.
CLO-5 To acquire fundamental knowledge on enzymes and their importance in biological reactions.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-I **30 Hours**
Metabolism of
Carbohydrate Introduction,
Importance of carbohydrate
Classification of
Carbohydrate
Digestion and absorption of
Carbohydrate Glycolysis; TCA
Cycle (Krebs cycle) Hexose
Monophosphate shunt
Gluconeogenesis; Glycogen sis
Blood Glucose and its regulation, GTT, Glycosylated Hb

Reference Books
1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).

2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
4. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York).

Teaching-Learning Strategies in brief

a. Lectures- Class room lectures and use of black/green/white boards. CT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
b. Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.
c. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).
d. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
e. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 302
Title of the Course: -Pathology-II
L-20 T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to…….
CLO-1Understand the pathogenesis of a variety of common and uncommon diseases.
CLO-2 Explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities that result.
CLO-3 Classify diseases of various body systems and how they manifest clinically and histopathological.
CLO-4 Devise likely diagnoses from clinical scenarios by recognizing key

manifestations of congenital, hemodynamic, inflammatory, infectious, metabolic, environmental, and neoplastic diseases.
CLO-5 Utilize high quality peer-reviewed literature to maintain currency in the management of pathologic conditions.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	3	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	2	2	3	1	2	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	2	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-I **10 Hours**

-Urinalysis: Indications for urine examination, collection & preservation of urine; Composition of urine;

-Physical Examination; Routine examination of urine, Chemical Examination: Proteins Reducing substances, Ketone bodies; Blood, Bile Salts; Bile Pigment; Chyluria Sediments (Microscopic Examination)

-Quantitative examination of urine

-Dipstick technology, Bacteriological examination

UNIT-II **20 Hours**

-Body fluids examinations

-Cerebro- Spinal Fluid (CSF) examination collection of fluid; normal values; chemical examination; cell counts; CSF in differential diagnosis

-Pericardial, Pleural, Peritoneal and synovial fluids examinations-Physical, chemical, microscopic & bacteriological examination of fluids

-Seminal fluid examination: (Semen) Physical examination, microscopic examination quality, quantity, viscosity, reaction & Morphological examination, Motility of Spermatozoa, sperm count & Clinical Significance

-Sputum Examination: Physical examination; Collection of specimens

-Stained Smear Leishman / Giemsa

- Gram Stain
- Z. N. Stain

-Concentration methods of sputum examination

Reference Books

a) Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
b) Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
c) Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania Elsevier, 2018.
d) Cross, Simon S. *Underwood's Pathology : A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.
e) Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh ; New York, Elsevier, 2018.

Teaching-Learning Strategies in brief

a. Lectures- Class room lectures and use of black/green/white boards. CT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

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c. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 303
Title of the Course: -Microbiology-II
L-20 T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 To explain disease symptoms with causative agent, isolate and identify pathogens.

CLO-2 Acquire fundamental knowledge of Molecular biology Techniques

CLO-3 Evaluate different type of bacteria and their role in diseases and ability to isolate and cultivate bacteria.

CLO-4 Evaluate different type of virus and their role in diseases and ability to isolate and cultivate bacteria.

CLO-5 Evaluate different type of fungi and their role in diseases and ability to isolate and cultivate bacteria.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	3	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	1	1	2	1	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	1	3	2	2	3	2	3	3	1	3	1	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-I **15Hours**

Mycology

Introduction;Classification; Common pathogenic fungi Difference between fungi and bacteria

Yeast and molds; Clinical and Laboratory diagnosis; Morphology of fungal thallus; Vegetative structure of dermatophytes; asexual spores of Chlamydia spores; arthospores; Sporangium of mucor; Conidiospores of Aspergillus; Spore head of Penicillium multi cellular conidia of Alternaria Species; Candidiasis.

Appearances of different fungi in tissues

Dermatophyte infections; Taenia (Ring warm): Deep mycosis. Serological tests used in medical mycology;

UNIT-II **15 Hours**

Basic Virology

Introduction: Classification of virus; RNA & DNA Virus. Bacteriophage; host life cycle.

General Properties of Virus

Cultivations of virus; Virus Structure; Laboratory Diagnosis HIV & AIDS

Hepatitis Virus; Hepatitis A; B; & C failures of various types of hepatitis virus

Reference Books

1. Tortora GJ, Funke BR and Case CL. Microbiology: An Introduction. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. Brock Biology of Microorganisms. Pearson International Edition
3. Wiley JM, Sherwood LM and Woolverton CJ. Prescott's Microbiology. McGrawHill International
4. Atlas RM. Principles of Microbiology. WM.T.Brown Publishers.
5. Pelczar MJ, Chan ECS and Krieg NR. Microbiology. McGraw Hill Book Company.
6. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. General Microbiology. McMillan
7. Cappucino J and Sherman N. Microbiology: A Laboratory Manual. Pearson Education Limited
8. Salle A.J. Fundamental Principles of Bacteriology. Tata McGraw-Hill Education
9. Modi H.A, Elementary Microbiology Vol I, Fundamentals of Microbiology

Teaching-Learning Strategies in brief

1. Lectures- Class room lectures and use of black/green/white boards. CT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
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problem-based learning (PBL).

4. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
5. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 304
Title of the Course: -Biochemistry -I Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to …….
CLO-1 Gain knowledge of the basic concepts and principles of Clinical Biochemistry, detail on the various biological specimens including the process of collection, preservation and storage.
CLO-2 To do analysis of specimen for Gastric function tests, Collection of gastric contents, their examination with the help of diagnostic kits that are used in clinical laboratories.
CLO-3 Able to analyze carbohydrates, proteins in the specimen
CLO-4 Able to perform quantitative analysis of specimen
CLO-5 Demonstrate the various renal function tests and glucose estimation

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	3	3	2	2	2	3	3	2	2	2	2
CLO3	2	2	3	1	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	2	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**
Demonstration of colorimeter, spectrophotometer, pH meter, single pan balance Estimation of Glucose
Estimation of Urea (Berthelot/ Nesselers)
Qualitative analysis, Identification of Carbohydrates, Proteins & substances of Biochemical importance

Reference Books
1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).

2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
4. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York).

Teaching-Learning Strategies in brief

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c. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).
d. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
e. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 305
Title of the Course: -Pathology-II Practical
P-50 **Credits-2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories.

CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-3 Able to demonstrate quantitative analysis of specimen in clinical pathology.

CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	3	3	3	3	3	1	3	3	3	3	1	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	1	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	1
CLO4	3	3	2	2	2	2	3	2	3	3	3	2	2	2
CLO5	3	2	3	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

Urinalysis
Seminal fluid examination

Reference Books

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology*. S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania
4. Elsevier, 2018.Cross, Simon S. *Underwood's Pathology : A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.\
5. Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh ; New York, Elsevier, 2018.

Teaching-Learning Strategies in brief

a) Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

b) Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.

c) Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e) Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 306
Title of the Course: -Microbiology-II Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to ……
CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories.
CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.
CLO-3 Able to demonstrate quantitative analysis of specimen in clinical microbiology.
CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.
CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**
Lab methods in diagnosis of viral and fungal infections

Reference Books

1. Tortora, Gerard J, et al. *Microbiology : An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston ; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997..
5. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
7. Cappuccino, James G, and Chad Welsh. *Microbiology : A Laboratory Manual*. 12th ed., New York, Pearson, 2019.
8. Salle A. *Fundamental Principles of Bacteriology*. New Delhi, Tata Mcgra-Hill Publishing Company Limited, 2007.

Teaching-Learning Strategies in brief

a) Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

b) Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.

c) Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e) Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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SEMESTER IV

Course Code: BMLT 401
Title of the Course: -Biochemistry II
L-20 T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to …….
CLO-1 To understand structure and function of proteins, nucleic acids, carbohydrates, fats, Vitamins-enzymes, etc and will understand the chemical properties of these bio-molecules and their functions.
CLO-2 learn basic concepts of Bioenergetics, mechanisms of oxidative phosphorylation and photophosphorylation.
CLO-3 To acquire fundamental knowledge on enzymes and their importance in biological reactions.
CLO-4 Explain disciplinary knowledge and understanding of biochemistry, structure and function of biological molecules.
CLO-5 They will understand composition and structure of bio membranes, transport mechanisms across biological membranes and will learn the concept and mechanism of ATP synthesis.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	2	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	2	3	3	2	2
CLO5	3	2	2	2	3	3	2	2	2	2	3	1	2	2

Detailed Syllabus:
UNIT-I **15 Hours**
Metabolismof
Lipids Introduction;
Importance of Lipids
Classifications
Digestion and absorption of fat
General outline of lipid Metabolism and metabolic transformation of Lipids Lipoproteins and classification; Chemical importance
Ketogenesis

UNIT-II **10 Hours**
Protein and Nucleic Acid
Metabolism Introduction: Functions
of Proteins.
Amino acids, Biomedical Importance, classification of proteins Essential amino acids, Peptides and Proteins
Formation of urea,
Urea cycle Trans-
amination and

Deamination
Plasma Proteins, functions & clinical importance

UNIT-III **5 Hours**

Nucleic Acid
Metabolism
Introduction;
Definition;
Structure &
functions of DNA
Structure function and types of RNA
Structure of Nucleic acid; Nitrogenous bases
biological role Formation of uric acid; Uric acid
metabolism

Reference Books:

1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).
2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
4. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York).

Teaching-Learning Strategies in brief

1. Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
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3. Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).
4. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
5. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 402
Title of the Course: - Pathology-III
L-20 T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to …….
CLO-1 Understand the pathogenesis of a variety of common and uncommon diseases.
CLO-2 Explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities that result.
CLO-3 To classify diseases of various body systems and how they manifest clinically and histopathologically.
CLO-4 Devise likely diagnoses from clinical scenarios by recognizing key manifestations of congenital, hemodynamic, inflammatory, infectious, metabolic, environmental, and neoplastic diseases.
CLO-5 Utilize high quality peer-reviewed literature to maintain currency in the management of pathologic conditions

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	3	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	2	2	3	1	2	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	2	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:
UNIT-I **15 Hours**
Basic Pathology
Introduction to Pathology: Terminologies Cell Injury Degenerations Cell death & Necrosis Inflammation Healing Tuberculosis Syphilis Typhoid Thrombosis- briefly Embolism- briefly Ischemia and Infraction –briefly
UNIT-II
Derangements of body fluids Disorders of circulation AIDS and Hepatitis Hypertension Diabetes Mellitus Adaptive disorders of growth General Aspects of Neoplasia.

Reference Books:

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania
4. Elsevier, 2018.Cross, Simon S. *Underwood's Pathology : A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.\
5. Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh ; New York, Elsevier, 2018.

Teaching-Learning Strategies in brief

a) Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
b) Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.
c) Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).
d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
e) Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 403
Title of the Course: - -Microbiology-III
L-20 T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to ……
CLO-1 To explain disease symptoms with causative agent, isolate and identify pathogens.
CLO-2 Acquire fundamental knowledge of Molecular biology Techniques
CLO-3 Evaluate different type of bacteria and their role in diseases and ability to isolate and cultivate bacteria.
CLO-4 Evaluate different type of virus and their role in diseases and ability to isolate and cultivate bacteria.
CLO-5 Evaluate different type of fungi and their role in diseases and ability to isolate and cultivate bacteria.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-I **10 Hours**

Immunology

Introduction: Basic Fundamentals of Immunology

Immunological Apparatus; structure and functions, T-Cells; B-Cell lymphocytes Antigen, Antibody, Antigen and Antibody reactions

Immunoglobulins; Classes of immunoglobulins; IgG; IgA; IgM; IgD; IgE; Immune Responses; Immunity; Hyper Sensitivity; Combs & Gel Classification

Laboratory Diagnosis of Immune responses; methods of detection of antigens and antibodies; Immunodiffusion; Immuno electrophoresis (IEP); CIEOP; Tests for serodiagnosis; Widal test; VDRL; Flocculation tests; Diagnostic kits.

Immuno diagnostics: Application and uses, EIA/ELISA, Immuno Diffusion; CIEP Gel Electrophoresis;

IFA

PCR: Uses and applications

UNIT-II **20 Hours**

Parasitology:

Classification of Human Parasites

Vector and arthropods of medical importance.(Mosquitoes, Fleas, Tick, Flies, Sand fly, Scabies etc)

Detail study of life cycle; morphologic features of medically important Protozoan Parasites Nematodes ,Cestodes, Trematodes

Stool Examination: Normal appearance and composition ,Importance of stool examination Collection of specimen and processing ,Physical examination ,Chemical Examination Examination for Intestinal parasites ova and cyst

Immuno- diagnostic Parasitology

Concentration technique of Examination of Stool

Examination of blood; Serological tests for parasite infestations Cultural Studies

Biopsy and Cytology Studies of an identification of parasitic disease

Reference Books

1. Tortora, Gerard J, et al. *Microbiology : An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston ; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997..
5. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
7. Cappuccino, James G, and Chad Welsh. *Microbiology : A Laboratory Manual*. 12th ed., New York, Pearson, 2019.
8. Salle A. *Fundamental Principles of Bacteriology*. New Delhi, Tata Mcgra-Hill Publishing Company Limited, 2007.

Teaching-Learning Strategies in brief

a) Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

b) Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.

c) Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e) Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 404
Title of the Course: Biochemistry-II Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to ……

CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories

CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-3 Able to perform quantitative analysis of specimen

CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to demonstrate quantitative analysis of biomolecules in clinical biochemistry

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

Principle and basic methods of Automation in Biochemistry Quality control in Biochemistry
Estimation of Creatinine, Cholesterol, Uric acid, Bilirubin, Proteins, Albumin, Alkaline phosphatase
Calcium, inorganic phosphate, CSF analysis Estimation of sodium potassium

Reference Books

1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).
2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
4. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and Company (New York).

Teaching-Learning Strategies in brief

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d. Case Studies: To express acquired knowledge, skills and attitudes, case based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research,student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 405
Title of the Course: - Pathology III Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to ……

CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories

CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-3 Able to demonstrate quantitative analysis of specimen in clinical pathology.

CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

Hands on work and training in laboratory as per mentioned in the syllabus.

Reference Books

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania
4. Elsevier, 2018.Cross, Simon S. *Underwood's Pathology : A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.\

5. Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh ; New York, Elsevier, 2018.

Teaching-Learning Strategies in brief

1. Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.
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4. Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.
5. Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: 406
Title of the Course: -- Microbiology III Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to ……
CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories
CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.
CLO-3 Able to demonstrate quantitative analysis of specimen in clinical microbiology.
C**LO-4** Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.
CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

-Quality control in microbiology lab
-Antigen antibody reactions
-Lab methods in diagnosing parasitic infections
-Stool Examination: Normal appearance and composition,Importance of stool examination Collection of specimen and processing ,Physical examination ,Chemical Examination Examination for Intestinal parasites ova and cyst

(i) Giardia lamblia
(ii) Entamaeba Histolytica
(iii) Blantidium coli.
(iv) Ascaris Lumbricoides
(v) Trichuris Trichura
(vi) Ankylostoma duodenale
(vii) Entrobius Vermicularis. (viii) Hymenolepis nana
(ix) Taenia Solium/Saginata. (x) Strongyloides Stereralis
(xi) Diphyllo bothrium Latum

Reference Books

1. Tortora, Gerard J, et al. *Microbiology : An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston ; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997..
5. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
7. Cappuccino, James G, and Chad Welsh. *Microbiology : A Laboratory Manual*. 12th ed., New York, Pearson, 2019.
8. Salle A. *Fundamental Principles of Bacteriology*. New Delhi, Tata Mcgra-Hill Publishing Company Limited, 2007.

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Assessment methods and weightages in brief

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SEMESTER V

Course Code: BMLT 501
Title of the Course: -Biochemistry III
L-20 T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to ……

CLO-1 Understand structure and function of proteins, nucleic acids, carbohydrates, fats, Vitamins, co-enzymes, etc and will understand the chemical properties of these bio-molecules and their functions.

CLO-2 Explain disciplinary knowledge and understanding of biochemistry, structure and function of biological molecules.

CLO-3 Learn basic concepts of Bioenergetics, mechanisms of oxidative phosphorylation and photophosphorylation.

CLO-4 Understand composition and structure of bio membranes, transport mechanisms across biological membranes and will learn the concept and mechanism of ATP synthesis.

CLO-5 To acquire fundamental knowledge on enzymes and their importance in biological reactions.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	2	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	2	3	3	2	2
CLO5	3	2	2	2	3	3	2	2	2	2	3	1	2	2

Detailed Syllabus:

UNIT-I **15 Hours**

Enzymes and Iso-enzymes
Definition general properties; of enzymes and coenzymes Classification of enzymes
Factors influencing enzyme activity Diagnostic importance of enzymes

UNIT-II **15 Hours**

Iron Metabolism - Source; functions; absorption transport; storage; clinical significance Sodium, Potassium, Chlorides- source, functions, deficiency, clinical importance Calcium and Phosphorus- source, functions, absorption, clinical importance
Fluoride, Magnesium, Copper -clinical importance

Reference Books

1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).
2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
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Assessment methods and weightages in brief

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Course Code: BMLT 502
Title of the Course: -Pathology-IV
L-20 T -10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 Understand the pathogenesis of a variety of common and uncommon diseases

CLO-2 Explain the basic nature of disease processes from the standpoint of causation, epidemiology, natural history, and the structural and functional abnormalities that result.

CLO-3 To classify diseases of various body systems and how they manifest clinically and histopathological.

CLO-4 Devise likely diagnoses from clinical scenarios by recognizing key manifestations of congenital, hemodynamic, inflammatory, infectious, metabolic, environmental, and neoplastic diseases

CLO-5 Utilize high quality peer-reviewed literature to maintain currency in the management of pathologic conditions

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:

UNIT-I **5 Hours**

Systemic Pathology

Anemia, Leukemia

Diseases of Lymph nodes- briefly

Pathology of disease of cardiovascular system, Respiratory system, Uri-genital system and Breast

UNIT-II **10Hours**

Histopathology Techniques

Introduction: Histology, Histopathology;

Histotechnology. Methods of examination of

tissues and cells;

Fresh and unfixed tissue examination; fixed specimen examination, frozen section paraffin section, Plastic Sections.

Fixatives,

Simple fixatives; Compound fixatives

Classification Reception Processing and

Reporting:

Organization of histopathology laboratory samples:

Fixation, Grossing of

Specimen, Labeling

of tissues,

Decalcification,

Tissue processing

Dehydration, Clearing, Impregnation, Embedding of tissues and paraffin block preparation. Automation in Histotechnology

Cryostat, Embedding Centers, Sharpening of

knives Section cutting; Microtome s, uses,

processing procedures

UNIT-III **10 Hours**

Museum

Technique

s; Staining

Haematoxylin and Eosin, Mounting Medias

Reception of specimen; Preparation of specimen; Fixation of the Specimens;

Restoration of specimens, Presentation and organization of specimens

Autopsy and Autopsy performance, basic dissection procedure preparations

Quality control in
Histopathology Cytology
and Cytology Techniques
Parameters for check: Reception; Registration; Tissue processing embedding, section cutting, Staining; Submission to pathologist for reporting.
Connective tissue Staining,
Collagen: Vongieson stain, Masson Trichrome Stain, Muscle Tissue: Mallory s phosphotungestic acid Haematoxylin method (PTAH), Elastic Fibers: Verhoeff s Method. Reticulin Fibers: Gomeris method: Silver impregnation, Stains for identifying specific muco substances like: Carbohydrate & Mucosubstances PAS, Alcian blue method; Mayer s Mucicarmine method.
Fat Sudan III; Sudan Black; Sudan IV; Oil Red O;
Osmic Acid Stains for Pigments & Minerals
Haemosiderin and Iron Perl s Prussian blue
method Calcium Von Kossa s Silver nitrate
method.

UNIT-IV **5 Hours**

Special Techniques in
Histocytology Immuno
Histochemistry:
Cytogenetic:
Brief Introduction; Genetic Material; Transcription; Translation; Techniques; Importance

Reference Books

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania
4. Elsevier, 2018.Cross, Simon S. *Underwood's Pathology : A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.\
5. Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh ; New York, Elsevier, 2018.

Teaching-Learning Strategies in brief

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Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 503
Title of the Course: -Microbiology-IV
L-20T-10 **Credits 1**

COURSE LEARNING OUTCOMES (CLOs)
After completing this Course, the students should be able to …….
CLO-1 To explain disease symptoms with causative agent, isolate and identify pathogens.
CLO-2 Aquire fundamental knowledge of Molecular biology Techniques
C**LO-**3 Evaluate different type of bacteria and their role in diseases and ability to isolate and cultivate bacteria.
CLO-4 Evaluate different type of virus and their role in diseases and ability to isolate and cultivate bacteria.
CLO-5 Evaluate different type of fungi and their role in diseases and ability to isolate and cultivate bacteria.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	1	2	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	2	2	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:
UNIT-I **25 Hours**
Organization and Laboratory Management
Introduction
Laboratory Management System
Types of Laboratories
Requirements of laboratory;
No. of tests arrangements, standardization Laboratory safety;
Procedures; Safety sign; Laboratory Hazards Preventive measures Laboratory disposal;
Decontamination;
Disinfections Laboratory management,
Planning and its place in patients care and service and Hospital Administration Medical ethics in the laboratory

Principles of quality control including knowledge of standards, controls, replicates and checks.
Personal cleanliness and care with regard to infected material flammable materials, broken glass, Chemical burns etc.
Cleaning and maintenance of equipments & glassware disinfection
Principles, construction, maintenance and use of Incubator, Water baths, Ovens, Autoclaves, Centrifuges, Stills, Electric, Stoves, Shakers, Steamers, Inspissator Pumps etc
Construction and uses of all types of analytical chemical balance Simple glass manipulation, making of capillary pipettes etc.
Medical documentation, Microphotography and laboratory record keeping and statistics. Proper collection, anticoagulation, preservation and methods of transmission of various specimens and materials for laboratory exams
Rural specimen collection, knowledge regarding to set up of a minimum laboratory on rural basis.

UNIT-II **5 Hours**

Laboratory management and planning:
Principles; Operational data, Market Potential, Hospital/Laboratory relatives, Competitions, Laboratory trends, Guiding Principles for planning, Hospital Laboratory services, planning for a basic health laboratory
Laboratory Organization
Principles, Components, and functions of a laboratory, Staffing the laboratory, Job descriptions and specifications, work schedule, Personnel re-arrangement and work load assessment. Communication:
Personnel Development and Relation Requisition/Report forms.
Quality Control
Non-Analytical FunctionsRequisition/Report forms. Material Management:
Procurement, Identification and correspondence of materials with sources, Inventory control and Analysis, Inspection and storage, Records and reports, Cost Control, Purchase and utilization of Supplies

Reference Books

1. Tortora, Gerard J, et al. *Microbiology : An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston ; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997..
5. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi.
6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
7. Cappuccino, James G, and Chad Welsh. *Microbiology : A Laboratory Manual*. 12th ed., New York, Pearson, 2019.
1. Salle A. *Fundamental Principles of Bacteriology*. New Delhi,

Tata Mcgra-Hill Publishing Company Limited, 2007.

Teaching-Learning Strategies in brief

a) Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

b) Discussions: Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas.

c) Practical: After completion of experiments in practical class, students should be given related problems. This will enhance the ability of problem-based learning (PBL).

d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e) Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

Internal assessment for 25 marks in respect of theory papers will be based on written tests assignments, presentations, viva-voice etc. The Semester examinations shall be held at the end of each semester as notified in the academic calendar.

Course Code: BMLT 504
Title of the Course: -Biochemistry -III Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories

CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-3 Able to perform quantitative analysis of specimen

CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to demonstrate quantitative analysis of biomolecules in clinical biochemistry

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

Renal Function test
Urea and creatinine clearance tests principles; procedure and clinical importance. GFR- Glomerular filtration rate
Tests for tubular functions Liver functions test:
Serum Bilirubin estimation
Conventional methods Auto Analysers
SGOT / SGPT;
Alkaline phosphatase tests
Pancreas function tests,
Functions of pancreas, clinical importance Determination of serum amylase
Gastric function tests
Functions of gastric juice, clinical importance Tests for free or total acids
Fractional meal tests Tubeless gastric analysis
Insulin test - Hollander test
Cardiac function tests (Profile), clinical importance. CPK (Creatinine phosphokinase), SGOT, SGPT; LDH, CK MB (Isoenzyme)
Thyroid function tests
Methods; Principle; Clinical Importance

Reference Books

1. Molecular Cell Biology (2016) 8th ed., Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A. and Scott, M.P., W.H. Freeman & Company (New York).
2. Biochemistry (2016) 6th ed., Garret, R. H. and Grisham, C.M., Cengage Learning (Boston),
3. Principles of Biochemistry (2008) 3rd ed., Voet, D.J., Voet, J.G. and Pratt, C.W., John Wiley & Sons, Inc. (New York), ISBN:13: 978-0470-23396-2
4. Lehninger: Principles of Biochemistry (2017) 7th ed., Nelson, D.L. and Cox,

M.M., W.H. Freeman and Company (New York).

Teaching-Learning Strategies in brief

a) Lectures- Class room lectures and use of black/green/white boards. ICT tools involving smart boards, power point presentations, live demonstrations, videos, animations, models, improve the understanding and make the teaching sessions enjoyable.

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d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

e) Project work: The students are encouraged to carry out small project work of their choice to quench their curiosity. In order to understand research, student can undertake a small dissertation work where he/she exhaustively performs the literature search and compiles them as a meaningful presentation.

Assessment methods and weightages in brief

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Course Code: BMLT 505
Title of the Course: -Pathology-IV Practical
P-50 **Credits**2

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories

CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-3 Able to demonstrate quantitative analysis of specimen in clinical pathology.

CL**O-4** Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

Hands on training and work in laboratory as per mentioned in syllabus

Reference Books

1. Goljan, Edward. *Rapid Review Pathology*. Philadelphia, Pa Elsevier, 2019.
2. Kumar, Edward C. *Robbins and Cotran Review of Pathology.* S.L., Elsevier - Health Science, 2020.
3. Kumar, Vinay, et al. *Robbins Basic Pathology*. 9th ed., Philadelphia, Pennsylvania
4. Elsevier, 2018.Cross, Simon S. *Underwood's Pathology : A Clinical Approach*. Edinburgh, Churchill Livingstone Elsevier, 2019.\

5. Roberts, Fiona, et al. *Pathology Illustrated*. Edinburgh ; New York, Elsevier, 2018.

Teaching-Learning Strategies in brief

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d) Case Studies: To express acquired knowledge, skills and attitudes, case-based learning (CBL) can be used where students can be given case specific problems both for theory and practical courses to find creative solutions to complex problems.

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Assessment methods and weightages in brief

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Course Code: BMLT 506
Title of the Course: -Microbiology-IV Practical
P-50 **Credits 2**

COURSE LEARNING OUTCOMES (CLOs)

After completing this Course, the students should be able to …….

CLO-1 Analyse specimen with the help of diagnostic kits that are used in clinical laboratories

CLO-2 Gain knowledge in diagnosis through the presentations made on the known case studies.

CLO-3 Able to demonstrate quantitative analysis of specimen in clinical microbiology.

CLO-4 Analyse and evaluate prognosis of a disease and know the relevance of preventive measures taken in healthcare.

CLO-5 Able to perform quantitative analysis of specimen.

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus: **50 Hours**

Hands on training and work in laboratory as per mentioned in syllabus

Reference Books

1. Tortora, Gerard J, et al. *Microbiology : An Introduction*. San Francisco, Ca, Pearson Benjamin Cummings, 2010.
2. Madigan, Michael T, et al. *Brock Biology of Microorganisms*. San Francisco Pearson/Benjamin Cummings, 2009.
3. Willey, Joanne M, et al. *Prescott, Harley, and Klein's Microbiology*. Boston ; Madrid, Mcgraw-Hill Higher Education, 2008.
4. Atlas, Ronald M. *Principles of Microbiology*. Dubuque, Ia, Wm. C. Brown Publishers, 1997..
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6. Stanier, Roger Y, et al. *General Microbiology*. London, Macmillan, 1995.
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SEMESTER VI

Course Code: BMLT 601
Title of the Course: -Assignment and Viva voce
Credits 5

Mapping of Course Learning Outcomes (CLOs)with Program Learning Outcomes (PLOs) and Program Specific Outcomes (PSOs)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	3	2	3	3	3	3	1	3	3	3	3	2	1	2
CLO2	2	2	2	2	2	2	2	2	3	3	2	2	2	2
CLO3	3	2	3	2	3	1	3	2	3	3	2	1	1	3
CLO4	3	3	2	3	2	2	3	2	3	3	3	3	2	2
CLO5	3	2	2	2	3	3	2	3	3	3	3	1	2	2

Detailed Syllabus:
Hands on training and work in laboratory as per mentioned in the syllabus.