THE ASSAM
ROYAL GLOBAL UNIVERSITY

ROYAL SCHOOL OF MEDICAL AND ALLIED SCIENCES (RSMAS)

DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY(MLT)

Learning Outcomes-based Curriculum Framework (LOCF) for

Undergraduate Programme in BSc. MLT & D.MLT

W.E.F 2022-23

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1. Preamble

The following aspects have been taken into cognizance by faculty members and members of Board of Studies while framing the BSc and Diploma MLT syllabus:

i. The learning outcomes of the BSc and Diploma MLT programme are designed to help students analyze, appreciate, and critically engage with theoretical knowledge and practical experiences in the field of medical sciences.

ii. It is significant to note that the BSc and Diploma MLT syllabus is the point of reference for the LOCF recommendations approach is envisioned to provide a focused, outcome-based syllabus at the undergraduate level with an agenda to structure the teaching-learning experiences in a more student-centric manner.

iii. The arrangement of courses/papers in the semesters is in accordance with the credit load in each semester and the overall credit. Of course, the selection of subjects and topics is made to ensure preliminary understanding of the subject and to retain courses in the second and third year that require greater attention and specialization. Courses are incorporated keeping in view that each program prepares students for sustainability and life-long learning. The assam royal global university hopes the LOCF approach of the program BSc. MLT (3Yr+1Yr Internship) will help students in making an informed decision regarding the goals that they wish to pursue in further education and life, at large.

iv. The overarching concern of the LOCF framework is to have definite and justifiable outcomes, including and their realization by the end of the programme. This also includes enhancing students' personalities, preparing students for the job market—including research area, diagnostic laboratory and hospitals sector.

1.1 Introduction

The learning outcomes-based curriculum framework for a B.Sc. degree in medical laboratory technology is structured to offer a broad outline within which a medical laboratory technology program could be developed. The course is upgraded keeping in mind the aspirations of students, changing nature of the subject as well as the learning environment. Courses within medical laboratory technology have been revisited to incorporate recent advancements, techniques to upgrade the skills of learners.

The new structure is expected to enhance the level of understanding among students and maintain the standard of medical laboratory technology degrees/program across the country. Effort has been made to integrate use of recent technology and use of MOOCs to assist teaching-learning process among students. This framework permits the review of graduate attributes, qualification descriptors, program learning outcomes and course-level learning outcomes periodically.

The framework offers flexibility and innovation in syllabi designing and in methods adopted for teaching- learning process and learning assessment. The major objective is to elevate the subject knowledge of the students, making them critical thinkers and able to solve problems and issues related to medical laboratory technology logically and efficiently. Overall, this course has been modified to upgrade skills related to biological science and provide our students a competitive edge in securing a career in hospital, diagnosis laboratory, academia, clinical research and development in private as well as public sectors.

1.2 Learning Outcomes-based Approach to Curricular Planning

The basic premise of learning outcomes-based approach to curriculum planning and development is that higher e education qualifications such as a Bachelors and diploma degree programmes are earned and awarded on the basis of the following factors--(a) achievement of outcomes, demonstrated in terms of knowledge, understanding, skills, attitudes and values and (b) academic standards expected out of the graduates of a programme of study.

The expected learning outcomes are used as reference points to formulate graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes which in turn will help in curriculum planning and development, and in the design, delivery, and review of academic programmes.

The bachelor's and diploma degree in medical laboratory technology as a subject, is framed for the students to attain sufficient knowledge during the course. The course learning outcome of medical laboratory technology are aimed at fascinating he learners to acquire knowledge, skills understanding, value, attributes, and academic standards. A student is awarded by B.Sc. and diploma medical laboratory technology based on the attainment of these outcomes at the end of the programme.

The key outcomes that underpin curriculum planning and development at the undergraduate level include Graduate Attributes, Qualification Descriptors, Programme Learning Outcomes, and Course Learning Outcomes. The LOCF for BSc. and Diploma MLT programme is based on these specific learning outcomes and academic standards expected to be attained by graduates of this programme.

An outcome-based approach provides greater flexibility to the teachers to develop and the students to adopt different pedagogical strategies in an interactive and participatory ecosystem. The Assam Royal Global University has addressed this aspect since its inception through the CBCS curricula adopted by the university in 2017. This approach is further consolidated through identifying further relevant and common outcomes beneficial to the student community and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values. Moreover, this curriculum keeps into perspective the fact that the focus is not just on domain knowledge or outcomes only but on processes and approaches to be employed in pedagogical transactions. This is important in order to ensure the efficacy of the curriculum adopted.

1.2.1 Nature and Extent of Bachelor's and Diploma degree Programme in MLT

A bachelor's and diploma degree in MLT with internship (BSc. MLT) is a 3+1year degree and 2 year degree for respective courses mention above.

A bachelor degree is divided into 6^{th} semester and diploma degree is divided into 4^{th} semester.

Sl. No.	Year	Mandatory Credits to be Secured for the Bachelor Award	Mandatory Credits to be Secured for the diploma Award
1	1st	48	48
2	2nd	53	53
3	3rd	50	-
4	4th	20	-
Total Credits		**171**	**101**

i. The BSc. and diploma MLT programme is well-recognized, structured, specialized graduate level qualification collegiate education that is in effect a bridge between secondary and tertiary level education and postgraduate education. The contents of this degree are determined in terms of knowledge, understanding, qualification, skills, and values that students need to acquire for their employability or in their pursuit of higher education.

ii. The BSc. and diploma MLT programme attracts students from the secondary level or equivalent, and they are expected to have at least minimum subject knowledge related to this subject. Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

iii. Qualification descriptors at this level reflect in-depth and specialized knowledge and understanding of their subjects enriched by domain knowledge, student knowledge, critical thinking, and effective communication skills. Knowledge at this level includes generic information about what all holders of the qualification are able to gather, and the qualities and skills that they develop in the course of the graduation programme. Courses, therefore, reflect diverse aspirations of diverse types of students, and skills, learning needs and personal circumstances. Programmes assess not only academic skills but other skills and attributes including clinical posting at various hospital and laboratories. The Department of MLT, The Assam Royal Global University, Guwahati aims at a curriculum design that fulfils these qualification descriptors.

iv. The attributes and outcomes associated with BSc. and diploma MLT programme are comprised of structured learning opportunities and therefore the BSc. and diploma MLT programme is devoted to classroom learning, group and individual learning, and library and clinical lab posting. The key component in the programme is developing the ability to communicate from basic level to critical level communication.

v. The critical perspective developed during the BSc. and diploma MLT programme helps students to link the degree to life skills including professional skills with an understanding of human and literary values.

1.2.1 Aims of Bachelor's and diploma Degree Programme in MLT

The BSc. and diploma MLT programme is inclusive and broad-based even as it carries imprints of specialized areas of study. In this programme, students practical exposure is given importance particularly in the final year of the BSc. and diploma MLT programme. The objectives of the LOCF syllabus in MLT revisit traditional expectations of teaching

and learning MLT by centre-staging outcomes that are demonstrable through the following key attributes: understanding, use, communication, expansion, and application of subject knowledge with a clear awareness. The

LOCF syllabus of BSc. and diploma MLT programme highlights the following: (i) the basic concept of teaching medical related core subjects in MLT programme, (ii) the core objectives of MLT programme is targeted at imparting through subject knowledge, practical exposures and clinical posting. (iii) application and use of knowledge of MLT programme in contributing to the society and the world at large through health cares sectors, (iv) demonstration of professional awareness and problem solving skills, (v) demonstration of basic knowledge of digital knowledge platforms; (vi) develop the ability to recognize the professional and social/ hospital/laboratory utility of the subject, and (vii) in the process understand, appreciate and imbibe values of life.The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF)for BSc. and diploma degree in MLT literature are—

- **Prospects of the Curriculum:** Formulating graduate attributes, qualification descriptors, programme learning outcomes, and course learning outcomes that are expected to be demonstrated by the holder of the degree of BSc. and Diploma MLT.
- **Core Values**: Enabling prospective students, parents, employers, etc. to understand the nature and level of learning outcomes (knowledge, practical skills, attitudes) or attributes suitable to the BSc. and Diploma MLT programme.
- **Bridge to the World**: Providing a framework to see the subject as a bridge to the world in such a way that while recognizing the different conditions in pluralistic society, the students also are aware of a core of shared values such as (i) commitment to the knowledge of the subject to understand the world at large, (ii) development of each person's unique potential, (iii) respect for others and their rights, (iv) social and civic responsibility, participation in democratic processes; social justice and cultural diversity, and (v) concern for the natural and cultural environment
- **Assimilation of Ability, Balance, Harmony and Inclusiveness:** Identify and define such aspects or attributes of MLT that a BSc. and Diploma MLT graduate should be able to demonstrate on successful completion of the programme.
- **Frame for National Standards:** Providing a frame of reference for maintaining national standards with international compatibility of learning outcomes of MLT and academic standards to ensure global competitiveness, and to facilitate graduate mobility
- **Pliability:** Formulating outcomes that are responsive to social and technological changes in order that the pedagogy will meet student's needs arising from the changes. The LOCF approach encourages effective use of new technologies as tools for learning and provide a balance between what is common to the education of all students and the kind of flexibility and openness required for education
- **Pedagogy:** Provide higher education institutions an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programmes and academic standards for BSc. and Diploma MLT with a shift from domain knowledge to processes of realising the outcomes
- **Development:** The specific objectives of the BSc. and Diploma MLT programme are to develop the student’s ability to demonstrate the following outcomes:
    1. Disciplinary Knowledge
    2. Communication Skills
    3. Critical Thinking
    4. Analytical Reasoning
    5. Problem Solving

6. Research-Related Skills
7. Self-Directing Learning
8. Technical Competence
9. Values: Moral and Ethical, Literary and Human
10. Digital Learning

The details are explained below:

1.3 Graduate Attributes (GA)

GA 1: Disciplinary Knowledge:

a) Ability to identify, learn and write about different diagnostic methods, and engage with various diagnostic fields and laboratories/ hospital and critical concepts.

b) Ability to understand appreciate, analyze and use different theoretical frameworks and develop one's critical position and present one's views coherently and persuasively.

c) Ability to situate one's own learning, to be aware of one's position in terms of society and upgrading technology.

GA 2: Critical Thinking:

a) Ability to read and analyse extant scholarship

b) Ability to substantiate critical evaluation of laboratory reports.

(The Assam Royal Global University has made ***Communicative English (CEN)*** compulsory at both the Undergraduate levels for all students across all semesters. A student at the UG level will study six papers of Communicative English as **Ability Enhancement Compulsory Course (AECC)** with a view to improving the communicative as well as soft skills of students and prepare them for the job-market in the future.)

GA 3: Problem Solving:

a) Ability to transfer critical skills to read other cultural texts

b) Ability to read any unfamiliar texts

GA 4: Analytical Reasoning:

a) Ability to evaluate the strengths and weaknesses in scholarly texts spotting flaws in their arguments

b) Ability to use critics and theorists to create a framework

GA 5: Research-Related Skills:

a) Ability to problematize; to formulate hypothesis and research questions, and to identify and consult relevant sources to find answers

b) Ability to plan and write a research paper

GA 6: Self-Directing Learning:

a) Ability to work independently in terms of reading critical texts

b) Ability to carry out personal research, postulate questions and search for answers

c) Ability to use digital sources, and read them critically

d) Ability to use digital resources for presentations

GA 7: Communication Skills and **Leadership Readiness:**

a) Ability to speak and write clearly in standard, academic English

b) Ability to listen to and read carefully various viewpoints and engage with them.

c) Ability to use critical concepts and categories with clarity

d) Ability to lead group discussions, to formulate questions for the class in literary and social texts

GA 8: Technical Competence:

a) Ability to apply specific technical and instrumental principles and information.

b) Ability to drive success in technical oriented and knowledge base positions.

GA 9: Digital Learning:

a) Ability to facilitated learning by giving control over time and pace.

b) Ability to build the skills needed to navigate technology and to get the best out of it.

GA 10: Moral and Ethical Values and Life-long Learning:

a) Ability to interrogate one's own ethical values, and to be aware of ethical issues

b) Ability to retain and build on critical reading skills

c) Ability to transfer such skills to other domains of one's life and work

1.4 Qualification descriptors for a bachelor's and diploma degree in MLT

The qualification descriptors for the bachelor's and diploma degree programme in MLT will focus on the following five learning attributes: understanding, use, communication, expansion, and application of subject knowledge with a clear understanding of one's location. This also involves an awareness on the differences that exist among students based on class, caste, gender, community, region, etc. in order that they can transcend these differences with transparency of purpose and thought. The key qualification descriptor for BSc. and diploma MLT includes the following:

i. An integrated grasp of the core and discipline specific subjects covered in Biomedical Science through stories of discovery and rigor of experiential learning.

ii. How to access, create and analyze knowledge and data, stitch diverse concepts and apply in the management of human diseases, public health, and related areas.

iii. Appreciation for interdisciplinary skills as the key theme in thinking, comprehending, and solving the local and global issues in medical research and development.

iv. An aptitude for diagnosis laboratory, research, academia, and hospital experimental skills and their application required for identifying problems and issues relating to the disciplinary area and field of study.

v. 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.

vi. Apply subject-specific skills in MLT to foster a larger sense of ethical and moral responsibility among patients in order to see, respect, and transcend differences among various life-forms. The programme will strengthen the student's competence to enable them to identify, analyze and evaluate and find sustainable solutions and/or answers to keys issues around in the world.

1.5 Programme Learning Outcomes relating to bachelor and diploma degree in MLT programme

Students graduating with the degree in MLT will be able to achieve the following:

PO 1: Ability to attain knowledge and understanding of the origin and development of English language and literature.

PO 2: Ability to substantiate critical readings of literary texts and place them in historical contexts

PO 3: Ability to classify areas of concern in literary discourses and identify sources to explore answers for the same.

PO 4: Ability to evaluate literary theories and assess their arguments to create new frameworks

PO 5: Ability to identify research gaps, formulate research questions and ascertain relevant sources to find substantive explanations.

PO 6: Ability to successfully complete internship within stipulated time.

PO 7: Ability to formulate logical arguments by analysing and evaluating intrinsic ideas.

PO 8: Ability to work independently and carry out personal research, postulate questions and search for answers.

PO 9: Ability to communicate and read carefully various viewpoints and engaging them in group discussion.

PO 10: Ability to interrogate one's own ethical values, and to be aware of ethical issues and to transfer such skills to other domains of one's life and work and pave way for lifelong learning.

1.6 Bachelor and diploma MLT Programme Specific Outcomes:

PSO 1: Understand and describe the various aspects of importance in health related field.

PSO 2: Ability to critically analyze various report interpretations.

PSO 3: Ability to engage in various clinal postings and equipped with practical experiences.

PSO 4: Ability to demonstrate communicative competence, interpersonal skills and creative acumen through effective classroom practices like group discussions, presentation sessions and mock interviews.

1.7 Teaching Learning Process

Teaching and learning in this programme involves classroom lectures as well as tutorial and remedial classes.

Tutorial classes: Tutorials allow closer interaction between students and teacher as each student gets individual attention. The tutorials are conducted for students who are unable to achieve average grades in their weekly assessments. Tutorials are divided into three categories, viz. discussion-based tutorials (focusing on deeper exploration of course content through discussions and debates), problem-solving tutorials (focusing on problem solving processes and quantitative reasoning), and Q&A tutorials (students ask questions about course content and assignments and consolidate their learning in the guiding presence of the tutor).

Remedial classes: The remedial classes are conducted for students who achieve average and above average grades in their weekly assessments. The focus is laid to equip the students to perform better in the exams/assessments. The students are divided into small groups to provide dedicated learning support. Tutors are assigned to provide extra time and resources to help them understand concepts with advanced nuances. Small groups allow tutors to address their specific needs and monitor them. Following methods are adopted for tutorial and remedial classes:

- Written assignments and projects submitted by students
- Project-based learning
- Group discussions
- Home assignments
- Class tests, quizzes, debates organised in the department
- Seminars and conferences
- Extra-curricular activities like cultural activities, community outreach programmes etc.
- Field trip, excursions, study tour, interacting with eminent authors, etc.

1.8 Assessment Methods

	Component of Evaluation	Marks	Frequency	Code	Weightage (%)
A	**Continuous Evaluation**				
I	Analysis/Class test	Combination of any three from (i) to (v) with 5 marks each	1-3	C	25%
Ii	Home Assignment		1-3	H	
Iii	Project		1	P	
Iv	Seminar		1-2	S	
V	Viva-Voice/Presentation		1-2	V	
Vi	MSE	MSE shall be of 10 marks	1-3	Q/CT	
vii	Attendance	Attendance shall be of 5 marks	100%	A	5%
B	Semester End Examination		1	SEE	70%
	Project				**100%**

2. Course Structure

1st semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	MLT232C101	Anatomy –I (Theory + lab)	2	1	1	4	4
2	MLT232C102	Physiology- I (Theory + lab)	2	1	1	4	4
3	MLT232C103	Pathology	3	1	0	4	4
Skill Enhancement Elective Courses (SEC)							
4	MLT232S101	Patient Care Management-I	2	0	0	2	2
Value Addition Course (VAC)							
5.	MLT232V101	Laboratory Management	2	0	0	2	2
Ability Enhancement Compulsory Courses (AECC)							
6	CEN982A101	Communication English– I	1	0	0	1	1
7	BHS982A104	Behavioural Science – I	1	0	0	1	1
Generic Elective							
8	MLT232G101	Biochemistry-I (GE-I)	3	0	0	3	3
9	MLT232G102	Clinical Pathlogy (GE-II) Offered by department	3	0	0	3	3
		Total Credits	**19**	**3**	**2**	**24**	**24**

2nd semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	MLT232C201	Anatomy- II (Theory + lab)	2	1	1	4	4
2	MLT232C202	Physiology- II (Theory + lab)	2	1	1	4	4
3	MLT232C203	General Microbiology	3	0	0	3	3
Skill Enhancement Elective Courses (SEC)							
4	MLT232S201	Patient Care Management-II	2	0	0	2	2
Value Addition Course (VAC)							
5.	MLT232V201	Quality in health system	2	0	0	2	2
Ability Enhancement Compulsory Courses (AECC)							
6	CEN982A101	Communication English—II	1	0	0	1	1
7	BHS982A104	Behavioural Science–II	1	0	0	1	1
Generic Elective							
8	MLT232G201	Biochemistry-II	3	1	0	4	4
9	MLT232G202	General Microbiology (GE-IV) Offered by department	3	0	0	3	3
		Total Credits	**19**	**3**	**2**	**24**	**24**

3rdsemester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	MLT232C301	Biochemistry-III	4	0	0	4	4
2	MLT232C302	Practical on microbiology and Biochemistry	4	0	8	4	4
DSE Subjects							
3	MLT232D302	Haematology-I	4	0	0	4	4
Ability Enhancement Compulsory Courses (AECC)							
4	CEN982A301	Communication English– III: Career Oriented Communication	1	0	0	1	1
5	EVS982A303	Environmental Science	1	0	0	1	1
Generic Elective							
6	MLT232C301	Microbiology-I (GE-V)	3	0	0	3	3
7	MLT232G301	Basic Biochemistry **(**GE-VI)	3	0	0	3	3
8	MLT22I301	Internship	4	0	0	4	4
		Total Credits	**24**	**0**	**8**	**24**	**24**

4th semester

Sl.No.	Subject Code	Names of subjects	L	T	P	C	TCP
Core Subjects							
1	MLT232C401	Clinical pathology& Blood banking	4	0	0	4	4
2	MLT232C402	Practical on Clinical pathology& Blood banking and Microbiology-II	4	0	8	4	4
DSE Subjects							
3	MLT232D401	Microbiology-II	4	0	0	4	4
Ability Enhancement Compulsory Courses (AECC)							
7	CEN982A101	Communication English—IV	1	0	0	1	1
Skill Enhancement course (SEC)							
5	MLT232S401	Clinical laboratory management	2	0	0	2	2
VALUE ADDITION COURSE (VAC)							
6	MLT232V401	Nutritional Biochemistry	2	0	0	2	2
Generic Elective							
7	MLT232G401	Histopathology& Cancer Biology	3	0	0	3	3
8	MLT232G402	Basic Histopathology (GE-IV)	3	0	0	3	3
		Total Credits	**24**	**0**	**8**	**24**	**24**

5th semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							
1	BML232C501	Clinical Immunology	4	0	0	4	4
2	BML232C502	Medical Bacteriology& Parasitology	4	0	0	4	4
3	BML232C511	HDPC-I	4	0	0	4	4
4	BML232C512	Medical Bacteriology& Parasitology Practical	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
5	CEN982A501	Communicative English-V	1	-	-	1	1
DSE Subjects							
6	BML232D501	Diagnostic Molecular Biology	4	0	0	4	4
7	BML232D502	Enzymology& Organ function test	4	0	0	4	4
8	BML232D511	Enzymology& Organ function test -Practical	0	0	4	2	4
		Total Credits	**17**	**0**	**8**	**25**	**29**

6th semester							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
Core Subjects							

1	BML232C601	Cytopathology	4	0	0	4	4
2	BML232C602	Clinical Biochemistry	4	0	0	4	4
3	BML232C603	HDPC-II	4	0	0	4	4
4	BML232C611	Clinical Biochemistry Practical	4	0	0	4	4
5	BML232C612	Cytopathology Practical	0	0	4	2	4
Ability Enhancement Compulsory Courses (AECC)							
6	CEN982A601	Communication English—II	1	0	0	1	1
DSE Subjects							
7	BML232D601	Virology & Medical Mycology	4	0	0	4	4
8	BML232D611	Virology & Medical Mycology-Practical	0	0	4	2	4
		Total Credits	**21**	**0**	**8**	**25**	**29**

7th and 8thsemester (12 MONTH INTERNSHIP)							
Sl.No.	**Subject Code**	**Names of subjects**	**L**	**T**	**P**	**C**	**TCP**
	BML232C781	Internship	0	0	20	20	20

Total credit for the course: 24+24+26+27+25+25+20 (practice school 12 month)=171

Level: Semester I

Course: C-1

Title of the Paper: Anatomy-I

Subject Code: MLT232C101

L-T-P-C: 2-1-0-3 (T) **Total credits: 4 (T+P)**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Anatomy of various structures, histological appearance of various organs of the human body.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To **define** the basic knowledge on the structure and function of the human body.	**BT 1**
CO 2	To **explain** the relation between the different organs and circulating system.	**BT 2**
CO 3	To **organize a**pplication of anatomical knowledge with various diseases.	**BT 3**
CO 4	To **analyze** the various experiments related to special senses and nervous system.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	General Anatomy: Introduction to Anatomy, terms and terminology. Regions of Body, Cavities and systems. Surface anatomy – Musculo- skeletal, vascular, cardiopulmonary system General Embryology. Applied anatomy	**9**
II	Musculoskeletal system: Connective tissue & its modification, tendons, membranes, special connective tissue. Bone structure, blood supply, growth, ossification, and classification. Muscle classification, structure and functional aspect. Joints – classification, structures of joints, movements, range, limiting	**9**

	factors, stability, blood supply, nerve supply, dislocations and applied anatomy.	
III	hypothalamus Structure and features of meninges Ventricles of brain, CSF circulation Development of nervous system & defects Cranial nerves – (course, distribution, functions and palsy) Sympathetic nervous system, its parts and components Parasympathetic nervous system Applied anatomy	**9**
IV	Sensory system: Structure and function of, Visual system, Auditory system, Gustatory system, Olfactory system, Somato sensory system	**9**
TOTAL		**36**

Title of the Paper: Anatomy Lab-I

L-T-P-C: **0-0-1-1 (P)**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Identification and description of all anatomical structures.	**3**
II	The learning of Anatomy is by demonstration only through dissected parts, slides,	**3**
III	Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).	**3**
IV	Demonstration of skeleton- articulated and disarticulated.	**3**
TOTAL		**12**

Texts:

1. Alison,G.Anne,W.(2014). Ross and Wilson Anatomy and Physiology in Health and Illness. Elsevier Health; UK, 13th edition

2. Khurana, I., Khurana, A., (2018). Textbook of anatomy and physiology, 3rd edition.

3. Shekar C N C. Manipal Manual of Medical Physiology: CBS Publication, 1st edition.

4. Singh, S.H. (2017). Principles of human physiology for allied health sciences: CBS Publishers & Distributors

Reference Book:

1. Tortora,GJ. &Derrickson. (2008). Principles of Anatomy and Physiology. Wiley, Global edition.
2. Venkatesh D. Sudhakar H.H. (2016). Basics of anatomy, physiology &microbiology level 1: CBS Publishers & Distributors, 4th edition
3. YalayyaswamyN.N.(2018). Human anatomy and physiology for courses in nursing and allied health sciences, 3rd edition

Level: Semester I

Course: C-2

Title of the Paper: Physiology-I

Subject Code: MLT232C102

L-T-P-C: 2-1-0-3 (T) **Total credits: 4 (T+P)**

Course Objectives

The objective of the course is to introduce students acquire knowledge of the normal physiology of various human body systems and understand the alterations in physiology in diseases

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To **recall** the function of the cell, tissue and organ systems.	**BT 1**
CO 2	To **understand** the importance of body immunity, blood coagulation,blood grouping etc.	**BT 2**
CO 3	To **apply** the acquainted knowledge about the digestive system and its different role and actions.	**BT 3**
CO 4	To **distinguish** the various experiments related to special senses and nervous system.	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**General Physiology**- Cell: morphology, Structure and function ofcell organelles, Structure of cell membrane, Transport across cell membrane, Intercellular communication, Homeostasis	**9**
II	**Blood**- Introduction-composition & function of blood, W.B.C., R.B.C., Platelets formation & functions, Immunity, Plasma: composition, formation & functions, Plasma Proteins:-types &functions, Blood Groups- types , significance, determinationHemoglobin, Haemostasis, Lymph-composition, formation, circulation &functions **Cardiovascularsystem**-Conducting system-components, impulseconduction, Heart valves, Cardiac cycle- definition,	**9**
III	phases of cardiac cycle, Cardiac output- definition, normal value, determinants. Stroke volume and its regulation, Heart rate and its regulation, Arterial pulse, Blood pressure-definition, normal values, factors affecting blood pressure, Shock-definition, classification, causes and features, Basic idea of ECG, Cardiovascular changes during exercise	**9**

IV	**Nerve Muscle Physiology-** Muscles- classification, structure, properties, Excitation contraction coupling, Motor unit, EMG, factors affecting muscle tension,Muscle tone, fatigue, exercise, Nerve –structure and function of neurons, classification, properties, Resting membrane potential & Action potential their ionic basis, All or None phenomenon, Neuromuscular transmission, Ionic basis of nerve conduction, Concept of nerve injury &Wallerian degeneration, Synapses, Electrical events in postsynaptic neurons, Inhibition & facilitation at synapses, Chemical transmission of synaptic activity, neurotransmitters.	**9**
TOTAL		**36**

Title of the Paper: Physiology Lab-I

L-T-P-C: **0-0-1-1 (P)**

Detailed syllabus:

Modules	Topics (if applicable) & Course Contents	Periods
I.	Elicitation of Reflexes & jerks. Identification of blood cells by study of peripheral blood smear. Introduction to hemocytometry. Enumeration of white blood cell (WBC) count	**3**
II	Determination of blood group. Determination of erythrocyte sedimentation rate (ESR). Determination of heart rate and pulse rate.	**3**
III	Recording of blood pressure. Special senses Structure and functions of eye, ear, nose and tongue and their disorders.	**3**
IV	Enumeration of total red blood corpuscles (RBC) count Determination of bleeding time Determination of clotting time Estimation of hemoglobin content	**3**
TOTAL		**12**

Texts:

1. Arthur, Guyton,Textbook of Medical Physiology, Mosby. 3rd Edition

2. Singh, S.H. (2017). Principles of human physiology for allied health sciences: CBS Publishers & Distributors, Latest Edition

3. Anand&Manchanda,Textbook of Physiology, Tata McGrawHill. 5th Edition.

4. Sembulingam.K,Human Physiology- Vol. 1&2,MedicalAllied, 7th Edition.

Reference Books:

1. Chaudhari, S.K, Concise Medical Physiology, New CentralAgency,Calcutta, 4th Edition
2. Tortora&Grabowski,Harper Collins, Principals of Anatomy and Physiology, Gobal Edition

Level: Semester I

Course: C3

Subject: Pathology

Subject Code: **MLT232C103**

L-T-P-C: **3-1-0-4**

. **Total credits: 4**

Course Objective:

The objective of the course is to impart knowledge on disease caused by microbial agents, epidemiology, their mode of transmission, pathogenesis, prevention, and treatment. This will also provide knowledge on development of immunity, immunological agents and immunological
tests carried out to fight against infections.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To **recall** the etiology and pathogenesis of the selected disease states.	**BT 1**
CO 2	To **understand** signs and symptoms of the diseases.	**BT 2**
CO 3	To **identify** the signs and symptoms of infectious diseases.	**BT 3**
CO 4	To **analyze** the complications of the diseases.	**BT 4**

Detailed syllabus:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Introduction to pathology**: inflammation and repair, acute inflammation, chronic inflammation, and repair healing	**12**
II	**Cell injuries:** important aspects of normal cell structure, reversible cell injury and irreversible cell injury pigments.	**12**
III	**Hemodynamic disorder,thromboembolic disease shock:** hyperemia/ischemia and hemorrhage, edema, thrombosis, embolism infraction and shock.	**12**
IV	A**daptation of growth disturbnces& differentiation:** atrophy, hypertrophy, hyperplasia, metaplasia and neoplasia	**12**
TOTAL		**48**

Text:

1. Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2. Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3. Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.
3. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
4. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.
5. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester I

Course: SEC (Skill Enhancement Elective Courses)

Subject: Patient Care and Management-I

Subject Code: **MLT232S101**

L-T-P-C: **2-0-0-2** **Total credits: 2**

Course Objective:

The course is designed with an objective to understand basic care needed for patients, Organization of Hospitals, Management of Hospitals, importance of safety measures to be taken at the hospital and Personal Hygiene and its Maintenance.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the different organization of Hospitals, importance of personnel hygiene and its maintenance.	**BT 1**
CO 2	To explain how giving quality patientcare can absolutely have an effect on health outcomes, contributing to a more positive patient recovery experience.	**BT 2**
CO 3	To apply the knowledge of first aid and safety measures to be given during emergencies	**BT 3**
CO 4	To analyze how accidents can easily prevail in laboratory and the role of safety measures in preventing it.	**BT 4**

DETAILED SYLLABUS:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Hospital & Hygiene** Introduction, Functions & Classification of Hospitals, Organization of Hospitals, Department & Management of Hospitals, Personal Hygiene And Maintenance of Hygiene	**6**
II	**Basic care needs of patients:** Safety factors for patients such as, safety from mechanical injury, safety from thermal & chemical injury, safety from radiation & bacteriological injury and safety from allergens.	**6**
III	**First Aid:** Introduction, Aims & objectives of first aid, Priorities of first aid, Golden rules of first aid, Qualities & responsibilities of first aider, Simple first aid measures in selected conditions like – Food poisoning, Snake bite, Scorpion bite, Dog bite, Foreign bodies in various organs, and burns & Hemorrhage.	**6**
IV	**Safety in the Laboratory:** Common laboratory accidents from Physical injuries, Electrical shock, Chemical injury, Bleeding, Burn, Eye accidents and Biological hazards.	**6**
TOTAL		**24**

Text:

1. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states.
2. William and Wilkins, Baltimore;1991 [1990 printing].
3. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.

Reference Books:

1.Hugo W.B and Russel A.D, Pharmaceutical Microbiology, 7thedn, 2004, Blackwell Scientific publications, Oxford London.
2.Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
3.Pelczar, Chan Kreig, Microbiology, 5thedn, 2001, Tata McGraw Hill publisher ltd

Level: Semester I

Course: VAC (Value Addition Courses)

Subject: Laboratory Management.

Subject Code: **MLT232V101**

L-T-P-C: **2-0-0-2** **Total credits: 2**

Course Objective:

The course is designed with an objective to understand and gained knowledge on the principles of management in respect of clinical laboratory science

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the ethical principles and standards for a clinical laboratory professional.	**BT 1**
CO 2	To explain about good laboratory practice and its regulation and accreditation.	**BT 2**
CO 3	To apply the knowledge of awareness and safety practice in a clinical laboratory.	**BT 3**
CO 4	To analyze how accidents can easily prevail in laboratory and the role of safety measures in preventing it.	**BT 4**

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Duty to the patient, duty to colleagues and other professionals, duty to the society and factors affecting sample analysis.**	**6**
II	**Introduction to basics of GLP and accreditation, aims of GLP and accreditation, advantages of accreditation, brief knowledge about international and national agencies for clinical laboratory accreditation.**	**6**
III	**General safety precautions, HIV: Pre and post exposure guidelines, Hepatitis B and C: Pre and post exposure guidelines, drug resistant tuberculosis.**	**6**
IV	**Patient management for clinical sample collection, transportation and preservation.**	**6**
TOTAL		**24**

Text:

1. Laboratory Management; quality of laboratory diagnosis; Candis A Kinkus
2. Clinical Laboratory Management; 2nd edition; Lynne S. Garcir
3. Henry's Clinical diagnosis and Management by laboratory methods

Reference Books:

1. The guide to management for laboratory leaders
2. Laboratory Information Management System-LIMS
3. Lab dynamics; 3rd edition;Carl and Suzanne.

Level: Semester I

Course: Generic Elective (GE -1)

Title of the Paper: Biochemistry-I

Subject Code: MLT232G101

L-T-P-C: **3-0-0-3** **Total credits: 3**

Course Objectives: The course is designed to provide a wholesome Understand the metabolism of carbohydrate nutrient molecules in physiological and pathological conditions.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Bloom's Taxonomy Level**
CO 1	To **recall** the core knowledge of metabolism of Carbohydrates, lipids, nucleic acids and their applied aspects.	**BT 1**
CO 2	To **explain** the role, classifications and functions of lipids, carbohydrates, proteins.	**BT 2**
CO 3	To **develop** a wide knowledge of the nucleic acids, DNA, RNA and their applied importance.	**BT 3**
CO 4	To analyze the various biochemical experiments related to carbohydrates, proteins etc	**BT 4**

DETAILED SYLLABUS:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I	CARBOHYDRATES: Definition and classification of carbohydrates Common carbohydrates(Glucose, Fructose, Starch, Glycogen, Starch) and their sources. Biological significance of Carbohydrate	**9**
II	PROTEINS: Definition of Proteins along with the Biological significance. Amino acids and its classification Essential and Non-essential amino acids	**9**
III	LIPIDS: Definition and classification of lipids. Classification of Fatty Acids with examples and functions of some common lipids(Phospholipids, Glycolipids, Steroids).	**9**

IV	NUCLEIC ACIDS: Basic idea of the structure of DNA and RNA Function of DNA and RNA acid-base buffers Basic idea of acids, bases, Ph, buffer Acid base balance	**9**
TOTAL		**36**

Textbook:

1. Lehninger , Principles of Biochemistry. 7th Edition, 2017.
2. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell., Harper's Biochemistry. 30th Edition, 2015
3. Stryer , Biochemistry., 9th Edition, 2019.
4. D. Satyanarayan and U.Chakrapani , Biochemistry.5th Edition, 2017.
5. Rama Rao., Textbook of Biochemistry.2008.
6. A. C Deb, Textbook of Biochemistry.9th Edition, 2001.
7. Nelson, D.L, and M.M. Cox. Principles of Biochemistry, 4Th Edition, 2005. W.H. Freemen and Co. ISBN 9780716771081
8. D. Voet, J.G. Voet and W. Pratt. Fundamentals of Biochemistry: Life at the molecular level, 4th Edition, 2012, John Wiley & Sons Inc. ISBN 978-0-470-22842-5
9. Lehninger , Principles of Biochemistry. 7th Edition, 2017.
10. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell., Harper's Biochemistry. 30th Edition, 2015
11. Stryer , Biochemistry., 9th Edition, 2019.
12. D. Satyanarayan and U.Chakrapani , Biochemistry.5th Edition, 2017.
13. Rama Rao., Textbook of Biochemistry.2008.
14. A. C Deb, Textbook of Biochemistry.9th Edition, 2001.
15. Nelson, D.L, and M.M. Cox. Principles of Biochemistry, 4Th Edition, 2005. W.H. Freemen and Co. ISBN 9780716771081
16. D. Voet, J.G. Voet and W. Pratt. Fundamentals of Biochemistry: Life at the molecular level, 4th Edition, 2012, John Wiley & Sons Inc. ISBN 978-0-470-22842-5

Reference Book:

1. Robert Horton H, Laurence A Moran, Gray Scrimgeour K. Principles of Biochemistry, 4th Edition, 2006, Pearsarson Publisher. ISBN-13: 978-0321707338.
2. Conn and Stumpf , Outlines of Biochemistry, 5th Edition, 2006.

Level- Semester I

Course: GE-II

Title of the Paper: Clinical Pathology (GE-II)

Subject Code: MLT232G102

L-T-P-C: **3-0-0-3** **Total credits: 3**

Course Objectives: The course is designed with an objective to give the students basic knowledge on the different types of biological specimen, different methods to collect them and the abnormal conditions related to it.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the different types of biological specimens commonly tested in abnormal conditions.	**BT 1**
CO 2	To explain the physiological aspect of how different organ systems function.	**BT 2**
CO 3	To apply the knowledge gained during the course in addressing health related issues.	**BT 3**
CO 4	To analyze the role of biological specimen in detecting the abnormal pathological condition of a given individual.	**BT 4**

DETAILED SYLLABUS:

Modules	**Course Content**	**Periods**
I.	**Urine Examinations:** a. Renal Physiology of urinary system in brief b. Functions of the Kidney. c. Formation of urine and Composition of Urine. d. Clinical importance of urine analysis. e. Collection and preservation (preservative) of urine for routineexamination and special examination. f. Co...	9

II.	**Stool analysis:** a. Physiology and Anatomy of GIT and its infection. b. Formation of stool. c. Collection of stool for analysis. d. Normal composition, abnormal composition physical and microscopic examination. e. Occult blood test Concentration method of stool examination andclinical importance	9
III.	**Sputum**. a. Physiology of respiratory tract in brief. b. Air borne infection and symptoms related to it. c. Method for the collection of sputum. d. Types of sputum. e. Examination of sputum for AFB. f. Common Respiratory Disorders: Pulmonary Tuberculosis, asthma, pneumonia and lung cancer. Treatments and prevention	9
IV.	**Semen analysis** a. Formation of semen b. Method of collection of semen c. Importance and method of semen analysis d. Normal and abnormal morphology of sperms. e. Medico-legal aspects of specimen analysis **Cerebrospinal fluid** a. Physiology of central nervous system in brief. b. Collection of specimen c. Physical examination d. Chemical examination e. Microscopic examination. Abnormal conditions related to it.	9
TOTAL		36

Books recommended for reference:

1. Lynch's Medical Laboratory Technology -Raphael
2. Gradworl clinical laboratory methods &diagnosis
3. Medical laboratory technology and clinical pathology - Lynch,Raphael,Meller
4. Manual of clinical laboratory methods -Copal.E.Hopier
5. Medical laboratory methods -Dr.Ramnik sood
6. Clinical laboratory methods -Beuer.
7. Introduction to Medical laboratory technology -Baker
8. Clinical pathology and bacteriology -Sachdev
9. Clinical pathology -Batra.

Level: Semester II

Course: C-1

Title of the Paper: Anatomy II

Subject Code: MLT232C201

L-T-P-C: **2-1-0-3 (T)** **Total credits: 4 (T + P)**

Course Objectives

The objective of the course is to introduce students to gain knowledge regarding Anatomy of various structures, histological appearance of various organs of the human body.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define the structure of male and female reproductive system.	**BT 1**
CO 2	To outline the comprehensive idea of general description of pelvic organs, structure of kidney, ureter, urinary bladder etc.	**BT 2**
CO 3	To apply the knowledge of anatomical knowledge with various diseases.	**BT 3**
CO 4	To analyze the various experiments related to special senses and nervous system	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	**Cardiovascular system:** Circulatory system – major arteries and veins of the body, structure of blood vessels, Heart structure, positions, chambers, valves, internal & external features, Blood supply to heart, Conductive system of heart **Lymphatic system-**Circulation, structure & functions, Lymph nodes	9
II	**Respiratory system:** Structure of upper and lower respiratory tract **Thorax:** Pleural cavities & pleura, Lungs and respiratory tree, Heart and great vessels, Diaphragm	9
III.	**Digestive system-**Parts of digestive system, Abdominal cavity – divisions, Muscles of abdominal wall, Liver, Pancreas, Spleen, Alimentary canal, Gall bladder, Intestine (small & large) **Urinary and Reproductive system:** Urinary system, Pelvic floor, innervations, Kidney, Ureter, bladder, urethra, Genital system – male and female, Reproductive system of male, Reproductive system of female **Endocrine system:** Pituitary gland, Thyroid,	9

	Parathyroid	
IV.	**Urinary and Reproductive system:** Urinary system, Pelvic floor, innervations, Kidney, Ureter, bladder, urethra, Genital system – male and female, Reproductive system of male, Reproductive system of female **Endocrine system:** Pituitary gland, Thyroid, Parathyroid	9
TOTAL		36

Subject: Anatomy Lab-II

L-T-P-C: **0-0--1 (P)**

Modules	Course Content	Periods
I	Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).	**3**
II	Demonstration of skeleton- articulated and disarticulated.	**3**
III	During the training more emphasis will be given on the study of bones, muscles, joints, nerve supply of the limbs and arteries of limbs.	**3**
IV	Surface anatomy: -surface land mark-bony, muscular and ligamentous. -surface anatomy of major nerves, arteries of the limbs. Points of palpation of nerves and arteries.	**3**
TOTAL		**12**

TextBook

1. Alison,G.Anne,W.(2014). Ross and Wilson Anatomy and Physiology in Health and Illness. Elsevier Health; UK, 13th Edition.
2. Joshi. (2018).Physiology practical manual 2/E, for B.Sc occupational and physical therapy, B.Sc Nursing &allied sciences, 3rd Edition.
3. Kapoor R. (2014). Physiology practical manual 2/E, for B.Sc occupational and physical therapy, B.Sc Nursing &allied sciences, 11th Edition.
4. Khurana, I., Khurana, A., (2018).Textbook of anatomy and physiology, 3rd Edition.
5. Shekar C N C. Manipal Manual Of Medical Physiology: CBS Publication, 4th Edition.

Reference Book:

6. Singh, S.H.(2017). Principles of human physiology for courses in nursing and allied health sciences: CBS Publishers & Distributors, 3rd Edition.

7. Tortora,GJ. &DerriksonB.(2008).Principles of Anatomy and Physiology. WileyPublishers& Distributors, global Edition.

Level: II

Course: C-2

Subject: Physiology-II

Subject Code: **MLT232C202**

L-T-P-C: **2-1-0-3 (T)** **Total credits: 4 (T+P)**

Course Objectives:

The objective of the course is to introduce students acquire knowledge of the normal physiology of various human body systems and understand the alterations in physiology in diseases.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define the structure and function of endocrine system.	**BT 1**
CO 2	To outline the importance of body immunity, blood coagulation,blood grouping etc.	**BT 2**
CO 3	To identify the digestive system and its different role and actions.	**BT 3**
CO 4	To analyze the various experiments related to special senses and renal system	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	**Digestive System-** Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation, Functions of Liver & Stomach.	9
II.	Endocrinology-Physiology of the endocrine glands, pituitary, pleural body, para thyroid, adrenal gland.	9
III.	Male and female reproductive system- functions of testes, action and secretion.	9

IV	Renal system- physiology of kidney.	9
TOTAL		36

Subject: Physiology Lab-II

L-T-P-C: **0--0-1-1 (P)**

DETAILED SYLLABUS

Modules	Course Content	Periods
I	Spirometery to measure various lung capacities & volumes, Respiratory rate.	**3**
II	Tidal volume, IRV, IC, ERV, EC, residual volume on Spirometery.	**3**
III	1. Estimate of Haemoglobin, R.B.C., W.B.C., TLC, DLC, ESR count.	**3**
IV	Blood indices, Blood grouping, Bleeding& Clotting time.	**3**
TOTAL		**12**

Text:

1. Arthur, Guyton, Textbook of Medical Physiology, Mosby.2nd Edition
2. Singh, S.H. (2017). Principles of human physiology for allied health sciences: CBS Publishers & Distributors, 4th Edition
3. Anand&Manchanda,Textbook of Physiology, Tata McGrawHill,5th EditionSembulingam.K, Human Physiology- Vol. 1&2,MedicalAllied, 7th Edition

Reference Books:

1. Chaudhari, S.K,Concise Medical Physiology, New CentralAgency,Calcutta, 1st Edition
2. Tortora&Grabowski,Harper Collins, Principals of Anatomy and Physiology, Global Edition.

Level- Semester II

Course: C-3

Subject name: General Microbiology

Subject Code: **MLT232C203**

L-T-P-C: **2-1-0-3** **Total credits: 3**

Course Objectives:

This course has been formulated to impart comprehensive knowledge on Virology, Bacteriology, Parasitology and Mycology. To introduce the nutrition requirements and growth factor of the microbes. The students will learn to identify and classify fungi and parasites, as well as correlate their presence with disease states.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the microorganisms name and relate their growth and nutrition factors.	**BT 1**
CO 2	To classify the different media used for growth and nourishment of microbes	**BT 2**
CO 3	To Apply a basic techniques of Microscopes and its importance.	**BT 3**
CO 4	To analyse the morphology, pathogenesis and laboratory diagnosis of the microorganisms.	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	Introduction to Microbiology: Microscopy, Bright-field Microscopy, Dark field Microscopy, Phase contrast Microscopy, Fluorescence Microscopy, Electron Microscopy Transmission electron Microscopy, Scanning electron Microscopy Stains in microbiology:Preparation of smear, simple staining, classification of stains: Gram staining, Acid fast staining, Negative staining	**9**

II.	Shapes and structure of bacteria: Bacterial cell- structure and function, capsule ,spores, flagella,Virulence factor of Bacteria Operation and Principles of Incubator,Autoclave,Hot air oven, Inspissator, Distillation plant.	**9**
III.	Antisepsis, Autoclave, Dry heat Sterilisation Moist heat Sterilisation	**9**
IV	Bacteriological medias:-Simple Media, Differential Media, Special; media, Enrichment media Bacterial growth curve	**9**
TOTAL		**36**

Text Books:

1. Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2. Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3. Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.
3. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
4. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.
5. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester II

Course: SEC (Skill Enhancement Elective Courses)

Subject: Patient Care and Management-II

Subject Code: **MLT232S201**

L-T-P-C: **2-0-0-2** **Total credits: 2**

Course Objective:

The objective of the course is to impart thorough knowledge of the relevant aspects of Giving quality patient care can absolutely have an effect on health outcomes. It contributes to a more positive patient recovery experience and can improve the physical and mental quality of life for people with serious illnesses. This will also provide knowledge of basic functions as the centre for the training of health workers.

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Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define the Hospital duty and patient care management it is an aims in teaching the paramedical students to learn how to care the patients and the basic code of conduct of the hospital and laboratory.	**BT 1**
CO 2	To be able to explain the hospital, reception area, administration and emergency ward.	**BT 2**
CO 3	To apply the first aid kit based on the types of incidents and accidents.	**BT 3**
CO 4	analyze and identify the patients' situations like food poisoning, snake bite etc. and handling them in emergency ward.	**BT 4**

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Poisoning:** Definition, Causes of poisoning, Sources of Poisoning, Symptoms of poisoning, First aid & Management, Antidotes, Common drugs poisoning, Carbon monoxide poisoning	**6**
II	**Laboratory Investigations:** Preparation of patients, Preparation of equipments Collection of specimen of urine, stool, sputum, blood, CSF, Pericardial fluid, Peritoneal fluid, Pleural fluid, etc.	**6**
III	**Shock:** Definition, Types of shock, General Features of shock, Investigations of shock, Initial management & first aid of shock	**6**
IV	**Hyperglycemia&Hypoglycemia:** Definition ,Clinical features, Diabetes laboratory tests for diabetes, Different types of glycosuria, Ketone bodies Glucose tolerance test. Investigations for hypoglycemia	**6**
TOTAL		**24**

Text Books:

1. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states.
2. William and Wilkins, Baltimore;1991 [1990 printing].
3. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.

Reference Books:

4. Hugo W.B and Russel A.D, Pharmaceutical Microbiology, 7thedn, 2004, Blackwell Scientific publications, Oxford London.
5. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
6. Pelczar, Chan Kreig, Microbiology, 5thedn, 2001, Tata McGraw Hill publisher ltd

Level: Semester II

Course: VAC (Value Addition Courses)

Subject: Quality in Health system

Subject Code: **MLT232V201**

L-T-P-C: **2-0-0-2** **Total credits: 2**

Course Objective:

The course is designed with an objective to understand and gained knowledge on the principles of management in respect of clinical laboratory science

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall on the concept of health and national health policy.	**BT 1**
CO 2	To explain the objective of national health programmes.	**BT 2**
CO 3	To apply the knowledge of various techniques and methods to improve health care system.	**BT 3**
CO 4	To analyze the various sources of error using CAPA(corrective and preventive action)	**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	Definition of health, determinates of health, health indicator of India and national health policy and programmes.	**6**
II	Role of laboratory technologist/ technician in improvement of health care system, various waste disposal methods, basic first aids training.	**6**
III	Automation: Introduction, advantages, disadvantages, Single channel continuous flow analyzers, PCR and its applications.	**6**
IV	Quality assurance: Introduction to Quality control, Total quality management framework, quality laboratory process, quality assurance, quality assessment, CAPA	**6**
	TOTAL	**24**

Text Books:

1. Laboratory Management; quality of laboratory diagnosis; Candis A Kinkus
2. Clinical Laboratory Management; 2nd edition; Lynne S. Garcir
3. Henry's Clinical diagnosis and Management by laboratory methods

Reference Books:

1. The guide to management for laboratory leaders
2. Laboratory Information Management System-LIMS
3. Lab dynamics; 3rd edition;Carl and Suzanne.

Level: Semester-II

Course: Generic Elective (GE-I)

Subject: Biochemistry-II

Subject Code: MLT232G201

L-T-P-C: **3-0-0-3** **Total credits: 3**

Course Objectives:

The course is designed to learn about the metabolism of carbohydrate nutrient molecules in physiological and pathological conditions. Gain knowledge about the diseasesn caused by defects in metabolism of proteins, lipids with emphasis on the metabolic control of their disorders.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI. No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the definition and classification of enzymes and their importance.	**BT 1**
CO 2	To understand the importance of vitamins according to their solubility.	**BT 2**
CO 3	To develop the renal and liver system and its different role and actions.	**BT 3**
CO 4	To perform the various experiments related to special senses and renal System	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I	**ENZYMES:** Definition and classification of enzyme, Basic idea of co-enzyme, iso-enzyme, Mechanism of enzyme Action, Factors affecting enzyme action	**9**
II	**CARBOHYDRATES METABOLISM:** Glycolysis,Kreb's Cycle, Glyconeogenesis, Glcogenesis, Glcogenolysis **PROTEIN METABOLISM:** Transamination, Deamination, Urea Cycle and its Significance	**9**
III	. **LIPID METABOLISM:** ß oxidation of Fatty Acids, Ketone bodies Ketosis and ketoacidosis	**9**
IV	**VITAMINS AND MINERALS** :Definition and classification of vitamins according to solubility, Sources and functions of individual vitamins, Deficiency.Individual minerals (calcium, phosphorus, iron, magnesium	**9**

	fluslide, copper , selenium, molybdenum etc) – their sources,	
TOTAL		**36**

Text books:

1. Text book of Medical Biochemistry – MN Chaterjee, Rana Shinde, Jaypee publishers
2. Biochemistry, U.Sathyanarayana, Elsevier
3. Harper's Biochemistry,28th edition, Robert K Murray, Tata McGraw publishers

References:

1. Fundamentals of biochemistry,JLjain and Sanjay Jain,S Chand Publishers

2. Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publisher

Level: Semester II

Course: Generic Elective II

Subject: General Microbiology (G E - II)

Subject Code MLT232G2O2

L-T-P-C: **3-0-0-3** **Total credits: 3**

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the list of the microorganisms and relate their growth and nutrition.	**BT 1**
CO 2	To classify the different media used for growth and nourishment of microbes.	**BT 2**
CO 3	To make use of microscopes and its importance.	**BT 3**
CO 4	To analyze the morphology, pathogenesis and laboratory diagnosis of the microorganisms.	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I	Introduction to Microbiology Microscopy:Bright-field Microscopy, Dark field Microscopy, Phase contrast Microscopy, Fluorescence Microscopy, Electron Microscopy and their uses. Stains in microbiology: Preparation of smear, simple staining.	**9**

II	Shapes and structure of bacteria Bacterial cell- structure and function, capsule, spores, flagella Virulence factor of Bacteria Operation and Principles of Incubator, Autoclave, Hot air oven, Inspissator, Distillation plant.	**9**
III	Microbial Nutrition, Growth and control: Nutritional requirements (C,N,H,O,S,P),Nutritional types of Micro-organisms, Growth factors. Sterilization and disinfection: Definition, Classification, Action,	**9**
IV	➢ Bacteriological medias and their composition: Simple Media, Differential Media, Special media, Enrichment media. Bacterial growth curve	**9**
TOTAL		**36**

Text:

1.Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.

2.Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai

3.Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.

4.Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.

5. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.

2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.

3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.

4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.

5.Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester III

Course: C-1

Title of the Paper: Biochemistry III

Subject Code: MLT232C301

L-T-P-C: 4-0-0-4 **Total credits: 4**

Course Objective:

The course is designed to understand the basic characteristic of various biological macromolecules, their metabolism and physiological and pathological conditions, concept of different biochemical principles of biological systems

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To relate the pathway involve in carbohydrate and protein metabolism with its physiological and pathological conditions.	**BT 1**
CO 2	To explain the catalytic role of heme and formation of bile pigments, metabolism of bilirubin.	**BT 2**
CO 3	To apply the concept of different biochemical principles of biological systems to current biological questions of today.	**BT 3**
CO 4	To analyze the key regulatory points in metabolic pathway.	**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Metabolism of carbohydrates:** Glycogenesis, Glycogenolysis, Clinical orientation of glycogen, Glycolysis, Citric acid cycle, energetic of citric acid cycle, Glyconeogenesis, Regulation of glucose metabolism, Metabolism of Fructose, Metabolism of Galactose, Regulation of blood glucose concentration.	**12**
II	**Metabolism of Proteins:** General pathway of protein metabolism, Nitrogen metabolism, catabolism of proteins - Transamination, Oxidative Deamination, transdeamination. Synthesis of urea, metabolism of individual amino acids overview,	**12**
III	**Metabolism of Lipids:** Role of liver in fat metabolism, B Oxidation of fatty acid, Biosynthesis of lipids, Prostaglandin,Cholesterol metabolism, formation of bile acids, plasma lipoproteins,	**12**
IV	**Integrated metabolism:** Integration of metabolic pathways of carbohydrate,proteins, and fats **Catabolism of heme:** Formation of bile pigments, metabolism of bilirubin, catabolism of heme	**12**
TOTAL		**48**

Textbook:

1. Lehninger, Principles of Biochemistry. 7th Edition, 2017.
2. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell., Harper's Biochemistry.

30th Edition, 2015
3. Stryer , Biochemistry., 9th Edition, 2019.
4. D. Satyanarayan and U.Chakrapani , Biochemistry.5th Edition, 2017.
5. Rama Rao., Textbook of Biochemistry.2008.
6. A. C Deb, Textbook of Biochemistry.9th Edition, 2001.
7. Nelson, D.L, and M.M. Cox. Principles of Biochemistry, 4Th Edition, 2005. W.H. Freemen and Co. ISBN 9780716771081
8. D. Voet, J.G. Voet and W. Pratt. Fundamentals of Biochemistry: Life at the molecular level, 4th Edition, 2012, John Wiley & Sons Inc. ISBN 978-0-470-22842-5

Reference Book:

1. Robert Horton H, Laurence A Moran, Gray Scrimgeour K. Principles of Biochemistry, 4th Edition, 2006, Pearsarson Publisher. ISBN-13: 978-0321707338.
2. Conn and Stumpf , Outlines of Biochemistry, 5th Edition, 2006.

LEVEL: SEMESTER-III

Title of the Paper: Microbiology Practical and Biochemistry Practical

Subject Code: MLT232C302

L-T-P-C: **0-0-8-4** **Total credits: 4 (P + P)**

Course Objectives:

The course is designed to understand the basic characteristic of various pathogenic microorganisms, their mode of transmission and various laboratory diagnostic methods to identify, distinguish and differentiated based on their different properties.

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Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the classification, morphology and structural properties of the different microorganisms.	**BT 1**
CO 2	To explain the different stages of pathogenesis and its role in development of a disease.	**BT 2**
CO 3	To apply the knowledge of the laboratory diagnosis of different microorganism and use the knowledge in practical purpose	**BT 3**

CO 4	To analyze the different process of how microorganism grow, divide, multiply and proliferate in human body and cause life threatening conditions.	**BT 4**

COURSE OUTLINE:

Modules	Topics (if applicable) & Course Contents	Periods
I.	**BACTERIOLOGY** Systemic bacteriology Study of - Staphylococcus, Streptococcus, Pneumococcus, Cornybacteriumdiptheriae, Mycobaterium,, E. coli, Klebsiella, Salmonella, Pseudomonas, Vibrio with reference to their : - Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis.	**12**
II	**MYCOLOGY-** Classification, general structure, physiology, pathogenesis and medi cal importance of fungi; Aspergillus, candida, Cryptococcus, Histop lasma, Trichophyton, Epidermophyton, Cryptococcus, Tinea, Micro sporum, Coccidioidomyces, Paracoccidioidomyces, Laboratory diag nosis of fungal disease: Subcutaneous mycosis, Systemic Mycoses, Opportunistic Mycoses	**12**
III	**VIROLOGY**– General characters of viruses - Classification of viruses - Lab diagnosis of viral infections - Cultivation of viruses - Bacteriophages. - Retro viruses - HIV, Hepatitis virus , Pox virus , Picrona virus - Polio - Orthomyxo virus – Influenza	**12**
IV	**PARASITOLOGY-** Overview of parasite, host, parasitism, parasitic diseases prevalent in Nepal and world, Classification, geographical distribution, habitat, morphology, life cycle, pathogenicity (mode of infection, pathogenesis and pathology), laboratory diagnosis and prevention and control of medically important protozoa and helminthes: Entamoeba histolytica, Giardia lamblia, Trichomonas, Ascaris, Anacyclostoma and Necator, Enterobiusvermicularis, Trichuristrichiura, Strongloides, Taenia, , Brugia, Plasmodium, Leishmania, Wucheria.	**12**
TOTAL		**48**

Text Books:

1. Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2. Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3. Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.
3. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
4. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.

Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia

Course Objectives:

The course is designed with an objective to give students a wholesome practical knowledge on different biochemical test reactions for qualitative and quantitative measurement of different analytes, to prepare molar solution and also handling of different instruments and understand the principles behind its working.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall how to prepare a molar solution along with collection of blood and handling of instruments.	**BT 1**
CO 2	To show the qualitative measurement of different analytes and biochemical reactions.	**BT 2**
CO 3	To apply the knowledge of different biochemical testing and its core relation between the principle and the outcome of the result.	**BT 3**
CO 4	To analyze the biochemistry of various biomolecules.	**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	Study of instruments, and appliances, Calculation and preparation of percentage solution. Calculation and preparation of Molar solution.	**12**
II	Calculation and preparation of Normality solution. Collection and preservation of blood serum and plasma.	**12**
III	Urine R/E- Biochemical examination – reducing sugar, protein, ketone bodies, bile salts, bile pigments, urobilinogen, and blood	**12**
IV	Blood sugar & Protein estimation.	**12**
TOTAL		**48**

Text:

1. Bancroft's theory and practice of Histological techniques by S. Kim Suvarna, Christopher Layton, John D. Bancroft.

2. Textbook of pathology, Harsh Mohan, 8th edition, Jaypee publishers

3. Text book of Medical Laboratory Technology, Praful B. Godkar, Darshan P Godkar,3rd Edition, Bhalini publishing house

Book References:

1. Histotechnology, A self instructional text by Freida L. Carson,1st edition, Lippincott Williams publishers

2. Curran's Atlas of Histopthology, Robert Curran, 4th edition, Harvey Miller publications

Level: Semester III

Course: DSE

Title of the Paper: Haematology –I

Subject Code: MLT232D302

L-T-P-C: 3-1-0-4 **Total credits: 4**

Course Objectives

The course entails to educate the student about the basic concept on blood, its formation and function of all the circulating cells, the mechanism involve in formation of coagulation cascade and its role in maintaining primary and secondary haemostasis.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about blood formation and its composition, disorders related to blood cells, factors involve in coagulation and methods	**BT 1**
CO 2	To classify the different stages of blood, its morphology, formation and maturation, mechanism involve in coagulation cascade and its role in haemostasis	**BT 2**
CO 3	To apply the knowledge of the morphology of different cells in identifying them during practical class.	**BT 3**
CO 4	To analyze the inter relations between the functioning of different cells and their involvement in different functioning of the body.	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Introduction of Haematology:** Blood – formation, composition, method of collections, reservation of blood for routine examination and others (anticoagulant) **Red Blood Cells, White Blood Cells, Platelets:** Formation**,** Morphology Functions, Count methods and its clinical importance, Haemoglobin, Reticulocyte, PCV, ESR, Leukemia and its classification.	12
II	**Anaemia** – definition, morphology & Etiology classification, microcytic Hypochromic anaemia: Causes, Types, Lab investigation, Laboratory pictures, Clinical importance. Normocytic Hypochromic anaemia and Diamorphic anaemia and other types of anaemia in details such as sickle cell anemia and Thalassemia	12
III	**Haemostasis in details. Haemophilia:** Definition, Types & Investigation Clinical importance	

IV	**Coagulation's definition:** Principle & mechanism of coagulation. Factors of coagulation in brief coagulation profile. **Bone marrow:** Method of preparation of bone marrow smears Different types of staining of bone marrow smear	12
TOTAL		**48**

Text :

1. Essential in hematology and clinical pathology by Ramdas Nayak.
2. Handbook of Practical hematology for MLT by Sunit Nath and Anamika Das.
3. Hematology and blood banking(for paramedical students) by Poonam Bachheti and Aruna Singh.
3. A concise text book of Clinical Pathology hematology and blood banking by Rakesh joshi.
4. Histopathology(for paramedical students) by Poonam Bachheti and Aruna Singh.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rdedn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1stedn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5thedn, 2001, Tata McGraw Hill publisher ltd.
5. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester III

Course: Generic Elective (GE-V)

Subject: Microbiology-I

Subject Code: **MLT232G301**

L-T-P-C: **3-0--0--3** **Total credits: 3**

Course Objective:

The objective of the course is to impart knowledge on disease caused by microbial agents, epidemiology, their mode of transmission, pathogenesis, prevention, and treatment. This will also provide knowledge on development of immunity, immunological agents and immunological tests carried out to fight against infections.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To **recall** the etiology and pathogenesis of the selected disease states.	**BT 1**
CO 2	To **understand** signs and symptoms of the diseases.	**BT 2**

CO 3	To **identify** the signs and symptoms of infectious diseases.	**BT 3**
CO 4	To **analyze** the complications of the diseases.	**BT 4**

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Introduction to pathology**: inflammation and repair, acute inflammation, chronic inflammation, and repair healing	**9**
II	**Cell injuries:** important aspects of normal cell structure, reversible cell injury and irreversible cell injury pigments.	**9**
III	**Hemodynamic disorder,thromboembolic disease shock:** hyperemia/ischemia and hemorrhage, edema, thrombosis, embolism infraction and shock.	**9**
IV	A**daptation of growth disturbnces& differentiation:** atrophy, hypertrophy, hyperplasia, metaplasia and neoplasia	**9**
TOTAL		**36**

Text Books:

1. Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2. Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3. Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.
4. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
5. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

6. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
7. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
8. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
9. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.
10. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester III

Course: Generic Elective VI

Title of the Paper: Basic Biochemistry

Subject Code: MLT232G302

L-T-P-C: **3-0-0-3** **Total credits: 3**

Course Objectives:

The course is designed to provide a wholesome Understand the metabolism of carbohydrate nutrient molecules in physiological and pathological conditions.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To find the metabolism of Carbohydrates, lipids, nucleic acids and their applied aspects	**BT 1**
CO 2	To classify the role and functions of lipids, carbohydrates, proteins	**BT 2**
CO 3	To build the nucleic acids, DNA, RNA and their applied importance.	**BT 3**
CO 4	To perform the various biochemical experiments related to carbohydrates, proteins etc.	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	**CARBOHYDRATES** Definition and classification of carbohydrates, Common carbohydrates(Glucose, Fructose, Starch, Glycogen, Starch) and their sources, Biological significance of Carbohydrate	9
II.	**PROTEINS** Definition of Proteins along with the Biological significance Amino acids and its classification, Essential and Non- essential amino acids	9

III.	**LIPIDS** Definition and classification of lipids, Classification of Fatty Acids Examples and functions of some common lipids(Phospholipids, Glycolipids, Steroids) Examples and functions of some common lipids(Phospholipids, Glycolipids, Steroids)	9
IV	**NUCLEIC ACIDS** Basic idea of the structure of DNA and RNA, Function of DNA and RNA. **VITAMINS** Definition, classification, source and deficiency disease. **MINERALS NUTRIENTS** Source, requirement and function of calcium, phosphorus, magnesium, sodium, potassium, chloride, sulphur.	9
TOTAL		36 hrs

Text:

1. Lehninger , Principles of Biochemistry. 7th Edition, 2017.

2. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell., Harper's Biochemistry. 30th Edition, 2015

3. Stryer , Biochemistry., 9th Edition, 2019.

4. D. Satyanarayan and U.Chakrapani , Biochemistry.5th Edition, 2017.

5. Rama Rao., Textbook of Biochemistry.2008.

6. A. C Deb, Textbook of Biochemistry.9th Edition, 2001.

7. Nelson, D.L, and M.M. Cox. Principles of Biochemistry, 4Th Edition, 2005. W.H. Freemen and Co. ISBN 9780716771081

8. D. Voet, J.G. Voet and W. Pratt. Fundamentals of Biochemistry: Life at the molecular level, 4th Edition, 2012, John Wiley & Sons Inc. ISBN 978-0-470-22842-5

Reference Book:

1.Robert Horton H, Laurence A Moran, Gray Scrimgeour K. Principles of Biochemistry, 4th Edition, 2006, Pearsarson Publisher. ISBN-13: 978-0321707338.

2.Conn and Stumpf , Outlines of Biochemistry, 5th Edition, 2006.

Level: Semester IV

Course: C-1

Title of the Paper: Clinical Pathology & Blood Banking

Subject Code: MLT232C401

L-T-P-C: **4-0-0-4** **Total credits: 4**

Course Objectives

The course is designed to understand the different types of biological specimen, different methods to collect them and the different test conducted for each specimen, also perform ABO blood grouping and DAT test in the laboratory.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the different types of biological specimens commonly tested in clinical laboratory and the procedure to collect and analyze it.	**BT 1**
CO 2	To explain the clinical importance of 24 hours urine examination for proteins.	**BT 2**
CO 3	To apply the knowledge of the principle of blood grouping and the chromosomes involve in deciding the specific blood group of an individuals.	**BT 3**
CO 4	To analyze the physical and microscopic examination of the various biological specimen.	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	**Urine Examinations:** a. Anatomy of urinary system, (Kidney Ureter, Bladder) functions of kidneys, formation of urine and Clinical importance of urine analysis. b. Collection and preservation (preservative) of urine for routine examination and special examination. c. Composition of urine, normal and abnormal. d. Physical, chemical, microscopic and bacteriologic examination of urine and clinical importance. e. Special examination, Methods etc. And its clinical importance of - 24 hrs. Urine examination for proteins. - Occult blood test, Pregnancy test Bence Jones Proteins Urobilinogen etc	**12**

II	**Stool analysis:** a. Anatomy of GIT and its infection. b. Formation of stool c. Collection of stool for analysis d. Normal composition, abnormal composition physical and microscopic examination. e. Occult blood test Concentration method of stool examination and clinical importance.	**12**
III.	**Body fluids:** a. Semen analysis - Formation of semen - Method of collection of semen - Importance and method of semen analysis - Normal and abnormal morphology of sperms. - Medico-legal aspects of specimen analysis b. Pleural fluid, ascetic fluid, pericardial fluid, synovial fluid and cerebrospinal fluid - Physical examination - Chemical examination - Microscopic examination. Other Body fluids – Amniotic fluid, Sweat, Saliva etc	12
IV.	**Blood banking and Immune-Haematology** i. History of blood group ii. Importance types and principle of blood grouping systems methods iii. Blood banking • Requirements iv. Blood preservatives v. ABO blood grouping and Rh Typing vi. Other Blood grouping system vii. ABO antibody Titration viii. Donors screening ix. Cross matching, definition, types, methods. x. Coomb's test xi. Transfusion reaction/complication. Blood components – separation etc. Clinical importance of all relevant blood banking.	12
TOTAL		**48**

Text Books:

1. Essential in hematology and clinical pathology by Ramdas Nayak.
2. Handbook of Practical hematology for MLT by Sunit Nath and Anamika Das.
3. Hematology and blood banking(for paramedical students) by Poonam Bachheti and Aruna Singh.

Reference book:

1. A concise text book of Clinical Pathology hematology and blood banking by Rakesh joshi.
2. Histopathology(for paramedical students) by Poonam Bachheti and Aruna Singh.

SEMESTER IV

Subject: Clinical Pathology & Blood Banking Practical

Subject Code: MLT232C402

L-T-P-C: **4-0-8-4** **Total credits: 4**

Course Objectives:

The course with an objective to give the students a wholesome practical knowledge on collecting different biological specimen and its role in analyzing different pathological disorders, on performing different biochemical and microscopic examination of urine and the different methods to perform ABO blood grouping.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI. No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To name the biological specimen commonly collected in clinical laboratory.	**BT 1**
CO 2	To explain the clinical importance of 24 hours urine examination for proteins.	**BT 2**
CO 3	To apply the knowledge of the principle of blood grouping and perform both forward and reverse grouping.	**BT 3**
CO 4	To analyze the physical and microscopic examination of the various biological specimen	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I	**CLINICAL PATHOLOGY** Urine collection for Routine examination Midstream Urine Collection 24 hrs. Urine examination for proteins. Urine R/E- **Physical Examination-** Colour, pH, Specific Gravity **Biochemical Examination-** Urine Sugar, Urine	**12**

	Protein, Bile salt, Bile Pigment Urobilinogen Ocult Blood Ketone bodies Pregnancy test Bence Jones Proteins	
II	**Microscopic Examination** Fluid – Pleural Fluid examination -Physical, Chemical, Cell count – DLC/TLC, - Bacteriological Cerebrospinal Fluid (CSF) examination:Physical, Chemical, Cell cou DLC/TLC, - Bacteriological Synovial fluid examination Physical, Chemical, Cell count – DLC/TLC, - Bacteriological	**12**
III	Semen analysis Physical Examination, Chemical examination, Sperm count, Motility, Morphology study etc Stool analysis	**12**
IV	Preparation of Blood cells for ABO grouping ,Preparation of Serum Cells for reverse grouping, Blood grouping Forward grouping - Moist Chamber Slide method and tube method Reverse Grouping – Moist Chamber Slide method and tube metho Cross matching, Donor Screening	**12**
TOTAL		**48**

Suggested Books:

1. Textbook of pathology, Harsh mohan, 8th edition, Jaypee publishers
2. Textbook of Medical laboratory Technology, 3rd edition, Godkar PB, Bhalani publishing house
3. Textbook of Medical laboratory Technology , RamnikSood, Jaypee publishers

References:

1. Dacie and lewis practical Haematology, Barbara J Bain, Imedla Bates, Mike A Laffan,12th edition, Elsevier publications
2. Manual of Medical Laboratory Technology, K.N.Sulochana and S. Ramakrishnan, Jaypee publishers

Level: Semester-IV

Course: Discipline Specific Elective (DSE) **Total credit: 4**

Subject: Microbiology-II

Subject Code: MLT232D4O1

L-T-P-C: **4-0-0-4**

Course objective: The course is designed to understand the basic characteristic of the different serological test perform to analyze the antigen antibody reactions, grade the agglutination reactions, to identify various bacteria and parasites , understand their mode of transmission and various laboratory diagnostic methods to identify, distinguish and differentiated based on their different properties.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about vaccine and its various type and its role in developing immunity	**BT 1**
CO 2	To explain the basic concept behind antigen and antibody reaction.	**BT 2**
CO 3	To apply the knowledge and interpret the agglutination testing in serological assays.	**BT 3**
CO 4	To analyze and interpret the laboratory diagnosis of various microorganism.	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I	Introduction to vaccines and its types, Antigen and Antibodies, Ag-Ab reactions, hypersensitivity and complement fixation And Serological tests	**12**

	(WIDAL,VDRL,ASO,CRP,RIA,RF & ELISA) and Rapid test for HIV and Hbs Ag	
II	General Bacteriology – Introduction, Morphology, cultural characteristics, diagnosis and diseases caused by : Staphylococcus, Streptococcus Pneumococcus Introduction to Enterobactericeae,E. coli, Salmonella, Shigella Klebsiella.	**12**
III	Parasitology:Introduction and Classification of parasites Morphology, life cycle and laboratory diagnosis of E histolytica. Plasmodium vivax & falciparum. G. lamblia Balantidium coli Leishmania	**12**
IV	Nosocomial infections- Causative agents, transmission methods, prevention and control hospital born infection.Biomedical waste Disposal Normal Microbial Flora	**12**
Total		**48**

Recommended Books:

1.Rang, H. P., Henderson, G., Flower, R. J., Dale, M. M. (2015). Rang&Dale's Pharmacology. 8th edition.United Kingdom**.** Churchil LivingstoneElsevier

2. Katzung B. G., Masters S. B., Trevor A. J.(2013). Basic and clinical pharmacology, 11th edition. New Delhi. Tata McGraw-Hill

3.Laurence L. Brunton et al.(2017).Goodman and Gilman's, The Pharmacological Basis of Therapeutics. 13th edition. Mcgrow hill education.

Reference Book:

1.Sharma. H. L., Sharma, K. K. (2017). Sharma & Sharma's Principles of Pharmacology. India: Paras Medical Publisher.

2.Stitzel, R. E. (2004). Modern Pharmacology with Clinical Applications. 6th edition. United Kingdom: Lippincott Williams & Wilkins.

3.Ghosh MN.(2015).Fundamentals Of Experimental Pharmacology. India: Hilton & Company.

Level: Semester IV

Course: Skill Enhancement Course (SEC) **Total credit: 2**

Subject: Clinical Laboratory Management

Subject Code: MLT232S401

L-T-P-C: **2-0-0-2**

Course Objectives:

The objective of the course is to guide the students to understand how important it is for lab personnel to deliver their assigned duties within limited time and resources. This includes acquiring grants, personnel, equipment, designing the workflow, and overseeing the daily operation of the laboratory.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the importance of laboratory management for proper functioning of clinical samples.	**BT 1**
CO 2	To explain the basic concept of maintaining components and organization of laboratory.	**BT 2**
CO 3	To apply the knowledge of maintenance of stock register and importance of accreditation in providing Quality result.	**BT 3**
CO 4	To analyze the role of laboratory technologist/technician in implementing strict guidelines and regulation for quality laboratory management.	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I	Laboratory: General over view and Classification of medical laboratories, Code of Ethics of a laboratory Professional and Role of communication in laboratory.	**6**
II	Organization of the laboratory, Components of a Laboratory, structure of medical laboratory service and Role of medical laboratory services.	**6**

III	Lay out plan of a multi-room laboratory Organizational pattern of a Laboratory Familiarization of Request forms and report forms. Ordering and Utilization of supplies Maintenance of Stock Registers- Consumables, Non-consumables Accreditation and Certification of Laboratories.	**6**
IV	Role of medical laboratory technologist and various Laboratory rules, ethics, professional code of conduct.and Laboratory policies	**6**
	Total	**24**

Recommended Books:

1. Medical laboratory technology: reference book state council of educational research and training (scert), kerala 2016
2. Clinical laboratory Science; Linne & Ringsrud's; 7th edition; Mary Louise Turgeon.
3. Text book of Medical Laboratory Technology, Praful B. Godkar, Darshan P Godkar,3rd Edition, Bhalini publishing house
4.Henry's Clinical diagnosis and Management by laboratory methods

Reference Book:

1. Introduction to Medical Laboratory Technology; Berhanu Seyoum Haramaya University In collaboration with the Ethiopia Public Health Training Initiative, The Carter Center, the Ethiopia Ministry of Health, and the Ethiopia Ministry of Education December 2006
2. Laboratory Management; quality of laboratory diagnosis; Candis A Kinkus
3. Clinical Laboratory Management; 2nd edition; Lynne S. Garcir

Level: Semester-IV

Course: Value Additional Course (VAC)

Subject: Nutritional Biochemistry

Subject Code: MLT232V401

L-T-P-C: **2-0-0-2** **Total credits: 2**

Course Objectives:

The objective of the course is to introduce the students to vital information about the role diet. vitamins and minerals plays in the establishment, development, and prognosis of physical diseases.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the classification of fixatives and details of each fixatives.	**BT 1**
CO 2	To expalin the working principle of common instruments used in histopathology.	**BT 2**
CO 3	To apply the knowledge of various principles of different stains and identify the different tissue and cells in practical class.	**BT 3**
CO 4	To analyze the difference between connective tissue stains and RNA stain.	**BT 4**

DETAILED SYLLABUS

Modules	Course Content	Periods
I	Introduction of Nutritional Biochemistry, Digestion and Absorption. Vitamins, Introduction of vitamins i.e. fats soluble & water soluble vitamins.	**6**
II	Classification of vitamins:Water-Soluble Vitamins - Niacin, Riboflavin Choline, Thiamin, F,olate, B12, B6, Biotin. Sources, requirement, deficiency and disorders.	**6**
III	Fat-Soluble Vitamins - Vitamin A, D. E ,K. Mineral Metabolism – iodine, sodium. Potassium and chloride.	**6**
IV	Food sources that provide energy and Nutrition in health & diseases (protein energy malnutrition)	**6**
TOTAL		**24**

Texts:

1. Nutritional Biochemistry; 2nd edition; Elsevier.
2. Nutritional Biochemistry (Pb 2017) **by** Sharma D. C (Author)
3. TEXTBOOK OF APPLIED BIOCHEMISTRY AND NUTRITION AND DIETETICS by Harbans Lal (Author)
4. Textbook Of Nutrition And Biochemistry (Pb 2022) By Lal H

Reference book:

1. Basic and Applied Biochemistry Nutrition and Dietetics; 3rd edition; Shella John
2. Handbook of biochemistry and nutrition for nursing and allied health students by shivananda Nayak B

References Books:

1. Histotechnology, A self instructional text by Freida L. Carson,1st edition, Lippincott Williams publishers

2. Curran's Atlas of Histopthology, Robert Curran, 4th edition, Harvey Miller publications

Level: Semester IV

Course: Generic Elective (GE) **Total credit: 3**

Subject: Histopathology & Cancer Biology

Subject Code: MLT232G401

L-T-P-C: **3-0-0-3**

Course Objectives:

The objective of the course is to introduce the students to Cells, Tissues, Classification of fixatives, Tissue Processing-Definition, Grossing, Dehydration, Clearing, Impregnation, Embedding, tissue cutting in the microtomb and the principle behind the staining techniques.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the classification of fixatives and details of each fixatives.	**BT 1**
CO 2	To explain the basic concept of tissue processing and the various steps involve in the staining process	**BT 2**

CO 3	To apply the knowledge of various principles of different stains and identify the different tissue and cells in practical class.	**BT 3**
CO 4	To analyze the difference between connective tissue stains and RNA stain.	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I	Introduction to Cells, Tissues, Fixation- Definition, Classification of fixatives, Details of each fixatives, Tissue Processing-Definition, Grossing, Dehydration, Clearing, Impregnation, Embedding, Paraffin waxes and its properties	**9**
II	Microtomy- Definition, Microtome knife, Microtome types and its functions, horning and stropping, Blocking, Section cutting, Mounting, Frozen section	**9**
III	Staining- Basic structure of a dye, Production of colour, Mechanism of staining, Metachromasia, Progressive and regressive staining, Mordant, Accentuators, Classification of dyes Special stains a) Connective tissue stains- Van Gieson's stain, Masson's trichrome stains, Mallory trichrome stains, Gordon's and sweets methods, Orcein method for elastic fibres, PTAH	**9**

	b) RNA stain -Fuelgen stain, Unna preparation, Carbohydrates staining-PAS, Mucicarmine stain	
IV	Pigments and its stains- Endogenous pigments. Eg : Haem pigments, Perl's Prussian blue, Haemozoin pigments, Haematoidin pigments, Bile pigments, Tyrosine pigments, Lipid pigments Immunohistochemistry (IHC)-Introduction, Cancer Biology	**9**
	Total	**36**

Recommended Books:

4. Bancroft's theory and practice of Histological techniques by S. Kim Suvarna, Christopher Layton, John D. Bancroft.

5. Textbook of pathology, Harsh Mohan, 8th edition, Jaypee publishers

6. Text book of Medical Laboratory Technology, Praful B. Godkar, Darshan P Godkar,3rd Edition, Bhalini publishing house

Reference Book:

1.Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi.
2.Cunningham W.P., Cunningham M.A., "Principles of Environmental Science", Tata McGraw Hill Publishing Company Ltd., New Delhi.
3.Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi.
4.Krishnamoorthy B., "Environmental Management, Text Book and Cases", PHI Learning (P) Ltd., New Delhi

Level: Semester-IV

Course: Generic Elective (GE)

Subject: Basic Histopathology

Subject Code: BML232G401

L-T-P-C: **3-0-0-3** **Total credits: 3**

Course Objectives:

The objective of the course is to introduce the students to Cells, Tissues, Classification of fixatives, Tissue Processing-Definition, Grossing, Dehydration, Clearing, Impregnation, Embedding, tissue cutting in the microtomb and the principle behind the staining techniques.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**

CO 1	To recall about the classification of fixatives and details of each fixatives.	**BT 1**
CO 2	To expalin the working principle of common instrumentsused in histopathology.	**BT 2**
CO 3	To apply the knowledge of various principles of different stains and identify the different tissue and cells in practical class.	**BT 3**
CO 4	To analyze the difference between connective tissue stains and RNA stain.	**BT 4**

DETAILED SYLLABUS

Modules	Course Content	Periods
I	Introduction of histopathology, ,Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology.	**9**
II	Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, Decalcification, decalcification methods, types of decalcifying fluid, Embedding media, its type and properties	**9**
III	Microtome, its type and working, Microtome knives, its type and knife sharpening,Section cutting, fault and remedies,Section adhesive Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant.	**9**
IV	Types of hematoxylin, Haematoxylin and eosin staining, mounting and mounting media, special staining advantages & disadvantages.	**9**
TOTAL		**36**

Suggested Books:

5. Bancroft's theory and practice of Histological techniques by S. Kim Suvarna, Christopher Layton, John D. Bancroft.

6. Textbook of pathology, Harsh Mohan, 8th edition, Jaypee publishers

7. Text book of Medical Laboratory Technology, Praful B. Godkar, Darshan P Godkar,3rd Edition, Bhalini publishing house

References Books:

3. Histotechnology, A self instructional text by Freida L. Carson,1st edition, Lippincott Williams publishers

4. Curran's Atlas of Histopthology, Robert Curran, 4th edition, Harvey Miller publications

Level: Semester V

Course: C-1

Title of the Paper: Clinical Immunology

Subject Code: BML232C501

L-T-P-C: 3-1-0-4 **Total credits: 4**

Course Objectives

The course is designed with an objective to give the students a concept of immune system, role of specificity in antigen-antibody binding and mechanism of humoral and cell mediated immune response.

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the general concepts of the immune system, innate and adaptive immunity.	**BT 1**
CO 2	To expalin the role of epitope and paratope in antigen- antibody binding.	**BT 2**
CO 3	To apply the mechanism of humoral and cell mediated immune response in understanding how body defend itself from pathogens	**BT 3**
CO 4	To analyze the key regulatory proteins and its role in complement system activation.	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**Immunology:** Historical background, general concepts of the immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response, Cell and organs of immune system, Phagocytosis	12 hr
II	**Antigens and Antibodies:** Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens	12 hr

	Antibodies: Historical perspective of antibody structure; structure, function, and properties of the antibodies; different classes, subclasses and biological activities of antibodies; concepts of antibody diversity, isotype, allotype, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody	
III	**Mechanism of humoral and cell mediated immune response:** Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation, complement system and complement fixation test.	
IV	**Autoimmune and immunological disorders**: Autoimmune disorders, pathogenesis, organ specific and systemic autoimmune disorders and its markers, Immunological disorders: primary and secondary immunodeficiency, SCID, AIDS.	12 hr
TOTAL		**48**

Recommended Books:

1.Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication

2. Mackie and Mccartney practical Medical Microbiology, A G Fraser, J G Collee, A Simmons, 14th edition, Elsevier Health Sciences

Reference Book:

Textbook of Microbiology, Ananthanarayann, Paniker, Arti Kapil,9thedition, universities press

2. Laboratory immunology & Serology – Neville J. Bryant.

3. C.P.Baveja, Textbook of microbiology,6thedition,Arya Publications

Level: Semester V

Course: C-2

Title of the Paper: Medical Bacteriology & Parasitology

Subject Code: BML232C502

L-T-P-C: 4-0-0-4 **Total credits: 4**

Course Objectives

The course is designed with an objective to understand the classification, morphology and structural properties of the different microorganisms, different stages of pathogenesis and its role in development of a disease and the different laboratory diagnostic methods procedure to identify the pathogens

Course Outcomes

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To name the types, morphology and structural properties of the different microorganisms.	**BT 1**
CO 2	To explain the different stages of pathogenesis and its role in development of a disease.	**BT 2**
CO 3	To apply the knowledge of the laboratory diagnosis of different microorganism and use the knowledge in practical purpose.	**BT 3**
CO 4	To analyze the different process of how microorganism grow, divide, multiply and proliferate in human body and cause life threatening conditions	**BT 4**

COURSE OUTLINE:

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	➢ Morphology, colony characteristics, pathogenisity and laboratory diagnosis of : • *Vibrio cholera* • Pseudomonas Spp • *Corynobacterium diphtheriae* • Proteus spp • Rickettsisa • Spirochetes: - *Treponema pallidum* - Borrelia Leptospira	**12**
II	• Mycoplasma • Clamydia trachomatis • Beta haemolytic Streptococcus • Mycobacteriology Clostridium spp	**12**
III	Parasitology II • Ascaris lumbricoides • Taenia solium and saginata • wuchereria bancrofti • Ancylostoma duodenale • Enterobius vermicularis • Trichuris trichura • schistosoma haematobium Fasciola hepatica	**12**
IV	Antibacterial and antiviral agents Antibiotic susceptibility testing Bacteriology of Water, Air And Milk Sample collection in microbiology	**12**
TOTAL		**48**

Text Books:

1. Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2. Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3. Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.
3. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
4. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.
5. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Level: Semester V

Course: Core (C3)

Subject: Hospital Duty & Patient Care-1

Subject Code: **BML232C503**

L-T-P-C: **4-0-0-4** **Total credits: 4**

Course Objective:

The course is designed with an objective to understand basic care needed for patients, Organization of Hospitals, Management of Hospitals, importance of safety measures to be taken at the hospital and Personal Hygiene and its Maintenance.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the different organization of Hospitals, importance of personnel hygiene and its maintenance.	**BT 2**
CO 2	To explain how giving quality patientcare can absolutely have an effect on health outcomes, contributing to a more positive patient recovery experience.	**BT 3**
CO 3	To apply the knowledge of first aid and safety measures to be given during emergencies	**BT 3**
CO 4	To analyze how accidents can easily prevail in laboratory l the role of safety measures in preventing it.	**BT 4**

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I.	**Hospital & Hygiene** • Introduction • Functions & Classification of Hospitals • Organization of Hospitals • Department & Management of Hospitals • Personal Hygiene Maintenance of Hygiene	**12**
II	**Basic care needs of patients:** • Safety factors for patients such as • Safety from mechanical injury • Safety from thermal & chemical injury	**12**
III	**First Aid:** • Introduction • Aims & objectives of first aid • Priorities of first aid • Golden rules of first aid • Qualities & responsibilities of first aider • Simple first aid measures in selected conditions like – ▪ Food poisoning	**12**
IV	**Safety in the Laboratory:** • Common laboratory accidents from • Physical injuries • Electrical shock	**12**
TOTAL		**48**

Text Books:

7. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states.
8. William and Wilkins, Baltimore;1991 [1990 printing].
9. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.

Reference Books:

10. Hugo W.B and Russel A.D, Pharmaceutical Microbiology, 7thedn, 2004, Blackwell Scientific publications, Oxford London.
11. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
12. Pelczar, Chan Kreig, Microbiology, 5thedn, 2001, Tata McGraw Hill publisher ltd

Level: Semester V

Course: C-4

Title of the Paper: : Medical Bacteriology & Parasitology -Practical

Subject Code: BML232C512

L-T-P-C: **0-0-4-2** **Total credits: 2**

Course Objectives

The course is designed with an objective to provide wholesome practical on identifying the morphology of the different microorganisms by performing different biochemical test such as IMViC test, Coagulase test, Oxidase test, TSI, Catalase test and also wet mount preparation of stool specimen.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Bloom's Taxonomy Level**
CO 1	To recall the cultural characteristic of various bacteria	**BT 1**
CO 2	To explain the purpose and importance of different biochemical tests and their role in identifying different microorganisms.	**BT 3**
CO 3	To apply the acquire knowledge in identifying trophozoites and cysts of protozoa, in Wet mount preparation.	**BT 4**
CO 4	To analyze the importance of water, air and milk sampling in valuating the quality of the given test.	**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I	• Stool examination Wet mount preparation- Saline & iodine Concentration method Floatation method	**6 hts**
II	• Water sampling & testing Air sampling & testing Milk sampling & testing,Blood Culture	**6 hrs**
III	Culture characteristic study of Bacteria - Staph Spp - Streptococcus Spp	**6 hrs**
IV	Biochemical tests • Sugar Utilisation • IMViC test • Coagulase test • Oxidase test TSI	**6 hrs**
TOTAL		**24**

Text Books:

1. Peppler J H, Microbial Technology, 2nd edn, 1979, Academic press.
2. Ananthnarayan and Panikar's Text Book of Microbiology, 10th edn, 2017, Orient-Longman, Chennai
3. Sastry SA, Bhat S, Essentials of medical microbiology, 2nd edn, 2018, CBS publisher and distributors.

3. Edward Alcamo, Fundamentals of Microbiology, 4th edn, 2004,Benjamin-cummings Pub. Co. Ltd.
4. Bergeys manual of systematic bacteriology, 2nd edn, 2012, Vol-I to V, Williams and Wilkins- A Waverly company.

Reference Books:

1. Harvey AR, Lippincott's Illustrated Reviews Microbiology, 3rd edn, 2012, wolter and klower publications.
2. Mims R, Medical microbiology, 1st edn, 2020, Mosby publisher.
3. Prescott and Dunn., Industrial Microbiology, 8th edn, 2011, CBS Publishers & Distributors, Delhi.
4. Pelczar, Chan Kreig, Microbiology, 5th edn, 2001, Tata McGraw Hill publisher ltd.
5. Martin frobisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. 1987, Saunders, Philadelphia.

Course DSE-I

Title of the Paper: Diagnostic Molecular Biology

Subject Code: BML232D501

L-T-P-C: 4-**0-0-4** **Total credits: 4**

Course Objectives:

The course is designed with an objective to provide a basic introduction of molecular biology, role and importance of translation and transcription processes occurring within the living cell and techniques in molecular biology like PCR, RT-PCR etc

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall about the general concepts of nucleic acid and its types- DNA and RNA.	**BT 2**
CO 2	To explain how replication, transcription and translation processes occur within the living cell.	**BT 3**
CO 3	To apply the knowledge gained during the course in Performing the various practical activities.	**BT 3**
CO 4	analyze the effects of various factors on molecular events such as replication, transcription and translation.	**BT 4**

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I.	Nucleic Acids, DNA, RNA, composition, structure, types, denaturation andrenaturation of DNA, chemistry of DNA synthesis, general	12 hrs
II	Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors Introduction of translation	12 hrs
III	Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT PCR, reverse transcriptase PCR, Nested PCRBlotting techniques, southern blotting and Western blotting Introduction to chromosomes, its structure and disorder, Karyotyping,	12 hrs
IV	Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of	12 hrs
TOTAL		**48 hrs**

Recommended Books:

1. Basic Biotechnology (Paperback) By Colin Ratledge and Bjorn Kristiansen. Cambridge University Press.
2. Introduction to Biotechnology (Paperback) By William J. Thieman and Michael A. Palladino. Benjamin Cummings; US Ed edition.
3. Recombinant DNA Principles and Methodologies By James Joseph Greene, CRC Press.
5. Molecular Biotechnology: Principles and Applications of Recombinant DNA (Paper-back) By Bernard J Glick and Jack J Pasternak. Publisher: American Society for Microbiology.
6. Laboratory Techniques in Biochemistry and Molecular Biology; DNA sequencing (Vol 10). By J Hindley. Elsevier Biomedical

Reference Book:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22ndedition, Elsevier
3. Singh &Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science

Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman

Course: DSE-II

Title of the Paper: Enzymology & Organ function test

Subject Code: BML232C112

L-T-P-C: 4-**0-0-4** **Total credits: 4**

Course Objectives:

The prime concern of this subject to learn about the enzymes which act as an therapeutic agent. Learn about the radioactivity and different organ function therapeutic agent. Learn about the radioactivity and different organ function test.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define the various classification of enzymes and their importance.	**BT 1**
CO 2	To explain the importance of vitamins according to their solubility.	**BT 2**
CO 3	To apply the knowledge related to the renal and liver system and its different role and actions.	**BT 3**
CO 4	To analyze the various experiments related to special senses and renal	**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	**CLINICAL ENZYMOLOGY:** Iso-enzymes, Lactate dehydrogenase, creatine kinase, aspartate amino amylase, isocitrate dehydrogenase., Enzymes as therapeutic agents, Enzymes used for diagnosis,**i**mmobilized enzyme	12 hours
II	RADIOACTIVITY: Introduction, properties of alpha, beta and gamma radiations,radioisotopes, measurement of radioactivity, Radioisotopes in medicine, radiation hazards,radiation safety and precaution, diagnostic,therapeutic uses of radioisotopes	12 hours
III	**Liver function tests:** Tests for Liver Function, Serum bilirubin, Classification of jaundice	12 hours

IV	**Gastric function tests:** Test for determining gastric function, Examination of resting contents, Fractional gastric analysis, Histamine stimulation tests	12 hours
TOTAL		48 hrs

Reference Book:

1. Biochemistry – U. Satyanarayana, U. Chakrapani.
2. Text book of Medical Biochemistry – MN Chaterjee, Kano Shinde.
3. Principle & Technique of Biochemistry – S Ramakrishnan, K. G. Prasannan, R. Rajan.
4. Principle & Techniques of Biochemistry & Molecular Biology – Keith Coilson.
5. Textbook of Medical Lab Technology – Praful B. Godkar, Darshan P. Godkar

Level: Semester V

Title of the Paper: Enzymology & Organ function test- Practical

Subject Code: BML232D511

L-T-P-C: **0-0-4-2** **Total credits: 2**

Course Objectives:

The course is designed to provide a wholesome practical knowledge about theenzymes which act as an therapeuticagent, get a basic concept about the radioactivity and different organ function test.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To recall the general concepts different organs, its normal and abnormal conditions.	**BT 2**

CO 2	To explain the properties of different biochemical test and its role to diagnose any abnormalities in the sample.	**BT 2**
CO 3	To apply the knowledge gained during the course in performing the various practical activities.	**BT 3**
CO 4	To analyze the role of various factors on renal, thyroid and electrolyte functions and the different test methods to diagnose any abnormal	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	Glucose tolerance test (GTT) Liver function tests ➢ Bilirubin (total direct indirect) ➢ SGOT SGPT	6 hrs
II.	Renal function tests ➢ Urea, Creatinine ➢ Uric acid Thyroid function tests (demonstration) ➢ TSH T3,T4	6 hrs
III.	Thyroid function tests (demonstration) ➢ TSH	6 hrs
IV.	Serum electrolyte ➢ Bicarbonate ➢ Sodium ➢ Potassium ➢ Calcium Chlorine	6 hrs
TOTAL		24 hrs

Reference Book:

1. Biochemistry – U. Satyanarayana, U. Chakrapani.
2. Text book of Medical Biochemistry – MN Chaterjee, Kano Shinde.
3. Principle & Technique of Biochemistry – S Ramakrishnan, K. G. Prasannan, R. Rajan.
4. Principle & Techniques of Biochemistry & Molecular Biology – Keith Coilson.
5. Textbook of Medical Lab Technology – Praful B. Godkar, Darshan P. Godkar

Level: Semester VI

Course: C-1

Title of the Paper: Cytopathology

Subject Code: BML232C601

L-T-P-C: **4-0-0-4** **Total credits: 4**

Course Objectives

The subject is design to have knowledge on sample collection, cell block preparation, routine or special staining, counting of cells of exfoliated, imprint, crush, biopsy sediment and interventional cytological preparation.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define the process of collection of specimens from different parts of the body.	**BT 2**
CO 2	To explain the definition and classification of cytology, cells and tissues.	**BT 2**
CO 3	To identify the different cytological specimens.	**BT 3**
CO 4	To examine on collection and processing of body cavity specimens.	**BT 4**

DETAILED SYLLABUS

Modules	Course Content	Periods
I.	Introduction : Definition of cytology, Cells & tissues, Normal tissues, Classification of cytology- Exfoliative and interventional cytology, Role of Cytology, Nuclear criteria of inflammation & malignancy, Mounting and Labelling i. Cell block preparation ii. Cytological fixative and mailing Definition, Types/classification, Aims & object Materials for establishments of cytological lab	**12**
II	Collection of specimen from female genital tract specimen for routine screening. ➢ Cervical smear ➢ Vaginal pool smear ➢ Lateral vaginal smear, Combined (fast) smear ➢ Triple smear ➢ Endocervical and endometrial smear. Urinary cytology ➢ Collection of `urinary tract specimens Diagnostic utility of urinary cytology	**12**
III.	Body cavity Fluids, Cellular Components in effusions i. Effusions(Benign and Malignant) ii. Collection and processing of body cavity fluid specimens iii. Cyto-preparation and staining Processing of clotted and Bloody specimen	12
IV.	Fine Needle Aspiration Cytology ➢ Application of FNAC ➢ Advantages of FNAC ➢ General procedure of FNAC ➢ Limitation of FNAC ➢ Wet and Dry fixed smear, its difference Staining : R/E stain types-Methods, Maintenance, Preparation of stain, Pap's stain Special stains- MGG, PAS, ZN, Mucicarmine etc	12
TOTAL		**48**

Text Books:

1. Essential in hematology and clinical pathology by Ramdas Nayak.
2. Handbook of Practical hematology for MLT by Sunit Nath and Anamika Das.
3. Hematology and blood banking(for paramedical students) by Poonam Bachheti and Aruna Singh.
3. A concise text book of Clinical Pathology hematology and blood banking by Rakesh joshi.
4. Histopathology(for paramedical students) by Poonam Bachheti and Aruna Singh.

Recommended Books:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications

Level: VI

Subject: Clinical Biochemistry

Subject Code: **BML232C602**

L-T-P-C: **4-0-0-4** **Total credits: 4**

Course Objectives:

This course covers various aspects of Inborn error of carbohydrate metabolism and their clinical significance. Specimen collection and analysis is also learn i.e NABL,NABH,LJ graph etc.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define the carbohydrates, proteins and lipids.	**BT 2**
CO 2	To explain about the technique of collection of specimen	**BT 3**
CO 3	To identify the properties of cancer cells	**BT 3**
CO 4	. To analyze the condition of clinical and diagnostic approach.	**BT 4**

DETAILED SYLLABUS

Modules	**Course Content**	**Periods**
I.	**Specimen collection and analysis:** Concept of accuracy, precision, reliability,reproducilibilty, reference ranges, Quality control, LJ graph, collection distribution preservation storage of specimen for appropriate	**12**
II.	**Inborn error of carbohydrate metabolism** Disorders of carbohydrate metabolism, diabetes mellitus, glycosuria, glycogen storage diseases, galactosemia pentosuria, fructosuria, G6PD	**12**

III.	Disorders of protein and amino acid metabolism, inherited disorders associated with urea cycle, proteinuria , sickle cell anaemiathalasemia, multiple myeloma, plasma protein profile in various diseses, aminoacid uria, Alkaptonuria, ,maple syrup urine disease, phenylketonuria, , cystinuria, homocystinuria, Fanconi syndrome,tyrosinemia, albinism	**12**
IV	**Inborn error of lipid metabolism** Hyperlipdemia, Carnitinedeficiency, hyperlipoproteinemias hypolipoproteinemia, atherosclerosis,fatty liver	**12**
TOTAL		**48**

Recommended Books:

1. Lehinger Principle of Biochemistry, David L Nelson, 7th edition, WH freeman Publishers
2. Fundamentals of biochemistry,JLjain and Sanjay Jain,S Chand Publishers.

References:

1. Text book of Medical Biochemistry – MN Chaterjee, Rana Shinde, Jaypee publishers.

2. Biochemistry, U. Sathyanarayana, Elsevier

3. Harper's Biochemistry,28thedition, Robert K Murray, Tata McGraw publishers.

Title of the Paper: : Hospital Duty & Patient Care-II
Subject Code: BML232C603
L-T-P-C: **4-0-0-4** **Total credits: 4**

Course Objectives

: The objective of the course is to impart thorough knowledge of the relevant aspects of Giving quality patient care can absolutely have an effect on health outcomes. It contributes to a more positive patient recovery experience and can improve the physical and mental quality of life for people with serious illnesses. This will also provide knowledge of basic functions as the centre for the training of health workers.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Bloom's Taxonomy Level**
CO 1	To define the Hospital duty and patient care management it is an aims in teaching the paramedical students to learn how to care the patients and the basic code of conduct of the hospital and	**BT 1**
CO 2	To be able to explain the hospital, reception area, administration and emergency ward.	**BT 3**
CO 3	To apply the first aid kit based on the types of incidents and accidents.	**BT 4**
CO 4	o analyze and identify the patients' situations like food poisoning, snake bite etc. and handling them in emergency ward.	**BT 4**

DETAILED SYLLABUS

Modules	Topics (if applicable) & Course Contents	Periods
I	**Poisoning:** • Definition • Causes of poisoning	**12 hts**
II	**Laboratory Investigations:** • Preparation of patients • Preparation of equipments • Collection of specimen of urine, stool, sputum, blood, CSF,	**12 hrs**
III	**Shock:** • Definition • Types of shock • General Features of shock	**12 hrs**
IV	**Hyperglycemia&Hypoglycemia:** • Definition,Clinical features • Diabetes laboratory tests for diabetes • Different types of glycosuria • Ketone bodies Glucose tolerance test. Investigations for hypoglycemia	**12 hrs**
TOTAL		**48**

Title of the Paper: Clinical Biochemistry Practical

Subject Code: BML232C611

L-T-P-C: **0-0-4-2** **Total credits: 2**

Course Objectives:

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1		**BT 2**
CO 2		**BT 3**
CO 3		**BT 3**
CO 4		**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	Liver function tests – Total Bilirubin, direct and Indirect Bilirubin, Urinary Bile salt, Urinary Bile pigments,	6 hrs
II	Urinary Urobilinogen, Total Protein, Albumin, SGOT, SGPT.	6 hrs
III	Renal Function Test – Estimation of urea, Uric acid and Creatinine, Urine Examination R/E	6 hrs
IV	Gastric Function Test – Examination of resting Content	6 hrs
TOTAL		**24 hrs**

Title of the Paper: Cytopathology Practical

Subject Code: BML232D612

L-T-P-C: **0-0-4-2** **Total credits: 2**

Course Objectives:

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1		**BT 1**
CO 2		**BT 2**
CO 3		**BT 3**
CO 4		**BT 4**

DETAILED SYLLABUS

Modules	**Topics (if applicable) & Course Contents**	**Periods**
I.	• Sample receiving labelling and entering • Preparation of Exfoliative cytological smears • Fixation – types and methods • Preparation of different solution Preparation of smears in interventional cytology, Fixation and stains	6 hours

II	Staining R/E - Preparations of stains - Methods – MGG & PAPs - Mounting - Labelling	6 hours
III	Record keeping of reports and blocks etc	6 hours
IV	Lab safety& Quality controls	6 hours
TOTAL		24 hrs

Title of the Paper: Virology and Medical Mycology

Subject Code: BML232D601

L-T-P-C: 4-**0-0-4** **Total credits: 4**

Course Objectives:

The course is designed to learn about the pathogenic virus and fungi which is cause different pathogenic diseases and to diagnose the diseases and treatment.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To name the virus, fungus and its causative agent with different diseases.	**BT 1**
CO 2	To summarize on mycology and its classification.	**BT 2**
CO 3	To plan how to collect and transport the specimen and processing it.	**BT 3**

CO 4	To know how to analyse and diagnosed the samples.	**BT 4**

DETAILED SYLLABUS

Modules	Course Content	Periods
I.	General virology • Introduction and classification of viruses • HIV • Hepatitis virus • Rabies virus • Dengue virus • Influenza and Parainfluenza virus	12 hrs
II.	Diagnostic Virology- - Sample collection and transport,Processing, Identification	12 hrs
III.	Medical Mycology: General properties of fungus Classification: yeast, yeast like fungus, moulds, dimorphic fungus Superficial mycoses Subcutaneous mycoses Systemic mycoses Opportunistic mycoses Diagnostic Mycology- Sample collection Processing Identification Antifungal susceptibility Testing	12 hrs
IV.	Biomedical Waste Managment Pyrexia of unknown origin Urinary tract infection Meningitis	12 hrs
TOTAL		48 hrs

Text Books:

1. Essential in hematology and clinical pathology by Ramdas Nayak.

2. Handbook of Practical hematology for MLT by Sunit Nath and Anamika Das.
3. Hematology and blood banking(for paramedical students) by Poonam Bachheti and Aruna Singh.
3. A concise text book of Clinical Pathology hematology and blood banking by Rakesh joshi.
4. Histopathology(for paramedical students) by Poonam Bachheti and Aruna Singh.

Recommended Books:

1.Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications

Level: Semester VI

Course: DSE-4

Title of the Paper: Virology and Medical Mycology-Practical

Subject Code: BML232D601

L-T-P-C: **0-0-4-2** **Total credits: 2**

Course Objectives:

This practical paper imparts the required skills for the detection of diseases, operation and application of various advance techniques like Slide culture, LPCB, Germ tube test, KOH preparation etc.

Course Outcomes:

On successful completion of the course the students will be able to:		
SI No	**Course Outcome**	**Blooms Taxonomy Level**
CO 1	To define on the types of virus, fungus and its causative agent with different diseases.	**BT 2**
CO 2	To illustrate the basic knowledge on mycology and its classification	**BT 2**
CO 3	To make use of how to collect and transport the specimen and processing it.	**BT 3**
CO 4	To know how to analyse and diagnosed the samples.	**BT 4**

DETAILED SYLLABUS

Modules	Course Content	Periods
I.	• Sample Collection for virology Urine culture	6
II	Media preparation for Mycology - Fungal culture - Slide culture - Germ tube test - Lactophenol cotton blue stainin mount KOH preparation	6
III.	Biological Specimen culture Sputum culture,	6
IV.	Pleural fluid fluid, Pus culture, Biopsy Vitreous tap/Aquaous Tap Others	6
TOTAL		**24**

Recommended Books:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
3. Singh &Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. Wilson & Walker, Practical Biochemistry,2nd edition

12 MONTH INTERNSHIP

Subject Name: Internship Subject Code:BML232C781

L-T-P-C –0 -0-20-20 **Credit Units: 20** **Scheme of Evaluation: (P)**

- There shall be 12 months of Internship after the final year examination for candidates declared to have passed the examination in all the subjects.
- During the internship candidate shall have to devote 20 hours per week for 12 Calendar months.

- The Internship should be rotatory and cover Haematology, Histology & Cytology, Biochemistry, Microbiology, Endocrinology & Automation sections of Pathology laboratory.
- Based on the attendance and work done during posting the Director/Principal/ head of institution/department shall issue 'Certificate of Satisfactory Completion' of training following which the University shall award the B.Sc. in Medical Laboratory Technology Degree or declare the candidate eligible for the same.
- No candidate shall be awarded degree without successfully completing 12 months internship.
- Institute's Director / Principal can at his discretion grant NOC to the students to do the Internship at the place of his choice provided the concerned Hospital/Pathology Laboratory fully satisfies the above criteria. For the purpose of granting NOC the candidate shall have to submit to the Institution the status of Pathology Laboratory services available at the place where he intends to do his Internship.