HNB MEDICAL UNIVERSITY DEHRADUN, (UTTARAKHAND)

REGULATION OF THE UNIVERSITY FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE – MEDICAL LAB. TECHNOLOGY

An exercise of the powers conferred by section of HNB medical university Dehradun hereby makes the following regulations: -

SHORT TITLE AND COMMENCEMNT

These regulations shall be called "THE REGULATIONS FOR THE BACHELOR OF SCIENCE – MEDICAL LABORATORY TECHNOLOGY OF DIMS COLLEGE, DEHRADUN, UTTARAKHAND"
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I. These Regulations and the syllabus shall come into force from the 2017-2018 academic session onwards.

II. The regulations framed are subject to modification from time to time by the standing Academic Board of the University.

OBJECTIVES OF ALLIED HEALTH SCIENCE GRADUATE TRAINING PROGRAMME:

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

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

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

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

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

INSTITUTIONAL GOALS: In consonance with the national goals each Allied Health Science Institution should evolve institutional goals define the kind of trained manpower (or professional) they intend to produce. The undergraduate students coming out of an Allied Health Science institute should: Be competent in therapeutic techniques of common health problems of the individual and the community, associated with or concerned with Physiotherapy commensurate with his/her position as a member of the health team at the primary, secondary or tertiary levels using his her clinical /technical skills based on history, physical examination and relevant investigation techniques and as per the advise of the attending physician.

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

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

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

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

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

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

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

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

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

ADMISSION, SELECTION, MIGRATION AND TRAINING

ADMISSION TO THE B.Sc. (Medical Lab, Technology) COURSE

ELIGIBILITY CRITERIA

No Candidate shall be allowed to be admitted to the B.Sc (Medical Lab Technology) until:-

a) He/She has completed the age of 17 years on or before first day of July of the year commencing the prescribed academic session of the said course:
b) He/She has passed qualifying examination as under:

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

OR

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

OR

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

OR

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

OR

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

OR

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

Note: 10+2 with vocational training in Nursing/Medical Lab technology/Medical Microbiology are also eligible and 10+2 with Diploma in Medical Microbiology are

also eligible for the respective course. Marks obtained in Mathematics are not to be considered for admission to the B.Sc MLT Course. After the 10+2 course is introduced, the integrated courses should be abolished.

MIGRATION /TRANSFER OF CANDIDATES

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

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

TRAINING PERIOD AND TIME DISTRIBUTION

1) Every student shall undergo a period of certified study extending over Three and a Half Academic years OR Six semesters, plus 6 months internship, from the date of commencement of his study for the subjects comprising the B.Sc Medical Lab Technology curriculum to the date of completion of examination and followed by compulsory rotating internship. Each academic year shall consist of 180 days/each Semester of 90 days teaching of 8 hours each day college working time, including one hour of Lunch.

2) The period of Three & Half years is divided into phased as follows: -

a) Phase-I- First year B.Sc Medical Lab. Technology (One Year Duration-two Semesters)

   i) Human Anatomy and Physiology
   ii) Basic Pathology
   iii) Clinical Biochemistry
   iv) Preventive Medicine & Health Care
   v) Microbial Biology
   vi) Technical Methods in Microbial Biology

b) Phase-II- Second year B.Sc Medical Lab. Technology (One Year Duration/Two Semesters)

   I) Clinical Biochemistry-I
   II) Clinical Biochemistry-II
   III) Medical Microbiology-I
   IV) Medical Microbiology-II
   V) Pathology & Allied Sub.-I
   VI) Pathology & Allied Sub.-II

c) Phase-III- Third year B.Sc MLT (One Year Duration/Two Semesters)

I. Clinical Biochemistry-I
II. Clinical Biochemistry-II
III. Medical Microbiology-I
IV. Medical Microbiology-II
V. Pathology & Allied Sub.-I
VI. Pathology & Allied Sub.-II

d) Phase-Fourth year B.Sc MLT (Six Months duration): Internship

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

DISTRIBUTION OF MARKS TO VARIOUS DISCIPLINES

Ist Year

Course code	Course title	Marks for Theory			Marks for Practical			Total Marks
		IA*	EE*	Total	IA*	EE*	Total	
BMLT 101	Human Anatomy & Physiology	30	70	100	30	70	100	200
BMLT 102	Basic Pathology	30	70	100	-	-	-	100
BMLT 103	Clinical Biochemistry	30	70	100	30	70	100	200
BMLT 104	Preventive Medicine & Health Care	30	70	100	-	-	-	100
BMLT 105	Microbial Biology	30	70	100	30	70	100	200
BMLT 106	Technical Methods in Microbial Biology	30	70	100	-	-	-	100
	TOTAL	**180**	**420**	**600**	**90**	**210**	**300**	**900**

IInd Year

Course code	Course title	Marks for Theory			Marks for Practical			Total Marks
		IA*	EE*	Total	IA*	EE*	Total	
BMLT 201	Clinical Biochemistry-I (Separative & Instru. Techniques)	30	70	100	30	70	100	200
BMLT 202	Clinical Biochemistry-II (Metabolic &Blood Chemistry)	30	70	100				
BMLT 203	Medical Microbiology-I (Bacterial Pathogens & Asso. Diseases)	30	70	100	30	70	100	200
BMLT 204	Medical Microbiology-II (Technical Methods in Medical Microbiology)	30	70	100				

BMLT 205	Pathology & Allied Subject-I (Haematology & Clinical Pathology)	30	70	100	30	70	100	200
BMLT 206	Pathology & Allied Subject-II (Histopathology & Cytology Techniques)	30	70	100				
	TOTAL	**180**	**420**	**600**	**90**	**210**	**300**	**900**

III[rd] Year

Course code	Course title	Marks for Theory			Marks for Practical			Total Marks
		IA*	**EE***	**Total**	**IA***	**EE***	**Total**	
BMLT 301	Clinical Biochemistry-I (Biostatics Automation & Endocrinology	30	70	100	30	70	100	200
BMLT 302	Clinical Biochemistry-II (Diagnostic Enzymology)	30	70	100				
BMLT 303	Medical Microbiology-I (Pathegonic Viruses & Misc. Microbes)	30	70	100	30	70	100	200
BMLT 304	Medical Microbiology-II (Applied Microbiology & Advanced Tech.)	30	70	100				
BMLT 305	Pathology & Allied Subject-I (Immunopathology & Transfusion Medicine)	30	70	100	30	70	100	200
BMLT 306	Pathology & Allied Subject-II (Histopathology & Cytology)	30	70	100				
	TOTAL	**180**	**420**	**600**	**90**	**210**	**300**	**900**

Note: Course Structure (Teaching duration) will be of 2 hrs / week for Theory & 3 hrs /week for Practicals for each paper**.**

The minimum pass marks will be 40 % in individual subjects in theory and Practical and 50% in Aggregate.

The theory and practical papers will be of equal weightage with 30% in sessional and 70% in final University Examination.

The division will be determined on the basis of aggregate of the marks of all the courses/subjects prescribed for the degree as under:

(i) Passed with honors will be rewarded on 75% and above only in first attempt.
(ii) First Division will be marked on 60% and above.
(iii) Second Division will be marked on 50% and above but less than 60%

Compartment/Supplementary/Back Paper

(i) A student who obtains 40% of the marks individually but has failed in two Papers shall be permitted to appear in those papers only at the two consecutive examinations and if he/she passes at either of those examinations he/she will be deemed to have passed the examination and will be promoted to higher class. (Aggregate marks should be 50%)

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

There shall be one main examination in a year and a supplementary to be held not later than 6 months after the publication of its results.

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

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

PHASE DISTRIBUTION AND TIMING OF EXAMINATIONS:-

1. Ist Annual Examination at the end of Ist year.
2. 2nd Annual Examination at the end of 2nd year.
3. 3rd Annual Examination at the end of 3rd year.
4. Six months Internship after third Annual Examination.

EXAMINATION REGULATIONS

Essentialities for qualifying to appear in professional examinations. The performance in essential components of training is to be assessed, based on.

ATTENDANCE: 75% of attendance in a subject for appearing in the examination is compulsory provided he/she has 80% attendance in non lecture

teaching i.e. seminars, group discussion tutorials, demonstrations, practicals hospital (territory, secondary, Primary) Postings and bed side clinics etc.

INTERNAL ASSESSMENT:

(i) It shall be based on day today assessment (see note), evaluation of student assignment, preparation for seminar, clinical case presentation etc.

(ii) Sessional examination shall be conducted throughout the course. The question of number of examinations is left to the institution.

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

(iv) Weightage for the internal assessment shall be 30% of the total marks in each subject.

(v) Student must secure at least 40% marks of the total marks fixed for internal assessment in particular subject in order to be eligible to appear in final University examination of that subject.

Note: Internal Assessment shall relate to different ways in which student's participation in learning process during semesters is evaluated. Some examples are as follows:

(i) Preparation of subject for student's seminar.

(ii) Preparation of a clinical case for discussion.

(iii) Clinical case study problem solving exercise.

(iv) Participation in project for health care in the community (planning stage to evaluation).

(v) Proficiency in carrying out a practical or a skill in small research project.

(vi) Multiple choice question (MCQ) test after completion of a system/teaching.

Each item tested shall be objectively assessed and recorded. Some of the items can be assigned as home work/Vacation work.

UNIVERSITY EXAMINATIONS:

Theory papers will be prepared by the examiners as prescribed. Nature of questions will be short answer type/objective type and marks for each part indicated separately.

Practical/clinical will be conducted in the laboratories or hospital wards. Objective will be to assess proficiency in skills. Conduct of experiment, interpretation of data and logical conclusion clinical cases should preferably include common diseases not esoteric syndromes or rare disorders. Emphasis should be on candidate's capability in eliciting physical signs and their interpretation.

Viva/oral includes evaluation of management approach and handling of emergencies candidate's skill in interpretation of common investigation data also is to be evaluated.

The examinations are to be designed with a view to ascertain whether the candidate has acquired necessary for knowledge, minimum skills along with clear concepts of the fundamentals, which are necessary for him to carry out his professional day to day work competently. Evaluation will be carried out on an objective basis.

Question paper should preferable be of short structure/objective type.

Clinical cases /practicals shall take into account common diseases, which the student is likely to come in contact in practice.

During evaluation (both external and internal) it shall be ascertained if the candidate has acquired the skills.

There shall be one main examination in a year and a supplementary to be held not later than 6 months after the publication of its results.

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

DURATION OF EXAMINATION & QUESTIONS

(i) Each written paper will be of three hours duration having eight questions, only five questions to be attempted. No choice will be given in any questions.

(ii) A Clinical/Practical examination in any subject for student shall not be for more than a day. In no case more than 20 students be examined for Clinical/Practical & Oral in a day.

GENERAL

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

INTERNSHIP

General

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

SPECIFIC OBJECTIVES

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

(i) Perform all the diagnostic techniques

(ii) Use discretely the essential laboratory services

(iii) Manage all type of clinical diagnostic methods

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

(v) Develop leadership qualities to function effectively as a leader of the Laboratory environment.

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

INTERNSHIP TIME DISTRIBUTION

Main Objective

Development of skill and competency in data processing, reporting and maintenance of records, Laboratory investigations.

Total Period and Internship: 6 months

Histopathology & Cytology Lab.	-	1-1/2 Months
Clinical Pathology & Hematology Lab.	-	1-1/2 Months
Clinical Biochemistry Lab.	-	1-1/2 Months
Medical Microbiology Lab.	-	1 Month
Transfusion Medicine/Blood Bank	-	15 days

OTHER DETAILS

(i) All Parts of internship shall be done as far as possible in the Hospitals or Medical College.

(ii) Every Candidate will be required after passing the final B.Sc (Medical Lab. Tech.) Examination to under go compulsory rotator internship to the satisfaction of the college Authorities and University concerned for a period of 6 months so as to be eligible for the award of the degree of Bachelor of Science in Medical Laboratory Technology and registration.

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

(iv) The state medical faculty and council for allied health profession will grant Provisional registration to the candidate on production of the provisional B.Sc pass certificate. The Provisional registration will be for a period of 1year. In the event of shortage or unsatisfactory work, the period of provisional registration and the compulsory rotating internship may be suitable extended by the appropriate authorities.

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

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

ASSESSMENT OF INTERNSHIP

(i) The interns maintain the record of work, which is to be verified and certified by the senior Medical Officer/Technician under whom he/she works. Apart from scrutiny of the record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude during and the end of training. Based on the record of work and date of evaluation the Director principal/Principal shall issue 'Certificate of Satisfactory Completion' of training following which the University shall award the B.Sc (MLT) Degree of declare the candidate eligible for the same.

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

(a) Proficiency of knowledge required for each Laboratory Techniques

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

(c) Responsibility, Punctuality, work up of Laboratory Techniques, involvement in procedures, follow of report.

(d) Capacity to work in a team (behavior with colleagues nursing staff and relationship with Medical and Paramedicals).

(e) Initiating, participation in discussion, research aptitude.

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

VACATION

There shall be a minimum 30 days vacation every year or as session
requirement laid down by the Institute.

MEDIUM OF INSTRUCTION

English shall be the Medium of Instructions for all the subjects of study and for examination of the Bachelor of Medical Laboratory Technology course.

WORKING DAYS IN AN ACADEMIC YEAR

Each Academic year shall spread over a period of not less than 180 working days.

CONDONATION OF LACK OF ATTENDANCE

As per the existing rules and regulations of the SGRR University, Dehradun.

SUBMISSION OF RECORD NOTE BOOKS

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

CLASSIFICATION OF SUCCESSFUL CANDIDATES

REVALUATION OF ANSWER PAPERS

The regulations as prescribed by the University for other undergraduate course shall be applicable.

AWARD OF MEDALS AND PRIZES

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

UNIVERSITY RANKING

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

CURRICULUM (SUBJECT WISE)
SYLLABUS FOR MEDICAL LAB. TECHNOLOGY

Goal

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

Objectives

(A) Knowledge : At the end of course, student shall be able to comprehend the normal disposition, clinically relevant interrelationship, functional Anatomy of various structure in the body. Identify the microscopic structure and correlate elementary ultra structure of various organs and tissues and correlate the structure with functions as a pre requisite for understanding the alter state in various disease processes specially with respect to physical pathology and microbial infections and infestations.

(B) Skills: At the end of the course, student shall be able to Identify and locate all the structures of the body and mark the topography of the living anatomy. Identify the organs and tissues. Understand the principles of karyotyping, Understand clinical bases of common clinical procedures of diagnoses of Microbial infections and infestations.

(C) Integration: From the Integrated teaching of other basic sciences, students shall be able to comprehend the regulation and integration of the functions of the organs and systems in the body and thus interpret the pathological, biomolecular & microbial basis of diseases including advanced diagnostic technology.

B.Sc Medical Lab Technology Ist year

PAPER I: HUMAN ANATOMY & PHYSIOLOGY

Unit I

Introduction to Medical Sciences.
Organization of human body and integrated physiology.
Cell organizations, fundamental tissues of body and organ system.
Primary defense mechanism of human body against pathogenic microbes.
Gross anatomy and histology of organs or respiratory system, organs of respiration, mechanism of respiration and factors controlling it.
Gross anatomy and histology of organs of alimentary system, organs of digestive system, various glands associated with the digestive system, mechanism and physiology of digestion and absorption.

Unit II

Cells and organs of immune system: Morphology and their distribution.
Gross anatomy and physiology of reticulo – endothelial system.
Secondary immune response of human body to external stimuli.
Physiology of various body fluids: CSF, Peritoneal, Pericardial, Pleural and synovial fluids.
Gross anatomy, history & physiology of excretory system.
Gross anatomy and histology of organs of cardiovascular system, organs of the system, mechanism and physiology of blood flow through the cardiovascular system.

Unit III

Gross Anatomy and histology of musculo-skeletal system, classification & functions of bones and muscles. Physiology of muscular contraction and factor controlling them various types of joints and their physiology.
Gross anatomy and histology of organs of nervous system, division of nervous system and mechanism of nerve impulse transmission & reflex arc, sensory and motor system, sensory & motor systems special sense organs.
Gross Anatomy and histology of organs of reproductive system, mechanism of reproduction and factors controlling it
Gross anatomy and histology of organs of endocrine system, different glands of the system and their distribution. Mechanism of hormone production, factors controlling it and their mechanism of action.

B.Sc Medical Lab Technology Ist year
PAPER II: BASIC PATHOLOGY

Unit I

Introduction to Hematology. Laboratory organization & Safety measures.
Formation, Composition and functions of blood.
Anticoagulants, mode of action of anticoagulants and their merits and demerits.
Collection, preservation, transport and handling and disposal of blood samples.
Basic hematology and estimation of haematocrit values, physiological variations, normal and absolute values and quality assurance in hematology.

Unit II

Romanowsky dyes, preparation and staining procedure of blood smears
Morphology of blood cells and their identifications.
Haemo-globinometery : Various methods, errors involved and standardization of instruments.
Haemo-cytometry : Procedure of cell count, visual as well as electronic, red cell, leukocyte and platelet count. Errors involved and mean to minimize such errors.
Determinations of innate immunity and is mechanism, phagocytosis the compliment system, gross structure and development of cells concerned with antibody production, cellular processes involved in antibody formation.

Unit III

bacterial endocarditits) and rheumatological disorders.
Study of microbes responsible for pathogenesis of tumors and their oncogenesis.
Immuno- histopathology & Immuno – Pathology of inflammation in response to microbial invasion. Pathology of localized and systematic infections. Various routes of transport of Microbes tto human body and methods of defense. Invasive techniques for diagnosis of acute and chronic microbial infections.
Pathology of specific chronic infective disorders: Tuberculosis, Leprosy, Syphilis, SABE (subacute histochemistry (Basic Principles of Procedures and applications)
Introduction to blood banking technology

B.Sc Medical Lab Technology Ist year

PAPER III: CLINICAL BIOCHEMISTRY

Unit I

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

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

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

Sterilization and disinfection: Study of various methods of sterilization dry and moist heat. Radiation, filtration, autoclaving and chemical disinfection. Henderson – Hassalbach equation and its clinical applications. Acid base disturbances and their clinical significance. Acid-base- buffer and pH – simple calculations. Concept of clinical sensitivity and specificity and factors affecting the clinical results.

Collection of blood specimens avoiding Haemolysis, de- proteinization & separation of serum /Plasma.

Biochemical composition of body fluids and their physiological variations.

Physical and Biochemical Examination of Urine Samples: Qualitative tests of inorganic Urinary ingredients: Chlorides, phosphate, sulphur compounds, sodium, Potassium, calcium and magnesium and their clinical significance. Qualitative tests for glycosuria, pentosuria, galactosuria, proteinuria, microalbuminuria and Bence Jones Proteinuria and their clinical significance. Qualitative test of urine for uric acid, urea and creatinine. Quantitative estimation of 24 hours urine for albumin and 17-ketosteroids and their clinical significance. Physiological variation of biometabolytes in various body fluids and their significance. Pathological changes in composition of body fluids and their clinical correlation. Qualitative test of urine for ketone bodies, bilesalts, bile – pigments and urobilinogen and their clinical significance.

Unit II

1. **Carbohydrates:** Structure, classification and their function in biological system.
2. **Lipids:** General structure of Fatty Acids and classification of Lipids.
3. **Proteins:** Classification, structural organization and function of proteins.
4. **Enzymes:** Definition, classification of Enzyme, concept of active sites and general mode of action of enzymes.
5. **Nucleic acids:** Structure function and types of DNA and RNA. Nucleotides, Nucleosides, Nitrogen bases and role of Nucleic Acid.

B.Sc Medical Lab Technology Ist year

PAPER IV: PREVENTIVE MEDICINE AND HEALTH CARE

Unit I

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

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

Infection and control: Microbial Pathogenecity, source and spread of infections in community, Pathogenesis, toxigenicity, invasiveness, variations and virulence. Host factors controlling infections to men, mode of spread and their control by physical & chemical agents.

Unit II

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

Prophylactic immunization: Rationale of immunization, immune response and duration of immunity. Controlled studies of prophylactic vaccines and hazards immunization.

Reproductive, family planning & Child Health Care Programs.

Unit III

Bacteriology of water, milk, food and air: Bacteriological examination of water collection of specimens, presumptive coliform count, cloakroom test, colony count and interpretation of results. Bacterial examination of sewage and sewage effluents. Bacteriological examination and control of swimming bath, membrane filter technique and isolation of pathogens. Bacteriological examination milk, bacterial standards and various tests for pasteurized milk. Bacterial examination of ice-cream, shelfish and canned foods, milk bottles, crockery and cutlery. Examination of food stuff in cases of out break of food poisoning. Bacteriological examination of air and environment dust.

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

Health Planning & Management: Health planning, Planning Cycle, Malaria eradication & various other National Health policy & Programs.

B.Sc Medical Lab Technology Ist year

PAPER V: MICROBIAL BIOLOGY

Unit I

Microbiology & Medicine: Introduction to Medical Microbiology, Discovery of micro-organisms, Contribution of Robert Koch, Antony Van Leeuwen hook, Louis Pasteur, Bordet, Paul Ehrlich, Alexander Fleming, Matchnikoff, Needham, Tyndall Jensson, Joseph lister, Karls Landsteiner etc. Scope & relevance and Safety measures of Medical Microbiology, Role of medical microbiology in identification and management of various infectious diseases.

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

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

Sterilization and disinfection: Various physical methods of sterilization – heat UV radiation, ionizing radiation, character affecting sterilization, auto clave control and sterilization indicators. Chemical disinfectants – phenol and its compounds, aldehyde, gaseous compound. Use and abuse of disinfectants.

Unit II

Cultural Media: Liquid and solid media, container for medias distribution of media in tubes, bottles and Petri dishes. Common ingredients of cultural Medias. Synthetic media, peptone water, nutrient agar and broth, chocolate and blood agar, meat extract broth milk agar etc. Special Medias for neisseria corrynebacterium, mycobacterium & Enterobacteriacae group etc.

Cultivation of bacteria: Instruments used, inoculation hood, laminar flow, culture procedure, incubation (Aerobic and Anaerobic). Isolation of pure culture and its preservation. Suspending media for freeze drying of bacteria. Blood culture.

Pure cultures: Maintenance & preservation of pure cultures. Collection, transport processing & storage of clinical samples for microbiological Analysis.

Growth and Nutrition of Bacteria: Typical growth, curve, various phases of growth, physiology of bacteria – catabolism and anabolism. Nutrition of microbes and physical condition required for growth. Effect of Carbon, Nitrogen, Growth factors, Vitamins, Temperature, pH, Osmotic pressure, Oxygen and Carbon Di oxide on microbial growth.

Unit III

Lab. Organization, Management, Recording of Results and Quality Control in Medical Microbiology.
Principles of Staining Techniques, Preparation Stains and their storage.

Introduction to Virology, Mycology & Parasitology: (Characteristic, morphology, classification, nomenclature, pathogenesis).

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

B .Sc Medical Lab Technology Ist year

PAPER VI: TECHNICAL METHODS IN MICROBIAL BIOLOGY

Unit I

1. **Microscopy:** Study of compound microscope-magnifying, numerical aperture, resolution and components of microscope. Dark ground illumination care of microscope and common difficulties. Micrometry Study of phase contrast, interference, fluorescent an electron microscope. Preparation of smear for electron microscope.
2. **Study of pH in Microbiology:** Methods for measurements pH meter. Preparation, dilution and chemistry of suspension fluid. Oxidation-reduction redox) potential.
3. **Preparation of stains:** Making of films, staining methods, mounting media. Gram's stain-Preparation of stain and staining methods. Special stains for AFB, Diphtheria, spores, capsule, intracytoplasmioc lipids, polysaccharides, nuclear material, field's stain, stain for amoeba, fungi and rickettssiae.

Unit II

Study of instruments used in medical microbiology-

1. **General Instruments:** Distillation plant, centrifuge Machine, Analytical Balance, Hotplate, Magnetic Stirrer, Water Bath, Automatic Dispensers and diluters, De-idonizer etc.
2. **Microbiological Instruments:** Autoclave, Incubator, Hot air oven, Laminar Air flow, Colony Counter, Muffle furnace, Refrigerator, Inculator, Mac-Intos, intos field- jar etc.
3. **Instruments used in immunology:** Electrophoresis, Immunodiffusion, starplate, chromatography, Elisa reader, automatic washer and RIA equipments etc.
4. **Care and management of experimental animals:** General directions for the care of animals, material inoculated, necropsy common diseases and experimental procedures. Various experimental animals-rabbits, guinea pigs, mice, rat, hamsters' fowls and monkeys-their data, cages, feeding and handling.
5. **Safety measures in Microbiology Laboratory:** Occurrence of lab infections, route of infection in Laboratory, safety measure precaution in use of pathogens in teaching lab organization, management, recording of results and quality control n Medical Microbiology Lab.
6. **Culture and Drug Sensitivity tests:** Culture, isolation and identification of pathogens from urine, pus and sputum and recording of their results.

B.Sc Medical Lab Technology 2nd year

PAPER I: CLINICAL BIOCHEMISTRY-I
(SEPARATIVE AND INSTRUMENTAL TECHNIQUES)

Unit I

Chromatography: Thin layer chromatography, gas liquid chromatography.
Electrophoresis-Paper and gel electrophoresis for hemoglobin, urinary proteins, serum CSF & LDH.
Colorimetry, flame photometry, atomic absorption spectroscopy.

Unit II

Immunochemical, Immunoprecipitation, Immunofixation and radial immunidiffusion test.
Osmometry: Principle, procedure and applications.
Semi auto-analyzer, diluters & dry chemistry analyzer: Principal Procedure and applications.

Unit III

Principal Procedure and Application of:

Coulter counters.
Enzyme Linked Immunobsorvent Assay (ELISA) Reader.

Radio-Immunoassay. (RIA)
Polymerase chain reaction (PCR).

B .Sc Medical Lab Technology 2nd year

PAPER II: CLINICAL BIOCHEMISTRY-II (METABOLIC AND BLOOD CHEMISTRY)

Unit I

Carbohydrate metabolism, glycolysis, TCA and their clinical importance, glucose tolerance test (GTT).
Protein metabolism-urea cycle and its biomedical significance.
Lipid metabolism, Beta-oxidation of fatty acids, ketonebodies, metabolic changes in liver and adipose tissues during starvation, lipid profile.

Unit II

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

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

Unit III

Acid base balance test, Xylose Absorption test and insulin tolerance test, Urea and creatinin clearance tests and their significance. Renal function tests and their clinical interpretation.
Glycosylated Hb & Liver function tests. Principle technique and clinical significance.

B .Sc Medical Lab Technology 2nd year

PAPER III: MEDICAL MICROBIOLOGY-I (BACTERIAL PATHOGENS & ASSOCIATED DISEASES)

Unit I

Normal microflora of human body: Skin, Respiratory system and Genitourinary tracts. Source of infection, mode of spread and portals of entry.
Description, Pathogenecity, mode of infection, incubation period and toxigenecity of:-

Staphylococcus
Streptococcus
Pneumococcus
Neisseria
Bordetella
Haemophilus

Unit II

Host Parasite interaction in bacterial infections. Pathogenic properties of bacteria (colonization of surfaces, invasion of tissue, production of exo and indo toxins). Anti bacterial defence of the host.

Description, Pathogenecity, mode of infection, incubation period and toxigenecity of:-

1. Corynebacteria, Erysipelothrix, listeria
2. Mycobacteria
3. Atypical Mycobacteria
4. Anthrax bacillus
5. Brucella
6. Yersenia, pasteurella & francisella

Unit III

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

Description, Pathogenecity, mode of infection, incubation period and toxigenecity of:

1. Salmonella
2. Shigella
3. Proteus
4. Pseudomonas, Loeffleralla
5. vibrio
6. Clostridia

B .Sc Medical Lab Technology 2nd year

PAPER IV: MEDICAL MICROBIOLOGY-II

(TECHNICAL METHODS IN MEDICAL MICROBIOLOGY)

Unit I

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

a) Specimen collection from patients, clinics and hospitals.
b) Specimen collection for epidemiological investigations.
c) Training of medical microbiologist to handle epidemics.

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

a) Grams positive Cocci:- Cluster forming, chain forming and diplo cocci.
b) Neisseria, Bordetella and haemophilus.

Pathogenesis and Pathology of infections caused by 2 (a) and 2 (b).

Unit II

Isolation of pure culture and its preservation.

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

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

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

Unit III

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

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

Pathogenesis and Pathology of infections caused by 2 (1 to 7).

B .Sc Medical Lab Technology 2nd year

PAPER V: PATHOLOGY AND ALLIED SUBJECTS-I (HAEMATOLOGY & CLINICAL PATHOLOGY)

Unit I

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

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

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

Unit II

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

Hematological malignancies: Various types of malignancies such as leukemia Lymphomas including multiple myeloma. Their identification & clinical features.

Lab investigations in haematological malignancies.

Unit III

Haematological Changes in systematic disorders. Their microscopic picture with identification and clinical features. Hematological aspects of pediatric and Geriatric age groups. Hematological disorders in pregnancy and their blood picture. Hematological changes in AIDS.

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

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

B .Sc Medical Lab Technology 2nd year

PAPER VI: PATHOLOGY AND ALLIED SUBJECTS-II (HISTOPATHOLOGY & CYTOLOGY TECHNIQUES)

Unit I

Reception recording and labeling of histology specimens.
Fixation and various fixatives.
Processing of histological tissues for Paraffin embedding.
Embedding and embedding media.
Decalcification – various methods.
Microtomes – various types their working principle and maintenance

Unit II

Section cutting- faults and remedies.
Microtome knives and knife sharpening
Dye chemistry theory and practice of staining.
Routine Staining procedures H and E mounting and mounting media.
Solvents mordents accelerators and accentuators

Unit III

Uses of controls in various staining procedures.

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

B .Sc Medical Lab Technology 3rd year

PAPER I: CLINICAL BIOCHEMISTRY-I (BIOSTATICS, AUTOMATION & ENDOCRINOLOGY)

Unit I

Basic bio-statics for clinical quality control. Standard deviation, standard error, coefficient of variation, normal distribution, t-test and chi-square test.

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

Terminology of quality control and quality control charts.

Unit II

Normal ranges of various bio-metabolites and their confidence limits.

Automation: Handling of automatic analyzers, organization and management of hospital laboratory.

Unit III

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

Endocrinology: Estimation of growth hormone, ACTH, sex hormone binding globulin, eldosterone, parathormon, cortisol and 17 – hydroxyprogesteron and their clinical significance.

B .Sc Medical Lab Technology 3rd year

PAPER II: CLINICAL BIOCHEMISTRY-II (Diagnostic Enzymology)

(Principle of assay, procedure and clinical significance)

Unit I

1. Principles of enzyme activity determination. Units for expressing enzyme activity.

Factors affecting enzyme activity. Mechanisms responsible for abnormal enzyme levels.

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

Unit II

1. Serum leucine, amino peptidase, alkaline and acid phosphatases.

2. Fructosamine test in semen.

3. Analysis of renal biliary and prostatic stones. Tests for foetal well being by amniotic fluid. Analysis for alpha-foetoprotein and lactogen and their clinical significance.

Unit III

1. Gastric analysis, free and total acidity, pentagastrin test, histamine and caffeine stimulation tests.

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

3. Infertility profile: TSH, FSH, LH, testosterone, estrogen, prolactin and DHEA sulphate.

B .Sc Medical Lab Technology 3rd year

PAPER III: Medical Microbiology-I (PATHOGENIC VIRUSES AND MISC. MICROBES)

Unit I

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

2. Pox-viruses: Smallpox, Vaccinia, Molluscum contagiosum.

3. Herpes Virus: H Simplex, Chickenpox-Zoster, CMV, IMN and burkitts Lymphomas.

4. Adenoviruses: Pharyngeal infections Respiratory infections and conjuctival infections.

Unit II

1. Orthomixoviruses (Influenza Types A,B,C, etc,): Influenza.

2. Paramyxovirus: Respiratory infections, mumps and measles.

3. Miscellaneous Viruses: Rubella, Crona arena viruses: Rubella common cold lymphocytic choriomeningitis.

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

Unit III

1. Hepatitis Viruses: Infectious and Serum Hepatitis.

2. Arbo Viruses: Encephalitis Yellow fever, Dengue fever.

3. Rhabdo Viruses: Rabies

4. Slow and oncogenic Viruses: Scrapie Kuru and animal virus tumors.

5. Cell Culture and observation of effect of viruses on cell: Technique, procedure and interpretation of results.

B .Sc Medical Lab Technology 3rd year

PAPER IV: Medical Microbiology-II

(APPLIED MICROBIOLOGY & ADVANCE TECH.)

Unit I

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

2. Portal regulation and transport of specimen.

3. Flowchart of lab diagnostic procedures.

4. Documentation of specimen in laboratory.

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

Unit II

1. Human parasitology: Protozoa, rhizopoda and helminths.

2. Immunology and sero-diagnosis.

3. Prophylactic mass immunization

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

Unit III

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

2. Cell, tissue and organ culture.

3. Specific serological methods of diagnosis.

4. Test for bacterial sensitivity to antimicrobial agents and their interpretation.

5. Specific culture and drug sensitivity methods.

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

B .Sc Medical Lab Technology 3rd year
PAPER V: PATHOLOGY & ALLIED SUBJECT-I (IMMUNOPATHOLOGY & TRANSFUSION MEDICINE)

Unit I

1. Introduction and antigens.
2. Cells and organs of the immune system.
3. Immunoglobulin and antibodies.
4. Humoral & Cellular immune response.
5. Detection of various allergic agents and immunopathology of allergy.
6. Rheumatological diseases: Pathogenesis and Lab diagnosis.

Unit II

1. Infection, inflammation and the immune system.
2. Cancer immunology & Tumor markers.
3. Tissue typing for kidney transplant & bone marrow transplant.
4. Laboratory tests for demonstration of antigen-antibody reaction and cell mediated immunity.
5. Laboratory investigations in megaloblastic anaemias (Iron deficiency, megaloblastic, haemolytic).

Unit III

1. Pathogenesis and laboratory investigation in Leukemia's.
2. Laboratory investigation in coagulation disorder, bleeding disorder, disseminated intravascular coagulation (DIC), Platelet functions etc.
3. Cytogenetics in hematology.
4. Radioisotopes and their applications.

B .Sc Medical Lab Technology 3rd year
PAPER VI: PATHOLOGY & ALLIED SUBJECT-II (HISTOPATHOLOGY & CYTOLOGY)

Unit I

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

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

3. Lipids, identifications and demonstration.

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

5. Nucleic acids DNA and RNA special stains and procedures.

Unit II

1. Cytoplasmic constituents and their demonstration.

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

3. Neuropathological techniques.

4. Enzyme histochemistry demonstration of phosphates, dehydrogenases, oxidase and peroxidases. etc.

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

Unit III

1. Immunohistochemistry.

2. Cervical cytology-basis of detection of malignant and pre-malignant lesions.

3. Hormonal assessment with cytological techniques.

4. Demonstration of sex chromatin

5. Aspiration cytology principles indication and utility of the techniques with special emphasis on role of cytotechnician in FNAC clinics.