

H.N.B. Garhwal University, Srinagar, Garhwal

Examination Scheme, Syllabus & Ordinances

For

Bachelor of Science in

Medical Lab. Technology

Dolphin Institute of Bio-Medical & Natural Sciences
Manduwala, Dehradun

HEMWATI NANDAN BAHUGUNA GARHWAL UNIVERSITY
SRINAGAR (UTTARANCHAL)

**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 the H.N.B. Garhwal University Act, the Academic Council of the Hemwati Nandan Bahuguna Garhwal University, Srinagar, Garhwal hereby makes the following regulations:-

SHORT TITLE AND COMMENCEMENT

These regulations shall be called “THE REGULATIONS FOR THE BACHELOR OF fundament SCIENCE - MEDICAL LABORATORY TECHNOLOGY OF THE HE MWATI NANDAN BAHUGUNA GARHWAL UNIVERSITY, SRINAGAR, GARHWAL”

- I. These Regulation and the syllabus shall come into force from the 2001 -2002 academic session onwards.
- II. The regulations framed are subject to modification from time to time by the Standing Academic Board of the University
 - A) Graduate Allied Health Science curriculum is oriented towards training students to help the responsibilities of physician of first contact who is capable of looking after the preventive, promotive, curative and rehabilitative aspects of medicine.
 - B) With wide range of career opportunities available today, an Allied Health Science graduate has a wide choice of career opportunities. The training though broad based and flexible should aim to provide an educational experience of the essentials required for health care in our country.
 - C) To undertake the responsibilities of service situations which is a changing condition and of various types. It is essential to provide adequate placement training tailored to the needs of such services as to enable the Allied Health Science graduates to become effective instruments of implementation of those requirements. To avail of opportunities and be able to conduct professional requirements the graduate shall endeavour to have acquired basic training in different aspects of medical care.
 - D) The importance of the community aspects of health care and of rural health care services is to be recognized including rehabilitation. This aspect of education and training of Allied Health Science graduates should be adequately recognized in the prescribed curriculum. Its importance has been systematically upgraded over the past years and adequate exposure to such experiences should be available throughout all phases of education and training. This has to be further emphasized and intensified by providing exposure to field practice areas and training during the internship period. The aim of the period of training during internship is to enable the fresh graduates to function efficiently under such settings.

- E) As such all the basic concepts of modern scientific medical education allied with allied health sciences are to be adequately dealt with particularly the Physiotherapy and Physiotherapy areas.
- F) There must be enough experiences to be provided for self-learning. The methods and techniques that would ensure this must become a part of teaching-learning process.
- G) The Allied Health Science graduate of modern scientific medicine shall endeavor to become capable of functioning independently under the supervision of a Physician in both urban and rural environment. He/She shall endeavor to give emphasis on fundamental aspects of the subjects taught and on common problems on health and disease.
- H) The importance of social factors in relation to the problem of health and disease should receive proper emphasis throughout the course and to achieve this purpose, the educational process should also be community based particularly for Occupational Therapy and Physiotherapy.
- I) Adequate emphasis is to be place on cultivating logical and scientific habits of thought, clarity of expression and independence of judgment, ability to collect and analyze information and to correlate them.
- J) The educational process should be placed in a Laboratory/Practical background as and evolving process and not merely as an acquisition of a large number of disjointed facts without a proper perspective.
- K) Lectures alone are generally not adequate as a method of training and are a poor means of transferring/acquiring information and even less effective at skill development and in generating the appropriate attitudes. Every effort should be made to encourage the use of active methods related to demonstration and on first hand experience, Students will be encouraged to learn in small groups through peer interactions so as to gain maximal experience. While the curriculum objectives often refer to areas of knowledge or science, they are best taught in a setting of clinical relevance and hands on experience for students who assimilate and make this knowledge a part of their own working skills.
- L) The Allied Health Science graduate medical education in clinical subjects should be based primarily on outpatient teaching, other medical and surgical departments and within the community including peripheral health care institutions. The outpatient departments should be suitably planned to provide training to graduates in small groups and demonstration subjects of all the appropriate techniques.
- M) Clinics should be organized in small groups of preferably not more than 10 students so that a teacher can give personal attention to each student with a view to improve his skill and competence in handling of the patients.

- N) Proper records of the work should be maintained which will form the basis for the students internal assessment and should be available to the inspectors/examiners at the time of inspection/examination of the college.
- O) Maximal efforts have to be made to encourage integrated teaching between traditional subject areas using a problem based learning approach starting with clinical and exploring the relevance of various pre-clinical disciplines in both understanding and resolution of the problem. Every attempt be made to de-emphasize compartmentalization of disciplines so as to achieve both horizontal and vertical and integration in different phases.
- P) Every attempt is to be made to encourage students to participate in group discussions and seminars to enable them to develop personality, character, expression and other faculties which are necessary for Allied Health Science graduate to function either in solo practice or as a team leader when he begins his independent career. A discussion group should not have more than 20 students.
- Q) Faculty members should avail of modern educational technology while teaching the students and to attain this objective.
- R) To derive maximum advantage out of this, the vacation period to students in one calendar year should not exceed one month, during the 4 years of Bachelor of Allied Health Science Courses, which includes BPT, BOT, B.Sc. (MLT), B.Sc. (Med. Micro), B.Sc. (RD&IT), B.Sc. (Nursing), B. Pharm etc.

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 and vertical 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 to define the kind of trained manpower (or professional) they intend to produce. The undergraduate students coming out of a 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 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 the 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, provided 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 }.

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 and 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. M.L.T. 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 extraordinary 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 course of study in affiliated institution 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. M.L.T. (Six months duration) : Internship

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

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 the aggregate of the marks of all the courses/subjects prescribed for the degree as under:

- (i) Passed honours 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%

Compartments/Supplementary/Back Paper

- (i) A student who obtains 40% of marks individual but has failed in two papers shall be permitted to appear in those papers only at the two consecutive examinations and 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 1st year would not be admitted in 3rd year course.

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 Voce in each subject will carry 30% marks as internal & 70 % marks as external assessment (according to examination scheme) prescribed for the year.

PHASE DISTRIBUTION AND TIMINGS OF EXAMINATIONS:-

- Ist Annual examination (or at the end of second semester)
- IInd Annual examination (or at the end of forth semester)
- IIIrd Annual examination (or at the end 6th semester)
- 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 discussions tutorials, demonstrations, practicals, Hospital (Tertiary, Secondary, Primary) Postings and bed side clinics, etc. physic

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: Note: I

- (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/clinicals 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.	-	1-½ Months
Clinical Pathology & Hematology Lab.	-	1-½ Months
Clinical Biochemistry Lab	-	1-½ 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 undergo compulsory rotatory 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 1 year. 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 of work in a team (behavior with colleagues, nursing staff and relationship with Medical and Paramedical).
 - (e) Initiating, participation in discussions, 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 Instruction for all the subjects of study and for examinations 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 H.N.B. Garhwal University, Srinagar Garhwal.

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 aggregate 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 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 structures in the body. Identify the microscopic structure and correlate elementary ultra structure of various organs and tissue 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 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.

Regulations for the award the B.Sc. Medical Lab Technology Degree

Admission Requirements

1. **Marks Requirements :** 50% Minimum in Science (P.C.B. / P.C.M.) aggregate of Intermediate or Equivalent Examination. The B.Sc. Medical Lab Technology is a Three and Half Years integrated Degree course, under 10+2+3 system of education. Admission to the first year class of B.Sc. Medical Lab Technology degree course shall be open to a person who has passed 10+2 examination in science group under 10+2+3 system of education or its equivalent examination with Chemistry, Physics, Mathematics / Biology and English as the subjects with not less than 50% Marks conducted by a recognized Board / Council / University. Candidates who have passed 10+2 Examination in Medical Lab Technology in Vocational Scheme or 3 years Diploma in Medical Lab Technology / Medical Microbiology conducted by recognized Board / Council / University or Medical College will also be eligible.
2. A person shall be eligible to join the second / third year classes of the B.Sc. course who has passed first year or second year examination of B.Sc. Medical Lab Technology conducted by H.N.B. Garhwal University, Srinagar – Garhwal (Uttaranchal).
3. The Examination in First / Second / Third Year shall be open to a student who :
 - a) Has passed not less than one academic year previously the qualifying examination as laid down in regulation 2 above.
 - b) Has remained on the rolls of the course concerned for full one academic year proceeding the examination and having attended not less than 75% of the full course of lecture and practicals held for the purpose in each year. The lectures / practical will be counted upto the last day when the classes breakup for appearing in the examination.
4. Duration of course will be of Three and Half Years (Three years of course of work and six months of internship).
5. The degree of B.Sc. Medical Lab. Technology will be awarded to the candidate only after he / she has completed the following :-
 - (i) Has passed all the three University Examinations.

(ii) Has satisfactorily completed the full period of training of three years and submitted his /her project reports and completed six months internship in a hospital with not less than 20 beds.

(iii) All dues shall be cleared or after the clearance of all types of dues regarding Department / Institute / University.

B.Sc. Medical Lab. Technology Examination Scheme

1. The minimum pass marks will be 40% in individual subjects in theory and practical and 50% in aggregate.
2. The theory and practical papers will be of equal weight age with 25% in Sessional and 75% in final University Examination.
3. The division will be determined on the basis of the aggregate of the marks of all the courses / subjects prescribed for the degree as under :
 - (i) First Division 60% and above
 - (ii) Second Division 50% and above but less than 60%
 - (iii) Distinction will be marked on 75% and above.
4. Compartments / 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.
5. Theory Examination : All the papers in each year carrying 100 marks out of which 25 marks will be internal assessment and 75 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.
6. The practical examination will be held with the Final Examination. The Practical and Viva Voce in each subject will carry 25% marks as internal and 75% marks as external assessment (according to examination scheme) prescribed for the year.

EXAMINATION SCHEME

B.Sc. Medical Lab Technology – Ist Year

Paper No.	Theory	Paper Code	Duration	Theory (Max. Marks)		Total	Practical (Max. Marks)		Total
				Sessional	Annual		Sessional	Annual	
I.	Human Anatomy & Physiology		3 hrs	30	70	100	30	70	100
II.	Basic Pathology		3 hrs	30	70	100			
III.	Clinical Biochemistry		3 hrs	30	70	100	30	70	100
IV.	Preventive Medicine & Health Care		3 hrs	30	70	100			
V	Microbial Biology		3 hrs	30	70	100	30	70	100
VI.	Technical Methods in Microbial Biology		3 hrs	30	70	100			
Total Marks				180	420	600	90	210	300

B.Sc. Medical Lab Technology – II Year

Paper No.	Theory	Paper Code	Duration	Theory (Max. Marks)		Total	Practical (Max. Marks)		Total
				Sessional	Annual		Sessional	Annual	
I.	Clinical Biochemistry – I (Separative & Instru. Techniques)		3 hrs	25	75	100	25	75	100
II.	Clinical Biochemistry – II (Metabolic & Blood Chemistry)		3 hrs	25	75	100			
III.	Medical Microbiology – I (Bacterial Pathogens & Asso. Diseases)		3 hrs	25	75	100	25	75	100
IV.	Medical Microbiology – II (Tech. Methods in Med. Microbiology)		3 hrs	25	75	100			
V	Pathology & Allied Sub. I (Haematology)		3 hrs	25	75	100	25	75	100
VI.	Pathology & Allied Sub. II (Histotechnology)		3 hrs	25	75	100			
Total Marks in 2 nd Year				150	450	600	75	225	300

B.Sc. Medical Lab Technology – III Year

Paper No.	Theory	Paper Code	Duration	Theory (Max. Marks)		Total	Practical (Max. Marks)		Total
				Sessional	Annual		Sessional	Annual	
I.	Clinical Biochemistry – I (Separative & Instruments Techniques)	BMLT-301	3 hrs	25	75	100	25	75	100
II.	Clinical Biochemistry – II (Diagnostic Enzymology)	BMLT-302	3 hrs	25	75	100			
III.	Medical Microbiology – I (Pathogenic Viruses & Misc. Microbes)	BMLT-303	3 hrs	25	75	100	25	75	100
IV.	Medical Microbiology – II (Applied Microbiology & Advanced Technology)	BMLT-304	3 hrs	25	75	100			
V	Pathology & Allied Sub. I (Immunopathology & Haematology)	BMLT-305	3 hrs	25	75	100	25	75	100
VI.	Pathology & Allied Sub. II (Histopathology)	BMLT-306	3 hrs	25	75	100			
Total Marks in 3 rd Year				150	450	600	75	225	300

B.Sc. Medical Lab Technology – Ist Year
HUMAN ANATOMY & PHYSIOLOGY
Paper – I

Unit – I

1. Introduction to Medical Sciences.
2. Organization of human body and integrated physiology.
3. Cell organization, fundamental tissue of body and organ systems.
4. Primary defense mechanism of human body against pathogenic microbes.
5. Gross anatomy and histology of organs of respiratory system, organs of respiration, mechanism of respiration and factors controlling it.
6. Gross anatomy and histology of organs of alimentary system, organs of digestive system, and various glands associated with the digestive system, mechanism and physiology of digestion and absorption.

Unit – II

1. **Cells and organs of immune system:** Morphology & their distribution.
2. Gross anatomy and physiology of reticulo – endothelial system.
3. Secondary immune response of human body to external stimuli.
4. Physiology of various body fluids: CSF, Peritoneal, Pericardial, Pleural and synovial fluids.
5. Gross anatomy, histology & physiology of excretory system.
6. 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

1. Gross anatomy and histology of musculo – skeletal system, classification & functions of bones and muscles. Physiology of muscular contraction and factors controlling them. Various types of joints and their physiology.
2. Gross anatomy and histology of organs of nervous system, division of nervous system and mechanism of nerve impulse transmission and reflex arc, sensory and motor system, special senses organs.
3. Gross anatomy and histology of organs of reproduction system, mechanism of reproduction and factors controlling it.
4. 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
BASIC PATHOLOGY
Paper – II

Unit – I

1. Introduction to Hematology. Laboratory organization and safety measures.
2. Formation, composition and functions of blood.
3. Anticoagulants, mode of action of anticoagulants and their merits and demerits.
4. Collection, preservation, transport and handling and disposal of blood samples.
5. Basic hematology and estimation of haematocrit values, physiological variations, normal and absolute values, and quality assurance in hematology.

Unit – II

1. Romanowsky dyes, preparation and staining procedures of blood smears. Morphology of blood cells and their identification.
2. Haemo – globinometry : Various methods, errors involved and standardization of instruments.
3. Haemo – cytometry : Procedure of cell count, visual as well as electronic, red cell, leukocyte and platelet count. Errors involved and means to minimize such errors.
4. Determination of innate immunity and its mechanism, phagocytosis, the complement system, gross structure and development of cells concerned with antibody production, cellular processes involved in antibody formation.

Unit – III

1. Pathology of inflammation in response to microbial invasion. Pathology of localized and systemic infections. Various routes of transport of microbes to human body and methods of defense. Invasive techniques for diagnosis of acute and chronic microbial infections.
2. Pathology of specific chronic infective disorders : Tuberculosis, Leprosy, Syphilis, SABC (subacute bacterial endocarditis) and rheumatological disorders.
3. Study of microbes responsible for pathogens of tumors and their oncogenesis.
4. Immuno – histopathology and Immuno – histochemistry (Basic Principles Procedures and applications).
5. Introduction to blood banking technology.

B.Sc. Medical Lab Technology – Ist Year
CLINICAL BIOCHEMISTRY
Paper – III

Unit – I

1. Introduction to Clinical Biochemistry and role of medical microbiologist, ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents.
2. Basic awareness of laboratory in respect to equipments and glasswares. Unit of measurements and calibration of volumetric apparatus. Colorimetry, spectrophotometry, flame-photometry, analytical balance etc. (principles, instrumentations and applications).
3. Preparation and storage of reagents, standard solutions, buffer solutions and their pH determination. Biophysical, techniques – osmosis, dialysis, surface tension, sedimentation and viscosity – principles and applications.
4. Sterilization and disinfection : Study of various methods of sterilization – dry and moist heat, radiation, filtration, autoclaving and chemical disinfection.
5. Henderson – Hassalbach equation and it's 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.

Unit – II

1. Collection of blood specimens avoiding Haemolysis, de-proteinization and separation of serum / plasma.
2. Biochemical composition of body fluids and their physiological variations.
3. 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.
4. 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 hrs urine for albumin and 17-ketosteroids and their clinical significance.
5. Physiological variation of biometabolites in various body fluids and their clinical significance. Pathological changes in composition of body fluids and their clinical correlation. Qualitative test of urine for ketone bodies, bile slats, bile – pigments and urobilinogen and their clinical significance.

Unit – III

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 functions of protein.
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
PREVENTIVE MEDICINE AND HEALTH CARE
Paper IV

Unit – I

1. 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.
2. Hygiene and sanitation : Sanitation barriers, excreta disposal and disposal of hospital waste. Incineration and disinfection.
3. Infections and control : Microbial pathogenicity, source and spread of infections in community, pathogenesis, toxogenicity, invasiveness, variations and virulence. Host factors controlling infections. Sources of infections to men, mode of spread and their control by physical and chemical agents.

Unit – II

1. Epidemiology : Epidemiology, surveillance and control of community infections. Role of laboratory in community and hospital infections. Emergence of drug resistance. Methods of prevention and control – isolation of patients quarantine and incubation periods of various infectious diseases. Management of patients in infectious disease hospital (IDH).
2. Prophylactic immunization : Rationale of immunization, immune response and duration of immunity. Controlled studies of prophylactic vaccines and hazards of immunization. Various national immunization programs and vaccine schedules.
3. Reproductive, Family planning and Child Health Care Programs.

Unit – III

1. 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 sewae and sewage effluents. Bacteriological examination and control of swimming bath, membrane filters technique and isolation of pathogens.
2. Bacteriological examination of milk, bacterial standards and various tests for pasteurized milk. Bacterial examination of ice-cream, shellfish and canned foods, milk bottles, crockery and cutlery. Examination of foodstuff in cases of out break of food poisoning. Bacteriological examination of air and environmental dust.
3. 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 and yoga in prevention and management of various diseases.
4. Health Planning and Management : Health Planning, Planning Cycle, Malaria eradication and various other National Health Policy and Programs.

B.Sc. Medical Lab Technology – Ist Year
MICROBIAL BIOLOGY
Paper - V

Unit – I

1. Microbiology and Medicine : Introduction to Medical Microbiology, Discovery of micro-organisms. Contribution of Robert Koch, Antony Van Leeuwen Hock, Louis Pasteur, Bordot, Paul Ehrlich, Alexander Fleming, Matchnikoff, Needham, Tyndall, Jenson, Joseph Lister, Kal Land Steiner etc. Scope and relevance and Safety measures of Medical Microbiology. Role of Medical Microbiology in identification and management of various infectious diseases.
2. Morphology and 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, spores and cysts.
3. 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 and antigenic characters etc.
4. Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, characters affecting sterilization, autoclave control and sterilization indicators. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. Use and abuse of disinfectants.

Unit – II

1. Cultural Medias: Liquid and solid medias, containers for medias, distribution of medias 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 and enterbacteriaceae group etc.
2. Cultivation of bacteria: Instruments used, inoculation hood, laminar flow, culture procedure, incubation (Aerobic and Anaerobic). Isolation of pure culture and its preservation. Suspending medias for freeze drying of bacteria. Blood culture.
3. Pure Cultures: Maintenance and Preservation of pure cultures. Collection, transport, processing and storage of clinical samples for Microbiological Analysis.
4. 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

1. Lab. Organization, Management, Recording of Results and Quality Control in Medical Microbiology.
2. Principles of Staining Techniques, Preparation of Stains and their storage.
3. Introduction to Virology, Mycology & Parasitology: (Characteristic, morphology, classification, nomenclature and pathogenesis).
4. Antimicrobial agents and antibiotic: Disinfectants, antiseptic, chemotherapeutic agents, chemotherapeutic index, and development of chemotherapy, antibiotics and effect of antibiotics on protein, nucleic acid and cytoplasmic membrane. Future development of chemotherapy.

B.Sc. Medical Lab. Technology – Ist Year
TECHNICAL METHODS IN MICROBIAL BIOLOGY
Paper – VI

Unit – I

1. Microscopy : Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties micrometry. Study of phase contrast, interference, flurescent and 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 fluids. Oxidation-reduction (redox) potential.
3. Preparation of stains : Making of films, staining methods, mounting medias. Gram's stain –preparation of stain and staining methods. Special stains for AFB, dyptheria, spores, capsule, intracytoplasmic lipids, polysaccharides, nuclear material, Field's stain, stain for amoebae, fungi and rickettssia.

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, Inoculator, Mac-intos Field-jar etc.
3. Instruments used in immunology : Electrophoresis, Immunodiffusion, starplate, chromatography, ELISA reader, automatic washer and RIA equipments etc.

Unit – III

1. 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, guineapigs, mice, rates, hamsters, fowls and monkeys – their data, cages, feeding and handling.
2. Safety measures in Microbiology Laboratory : Occurrence of lab infections, route of infections in laboratory, safety measures precaution in use of pathogens in teaching. Lab organization, management, recording of results and quality control in Medical Microbiology Lab.
3. 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 – II Year
Clinical Biochemistry – I [Separative and Instrumental Techniques]
Paper – I

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 immunodiffusion tests.

Osmometry : Principle, procedures and applications.

Semi auto – analyzer, auto-analyzer, diluters and dry chemistry analyzer : Principle procedure and applications.

Unit – III

Principle Procedure and Application of :

Coulter Counters

Enzyme Linked Immunosorbent Assay (ELISA) Reader.

Radio-immunoassay. (RIA)

Polymerase chain reaction (PCR)

B.Sc. Medical Lab. Technology – II Year
Clinical Biochemistry – II [Metabolic and Blood Chemistries]
Paper – II

Unit – I

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

Unit – II

1. Principle, assay procedures and clinical significance of following : Glucose, Proteins, A/G, urea, BUN, uric acid, creatinin cholesterol, Bilirubin (Direct and Indirect).
2. Electrolytes : Quantitative estimation of sodium, potassium, calcium, chloride, lithium, phosphorus, magnesium and their clinical significance.

Unit – III

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

B.Sc. Medical Lab. Technology – II Year
Medical Microbiology - I [Bacterial Pathogens & Associated Diseases]
Paper – III

Unit – I

1. Normal microflora of human body: Skin, Respiratory System, Gastrointestinal and Genitourinary tracts. Source of infection, mode of spread and portals of entry.
2. Description, pathogenicity, mode of infection, incubation period and toxigenicity of :-
 1. *Staphylococcus*
 2. *Streptococcus*
 3. *Pneumococcus*
 4. *Neisseria*
 5. *Bordetella*
 6. *Haemophilus*

Unit – II

1. Host Parasite interaction in bacterial infections. Pathogenic properties of bacteria (colonization of surfaces, invasion of tissue, production of exo and endo toxins). Anti bacterial defense of the host.
2. Description, pathogenicity, mode of infection, incubation period and toxigenicity of :-
 1. *Corynebacteria, Erysipelothrix, Listeria*
 2. *Mycobacteria*
 3. *Atypical Mycobacteria*
 4. *Anthrax bacillus*
 5. *Brucella*
 6. *Yersenia, Pasteurella & Francisella*

Unit – III

1. Physiology and Biochemistry of Bacteria : Protein, Carbohydrate, lipids and nucleic acid as antigens.
3. Description, pathogenicity, mode of infection, incubation period and toxigenicity of :-
 1. *Salmonella*
 2. *Shigella*
 3. *Proteus*
 4. *Pseudomonas, Loefflerella*
 5. *Vibrio*
 6. *Escherichia coli*
 7. *Clostridia*

B.Sc. Medial Lab. Technology – II Year
Medical Microbiology - II [Technical Methods in Medical Microbiology]
Paper - IV

Unit – I

1. The role of laboratory in the diagnosis and control of infections. 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.
2. Morphology, Staining, Cultural Character of Bacteria. Selective cultural medias, indentification by special tests, biochemical reactions and sero-typing of
 - a) Gram's postivie cocci :- Cluster forming, chain forming and diplo cocci.
 - b) Neisseria, Bordetella and Haemophilus.
3. Pathogenesis and Pathology of infections caused by 2 (a) and 2 (b).

Unit – II

1. Isolation of pure culture and its preservation.
2. Morphology, Staining, Cultural Character, Selective cultural medias, 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
3. Pathogenesis and Pathology of infections caused by 2 (1 to 6).

Unit – III

1. Microbial drugs sensitivity test's and its clinical interpretation.
2. Morphology, Staining, Cultural Character, Selective cultural medias, identification by special tests, biochemical reactions and serotyping of :-
 1. Salmonella
 2. Shigella
 3. Proteus
 4. Pseudomonas
 5. Vibrio
 6. Escherichia coli
 7. Clostridia
3. Pathogenesis and Pathology of infections caused by 2 (1 to 7).

B.Sc. Medical Lab. Technology – II Year
Pathology & Allied Subjects-I (Haematology)
Paper - V

Unit – I

1. Coagulation : Mechanism of coagulation, coagulation regulation, hyper coagulable states, coagulation disorders.
2. Bleeding disorders : Various types, vascular abnormalities, role of platelets in haemostasis, platelet disorders, thrombosis and thrombohaemorrhagic disorders.
3. Anaemias : Definition, various types of anaemia, causes of anemia, changes in the blood morphology due to anaemia.

Unit – II

1. Leucocytosis, neutropenia and pancytopenia their causes and significance infectious mononucleosis.
2. Hematological malignancies : Various types of malignancies such as Leukemia Lymphomas including multiple myeloma. Their identification and clinical features.
3. Lab investigations in Haematological malignancies.

Unit – III

1. Haematological Changes in systemic 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.
2. Various Parasites in blood and their clinical significance. Lab investigations and methods of identification.
3. 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 – II Year
Paper VI : Pathology and Allied Subjects – II

(Histotechnology)

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 Laboratory Technology 3rd year

PAPER I : CLINICAL BIOCHEMISTRY – 1 (BIOSTATICS, AUTOMATION & ENDOCRINOLOGY)

Unit I

Basic bio-static 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 for laboratory tests based upon medical usefulness.

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, aldosterone, parathormon, cortisol and 17 – hydroxyprogesteron and their clinical

B.Sc. Medical Laboratory Technology 3rd year

PAPER II: CLINICAL BIOCHEMISTRY – II

(Diagnostic Enzymology) (Principle of assay, procedures 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 Laboratory Technology 3rd year

PAPER III : MEDICAL MICROBIOLOGY – I (PATHOGENIC VIRUSES AND MISC. MICROBES)

Unit I

1. Misc. microbes : Actinomyces, Nocardia, Donovanias, Treponema, Chlamydia, Rickettsiae, Mycoplasma and pathogenic fungi. Pathogenesis, pathology and lab diagnosis.
2. Pox – viruses : Smallpox, Vaccinia, Molluscum contagiosum.
3. Herpes Virus : Herpes Simplex, Chickenpox – Zoster, CMV, IMN, and Burkitt's Lymphomas.
4. Adenoviruses : Pharyngeal infections, Respiratory infections and conjunctival infections.

Unit II

1. Orthomyxoviruses (Influenza Types A,B,C, etc.) : Influenza.
2. Paramyxovirus : Respiratory infections, mumps and measles.
3. Miscellaneous Viruses : Rubella, Corona, Arboviruses : Rubella, Common Cold, Lymphocytic Choriomeningitis.
4. Picorna Viruses : Enteroviruses, 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 Laboratory Technology 3rd year

PAPER IV : MEDICAL MICROBIOLOGY - II

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 : Periodic subculture method, cold storage, freezing, deep freezing, lyophilization methods. Total and viable counts of bacteria.

Unit II

1. Human parasitology : Protozoa, rhizopoda and helminthes
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, myco, dot, IgG, IgA, IgM and IgE testing, Australia Ag (HBs) etc.

B.Sc. Medical Laboratory Technology 3rd year

PAPER V : PATHOLOGY & ALLIED – I (IMMUNOPATHOLOGY & HAEMATOLOGY)

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, antigen – antibody reaction and cell mediated immunity.
5. Laboratory investigations in megaloblastic anaemias (Iron deficiency, megaloblastic, haemolytic)

Unit III

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

B.Sc. Medical Laboratory Technology 3rd year

PAPER VI – PATHOLOGY AND ALLIED SUBJECTS - 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, Freeze drying.
3. Lipids, identifications and demonstration.
4. Micro-organisms 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. eye ball B.M. biopsy, under calcified bones.
3. Neuropathological technique.
4. Enzyme histochemistry demonstrations of phosphatases, dehydrogenases, oxidase and peroxidases etc.
5. Electron microscopy, ultra-microtomy.

Unit III

1. Immuno histochemistry.
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 cyto technician in FNAC clinic.

B.Sc. Medical Microbiology 1st year
Paper I: Human Anatomy & Physiology

Code – 101
[Max. Marks – 70]

Topic	No. of Classes
Unit I	
Introduction to Medical Sciences.	
Organization of human body and integrated physiology	
Cell organizations	
1. Fundamental tissues of body	
2. Organ systems.	
Primary defense mechanism of human body against pathogenic microbes.	
Gross Anatomy	
1. Histology of organs of respiratory system	
2. Organs of respirations	
3. Mechanism of respiration and factors controlling it.	
Gross Anatomy	
1. Histology of organs of alimentary system	
2. Organs of digestive system	
3. Various glands associated with the digestive system	
4. Mechanism and physiology of digestion	
5. Absorption.	
Unit II	
Cells and organs of immune system:	
1. Morphology	
2. Their distribution.	
Gross Anatomy	
1. Physiology of reticulo – endothelial system.	
Secondary immune response of human body to external stimuli.	
Physiology of various body fluids:	
1. CSF	
2. Peritoneal	
3. Pericardial	
4. Pleural	
5. Synovial fluids.	
Gross Anatomy	
1. History	
2. Physiology of excretory system.	
Gross Anatomy	
1. Histology of organs of cardiovascular system	
2. Organs of the system	
3. Mechanism and physiology of blood flow through the cardiovascular system	

Unit III	
Gross anatomy	
1. Histology of musculo- skeletal system	
2. Classification & functions of bones and muscles.	
3. Physiology of muscular contraction	
4. Factor controlling them	
5. Various types of joints	
6. Their physiology	
Gross anatomy	
1. Histology of organs of nervous system	
2. Division of nervous system	
3. Mechanism of nerve impulse transmission	
4. Reflex arc	
5. Sensory	
6. Motor system	
7. Sensory & motor systems	
8. Special sense organs	
Gross Anatomy	
1. Histology of organs of reproductive system	
2. Mechanism of reproduction	
3. Factors controlling it	
Gross Anatomy	
1. Histology of organs of endocrine system	
2. Different glands of the system	
3. Their distribution	
4. Mechanism of hormone production	
5. Factors controlling it	
6. Their mechanism of action	

B.Sc. MM 1st Year

PRACTICAL'S

1.	Anatomical parts of respiratory system	02
2.	Pulmonary function test	02
3.	Anatomical parts of alimentary system	02
4.	Anatomy of liver, spleen, pancreas, stomach	09
5.	Anatomy of excretory system & demonstration of parts	03
6.	Anatomy of heart, its valves, chambers, blood supply	03
7.	Study of blood pressure	04
8.	Study of bone, classification	06
9.	Study of joints classification	10
10.	Study of muscles classification	02
11.	Reflex Arc of various Joints, Knee, Ankle, Elbow, Biceps & Triceps	06
Total		49