CURRICULUM

B. Sc. (Medical Laboratory Technology)

2022-23

ALL INDIA INSTITUTE OF MEDICAL SCIENCES – KALYANI
(AIIMS - KALYANI)

KALYANI - 741245

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B. Sc. (Medical Laboratory Technology)

CONTENTS

AIIMS KALYANI

REGULATIONS OF AIIMS KALYANI- B.SC (MLT) COURSE

1. SHORT TITLE AND COMMENCEMENT

These regulations shall be called "THE REGULATIONS FOR THE BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY OF AIIMS KALYANI".

They shall come into force from the academic year 2022 - 2023 Session.

The regulation and syllabus are subject to modifications by the standing Board of studies for paramedical courses from time to time.

II. REGULATIONS

1. ELIGIBILITY FOR ADMISSION

Candidates should have a pass in the Higher Secondary Examination (Academic) conducted by the Board of Higher Secondary Examination of Tamil Nadu, or any other equivalent examination accepted by the Final, thereto with a minimum of 50 % marks (40 % marks for SC, ST and OBC candidates) in Part –III subjects of Physics, Chemistry & Biology/Botany & Zoology) and should have English as one of the subjects.

2. DURATION OF THE COURSE AND COURSE OF STUDY

The period of certified study and training of the B.Sc. (MLT) degree course shall be of **three** academic years.

3. MEDIUM OF INSTRUCTION

English shall be the medium of instruction for all the subjects of study and for examinations of the course.

4. MINIMUM WORKING DAYS IN AN ACADEMIC YEAR

Each academic year shall consist of not less than 180 days with a minimum of 90 days working days per semester.

5. ATTENDANCE REQUIRED FOR APPEARING EXAMINATION

a) Examination will be conducted in both theory and practical as prescribed. Candidates will be permitted to appear for the Examinations in the subject, only if they secure not less than 75 % of attendance in each subject of the respective semester/year.

b) A student who does not meet the minimum attendance requirement in a semester or year must repeat the course work along with the next batch of students.

6. CONDONATION FOR LACK OF ATTENDANCE

Condonation of shortage of attendance in aggregate up to 10 % (between 65 % and 75 %) in each semester may be granted by the Institute's Academic Committee and as per the regulations of AIIMS KALYANI, *under extraordinary circumstances on payment of extra one-year tuition fee as penal fees.*

7. INTERNAL ASSESSMENT (IA):

Internal assessment will be done in each subject of study and the marks will be awarded to the candidates as detailed in the scheme of examinations. The marks awarded will be done on the basis of the candidate's performance in the assignments, class tests –written / practical, laboratory work, preparation and presentation of Project work/ seminars or any other accepted tools of assessment, as assessed by the teachers. Candidate should have scored a minimum of 35% in Theory (IA) and 35% in Practical's (IA) separately to be allowed to appear for the ***Summative / Final AIIMS KALYANI Examination***.

8. EXAMINATIONS:

a) The ***Summative/Final AIIMS KALYANI Examination*** will be conducted in the suggested pattern for all the three years.

b) The particulars of subjects for various examinations and distribution of marks are detailed in the Scheme of Examination.

9. ELIGIBILITY / MAXIMUM DURATION FOR THE AWARD OF THE DEGREE:

a) The candidates shall be eligible for the Degree of Bachelor of Science in Medical Laboratory Technology when they have undergone the prescribed course of study for a period of not less than three years in AIIMS KALYANI and have passed the prescribed examinations in all subjects.

b) The maximum period to complete the course successfully should not exceed the period of 6 years.

10. MARKS QUALIFYING FOR A PASS

a) Candidate has to pass separately in Theory +Viva voce and Practical by getting a minimum of 50 % marks in the aggregate marks obtained in internal assessment and ***Summative/Final AIIMS KALYANI Examination***. It is further subject to the condition that candidate should obtain minimum of 40% marks ***Summative/Final AIIMS KALYANI Examination and***, 50% marks in Final Practical and 35% marks in internal assessment.

b) If a candidate fails in either theory or practical, he / she has to reappear for both theory and practical.

11. DECLARATION OF CLASS

- A successful candidate obtaining 75% and more marks in the grand total aggregate in the first attempt shall be declared to have passed with **Distinction**.

- A successful candidate obtaining 60% and more but less than 75% of marks in the grand total aggregate shall be declared to have passed with **First Class**.

- A successful candidate obtaining 50% and more but less than 60% of marks in the grand total aggregate shall be declared to have passed with **Second Class**.

III. COURSE OF INSTRUCTION

Sl. No	Subjects	Theory (Hrs)	Lab (Hrs)	Clinical (Hrs)	Others (Hrs)
	SEMESTER I				
1	Anatomy	50	40		
2	Physiology	50	40		
3	General Biochemistry	50	40		
4	General Pathology	50	40		
5	Pharmacology	50	40		
6	Project time Library / self-study				30
7	English	15			
8	Computers and Lab informatics	15	15		
9	Bengali	15			
	Total (540)	295	215		30
	SEMESTER II				
1	Anatomy	50	40		
2	Physiology	50	40		
3	General Biochemistry	50	40		
4	General Pathology	50	40		
5	Pharmacology	50	40		
6	Project time Library / self-study				30
7	English	15			
8	Computers and Lab informatics	15	15		
9	Bengali	15			
	Total (540)	295	215		30
	SEMESTER III				
1	General Microbiology and Immunology	60	60	180	
2	Parasitology and entomology	60	60	180	
3	Clinical Pathology	60	60	180	
4	Hematology I	60	60	180	

	Total (600)	120	120	360	
	SEMESTER IV				
1	Systematic Bacteriology, Virology and Mycology	80	60	180	
2	Hematology II	30	20	90	
3	Blood Banking	30	20	90	
	Total (600)	140	100	360	
	SEMESTER V				
1	Preventive & Social Medicine	60	50		
2	Clinical Biochemistry	40	60	160	
3	Histopathology & Cytology	30	40	160	
4	Recent advances (QC, Bioethics, Biomedical techniques, Lab organization and management, etc..)	30	40	160	
	Total (600)	130	150	320	
	SEMESTER VI				
1	Clinical Biochemistry posting	80	40	200	
2	Pathology posting	40	40	200	
3	Microbiology posting				
	Total (600)	120	80	400	

IV. SCHEME OF EXAMINATION

Duration of Summative / Final Examination in each subject: 3 Hours

Sloe	Subjects	Final Max	Final Min	Vice Voce	IA Max	IA Min	Total Max	Total Min
	I Year							
1.1.1	Anatomy Theory	80	32	20	20	07	120	60
1.1.2	Anatomy Practical	60	30	-	20	07	80	40
1.1.3	Physiology Theory	80	32	20	20	07	120	60
1.1.4.	Physiology Practical	60	30	-	20	07	80	40
1.2.1	General Biochemistry Theory	80	32	20	20	07	120	60
1.2.2	General Biochemistry Practical	60	30	-	20	07	80	40
1.2.3	Pharmacology Theory	80	32	20	20	07	120	60
1.2.4	Pharmacology Practical	60	30	-	20	07	80	40
1.2.5	General Pathology Theory	80	32	20	20	07	120	60
1.2.6	General Pathology Practical	60	30	–	20	07	80	40
	SEMESTER III							
2.3.1	General Microbiology and Immunology Theory	80	32	20	20	07	120	60
2.3.2	General Microbiology and immunology Practical	60	30	-	20	07	80	40
2.3.3	Parasitology and entomology Theory	80	32	20	20	07	120	60
2.3.4	Parasitology and entomology	60	30	-	20	07	80	40
2.3.5	Clinical Pathology and Hematology Theory	80	32	20	20	07	120	60
2.3.6	Clinical Pathology and Hematology Practical	60	30	–	20	07	80	40
	SEMESTER IV							
2.4.1	Systemic Bacteriology, Virology and Mycology Theory	80	32	20	20	07	120	60

2.4.2	System Bacteriology, Virology and Mycology Practical	60	30	-	20	07	80	40
2.4.3	Hematology **Theory**	80	32	20	20	07	120	60
2.4.4	Hematology P**ractical's**	60	30	-	20	07	80	40
2.4.5	Blood Banking **Theory**	80	32	20	20	07	120	60
2.4.6	Blood Banking P**ractical's**	60	30	-	20	07	80	40

Sloe	Subjects	UE Max	UE Min	Viva Voce	IA Max	IA Min	Total Max	Total Min
	SEMESTER-V							
3.5.1	Preventive and Social Medicine **Theory**	80	32	20	20	07	120	60
3.5.2	Preventive and Social Medicine **Practical**	60	30	-	20	07	80	40
3.5.3	Histopathology and Cytology **Theory**	80	32	20	20	07	120	60
3.5.4	Histopathology and Cytology **Practical**	60	30	-	20	07	80	40
	SEMESTER-VI							
3.6.1	Clinical Biochemistry **Theory**	80	32	20	20	07	120	60
3.6.2	Clinical Biochemistry **Practical**	60	30	-	20	07	80	40
3.6.3	Clinical Pathology Theory	80	32	20	20	07	120	60
3.6.4	Clinical Pathology Practical	60	30	-	20	07	80	40
3.6.4	Clinical Microbiology Theory	80	32	20	20	07	120	60
3.6.5	Clinical Microbiology Practical	60	30	-	20	07	80	40

PERFORMANCE VALUATION IN EXAMINATIONS

1. Candidates having less than the prescribed minimum marks (35 %) in the internal assessment (Theory and Practical's separately) will not be allowed to take the final summative examinations.

2 There will be two examiners – one External and one Internal examiner for all the practical and oral examination.

3. Valuation of answer scripts will be done by Examiners, preferably two in number.

Grace Marks: A maximum of five marks only may be granted to a candidate to be added to the Theory marks only of any one subject, if with such an addition the candidate passes the subject, provided he/she has passed in all the other subjects of the examination session / semester.

ANATOMY

Course work – I YEAR

Duration in Hours
Theory: 100 Hrs
Practicals:80 Hrs

THEORY:

Sl. No	CONTENT
1	**General Anatomy**: Introduction to anatomical terms and organization of the human body. Tissues – Definitions, Types, characteristics, classification, location, functions and formation.
2	**Systemic Anatomy:** Musculoskeletal system: Bones – types, structure**,** Axial & appendicular skeleton. Bone formation and growth, Joints – classification and structure. Types and structure of muscles. Movements at the joints and muscles producing movements.
3	**Nervous System:** Structure of Neuroglia and neurons Parts and classification CNS – Structure of Brain and spinal cord and their functions. PNS - Cranial nerves and spinal nerves ANS - Sympathetic and Parasympathetic
4	**Cardiovascular System:** Circulatory system – Structure of the Heart, Structure of Blood Vessels – arterial and venous system. **Lymphatic System:** Gross and microscopic structure of lymphatic tissue.
5	**Respiratory System:** Parts, Nasal cavity and Paranasal air sinuses, trachea, Gross and microscopic structure of lungs, Diaphragm and Pleura.
6	**Digestive System:** Parts, Structure of Tongue, Salivary glands, stomach, Intestines, Liver, Pancreas.
7	**Urinary System:** Parts, structure of Kidney, Ureters, Urinary Bladder and Urethra.
8	**Reproductive System:** Parts of the system. Gross structure of both male and female reproductive organs.
9	**Endocrine System:** Gross structure of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal glands.
10	**Special Senses:** Structure of Skin, Eye, Nose, Tongue (Auditory and Olfactory apparatus)
11	**Anatomical Techniques:** Embalming of human cadaver, Museum Techniques, Basic principles of

	Karyotyping.

LIST OF PRACTICAL EXERCISE:

1. Study of Human skeleton
2. Study of all the system with models
3. Histological study of all the systems
4. Hematoxylin and eosin staining of given paraffin section.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books

1. Human Anatomy by Inderbir Singh
2. Ross & Wilson Anatomy & Physiology in Health & Illness by Waugh (A)
3. Text Book of Human histology by Inderbir Singh
4. Theory and Practice of Histological Techniques by Bancroft (JD)
5. Human Genetics by Gangane (SD)

TEACHING LEARNING ACTIVITIES:

1. The course content in Anatomy will be covered by:
2. Interactive Lectures
3. Practical
4. Demonstrations
5. Seminars
6. Assignments

EXAMINATION PATTERN

		Duration
Theory exam: (One Paper)	80 marks	3 hours
Practical exam	60 marks	3 hours
Oral exam	20 marks	
Internal assessment (Theory)	20 marks	
Internal assessment (Practical)	20 marks	
	200 marks	

The practical examination will have the following components:

Identification of Gross Spotters	20 marks
Identification of Histological slides	20 marks
Routine H & E staining of paraffin section provided	20 marks
	60 marks

INSTRUCTION TO QUESTION PAPER SETTER

SECTION I 40 marks

1. Systemic Anatomy
2. Anatomical Techniques

SECTION II 40 marks

1. General Anatomy
2. Systemic Anatomy

PATTERN OF QUESTION

PAPER SECTION I

Long Answer Question	1 x 10 = 10 marks
Short Answer Question	5 x 4 = 20 marks
Very short answer (1 to 2 marks)	5 x 2 = 10 marks

SECTION II

Long Answer question	1 x 10 = 10 marks
Short Answer question	5 x 4 = 20 marks
Very short answer (1 to 2 marks)	5 x 2 = 10 marks

MODEL QUESTION PAPER
ANATOMY

Time: 3 hours Max. Marks: 80

SECTION - I

1. Mention the different parts of Urinary system. Describe the features and histology of Kidney. 1 x 10=10 marks

2. Write short note on and FIVE 5 x 4= 20 marks

   a) Stomach
   b) Trachea
   c) Pituitary Gland
   d) Embalming fluid
   e) Karyotyping
   f) Hematoxylin & Eosin staining

3. Answer the following; 5 x 2 = 10 marks

   a) Parts of the stomach
   b) Name any two lymphatic organs
   c) Name any two major salivary glands
   d) Name any two organs associated with thymus
   e) What is bony labyrinth?

SECTION - II

4. Mention the organs of respiration. Explain the features and functions of lungs. 1 x 10 = 10 marks

5. Write short notes on any FIVE 5 x 4 = 20 marks

   a) Parts of male reproductive system.
   b) Structure of lymph node
   c) Classification of epithelium with examples.
   d) Functional areas of cerebrum
   e) Uterus
   f) Aorta

6. Answer the following: 5 x 2 = 10 marks

   a) Blood supply of uterus
   b) Lobes of cerebellum
   c) List the types of muscle
   d) Nerve supply of mastication

e) Name any two long bones of upper limb.

PHYSIOLOGY

Course work – I year

Duration in Hours

Theory: 100 Hrs

Practical: 80 Hrs

THEORY:

A brief account of function will be covered system wise. Main emphasis will be laid on the principles underlying various techniques or procedure to study functions of isolated organs and intact system/human body.

Sl. No.	CONTENT
1	**BLOOD:** Components, hematocrit, ESR, blood volume measurements. RBC, WBC & platelet counts, names of developmental stages of RBC, functions and fate of RBC. Functions of WBC and platelets. Basis of blood coagulation. Blood groups – ABO & Rh
2	**MUSCLE:** Structure in brief, mechanism of muscle contraction, isotonic and isometric contractions, energy sources of muscle contractions, motor unit.
3	**GASTRO INTESTINAL TRACT:** Functional anatomy of G.I.T, functions of G.I secretions, principles of secretion and movements of GIT.
4	**KIDNEY**: Structure of Nephron, measurement and regulation of GFR, mechanism of urine formation. Clearance tests & values of insulin, PAH and urea clearance.
5	**ENDOCRINES**: Names of endocrine glands & their secretions, functions of various hormones, Brief account of endocrine disorders.
6	**REPRODUCTION**: Reproductive cycle in female including menstrual cycle, pregnancy, parturition, lactation. Male sex hormones and spermatogenesis. Basis of contraception.
7	**CARDIO VASCULAR SYSTEM:** Anatomy of heart, cardiac cycle, heart sounds, definitions of cardiac output, stroke volume, principles of measurements of cardiac output. ECG – methods of recording and ECG waves. Normal values of blood pressure, heart rate and their regulation in brief.
8	**RESPIRATION:** Principles of respiration, respiratory muscles, lung volumes and capacities, collection and composition of inspired alveolar and expired airs. Transport of oxygen and carbon dioxide. Brief account of respiratory regulation. Definition of hypoxia, Cyanosis, asphyxia. Methods of artificial respiration.

9	**NERVE, CENTRAL NERVOUS SYSTEM:** Structure of neuron, nerve impulse, myelinated and non-myelinated nerve. Brief account of resting membrane potential, action potential and conduction of nerve impulse.

	Neuro-muscle transmission. Various parts of nervous system, C.S.F., Functions of muscle spindle and motor tracts including reflexes, cutaneous receptors, joint receptors, sensory pathways. Ascending reticular formation, EEG, functions of cerebellum, basal ganglia, thalamus & hypothalamus, vestibular apparatus and functions.
10	**AUTONOMIC NERVOUS SYSTEM**: Divisions and functions.
11	**SPECIAL SENSES**: **VISION:** Structure of eyeball, retina, visual pathway, accommodation, visual acuity, error of refraction, color vision. **HEARING:** Brief account external, middle and inner ear, hearing tests. **TASTE & SMELL:** receptors, pathways, method of transduction.

LIST OF PRACTICAL EXERCISES:

1. Study of appliances for amphibian practical. Simple muscle curve, effect of temperature on SMC, Genesis of fatigue, frog cardiogram.
2. Study of appliances for hematology practical. Making blood smear, staining and use of microscope for identifying, blood cells. Preparation of diluting fluids for RBC and WBC counts. Principles of hemocytometry., RBC and WBC counts, DLC, platelet count, BT, CT, ESR, Hb estimation.
3. Working principles and recording of chest movements with stethograph, ECG, Blood pressure, radial pulse with physiograph.
4. Spirometry –recording of lung volumes and capacities.
5. Identification of instruments used in study of cardio vascular system, respiratory system, nervous system and special senses.
6. Mosso's ergography, Perimetry, Tests of hearing.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Textbook of Medical Physiology by G.K. Pal.
2. Review of Medical Physiology by Ganong.
3. Samson Wrights Applied Physiology.
4. Text book of Medical Physiology by Guyton(AC)
5. Text book of Medical physiology by A.B. Das Mahapatra.

TEACHING LEARNING ACTIVITIES:

The course content in Physiology will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations

5. Seminars
6. Assignments

EXAMINATION PATTERN: **Duration**

Theory exam. (One Paper)	: 80 marks - 3 hours
Practical exam.	: 60 marks - 2 hours
Oral exam.	: 20 marks
Internal Assessment (Theory)	: 20 marks
Internal Assessment (Practical)	: 20 marks
	200 marks

The practical examination will have the following components

Practical Major	: 20 marks
Practical Minor	: 20 marks
Spotters	: 20 marks
	60 Marks

INSTRUCTION TO QUESTION PAPER SETTER

Distribution of course content:

Section I: Nerve, muscle, blood, kidney, GI tract, endocrines and reproduction.
Section II: Cardio Vascular system, respiratory system, central nervous system and special senses.

PATTERN OF QUESTION PAPER:

Section I:

Long answer question	-	1 x 10 = 10 marks
Short answer question	-	5 x 4 = 20 marks
Very short answer (1 to 2 marks)	-	10 marks

Section II:

Long answer question	-	1 x 10 = 10 marks
Short answer question	-	5 x 4 = 20 marks
Very short answer (1 to 2 marks)	-	10 marks

MODEL QUESTION PAPER FOR B.Sc. MLT

PHYSIOLOGY

Time: 3 Hours Max. Marks: 80

SECTION I

1. List and name the hormones of anterior pituitary. Describe in brief the action of these hormones and mention the names of two disorders associated with this gland. (3+5+2 = 10)

2. Write short notes on any FIVE (5 x 4 = 20)
   a) PAH clearance and its significance
   b) Intestinal movements
   c) Function of leucocytes
   d) Sarcomere
   e) Ovulation and its control
   f) Testosterone

3. Answer the following: (5 x 2 = 10)

   a) Two temporary methods of contraception in females.
   b) Name the organ regulating body temperature
   c) Name two enzymes present in pancreatic juice.
   d) Write the secretion of islets of the pancreas
   e) Name any two clotting factors.

SECTION II

4.Define cardiac cycle with the help of a suitable diagram; mention the change occurring in the heart during a cardiac cycle. Describe the physiological basis of measurements of cardiac output. (2+4+4=10)

5. Write short notes on any FIVE (5 x 4 = 20)
   a) Respiratory muscles
   b) Pathway for pain sensation
   c) Use of spirometer in respiratory function
   d) Functions of cerebellum
   e) Tests of hearing
   f) Short term regulation of Blood Pressure

6. Answer the following: (5 x 2 = 10)

   a) Name the sites where arterial baroreceptors are located.
   b) What is tidal volume
   c) Name the transmitter released at neuro muscular junction

d) Receptors for hearing
e) Write two functions of hypothalamus.

GENERAL ASPECTS OF BIOCHEMISTRY

Course work – I Year Course

Duration in Hours

Theory: 100 Hrs

Practical: 80 Hrs

THEORY UNIT I

S. No	CONTENT
1	Role of Medical Laboratory technologists – ethics of laboratory practice. Laboratory safety – Common lab accidents their prevention and their first aid. General laboratory layout as applicable to biochemistry.
2	Laboratory glassware and its uses – Types of pipettes, calibration of pipettes, cleaning of glassware.
3	Preparation of solutions – units of weights and volume, Calculation of concentration and methods of expressing concentration of solution. Types of water, their properties, uses and method of production.
4.	Basic and elementary concepts of chemistry and properties of carbohydrates as applicable to the human body.
5	Basic and elementary concepts of chemistry and properties of lipids as applicable to the human body.
6	Basic and elementary concepts of chemistry and properties of proteins & amino acids as applicable to the human body.
7	Basic and elementary concepts of chemistry and properties of nucleic Acids as applicable to the human body,
8	Basic concepts of principles of nutrition and nutrients macro and micro nutrients. Vitamins & Minerals. Vitamins- Fat soluble vitamins, Water soluble vitamins sources, Biochemical role, RDA, deficiency manifestations Minerals – Calcium, Phosphorous, Iron, Copper, Zinc, Magnesium, Manganese, Iodine.
9	Working Principles and application of photometry, and atomic absorption, Spectrophotometry.
10	Fundamental concepts of biophysical phenomena like osmosis, dialysis, colloidal state, viscosity, absorption, osmotic pressure, surface tension and their application in relation to the human body.
11	Definition, basic concepts of classification mechanism of action and properties of enzymes, factors influencing enzyme action.
12	Definition and basic concepts of acids, bases, indicators and buffer, their application in laboratory.
13	Elementary concepts of radioactivity, radioisotopes, their application in medicines and agriculture isotopic dilution analysis, radioactivity counting techniques.
14	Working principles Types and applications of Electrophoresis – Paper, Agarose Gel, Cellulose Acetate and PAGE.

15	Working principles, types and applications of Chromatography - Paper Chromatography, TLC, Ion Exchange, Affinity Gel, Filtration, Gas Chromatography and HPLC.
16	Working principles, types and application of centrifugation

LIST OF PRACTICAL EXERCISES:

Uses of Analytical balance, preparation and standard solution,

1. General reactions and identification of carbohydrates glucose, fructose, maltose, lactose and starch.
2. General reaction of proteins, colour reaction and precipitation of proteins- albumin, casein, gelatin, peptone.
3. Acidimetry and alkalimetry
4. pH determination using colorimetric methods and using pH meter.
5. Simple tests for identification of food constituents.
6. Verification of Beer- Lambert Law.
7. Qualitative analysis of milk, egg.
8. Effects of temperature, pH, substrate concentration on enzyme activity.
9. Demonstration on Electrophoresis, Chromatography and Radioactivity Counting.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Medical laboratory Procedure Manual (T-M) by K.L. Mukerjee 1987, Vol.I, II & III Tata McGraw Hill Publication.
2. Text book of Medical Biochemistry by Ramakrishna
3. Text Book of Clinical chemistry by Norbert Teitz
4. Principles and Techniques of Practical Biochemistry by Wilson and Walker.
5. Clinical Chemistry - Principle and techniques by Rj Henry, Harper & Row Publishers.
6. Text Book Biochemistry by Vasudevan and Sree Kumari.

EXAMINATION PATTERN		**Duration**
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components:

a) Qualitative analysis ally for identification of substance of biochemical importance	-	15 marks
b) Spotters	-	15 marks
c) Colorimetric experiment – Verification of Beer's Law	-	15 marks
d) Demonstration of the presence and/or absence of nutrients in the given sample.	-	15 marks
		60 marks

INSTRUCTION TO QUESTION PAPER SETTER

Distribution of course content:

Section I: Sl. No. 1 -9 of theory portions mentioned
Section II: Sl. No. 10 – 16 of theory portions mentioned.

PATTERN OF QUESTION PAPER:

Section I:

Long answer question	- 1 x 10 = 10 marks
Short answer question	- 5 x 4 = 20 marks
Very Short answer (1 to 2 marks)	- 10 marks

Section II:

Long answer question	- 1 x 10 = 10 marks
Short answer question	- 5 x 4 = 20 marks
Very Short answer (1 to 2 marks)	- 10 marks

MODEL QUESTION PAPER

GENERAL ASPECTS OF BIOCHEMISTRY

TIME: 3 hours **Max. Marks: 80**

SECTION I

1. Sketch a block diagram of flame photometer and correlate the components and function with the parallel features of an absorbance/transmittance photometer. (10 marks)

2. Write shorts on any FIVE: (5 x 4 = 20 marks)

a) Feature of Peptide Bond
b) Write the composition and use of Benedict's reagent
c) Structure of DNA
d) Cleaning of glasswares
e) RDA
f) Monochromator

3. Answer the following: (5 x 2 – 10 marks)

a) Define acid and give two examples for strong and weak acid
b) Mention the aromatic essential amino acid.
c) Define the biological value of protein
d) List the glasswares used in the biochemistry laboratory.
e) Mention two copper containing proteins and their function.

SECTION II

4. Name the various types of chromatographic methods available for biochemical separation. Write in brief the principles and techniques involved in paper chromatography. (10 marks)

5. Write shorts on any FIVE: (5 x 4 = 20 marks)

a) Principles and application of lyophilization
b) Buffers
c) Classification of enzymes with one example for each.
d) Osmosis
e) Radioisotopes
f) Centrifuge.

6. Answer the following: (5 x 2 = 10 marks)

a) What is the ring structure present in cholesterol and name two compounds derived from cholesterol?
b) Define Rf value
c) What is lyophilisation
d) State Beers Lamberts Law

e) Mention two commonly used isotopes in biochemistry laboratory.

PHARMACOLOGY

Course work : First Year **Duration in Hours**

Theory: 100 Hrs
Practical: 80Hrs

THEORY:

UNIT-I (General Pharmacology)

S.No.	CONTENT
1	Definitions and different branches of Pharmacology
2	Routes of drug administration
3	Absorption, Distribution, Metabolism and excretion of drugs
4	General mechanism of drug action
5	Animal used in experiments
6	Animal handling and ethics
7	Bioassay procedures(specific)
8	Instruments used in Pharmacology
9	Clinical trials-basic aspects

Classification, Mechanism of action, Therapeutic uses and important adverse effects of the following categories of drugs.

UNIT-II (Drugs Acting on the central nervous system)

S.No.	CONTENT
1	General anesthetics
2	Anxiolytic and hypnotic drugs
3	Psychotropic agents
4	Epilepsy and Anticonvulsant drugs
5	Narcotic analgesics and antagonists
6	Centrally acting muscle relaxation and antiparkinsonism agents
7	Analgesics, antipyretics, anti-inflammatory agents ant antirheumatic and antigout drugs
8	Central nervous system stimulant
9	Local anesthetics

UNIT III (Drugs acting on autonomic nervous system)

S.No.	CONTENT
1.	Autonomic nervous system and neurohumoral transmission
2	Cholinergie or parasympatholytic drugs
3	Antincholinergie or parasympathomimetic drugs
4	Adrenergic or sympathomimetic drugs
5	Anti adrenergic or sympatholytic drugs
6	Drugs acting on autonomic ganglion

7	Neuromuscular blockers

UNIT - IV (Drugs acting on respiratory system)

S.No.	CONTENT
1.	Bronchodilators and analeptics
2	Nasal decongestants, expectorants and antitussive agents.

UNIT –V (Drugs acting on cardiovascular system)

S.No.	CONTENT
1.	Antiarrhythmic drugs
2	Cardiotonics
3	Antianginal drugs
4	Antihypertensive drugs
5	Drugs used in atherosclerosis

UNIT – VI (Drugs acting on Blood and Blood forming organs)

S.No.	CONTENT
1	Haematinics
2	Coagulants
3	Anticoagulants.
4	Blood and plasma expanders

UNIT – VII

Drugs acting on gastrointestinal tract and respiratory system.

UNIT – VIII

Autocoids and chelating agents

UNIT – IX (Hormones and Hormone Antagonists)

S.No.	CONTENT
1.	Antithyroid drugs
2	Hypoglycaemic agents
3	Sex hormones and oral contraceptives
4	Corticosteroids

UNIT – X (Chemotherapy)

S.No.	CONTENT
1	General considerations
2	Antimetabolities, suifonamides and trimethoprim
3	Inhibitors of bacterical cell wall synthesis: penicillins, cephalosporins etc
4	Antibiotics inhibiting protein synthesis: Aminoglycosides, tetracyclines, chloramphenicol and macrolide antibiotics
5	Antibiotics affecting membrane permeable
6	Urinary antiseptics and miscellaneous antibacterial.
7	Antituberculosis and antileprotic drugs
8	Antifungal drugs
9	Antiviral drugs
10	Antimalarial drugs
11	Antimoebial, antigiardial and miscellaneous antiprotozoan drugs
12	Antineoplastic drugs
13	Antiseptics and disinfectants

LIST OF PRACTICAL EXERCISES:

I. Drug assays:

1. Matching assay, Cumulative assay, 1+ 2 assay, 2 + 2 assay, chemical assay including extraction procedures.
2. Identification and quantification of common poisons.
3. Data collection and tabulation procedures.

II. Pharmacodynamics:

1. Study of absorption and excretion of drugs in human volunteers.
2. Study of action of mydriatics, mioties on rabbit:s eye.
3. Study of action of local anaesthetics on laboratory animals.
4. a) Study of signs and stages of anaesthesia
   b) Study of the ionic action of magnesium sulphate.
5. Effect of drugs on frog rectus abdominus muscle
6. Study of the effect of drugs on ifood intake and locomotor activity.
7. Effect of drugs on isolated rat ileum.
8. Study of analgesic activity of drugs on laboratory animals and human volunteers.
9. Effect of drugs on isolated frog's heart..
10. Evaluation of anticonvulsant activity of drugs in animals.
11. Effect of drugs on cilliary movements of frog's oesophagus.
12. Demonstration of effects of drugs on the blood pressure and respiration of anaesthetized dog.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books:

1. Fundamentals of experimental Pharmacology by Dr. M.N. Ghosh.
2. Pharmacology & Pharmacotherapeutics by Satoskar (RS)
3. Essentials of Medical Pharmacology by Tripathi (KD)
4. Pharmacology by Rang (HP)

TEACHING LEARNING ACTIVITIES

The Course content in Pharmacology will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Seminars
6. Assignments

EXAMINATION PATTERN		**Duration**
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

Spotters	- 15 marks
Synopsis	- 15 marks
Experiments	- 30 marks
	60 Marks

INSTRUCTION TO QUESTION PAPER SETTER

SECTION I

Syllabus covering Unit – 1 to V - 40 marks

SECTION II

Syllabus covering Unit VI to X - 40 marks

PATTERN OF QUESTION PAPER:

Section I:

Long answer question	- 1 x 10 = 10 marks
Short answer question	- 5 x 4 = 20 marks
Very Short answer (1 to 2 marks)	- 10 marks

Section II:

Long answer question	- 1 x 10 = 10 marks

Short answer question	- 5 x 4 = 20 marks
Very Short answer (1 to 2 marks)	- 10 marks

MODEL QUESTION PAPER
PHARMACOLOGY

Time: 3 hours **Max. Marks: 80**

SECTION I

1. Explain the different types of experimental animal anesthesia. Add two points about the ethical aspects. (10 marks)

2. Write shorts on any FIVE: (5 x 4 = 20 marks)
   a) Bioassay
   b) Antagonists
   c) Analgesics
   d) Phases of clinical trials
   e) Neuromuscular blockers
   f) Antihypertension

3. Answer the following: (5 x 2 = 10 marks)

   a) Define the term agonist
   b) Mention two drugs used in Malaria and Leprosy.
   c) Name an antidote for iron poisoning and organo phosphorus
   d) Mention the therapeutic use of Antihistaminic agent.
   e) What is Pharmacodynamics.

SECTION II

4. Enumarate Aminoglycoside antibiotics mention the general properties of therapeutic uses and adverse effects.. (10 marks)

5. Write shorts on any FIVE: (5 x 4 = 20 marks)
   a) Sex hormones and oral contraceptives.
   b) Antiseptics and disinfectants
   c) Anti cancer drugs
   d) Picrotoxin
   e) Chloramphenicol
   f) Smooth muscle relaxants.

6. Answer the following: (5 x 2 = 10 marks)

   a) Define Biotransformation
   b) Name two different methods of drug administration.
   c) mention two adverse effects of ACE inhibitor
   d) Write the principle of bioassay
   e) Define super infection.

GENERAL MICROBIOLOGY AND IMMUNOLOGY

Course work – Third Semester

Time:
Theory: 60 (Hrs)
Practical: 60 (Hrs)
Clinical: 180 (Hrs)

THEORY:

UNIT – I GENERAL MICROBIOLOGY

S.No	CONTENT
1	History of Microbiology
2	Classification and nomenclature of micro-organisms
3	Morphology of bacteria , staining methods
4	Principle and uses of various microscopes.
5	Growth and nutrition of bacteria, Culture media and culture methods-aerobic and anaerobic.
6	Theory and practical of sterilization disinfection antisepsis and asepsis.
7	Metabolism of bacteria
8	Genetics of bacteria including gene cloning and genetic engineering.
9	Bacterial toxins
10	Anti- microbal agents, Antimicrobial susceptibility tests.
11	Quality control and safety in microbiology.

UNIT – II IMMUNOLOGY

S.No	CONTENT
1	Immunity – innate and acquired immunity, humoral and cell mediated.
2	Antigen antibody reactions and their applications
3	Complement
4	Hypersensitivity
5	Histocompatibility, autoimmunity and tumor immunity.

LIST OF PRACTICAL EXERCISES:

1. Use and care of microscopes.
2. Measurement of microbes by micrometry.
3. Composition and preparation of stains.
4. Simple staining methods and gram stains
5. Special staining methods – capsule, spore, acid fast, Metachromatic etc,
6. Tests for motality in bacteria.
7. Preparation of media.
8. Using of autoclave hot air oven, other common laboratory equipment etc.
9. Disinfection practices in laboratory and wards.

10. Assay for disinfection.
11. Techniques of cultivation of bacteria.

12. Isolation of bacteria from clinical specimens.
13. Biochemical testing.
14. Serological techniques.
15. Antibiotic susceptibility testing methods.
16. Methods of maintaining stock cultures.
17. Simples assays for endo –and exo –toxins.
18. Handling and care of laboratory animals.
19. Safety in microbiology.
20. Recording of laboratory data and use of computers.
21. Serological tests – VDRL, Widal and other febrile agglutination, passive heamagglution, neutralization, enzyme- immuno assays etc.
22. Skin test- tuberculin etc.
23. Simple assays for cell medical immunity.
24. Quality control methods.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books:

1. Medical Microbiology by R. Cruickshanketal , vol.I ELBS
2. Mackie & McCarty Practical Medical Microbiology, Edited by J.G. College et al vol. II, Churchill, Livingstone, London
3. Medical Laboratory Manual for Tropical Countries, Volume II: Microbiology, by Monica Cheesbrough ELBS.
4. Baily & Scott's Diagnostic Microbiology Edited by Sydney M. Finegold, C.V. Mosby Company, London.
5. Text book of practical Microbiology by S.C. Parija.

TEACHING LEARNING ACTIVITIES:

The course content will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical.
4. Demonstrations
5. Clinical Lab postings
6. Seminars
7. Assignments.

EXAMINATION PATTERN

		Duration
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	

200 marks

The practical examination will have the following components

Spotters	- 20 marks
Hanging drop preparation	- 10 marks
Gram stain	- 10 marks
Media preparation	- 10 marks
Serology	- 10 marks
Total :	60 Marks

INSTRUCTION TO QUESTION PAPER SETTER

Allocation of syllabus in the two sections and distribution of marks should be as follows:

Section I: General Microbiology (40 marks)

1. One long answer question	1 x 10	= 10 marks
2. Five short answer question	5 x 4	= 20 marks
3. Very Short answer (1 to 2 marks)		= 10 marks

Section II: Immunology (20 marks), General Microbiology (20 marks)

1. One long answer question	1 x 10	= 10 marks
2. Five short answer question	5 x 4	= 20 marks
3. Very Short answer (1 to 2 marks)		= 10 marks

MODEL QUESTION PAPER IN MICROBIOLOGY
III SEMESTER
General Microbiology and Immunology

TIME: 3 hours **Max. Marks: 80**

SECTION I

1. Describe the structure and functions of bacterial cell with the help of a diagram. (10 marks)

2. Write shorts on any FIVE: (5 x 4 = 20 marks)

   a) Conjugation
   b) Growth curve
   c) Florescent microscope
   d) Koch's Postulates
   e) Anaerobic culture
   f) Plasmid

3. Answer the following: (5 x 2 = 10 marks)

   a) Define indicator medium with one example.
   b) Name two chemical disinfectant and give its uses.
   c) Define precipitation reaction.
   d) Give two contributions of Louis Pasteur.
   e) Negative staining.

SECTION II

4. Define and classify hypersensitivity. Describe the mechanism of delayed hypersensitivity. (10 marks)

5. Write shorts on any FIVE: (5 x 4 = 20 marks)
   a) ELISA.
   b) Passive immunity
   c) Structure of IgG
   d) CFT
   e) Principles and use of electron microscope.
   f) Transport media.

6. Answer the following: (5 x 2 = 10 marks)
   a) Define active immunity
   b) Principle of CFT.
   c) Name any two antibiotics sensitivity tests.
   d) Define epitope and paratope.

e) What are adjuvants?

PARASITOLOGY AND ENTOMOLOGY

Course work - Third Semester

Time:
Theory : 60 (Hrs)
Practical : 60 (Hrs)
Clinical : 180 (Hrs)

THEORY

UNIT – 1 (PARASITOLOGY)

S.No	CONTENT
1	An elementary study of the types of animal associations parasitism commensalisms and symbiosis. Types of parasites. Classification of protozoan & Helminthes.
2	An elementary knowledge of the structure like history of parasites belonging to the following genera with reference to the forms seen in human pathological material, and the methods used to identify them. i) Protozoa: Entamoeba, Dientamoeba, Iodamoeba, Embadomonas, Trichomonas, Chilomastix, Enteromonas, Trypnosomes, Leishmania, Giardia, Plasmodium, Isopaora, Eilmeria and Balantidium, Toxoplasma. ii) Platyhelminthes, Diphyllobothrium, Sparganum, Taenia, Echinococcus, Hymenolepis, Schistosoma, Fasciola, Fasciolopsis, Clonorchis, Peragonimus. iii) Nemathelminthes : Ascaris, Ancylostoma, Necator, Strongloides, Trichinella Enterobius, Trichurias, Wucherei, Brugia, Loaloa, Onchocerca, Dracunculus. More emphasis to be given to the identification of species in general marked in this way.
3	Collection and preservation of specimens for parasitological examination, preservation of specimens of parasitic eggs and embryos, Preserving Fluids, Transport of specimens.
4	Detection of intestinal parasites: Detection and identification of amoebae and other intestinal protozoa and other parasites.
5	Examination of Blood parasites: Thick and Thin smears for malaria and Filaria and other parasites. Concentration methods.
6	Examination of Biopsy material and other body fluids. Brief account of spleen puncture for diagnosis of kalaazar, bone marrow biopsy, lymph node puncture and skin biopsy for parasites. Examination of vaginal swabs.

UNIT – II (ENTOMOLOGY)

S.No	CONTENT
1.	Role of Arthropods in the transmission of diseases.
2	Mosquito: Morphology and Bionomics of Anophales, Culex, Aedes and Mansaonia.
3	Mosquito – Borne diseases and their control
4	Phlebotomus: Morphology, Life- History and control.
5	House fly – Morphology, Life cycle, disease relationship and control.
6	Tse – Tse fly (glossina) morphology, life-cycle and public health importance.
7	Fleas: Morphology, Life cycle, disease transmitted and control
8	Louse: Morphology, Life cycle, disease transmitted and control.
9	Bed Bug: Life cycle and control.
10	Ticks: Morphology, Life cycle, disease transmitted and control.
11	Sarcoptis scabiei: Morphology, lifecycle, public health importance and control.

12	Cyclops and Public Health importance.

LIST OF PRACTICAL EXERCISES:

1. Identification of Arthopods of Medical importance dealt in the theory.
2. Collection and preservation of Arthropods.
3. Dissection of Mosquitos.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books:

1. Text book of Parasitology by K.D. Chatterjee, Chatterjee medical Publishers, Calcutta.
2. Parasitic diseases in man by Richard Knight English Language Book Society.(ELBS)

TEACHING LEARNING ACTIVITIES

The course content will be covered by:

1. Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Clinical lab postings
6. Seminars
7. Assignments.

EXAMINATION PATTERN		**Duration**
Theory exam(One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

Spotters	- 20 marks
Stool examination	- 10 marks
Peripheral blood smear examination	- 10 marks
Dissection of Mosquito	- 10 marks
Parasitological Technique	- 10 marks
Total:	- 60 Marks

INSTRUCTION TO QUESTION PAPER SETTER

Allocation of syllabus in the two sections and distribution of marks should be as follows:

Section I: Protozoology (40 marks)

1. One long answer question 1 x 10 = 10 marks
2. Five short answer question 5 x 4 = 20 marks
3. Very Short answer (1 to 2 marks) = 10 marks

Section II: Helminthology and Entomology (40 marks)

1. One long answer question 1 x 10 = 10 marks

2. Five short answer question 5 x 4 = 20 marks
3. Very Short answer (1 to 2 marks) = 10 marks

MODEL QUESTION PAPER IN MICROBIOLOGY
III SEMESTER
Parasitology and Entomology

Time: 3 hours **max. Marks: 80**

SECTION I

2. Describe the pathogenesis and laboratory diagnosis of Malaria. (10 marks)

2. Write shorts on any FIVE: (5 x 4 = 20 marks)

a) Giardia intetinals
b) Trichomonas vaginalis
c) NNN Medium
d) Cultivation of Entamoeba histolytica
e) Culex mosquitoes
f) Life cycle of Hook worm.

3. Answer the following: (5 x 2 = 10 marks)

a) Morphology of egg of Trichuris trichura.
b) Cyst of Giardia lambia
c) Mode of transmission of hydatid disease.
d) What is cysticercus cellulosae.
e) Name the definitive and intermediate host in Taenia Solium.

SECTION II

4. Describe the life cycle of Echinococcus granulosus and laboratory diagnosis of hydatid cyst. (1 x 10 = 10 marks)

5. Write shorts on any FIVE: (5 x 4 = 20 marks)

a) Detection of microfilaria in blood.
b) Differences between Tick and Flea.
c) Draw and label the parts of Cyclops.
d) Larva migrans.
e) General characters of Trematodes
f) Stool concentration Technique.

6. Answer the following: (5 x 2 = 10 marks)

a) Name two disease transmitted by ticks.
b) Draw a Cyclops and label its parts.
c) Differences between Culex and Anopheles mosquitoes.
d) Write briefly about control of fleas.

e) Define the term reservoir host with two examples

MICROBIOLOGY AND APPLIED BACTERIOLOGY, VIROLOGY AND MYCOLOGY

Course work - Fourth Semester

Time:

Theory: 80 (Hrs)
Practical: 60 (Hrs)
Clinical: 180 (Hrs)

THEORY:

UNIT – I SYSTEMATIC AND APPLIED BACTERIOLOGY

Theoretical instruction should include the study of pathogenic bacteria for human beings. Occurrence, epidemiology, morphology, virulence factor, pathology and laboratory diagnosis should be emphasized.

Sl.No.	CONTENT
1	Gram positive cocci – staphylococci, streptococci.
2	Gram negative cocci - Neisseria
3	Gram positive bacilli – Corynebacterium, Mycobacterium, Actinomy, Listeria, Bacillus, Clostridia.
4	Gram negative bacilli – Enterobacteriaceae, Pseudomonas, Alcaligenes, Vibrio, Aerononas, plesiomonas, Campylobacter, Bacteroides, Fusobacterium, Brucella, Haemophilus, Bordetella. Pasteurella, Francisella, Spirochaetes, Chlamydia, Rickettsia, Mycoplasma, L forms, etc.

UNIT – II VIROLOGY:

Sl.No.	CONTENT
1	General properties of viruses – structure, replication, growth, classification, identification.
2	Common viral disease – mode of infection, spread, laboratory Diagnosis – Polio, Influenza, Para influenza, mumps, Measles, Rubella, Respiratory syncital, Rhina, Rota, Hepatitis, arbo viruses prevalent in India (Dengue, West Nile, Japanese Encephalitis, KFD), Chicken pox, Adeno, Papova, Herpes, HIV, Cytomegalo viruses , etc.
3	Elementary knowledge of viral vaccines.
4	Bacteriophage – Phage typing.

UNIT – III MYCOLOGY

Sl.No	CONTENT
1	Fundamentals of mycology
2	Morphology and identification of contaminant and pathogenic fungi.
3	Laboratory diagnosis of common superficial, subcutaneous, and deep Fungal infections of man.

LIST OF PRACTICAL EXERCISES:

1. Collection and transportation of clinical specimens.
2. Procedures and tests required in the laboratory diagnosis of the infections caused by the pathogenic bacteria listed above.
3. Examination of urine, stool, etc. for isolation and identification of pathogenic bacteria.
4. Bacteriology of food, water, milk.
5. Preparation and standardization of bacterial vaccines and antiserum
6. Collection, transportation and preservation of specimens.
7. Isolation and identification of viruses from specimens.
8. Preparation of glassware and media for tissue culture.
9. Preparation and maintenance of tissue culture.
10. Virus isolation in tissue culture and identification.
11. Use of chick embryo – inoculation by various routes.
12. Use of laboratory animals for isolation of viruses, preparation of antisera and complement, etc.
13. Serological tests in virology.
14. Antigen detection by various techniques.
15. Collection of specimens for fungal examination.
16. Direct KOH examination.
17. Isolation and identification of fungi from clinical specimens.

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Text Book of Parasitology by K.D. Chatterjee, Chatterjee medical Publishers, Calcutta.
2. Text book of Medical Parasitology by S.C. Parija.
3. Parasitic diseases in man by Richard Knight English Language Book Society (ELBS)
4. Medical Microbiology by R. Cruickshanketal, Vol.I ELBS

TEACHING LEARNING ACTIVITIES:

The course content will be covered by:

1. Lectures
2. Group Discussions
3. Practical
4. Demonstrtions
5. Clinical lab postings
6. Seminars
7. Assignments.

EXAMINATION PATTERN		**Duration**
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

Spotters	- 20 marks
Gram stain	- 10 marks
Special stain	- 10 marks
Identification of fungus	- 10 marks
Identification of Bacterial Culture	- 10 marks
Total:	60 Marks

INSTRUCTION TO QUESTION PAPER SETTER

Allocation of syllabus in the two sections and distribution of marks should be as follows:

Section I: Bacteriology

1. One long answer question	1 x 10	= 10 marks
2. Five short answer question	5 x 4	= 20 marks
3. Very Short answer (1 to 2 marks)		= 10 marks

Section II: Applied Bacteriology, Virology and Mycology.

1. One long answer question	1 x 10	= 10 marks
2. Five short answer question	5 x 4	= 20 marks
3. Very Short answer (1 to 2 marks)		= 10 marks

Relevance of question to diseases commonly prevalent in India and to practical aspects may be kept in mind.

MODEL QUESTION PAPER

MICROBIOLOGY AND APPLIED BACTERIOLOGY, VIROLOGY AND MYCOLOGY.

IV SEMESTER

Time: 3 hours **Max. Marks: 80**

SECTION I

1 Describe the laboratory investigations for the diagnosis of a case of enteric fever. (10 marks)

2. Write shorts on any FIVE: (5 x 4 = 20 marks)

a) Direct demonstration of M. tuberculosis in sputum.
b) Isolation of pathogens from gas gangrene.
c) Preparation of high titre anti sera.
d) Coagulase test.
e) Widal Test
f) Gram's Staining

3. Answer the following: (5 x 2 = 10 marks)

a) Name two gram negative cocci and disease caused by it.
b) Name two bacteria causing food poisoning
c) Name two bacteria causing UTI.
d) Name two congenitally transmitted diseases.
e) Name two sporulated bacteria

SECTION II

4. Describe the investigations required for an aetiological diagnosis in an outbreak of food poisoning. (1 x 10 = 10 marks)

5. Write shorts on any FIVE: (5 x 4 = 20 marks)

a) Use of egg in diagnosis of viral disease.
b) Preparation of a mono layer of monkey kidney cells.
c) Isolation of fungus in a case of dermatophytosis.
d) Bacteriological examination of water.
e) Measles.
f) Lab. diagnosis of candidial infections.

6. Answer the following: 5 x 2 = 10 marks

a) What is tube coagulase ?
b) Name any two anaerobic organism.
c) Name two Dimorphic fungi.
d) Name two DNA viruses.

e) Name two diseases caused by Chlamydiae.

HEMATOLOGY AND BLOOD BANKING

Course work - Fourth Semester

Time:
Theory : 60 (Hrs)
Practical : 40 (Hrs)
Clinical : 180 (Hrs)

THEORY:

UNIT – I

Sl. No	CONTENT
1	General-Hematology: Origin, development, morphology, maturation, function and fate of blood cells, nomenclature of blood cells.
2	Various methods of blood collection, anticoagulants-mechanism and uses.
3	Counting chamber- hemocytometry. Enumeration of RBC including various counting chambers, diluting fluids for RBC count.
4	Hemoglobinometry. Principles and methods of quantitating Hb. Concentration of blood including knowledge of errors and quality control in various method. Abnormal hemoglobin and its investigation.
5	Principles and methods of determining PVC calculation and interpretation of red cell indices.
6	ESR: introduction, factors affecting ESR, principles and methods of determining ESR, increasing and decreasing conditions of ESR.
7	WBC: introduction, development of WBC, diluting fluids. Absolute eosinophil count, errors in sampling, mixing, diluting and counting.
8	Cell counting, advantages and disadvantages, uses and mechanism of cell counting, quality control in cell counts.
9	Preparation of peripheral smear and bone marrow smear. Thin smear, thick smear. Buffy coat smear, wet preparation. Romanowsky stain. Preparation advantages and disadvantages.
10	Principle and methods of staining of Blood smears and bone marrow smears. Supravital stain. Recticulocyte count. Heinz bodies.
11	Description of morphology of normal and abnormal red cells.Blood differential WBC counting. Recognition of abnormal cell. Anaemia – definition etiology classification and laboratory diagnosis.
12	Hemolytic anaemia, definition, causatives, laboratory investigations. Auto hemolysis, acid hemolysis.
13	Methods of identification of abnormal hemoglobin including spectroscopy. HB electrophoresis. Alkali denaturation Test. Sickle cell preparation.
14	Various benign leucocyte reaction – Leukocyposis. Neutrophilia, Eosinophilia, Lymphocytosis. Infectious mononucleosis. leucopenias.
15	Leukemias – definition, causes, classification, detection of leukemia. Total leucocyte count in leukemias. Multiple myeloma.

16	Blood Coagulation and disorders of hemostasis. Principles and methods of assessment of coagulation. BT, CT, Prothrombin time, partial thromboplastin time, thromboplastin regeneration time.

17	Thrombocytopenia, thrombocythemias, platelet function test, platelet count. Clot retraction test. Platelet factor III Test.
18	LE cell – definition, morphology causative agents. Various methods of demonstrating LE cells. Blood parasites. Malaria, LD bodies, microfilaria and methods of demonstration.
19	Preparation of donor and collection of blood. Solution and apparatus used. Storage of blood. Preparation and storage of plasma. Preparation of packed red cells.
20	Principles involved in Blood grouping. ABO system and the methods used. Factors influencing the results of blood grouping, Rh system. Rh antigen. Principles and methods used.
21	Cross matching. Compatibility test, direct and indirect Coomb's test – Principle involved and the methods used. Blood transfusion and its Hazards.

LIST OF PRACTICAL EXERCISES:

1. Collection of blood – finger prick, venous blood.
2. Hb estimation
3. RBC count and estimation of packed cell volume.
4. Total WBC count and absolute eosinophil count.
5. Differential count of WBC, staining of blood smears.
6. Platelet count by various methods.
7. Erythrocyte sedimentation rate by various methods.
8. Preparation of leishman stain.
9. Osmotic fragility of RBC.
10. Clot retraction test and reticulocyte count.
11. Preparation of reagents of coagulant studies.
12. Preparation of Hemolysate
13. Preparation of bone marrow smears.
14. Preparation of LE cell smears.
15. Comment on peripheral smear.
16. Supervision of cleaning of glass wares and entry in register.
17. Screening of donors.
18. Preparation of anticoagulant fluids
19. Grouping of blood.
20. Cross matching of blood samples.
21. Coomb's test
22. Screening of HbS .Ag.

TEXT BOOK RECOMMENDED:

Latest editions of the following books:

1. Essentials of Hematology by Haufbrand .
2. Practicals in Hematology by J.V. Dacie.
3. Medical Laboratory Technology by Lynch.
4. Wintrobe’s clinical Hematology

TEACHING LEARNING ACTIVITIES:

The course content will be covered by:

1. Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Clinical lab postings
6. Blood donation camps
7. Seminars
8. Assignments.

EXAMINATION PATTERN		**Duration**
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

1	Blood test counts	- 10 marks
2	HB estimation	- 10 marks
3	Blood Grouping	- 5 marks
4	Cross matching	- 5 marks
5.	DLC	- 15 marks
6.	Spotters	- 5 marks
	Total	60 marks

INSTRUCTION TO QUESTION PAPER SETTER

Section - I

Question from syllabus covering Erythrocyte, Leucocytes their abnormalities and investigation

Section – II

Question from syllabus covering Blood banking, blood coagulation, platelets.

PATTERN OF QUESTION PAPER:

Section I

1. Long answer question 1 x 10 = 10 marks
2. Short answer question 5 x 4 = 20 marks
3. Very Short answer (1 to 2 marks) = 10 marks

Section II:

1. Long answer question 1 x 10 = 10 marks

2. Short answer question 5 x 4 = 20 marks
3. Very Short answer (1 to 2 marks) = 10 marks

MODEL QUESTION PAPER
HEMATOLOGY AND BLOOD BAMKING
SECTION I

1. Describe the principles of Hemoglobinometry and discuss the merits and demerits of various methods. (10 marks)

2. Write shorts on any FIVE: (5 x 4 = 20 marks)

   a) ESR.
   b) Osmotic fragility.
   c) Sickling test.
   d) peroxide staining.
   e) Buffy Coat Preparation.
   f) AEC.

3. Answer the following: (5 x 2 = 10 marks)

   a) Give an example of RBC diluting fluid and give its compensation.
   b) Name the disadvantages of Sahli's method of Hb estimation
   c) What is supravital staining? Give examples.
   d) Write any two conditions when PVC is increased.
   e) Name any two types of anemia.

SECTION II

4. Describe in detail the procedure you would adopt in and cross matching and dispatching blood to patient. (1 x 10 = 10 marks)

5. Write shorts on any FIVE: (5 x 4 = 20 marks)

   a) Coomb's test.
   b) Bleeding time.
   c) Platelet count.
   d) Clot retraction.
   e) Blood grouping.
   f) FFP

6. Answer the following: 5 x 2 = 10 marks

   a) What is prothrombin time give its normal value
   b) What is FFP? Give its use.
   c) What is coomb's test?
   d) Name two anticoagulants used in Blood bank.
   e) What is major and minor cross matching?

COMMUNITY MEDICINE

Course work – Fifth Semester

Time
Theory: 60 (Hrs)
Practical: 50(Hrs)

THEOR

Y: UNIT –

I

Sl.No	CONTENT
1.	Natural History of Disease Determinants of health, multi – factorial causation of disease host, agent, environment relationship primary, secondary and tertiary levels of prevention with examples related to few diseases of national importance.
2	Mode of transmission of disease Air – borne, vector and vehicle transmission. Methods of control with examples for control of each mode.
3	Disinfection Disinfection of the infective materials received in the Laboratory by using the appropriate disinfection methods, at the health centre level.

UNIT – II

Sl.No	CONTENT
1.	Health services Brief description of organization of health services at the centre and state levels.
2.	Primary Health Care - Definition, components and principles of primary health care. Health for all indicators.
3.	Primary Health Centre The functions, staffing pattern and the role of laboratory technicians in primary Health Centre. Laboratory tests for use in Health Centre(See annexure for description)
4.	National Programmes of Health and disease eradication /control A) Health Programmes: - Family Welfare Programme - National Programme for water supply and sanitation. - Nutritional Programmes. - Immunization and universal immunization programme. B) Disease Eradication programme: Leprosy & Guniea worm. C) Disease control programmes: Tuberculosis, Malaria, Filaria, S.T.D, Goitre, Cholera and other diarrhaeal diseases and Natioanl Programme for prevention of

	blindness including trachoma.

UNIT - III

Sl.No	CONTENT
1	Demography & Population control. - The factors influencing population growth, death rate, birth rate and methods of contraception.
2	Biostatistics - Application of statistical principles in history - Presentation of data, calculation of mean, median and mode, range and standard deviation and their significance. - Significance of' T ' test, $\chi 2$ values.

UNIT – IV

Sl.No.	CONTENT
1	Environmental sanitation: - Methods of water purification and disinfection, collection of water samples, their transport and bacteriological analysis. - Methods of excreta disposal.

UNIT – V

Sl.No	CONTENT
1.	Health education – definition, principles, objectives, pupose, types and AV aids,
2	Communication – definition, process and types Behavioral change communication. IEC (Information education and communication): aims, scope, concept and approaches.
3	Teaching and learning process, concept, characteristics of leaner and educator.
4	Role and skill of health professional in Health Education; Inter personal relationship: Co-ordination and co-operation in health education with other members of the health team.

ANNEXURE

ESSENTIAL LABORATORY TESTS FOR USE IN HEALTH CENTRE

ESSENTIAL TESTS:	**METHOD**
BLOOD	
Haemoglobin	Comparator
White cell count	Counting chamber
Examination of a film for differential count	Leishman stain
Erythrocyte sedimentation rate	Westergen method
Parasites	Direct and Romanowsky

stained preparations.

URINE

Protein	Sulphosalicyclic acid method
Glucose	Benedict's method
Sediment for cells, casts, parasites	Direct microscopy

SPUTUM

M. Tuberculosis	Ziehl Neelsen stain

STOOLS

Protozoa and ova	Direct saline and iodine preparation

SKIN SMEAR FOR ACID FAST B Ziehl Neelsen stain

TEXT BOOKS RECOMMENDED

Latest editions of the following books:

1. Text book prevention & social medicine – by J.E. Park.
2. Manual for laboratory technician – 1985. DGHS, Ministry of Health, Govt.of India.

TEACHING LEARNING ACTIVITIES

The course content in Community Medicine will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Field Visits
6. Seminars
7. Assignments.

EXAMINATION PATTERN		**Duration**
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

Spotters	- 20 marks
Exercises in demography and statistics	- 15 marks
Water Analysis	- 15 marks
Identification of slides and specimens	- 10 marks
Total:	60 Marks

PATTERN OF QUESTION PAPER:

Section I:

Long answer question	1 x 10	= 10 marks
Short answer question	5 x 4	= 20 marks
Very Short answer (1 to 2 marks)		= 10 marks

Section II:

Long answer question	1 x 10	= 10 marks
Short answer question	5 x 4	= 20 marks
Very Short answer (1 to 2 marks)		= 10 marks

MODEL QUESTION PAPER

COMMUNITY MEDICINE

Time: 3 hours Max. Marks: 80

Answer the two sections separately.

SECTION – I

1. Describe briefly the terms host, agent and environment. Explain how a disease is caused. (1 x 10 = 10 Marks)

2. Write short notes on any Five (5 x 4 = 20 marks)

   a) The National Programmes to prevent Anaemia.
   b) Write the formulae to calculate Mean, Medium and mode for unclassified data.
   c) Sanitary well.
   d) Quarantine
   e) Oral Contraceptives
   f) Multi drug therapy for leprosy (MDT)

3. Answer the following (5 x 2 = 10 marks)

   a) Name any two permanent methods of contraception.
   b) List the determinants of health.
   c) Name two lab diagnosis malaria parasite
   d) Mention two components of PHC
   e) Define incubation period.

SECTION – II

4. List the Laboratory tests available in a primary health Centre for Leprosy patients. How are the results of slit smear examination interpreted? How are these tests useful in the implementation of national Leprosy Eradication Programme? (1 x 10 marks)

5. Write briefly on any FIVE (5 x 4 = 20 marks)

   a) Disinfection /sterilization procedures practiced at PHC.
   b) List the components of Primary health care.
   c) National immunization Schedule.
   d) Methods of presentation of statistical data
   e) Rehabilitation Services
   f) Management of needle pricks injury.

6. Answer the following: (5 x 2 = 10 marks)

   a) Define mean and mode
   b) Name any two chemical disinfectant used in water purification
   c) Write any two nutritional programme implemented in India.
   d) List any two methods of presenting statistical datas.

e) list any two methods of disposal of excreta.

CLINICAL BIOCHEMISTRY

Course work – Fifth & Sixth Semester

Time
Theory : 120 Hrs
Practical : 100 Hrs
Clinical : 360 Hrs

THEORY

UNIT – I

S. No	CONTENT
1	Basic procedure, techniques and equipment used in clinical laboratory – concepts relating to the section of appropriate methods, supplies and reagents.
2	Theory and types of electrophoresis, description of technique. Methods for detecting and quantitating separated zones of proteins. Role of electrophoretic technique in clinical biochemistry.
3	Chromatography – Basic concepts, separation mechanisms and its role in clinical biochemistry, Qualitative and quantitative analyses.
4	Overview of approaches to clinical laboratory automation and its goal- general concepts used in automated instruments and specific applications of these concepts to selected instruments. Criteria to be used in evaluating and selecting appropriate laboratory instrumentation.
5	Definition and concepts of reference values and related terminology – selection of individuals for determination of population based reference values- criteria for specimen collection and procedure for collecting data.
6	Analytical goals. Performance criteria for laboratory tests and quantitative means of assessing the diagnostic capabilities of tests (Clinical relevance) - appropriate and optional use of laboratory and data it generates.
7	Goals of procedures and statistical techniques utilized for selecting and evaluating analytical quality and utility of procedures monitoring – quality assurance program.
8	Overview of application of the computer in clinical Biochemistry laboratories.

UNIT – II

Sl.No	CONTENT
1	Specimen collection, processing and handling in clinical laboratory – sources of biological variation.
2	Overview of metabolism of amino acids and proteins – current methodologists for their determination and identification in biological specimens – disease associated with alternation in or deficiencies of amino acids and proteins.
3	Clinical Enzymology – Enzyme units, Enzymes of clinical importance and their methods of determination in biofluids. Isoenzymes and their clinical significance. Importance of estimation of enzyme activity in various disease states.
4	Overview of metabolism of carbohydrates – Methods for determining glucose, ketones, lactate, pyruvate reducing sugars and mucopolysaccharides and their clinical significance. Biochemistry, types, criteria parameters in diagnosis and prognosis of Diabetes mellitus.

5	Overview of lipid. Importance of lipids in the body in body basic metabolic aspects and analytical importance. Disorders of lipid metabolism. Lipoproteins patterns in disease – analytical methods and procedures applicable to detecting and monitoring such disorders.

UNIT – III

Sl.No	CONTENT
1	General dietary requirements of nutrients – factors affecting status, effects of poor nutition – factors affecting status, effects of poor nutrition – analytical methods and recommendations for testing and assessing nutritional deficiency – Methods for assessing concentration of vitamins in biological samples.
2	Essential trace elements and major elements in humans – general requirements for laboratory assessment of trace elements including specimen collection, handling, selection of analytical methodology and establishing quality.
3	Overview of current concepts in endocrinology RIA, ELISA, chemiluminescence assay procedure for hormones – physiological effects produced by normal and abnormal levels of various hormones. Thyroid function test and Adrenal function test.
4	Overview of Biochemical roles of major electrolytes and blood gases and their changes in pathological states – relationship between major electrolytes and acid base balance – application of physical and chemical principles to biological system – laboratory measurements of electrolytes and blood gases. Acid base balance disorders.
5	Introduction to molecular Biology. Recombinant DNA technology, Role of recombinant DNA technology as diagnostic tool. Polymerase chain reaction.

UNIT – IV

Sl.No	CONTENT
1	Kidneys and their physiological role – Laboratory tests to assess, detect and monitor renal diseases.
2	Overview of calcium and inorganic phosphate metabolism current laboratory analytical
3	Laboratory tests and analytical methods used in identification and evaluation of hepatobiliary disorders.
4	Stomach, pancreas and intestinal tract – procedure and tests used in the diagnosis and treatment of gastro intestinal diseases.
5	Overview of porphyrins, their precursors, primary and secondary disorders of porphyrin metabolism – diagnostic laboratory methodologies including appropriate specimen collection and preservation techniques related to porphyrins
6	Overview of clinical toxicology – Screening procedures for detection of drugs. Drugs of abuse and their evaluation. Toxic metals – Lead, Mercury, Arsenic, Cadmium and Chromiun – Toxicity and their evaluation.

LIST OF PRACTICAL EXERCISES

1. Preparation and identification of hemoglobin derivatives using hand spectroscope.
2. Complete Urinalysis- quantative and quantitative analysis – characteristics of normal urine – appearance –specific gravity – reaction- microscope examination – normal and abnormal constituents in urine.
3. Estimation of blood glucose, urea, creatinine, cholesterol, total lipids, proteins, bilirubins, uric acid, calcium, phosphate, Estimation of urea, creatine, and proteins in urine.

4. Estimation of blood gas analysis and electrolytes.
5. Clinical enzymology and determination of transminases phosphatases, amylase, lipase, lactase dehydrogenase, creatinine kinase, cholinesterases.
6. Electrophorectic separation of hemoglobins, serum proteins, lipoproteins using agarose, cellulose acetate and polycrylamide.
7. Determination of clearance values.
8. Qualitative screening tests of toxic substances like carbon monoxide, phenol, organophosphates, heavy metals, methanol, phenol, salicylates, Cyanides.
9. Assay of hormones like T3, T4 insulin TSH by radio-immunoassay procedures, ELISA procedures.

TEXT BOOKS RECOMMENDED:

Latest editions of the following books:

a) Medical Laboratory procedures Manual (T-M) by K.L. Mukherjee, Vol.I, II, III.
b) A manual of laboratory Diagnostic tests Fischback
c) Practical clinical Biochemistry , Harold Varley.
d) Tietz's Text book of clinical chemistry – by N.Tietz Latest edition W.E. Saunders company.
e) Clinical chemistry – Theory, Analysis, Correlation by Kaplan.
f) Principles and Techniques of biochemistry and molecular biology by Keith Wilson & Walker.
g) Lippincott's illustrated reviews Biochemistry by Pamela C. Champe.
h) Text book of Biochemistry by D.M. Vasudevan and Sreekumari
i) Todd-Sanford Clinical Diagnosis by laboratory Methods.

TEACHING LEARNING ACTIVITIES

The course content in clinical biochemistry will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Clinical lab Postings
6. Seminars
7. Assignments.

EXAMINATION PATTERN		**Duration**
Theory exam(One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment(Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

Quantitative determination of blood Constituents - 20 marks
Preparation of standard graph Colorimetrically - 10 marks
Qualitative analysis of urine Sample - 10 marks
Interpretation Spotters - 20 marks
Total 60 marks

INSTRUCTION TO QUESTION PAPER SETTER

Distribution of course content:

Section I - Descriptive questions covering syllabus in unit I and Unit II

Section II - Descriptive questions covering syllabus in unit III and unit IV

PATTERN OF QUESTION PAPER

Section I

Long answer question	-	1 x 10 = 10 marks
Short answer question	-	5 x 4 = 20 marks
Very short answer (1 ti 2 marks)		= 10 marks

Section II

Long answer question	-	1 x 10 = 10 marks
Short answer question	-	5 x 4 = 20 marks
Very short answer (1 ti 2 marks)		= 10 marks

MODEL QUESTION PAPER

CLINICAL BIO CHEMISTRY

Time: Three Hours **Maximum: 80 Marks**

SECTION I

1. Discuss the principles and procedures for the separation amino acids by paper chromatography. (1 x 10 = 10 marks)

2. Write short notes on any five of the following: (5 x 4 = 20 marks)

a) Reference values
b) Lipid profile in MI
c) Serum transaminases
d) Identification of amino acidurias
e) Ketone body metabolism in Diabetes mellitus.
f) Accuracy & Precision.

3. Answer the following: (5 x 2 = 10 marks)

a) Name any two non protein nitrogenous compounds.
b) Give the normal range for serum proteins.
c) Name two iron containing compounds.
d) Name two conditions where ketonuria is present
e) Give the principle of electrophoresis.

SECTION II

4. Describe the sources, biochemical role, daily requirement and deficiency manifestations of thiamine. (1 x 10 = 10 marks)

5. Write short notes on any FIVE (5 x 4 = 20 marks)

a) Renal clearance
b) Van den Bergh test
c) Urine screening tests for drugs of abuse.
d) Bence – Jones proteins and its clinical importance
e) Regulation of serum calcium
f) Respiratory acidosis.

6. Answer the following:

a) List the body buffer systems
b) Name two anticoagulants used in clinical biochemistry
c) List few blood parameters estimated for assessing liver function
d) Give the deficiency manifestations of Thiamine and Vitamin C

e) Define urea clearance

HISTOPATHOLOGY AND CYTOLOGY

Course Work – Fifth & Sixth Semester

Time:
Theory : 70 (Hrs)
Practical: 80 (Hrs)
Clinical : 360 (Hrs)

THEORY:

UNIT – I

S.No	CONTENT
1.	Definition, sources and types histological specimens, kinds of histological presentations.
2.	Labeling, fixation, properties of fixing fluids, classification and composition of fixing fluids. Advantages and disadvantages of secondary fixatives. Post chroming.
3	Tissue processing, dehydration and cleaning.
4	Embedding. Water soluble substances, embedding in paraffin nitrocellulose.
5	Equipment for sectioning microtome, knife, honing and stropping. Types, care and use of microtome.
6	Technique for sectioning – frozen section. Technique for sectioning – Paraffin embedded tissue. Errors in sectioning and remedies. Attaching blocks to carriers.
7	Technique of processing bone for histological studies. Mounting and covering. Mounting media.
8	Staining – theory, types of staining agent. Mordents and differentiation. H & E staining. Types of hematoxillin and its preparation. Eosin stock stain and other counter stain used.
9	Demonstration of collagen, reticulin, elastin and fat.
10	Demonstration of amyloid, glycogen and mucin.
11	Demonstration of pigments and minerals (malarial, mercury, bile, lipofuscin, calcium, iron, copper).
12	Stains for bacteria including AFB, fungi, amoeba.
13	Principles of histo chemistry. And its application
14	Demonstration of neuron, neuroglia, myelin and axon. Processing of eye ball for histology.
15	Demonstration of fat, iron, amyloid, bile in large sections of tissue.
16	Cytology – introduction, definition, types of cytological specimen, preparation of slide for microscopic studies, stains used.
17	Museum technique. Preparation, setting up of and arrangement of museum.
18	Preparation of cell blocks, mailing of slides.
19	FNAC, definition, techniques involved in preparation of smear and staining. PAP smear.
20	Demonstration of sex chromatin, barr bodies, Amniotic fluid study.

LIST OF PRACTICAL EXERCISES

1. Paraffin section cutting.
2. H & E staining

3. Special staining

TEXT BOOKS RECOMMENDED:

Recent editions of

1. Cellular pathology by Culling.
2. Theory and practical of histological techniques by Bancroft
3. Medical Laboratory technology by Lynch.

TEACHING LEARNING ACTIVITIES

The course content in Histopathology & Cytology will be covered by:

1. Interactive Lectures
2. Group Discussions
3. Practical
4. Demonstrations
5. Clinical lab Postings
6. Seminars
7. Assignments.

EXAMINATION PATTERN		**Duration**
Theory exam (One paper)	- 80 marks	3 hours
Practical exam	- 60 marks	3 hours
Oral exam	- 20 marks	
Internal assessment (Theory)	- 20 marks	
Internal assessment (Practical)	- 20 marks	
	200 marks	

The practical examination will have the following components

Spotters	- 20 marks
Paraffin section cutting in rotary microtome	- 15 marks
Routine H & E section of paraffin section provided.	- 15 marks
Any one special staining procedure.	- 10 marks
	- 60 marks

INSTRUCTION TO QUESTION PAPER SETTER

Distribution of course content:

SECTION – I **40 MARKS**

1. Fixatives
2. Processing including bone
3. Microtome and frozen section

SECTION II **40 MARKS**

1. Staining procedure (routine / special)
2. Cytological techniques

PATTERN OF QUESTION PAPER

Section I

Long answer question marks	-	1 x 10 = 10
Short answer question marks Very short answer (1 to 2 marks) marks	-	5 x 4 = 20 = 10

Section II

Long answer question marks	-	1 x 10 = 10
Short answer question marks Very short answer (1 to 2 marks) marks	-	5 x 4 = 20 = 10

MODEL QUESTION PAPER
HISTOPATHOLOGY AND CYTOLOGY

Time: 3 hrs. Max marks: 80

SECTION I

1. What is an ideal fixative? Discuss the merits and demerits of formalin as fixative. (10 Marks)

2. Write short note on any FIVE (5 x 4 = 20 marks)

a) Demonstration of fat in tissue.
b) Decalcification of bone.
c) Aqueous mounting media
d) Tissue processing
e) Care of microtome
f) Cryostat Sections.

3. Answer the following: (5 x 2 = 10 marks)

a) Name two methods of decalcifying bones.
b) Define honing and stropping
c) Define bewel angle.
d) Mention the role of fixatives
e) What is double embedding?

SECTION II

4. Name the various hematoxylin used in histopathology. Discuss the advantages and disadvantages of Ehrlich's hematoxylin. (1 x 10 = 10 marks)

5. Write short note on (5 x 4 = 20 marks)

a) Stains for mucin
b) Demonstration of acid fast bacilli in tissue.
c) Silver impregnation technique.
d) Pap stain technique
e) Cell Block Preparation
f) Millipore filter.

6. Answer the following: (5 x 2 = 10 marks)

a) What are mordants? Give example.
b) Name two staining techniques in identifying microorganisms in tissues.
c) Write two applications of enzyme histochemistry
d) Name the cytological fixatives used.

e) What is mailing of cytology slides?