BIOPHYSICAL & BIOCHEMICAL TECHNIQUES (THEORY)
Course Code: PMS.501T
Credit Hours: 3
Semester: I

UNIT –I: Microscopy **(10 Lectures)**

- Electron microscopy-principles and applications
- Phase contrast microscopy
- Micrometry
- Immunofluorsecent microscopy

UNIT –II: Immunochemical Techniques **(10 Lectures)**

- Introduction
- Immunoblotting Techniques (western, southern and northern blotting)
- Immunoassays (RIA and ELISA)
- Immunohisto/Cytochemistry

UNIT –III: Centrifugation Techniques **(5 Lectures)**

- Introduction
- Basic Principle of sedimentation
- Centrifuges and their uses
- Autoanalyzers-principles and their applications

UNIT – IV: Spectroscopic Techniques **(15 Lectures)**

- Atomic and Molecular Electronic Spectroscopy-Brief Introduction
- X- Ray Spectroscopy
- Ultraviolet and Visible Light Spectroscopy
- Vibrational, Electron Spectroscopy and nuclear Spin Orientation in Magnetic Fields-Brief Introduction
- Infrared and Raman Spectroscopy
- Electron Spin Resonance Spectroscopy
- Nuclear Magnetic Resonance Spectroscopy

UNIT – V: Chromatographic Techniques **(15 Lectures)**

- Introduction
- Low pressure Column Chromatography
- High Performance Liquid Chromatography
- Adsorption Chromatography
- Partition Chromatography
- Ion – Exchange Chromatography
- Gas – Liquid Chromatography
- Thin Layer Chromatography

UNIT – VI : Electrochemical Technique **(5 Lectures)**

- Concepts of buffers, their preparation and significance.
- Principles of Electrophoresis-PAGE, SDS-PAGE, Isoelectric focussing, PGFE

BIOPHYSICAL & BIOCHEMICAL TECHNIQUES (PRACTICAL)
Course Code: PMS.501P
Credit Hours: 3

- Demonstration of various techniques as per theory syllabus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
TOTAL MARKS				**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1^{st} ,2^{nd} Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
TOTAL MARKS		**100**

SYSTEMIC BACTERIOLOGY (THEORY)
Course Code: MIC.502T
Credit Hours: 3
Semester: I

Morphology, Cultural characteristics, Pathogenesis, Lab diagnosis of bacteria belonging to genus

- Staphylococcus **(1 Lectures)**
- Streptococcus and Enterococcus **(2 Lectures)**
- Pneumococcus **(1 Lectures)**
- Neisseria and Moraxella **(2 Lectures)**
- Corynebacterium **(2 Lectures)**
- Bacillus **(2 Lectures)**
- Clostridium **(2 Lectures)**
- Non-sporing Anaerobes **(2 Lectures)**
- Enterobacteriaceae **(2 Lectures)**
- Shigella **(2 Lectures)**
- Salmonella **(2 Lectures)**
- Vibrio **(2 Lectures)**
- Campylobacter, Helicobacter, Mobiluncus **(3Lectures)**
- Pseudomonas, Strenotrophomonas, Burkholderia **(2 Lectures)**
- Yersinia, Pasteurella, Francisella **(2 Lectures)**
- Legionella **(1 Lectures)**
- Haemophilus **(2 Lectures)**
- Bordetella **(2 Lectures)**
- Brucella **(2 Lectures)**
- Mycobacterium tuberculosis **(2 Lectures)**
- Mycobacterium Leprae **(2 Lectures)**
- Spirochaetes **(2 Lectures)**
- Mycoplasma and Ureaplasma **(2 Lectures)**
- Actinomycetes **(2 Lectures)**
- Rickettsia, Orientia, Coxiella, Ehrlichia, Bartonella **(2 Lectures)**
- Chlamydia and Chlamydophila **(2 Lectures)**

SYSTEMIC BACTERIOLOGY (PRACTICAL)
Course Code: MIC.502P
Credit Hours: 3

- Lab diagnosis of the infections caused by above bacteria; as per theory syllabus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
TOTAL MARKS				**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1^{st} ,2^{nd} Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
TOTAL MARKS		**100**

CLINICAL BIOCHEMISTRY (THEORY)
Course Code: BIO.503T
Credit Hours: 3
Semester: I

UNIT- I **(4 Lectures)**
Specimen Collection and preservation
Quality Control in Clinical Laboratory
Units and Reference Values

UNIT- II **(6 Lectures)**
Enzymes and Isoenzymes of Clinical Importance

UNIT- III **(6 Lectures)**
Renal Function Test

UNIT- IV **(6 Lectures)**
Liver Function Test

UNIT- V **(6 Lectures)**
Gastric Function Test

UNIT- VI **(6 Lectures)**
Cardiac Function Test

UNIT- VII **(6 Lectures)**
Pancreatic Function Test

UNIT- VIII **(6 Lectures)**
Thyroid Function Test

UNIT- IX **(6 Lectures)**
Water & Electrolyte Balance and Imbalance

UNIT- X **(6 Lectures)**
CSF- Chemistry and Clinical Significance

UNIT- XI **(2 Lectures)**
Radioactivity: Radioisotopes in Medicine

CLINICAL BIOCHEMISTRY (PRACTICAL)
Course Code: BIO.503P
Credit Hours: 3

- Determination of Electrolytes: Na^+,K^+,Cl^-
- Estimation of Proteins: Total Protein, Albumin, Globulin
- Estimation of Carbohydrates: Blood Glucose(Fasting & Random), GTT
- Determination of Nitrogenous Content: BUN, Creatinine, Uric acid, Urea
- LFT: SGOT, SGPT, Bilirubin(Total & Conjugated), Acid Phosphatase, Alkaline Phosphatase
- Estimation of Lipid: Cholesterol, Triglycerides, HDL, LDL, VLDL,
- Estimation of Enzymes:
  - Cardiac Profile-CKMB, LDH, Trop-T

- Thyroid Profile-T3, T4, TSH
- Fertility Hormones- FSH, LH, PRL, Testosterone
- Amylase: Salivary & Pancreatic
- Serum Lipase

– Estimation of Minerals: Calcium, Phosphorus, Magnesium

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
			TOTAL MARKS	**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1^{st} ,2^{nd} Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
	TOTAL MARKS	**100**

HUMAN VALUES AND PROFESSIONAL ETHICS
Course Code: HVE.501T
Credit Hours: 2
Semester: I

UNIT -I

Introduction to Value Education: Understanding the need, basic guidelines, content and process for Value Education, Self-exploration—its content and process; 'Natural Acceptance' and Experiential Validation—as the mechanism for self-exploration.

UNIT - II

Continuous Happiness and Prosperity: A look at basic human aspirations, Right understanding, Relationship and Physical Facilities — the basic requirements for fulfillment of aspirations of every human being, Understanding Happiness and Prosperity come — A critical appraisal of the current scenario, Method to fulfill the above human aspirations: Understanding and living in harmony at various levels.

UNIT -III

Harmony in the Human Being: Understanding human being as a coexistence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' Sukh and Suvidha. Body as an instrument of 'I': Being the doer. seer and enjoyer, understanding the characteristics and activities of 'I' and harmony in 'I', understanding the harmony of 'I' with the Body: Sanyam and Svasthya; correct appraisal of physical needs, meaning of prosperity in detail, programs to ensure Sanyam and Svasthya.

UNIT -IV

Harmony in the Family and Society: Understanding harmony in the Family — the basic unit of human interaction, Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhaya —tripti; Trust; vrs-vasa) and Respect (Sammana) as the foundational values of relationship. Understanding the meaning of VI-S-vasa; Difference between intention and competence, Understanding the meaning of Sammana, Difference between respect and differentiation; the other salient values in relationship.

UNIT – V

Harmony in the society: Understanding the harmony in the society (society being an extension of family): Sarnadhana, Samriddhi, Abhaya. Sah-astirva as comprehensive Human Goals, Visualizing a universal harmonious order in society — Undivided Society (Akhand Sarnal), Universal Order (Sarvabhauma Vyavasthal- from family to world family.

UNIT – VI

Harmony in the Nature (Existence): Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature—recyclability and self-regulation in nature.

UNIT – VII

Understanding Sah-astitva: Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

UNIT – VIII

Implications of the Holistic Understanding — A Look at Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics. Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of

people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems.

UNIT – IX

Strategy for transition *frori* the present state to Universal Human Order: (a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, (b) At the level of society as mutually enriching institutions and organizations.

UNIT -X

Introduction to Medical Ethics (Deontology): (a) Relationship of health workers with their patients, relatives of patients and their co-workers. (b) History of Deontology (c) Principles and practice of Deontology.

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
			TOTAL MARKS	**100**

RESEARCH METHODOLOGY AND BIOSTATISTICS
Course Code: RMB.501T
Credit Hours: 3
Semester: I

UNIT-I: Research Design

Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses.

Experimental Design: Concept of Independent & Dependent variables.

UNIT-II: Qualitative and Quantitative Research:

Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

UNIT-III: Measurement

Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.

Definition & Calculations of mean(by both direct and shortcut method and step deviation method) mode and Median(individual observation, discrete observation and continous observation .

UNIT-IV: Sampling

Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.

UNIT-V: Data Analysis

Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.

UNIT-VI: Interpretation of Data and Paper Writing

Layout of a Research Paper, Journals in Medical Lab technology, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
		TOTAL MARKS		**100**

ENVIRONMENTAL STUDIES
Course Code: EVS.501T
Credit Hours: 2
Semester: I

UNIT-I

Introduction to ecology and environment; Definition, scope and importance of environment and environmental science. Structure of Environment – layers of atmosphere, hydrosphere – water budget, groundwater and ocean, lithosphere – soil formation and profile. Concept of ecology and ecosystem; types of ecosystem (Forest, pond, lakes, river, desert and grass land); energy flow of ecosystem; food chain and food web; ecological pyramids and succession

UNIT- II

Natural resources; Forest resources–uses and exploitation, deforestation and conservation; Renewable, Nonrenewable and alternate energy resources; Mineral resources - Use and exploitation, environmental effects of extracting and using mineral resources; water resources–uses and exploitation; Human resources and food resources; Bioresources–biodiversity value, threats and conservation, hot spots of biodiversity and endangered species, red data book; soil erosion and desertification.

UNIT- III

Environmental pollution; Air, water, soil and noise – sources, effects and consequences; marine and thermal pollution; Greenhouse effect, acid rain, ozone depletion, nuclear winter, photochemical smog, London smog Solid waste management–sources of waste generation, collection, segregation and disposal. Waste hierarchy and Integrated solid waste management Pollution control methods–sewage treatment plant, water treatment plant, air pollution control methods

UNIT-IV

Natural disasters; Earthquakes, floods, tsunamis, cyclones, droughts, landslides and tsunamis**.**

UNIT-V

Environmental laws, conventions and protocols; Water (Prevention and control of Pollution) act; Air (Prevention and Control of Pollution) Act; Environment Protection Act; Forest Conservation act; Kyoto protocol, Montreal protocol, Stockholm convention, Rio summit 1992 and convention on biodiversity, Cartagena protocol, IPCC.

UNIT- VI

Social issues and the environment; Rain water harvesting; wasteland reclamation; environmental ethics; sustainable development; population growth, industrialization, urbanization, family, child and women welfare programmes, human health and environment; Role of Information Technology in Environment; value education; sustainable development

UNIT- VII

Field work; Visit to local polluted site, biogas plant, waste management site, wastewater treatment plant, wildlife sanctuary; Study of simple ecosystems-pond, river etc.

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
		TOTAL MARKS		**100**

VIROLOGY & MYCOLOGY (THEORY)
Course Code: MIC.506T
Credit Hours: 3
Semester: II

SECTION-I: VIROLOGY (30 Lectures)

UNIT – I (6 Lectures)

- General properties of Viruses: Replication, Genetics and Classification of Viruses
- Viral Infections: Epidemiology, Pathogenesis and Pathology

UNIT- II (6 Lectures)

- Interferon and Antiviral Agents
- Lab Diagnosis of Viral Diseases
- Virus- Host Interactions

UNIT- III (18 Lectures)

- Bacteriophage
- Poxviruses
- Herpesviruses
- Adenoviruses
- Picornaviruses
- Orthomyxoviruses
- Paramyxoviruses
- Arboviruses
- Rhabdoviruses
- Hepatitis Viruses
- Retroviruses: HIV
- Miscellaneous Viruses
  - *DNA Viruses:* Papovirus & Parvovirus
  - *RNA Viruses:* Coronavirus & Reovirus
- Oncogenic Viruses

SECTION-II: MYCOLOGY (20 Lectures)

- Morphology and Structure of fungi
- Classification of fungi
- Nutrition and cultivation of fungus
- Cutaneous & Subcutaneous and Systemic Mycosis (in brief)
- Lab diagnosis of fungal Infections
- Opportunistic fungal infections

VIROLOGY & MYCOLOGY (PRACTICAL)
Course Code: MIC.506P
Credit Hours: 3

Virology:

- Techniques in tissue culture.
- Demonstration of Cytopathogenic effect (CPE)
- Haemagglutionation test.
- Haemagglutination inhibition test.
- Viral Serology/PCR

Mycology

- Lactophenol – cotton blue staining
- KOH Preparation
- Preparation of SDA
- Morphology of common fungi, yeasts isolated from various fungal infections
- Culture demonstration of contaminants- Aspergillus, Penicillium, Mucor, Rhizopus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
TOTAL MARKS				**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
TOTAL MARKS		**100**

HISTOPATHOLOGY & CYTOLOGY TECHNIQUES (THEORY)
Course Code: PAT.507T
Credit Hours: 3
Semester: II

UNIT- I: Basic Histopathology Techniques and Laboratory Requirements (30 Lectures)

- Histopathology and cytology Techniques- Introduction
- Laboratory Requirements
- Preparation of 70% (v/v) alcohol(200ml) from commercially available ethanol
- Equipment and Instruments
- Histopathological Techniques
- Cell Division
- Methods of examination of Tissues and Cells
- Various Method of Preparation of Tissue Sections
- Fixation
- Reagents employed as Fixatives
- Decalcification
- Gross examination and Fixation of the Specimen
- Decalcification of Calcified tissue
- Processing of Tissue By Manual Method
- Tissue Processing by using an Automatic Tissue Processor
- Sharpening of the Microtome Knife
- Section Cutting of Paraffin Wax Embedded Tissue
- To Fix the sections on the Slides

UNIT- II : Routine Staining Procedures and Frozen Section Techniques (15 Lectures)

- Staining of Tissue Section By using H&E Stain
- Staining of Connective Tissue(Weigert-Van Gieson Method)
- Staining of sections of reticulin by Silver Nitrate Method
- Staining of Section for Elastic Fibre
- Staining & Identification of the Various Types of Carbohydrates
- Staining & Identification of Amyloids
- Staining of the section for Hemosiderin (a Tissue Pigment)
- Staining of the section for Calcium
- Staining of fat
- Preparation of Frozen Section

UNIT – III: Cytological Techniques (5 Lectures)

- Staining of the cellular components in smears of exfoliated cells by Papanicolaou Method
- Crystal Violet Staining in Exfoliative Gynecologic Cytology
- Differentiation between normal and abnormal cells

HISTOPATHOLOGY & CYTOLOGY TECHNIQUES (PRACTICAL)
Course Code: PAT.516P
Credit Hours: 3

- Tissue Processing, Cutting and Section Fixing as per Theory Syllabus
- Routine Staining Procedures as per Theory Syllabus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
		TOTAL MARKS		**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
	TOTAL MARKS	**100**

BASIC IMMUNOLOGY (THEORY)
Course Code: MIC.508T
Credit Hours: 3
Semester: II

UNIT- I **(5 Lectures)**

- Introduction to Immunology
- Immunity: Innate & Adaptive
- Cells & Organs of Immune System
- Antigens
- Antibodies

UNIT-II **(5 Lectures)**

- Major Histocompatibility Test
- Complement system
- Hypersentivity

UNIT-III **(5 Lectures)**

- Cytokines, Chemokines and their receptors
- Effector Mechanisms
- Effector functions of Antibodies: Introduction, Antibody functions as per isotypes-Ig M, Ig A & Ig E
- Neutralizing antibodies in Infections-Prevention of attachment, Neutralization of Toxins.
- Cellular Effector Mechanisms: Introduction, Macrophages as Cytotoxic effectors, Effector Functions of NK cells, Effector Functions of T Helper Cells, ADCC, Effector Functions of Cytotoxic T Cells.

UNIT-IV **(3 Lectures)**

- *Monoclonal Antibodies:* Production and Applications

UNIT–V **(5 Lectures)**

- ***Immunology of Bacterial Diseases :*** Introduction, General Consideration of bacterial Diseases, Pathogenic bacteria and Diseases caused by them, Route of Transmission of Bacterial Diseases, General symptoms of Bacterial Diseases, Treatment for Bacterial Diseases, Immune Response to Bacterial Diseases, Mechanisms by which bacteria Invade Immune response

UNIT- VI **(5 Lectures)**

Immunology of Viral Diseases: Introduction***,*** Role of Innate Immunity in Controlling Viral Infection***,*** Adaptive immune Response to Viral Infection***,*** Immune Evasion Strategies of Viruses.

UNIT- VII **(5 Lectures)**

Immunology of Parasitic Diseases: Introduction ***,*** Vectors***,*** Epidemiology of Parasitic Diseases***,*** Immune Response to Parasitic Infections – General Considerations***,*** Role of Eosinophils and Ig E antibodies***,*** Role of antibodies

UNIT- VIII **(5 Lectures)**

Transplantation & Tumour Immunology

UNIT- IX **(10 Lectures)**

Principles & Applications of Laboratory Tests in Immunology

- Introduction
- Purification of antibodies
  - Precipitation with Ammonium sulphate
  - Gel Filtration
  - Ion Exchange Chromatography
  - Affinity Chromatography
- Antibody Assays:
  - Precipitation Reaction in Solution/Gel
  - Immunoelectrophoresis
  - Agglutination Reaction
  - Complement Fixation
  - Radioimmunoassay
  - Enzyme linked Immunosorbent Assay
  - Chemiluminescence Assays

UNIT- X **(2 Lectures)**

- Vaccines

BASIC IMMUNOLOGY (PRACTICAL)
Course Code: MIC.508P
Credit Hours: 3

- Demonstration of various techniques as per theory syllabus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
			TOTAL MARKS	**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
	TOTAL MARKS	**100**

CLINICAL HEMATOLOGY (THEORY)
Course Code: PAT.509T
Credit Hours: 3
Semester: II

UNIT- I **(15 Lectures)**

- Introduction to Hematology
- Blood
- Heamtopoietic system of Blood
- Erythropoiesis
- Leukopoiesis
- Thrombopoeisis
- Development of blood corpuscles
- Hemoglobin-types and methods of estimation

UNIT- II **(15 Lectures)**

Routine Hematological Tests

- Complete Blood Count(CBC)
- Basic Requirements of hematology Lab
- Collection of Blood
- Anticoagulants
- Determination of Hb by Sahli's Method & Cyanmethemoglobin Method
- Blood Cell Counts
- Total Erythrocyte Count by Hemocytometer
- Total Leucocyte Count by Hemocytometer
- Study of Blood Smear for differential Leucocyte Count and Cell Morphology
- Differential Leucocyte Count
- Study of morphology of Red Blood Cells
- Determination of Hematocrit (PCV)
- *Erythrocyte Sedimentation rate:* determination by Wintrobe method & Westergen method
- Determination of Platelet count
- Determination of Reticulocyte count
- Determination of Absolute Eosinophil count

UNIT – III **(15 Lectures)**

Hematological Diseases

- *Anaemia :* Various Types of anaemia: Pernicious Anaemia ,Sideroblastic anaemia, Anaemia of Chronic Renal Insufficiency, Sickle Cell anaemia, Acquired autoimmune haemolytic anaemia, Thalassemias, Polycythemia, Leukemia, Di Gugliemo Syndrome.
- Laboratory Investigation of anaemia
- Hereditary Spherocytosis
- Herditary elliptocytosis
- Hemolytic Disease of New Born

- Infectious mononucleosis
- Multiple myeloma
- Parasitic Infections of Blood

UNIT- IV **(15 Lectures)**

Special Haematological Tests

- Determination of Fetal Haemoglobin
- Determination of Osmotic Fragility of Red Blood Cells
- Preparation of Lupus Erythematosus(LE) cell
- Preparation of Heinz Bodies
- Microscopic Examination of Bone Marrow smear and Detection of iron in the Prepared Smear
- Determination of Plasma Hemoglobin
- Detection of Hemosiderin in Urine
- Determination of Red Cell Pyruvate Kinase
- Determination of Reduced Glutathione(GSH)
- Acidified- Serum Test(Ham Test)

CLINICAL HEMATOLOGY (PRACTICAL)
Course Code: PAT.509P
Credit Hours: 3

- Complete Hemogram as per Theory syllabus
- Special haematological test as per Theory Syllabus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
TOTAL MARKS				**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1^{st} ,2^{nd} Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
TOTAL MARKS		**100**

INTELLECTUAL PROPERTY RIGHTS(IPS) AND THEIR ACQUISITION (THEORY)
Course Code: CBR.516T
Credit Hours: 2
Semester: II

1.Introduction and need for Intellectual Property Rights (IPR), IPR in India and abroad **(2 Lectures)**
2.Patents, protection of innovations, Patent search, drafting and filing a patent application, grant of patent and patent rights **(8 Lectures)**
3.Copyrights, coverage, related rights **(2 Lectures)**
4.Trademarks, rights under trademarks, types, functions of trade marks, duration of protection, domain names in relation to trade marks **(4 Lectures)**
5.Geographical indications, protection of geographical indications **(2 Lectures)**
6.Industrial designs, protection of IPR through industrial designs **(4 Lectures)**
7.Protection of farmers rights and plant varieties, New plant varieties **(2 Lectures)**
8.Enforcement of IPR, infringement, enforcement measures **(6 Lectures)**
9.IPR in life sciences and Biotechnology, commercialization of events **(4 Lectures)**
10.IP commercialization and management, case studies **(8 Lectures)**

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
			TOTAL MARKS	**100**

FUNDAMENTALS OF MOLECULAR BIOLOGY (THEORY)
Course Code: CBR.517T
Credit Hours: 2
Semester: II

UNIT I: Basic Principles in Molecular Diagnostics (6 Lectures)

Organizations of molecular diagnostic laboratory-Bio-membranes and the sub-cellular organization of eukaryotic cells.

UNIT-II: Nucleic acid organelle (6 Lectures)

DNA-the genetic code and the synthesis of macromolecules-structure of nucleic acids-synthesis of biopolymers-nucleic acid synthesis-the role of RNA in protein synthesis stepwise formation of proteins on ribosome.

UNIT-III: Molecular structure of genes and chromosomes (6 Lectures)

organization of cellular DNA into chromosomes-morphology and functional elements of eukaryotic chromosomes-chromosomal organization of genes and non-coding DNA.

UNIT-IV: (6 Lectures)

DNA replication-repair-recombination-mutation-Regulation of the eukaryotic cell cycle-gene control in development-Cellular energetic-Types of syndromes-Cystic fibrosis.

UNIT -V: (6 Lectures)

Molecular oncology including DNA assay for T and B-cell rearrangement-analysis for translocation, oncogenes analysis-translocation gene mutation in various cancer, in situ hybridization- Blood group, molecular histocompatibility testing, forensic identity testing by DNA analysis.

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
			TOTAL MARKS	**100**

HUMAN PARASITOLOGY (THEORY)
Course Code: MIC.510T
Credit Hours: 3
Semester: III

UNIT-I: Introduction **(5 Lectures)**

- Definition - parasitism, host, Vectors etc.
- Classification of Parasites & hosts
- Host-parasite interactions
- Life cycles of parasites: general outline
- Consequences of parasitism

UNIT-II: Clinical Parasitology **(40 Lectures)**

- *Amoebae:*
  - *Entanoeba histolytica*
- *Flagellates*
  - *Giardia lamblia*
  - *Trichomonas Vaginalis*
  - *Leishmania donovani*
  - *Leishmania tropica*
  - *Trypanosoma cruzi*
  - *Trypanosome brucei gambiense*
- *Sporozoa*
  - *Malarial parasites*
  - *B.coli*
- *Cestodes or Tapeworms*
  - *Taenia saginata and Taenia solium*
  - *H. nana*
- *Tramatodes of flukes*
  - *Fasciola*
- Nematodes
  - *Ancyclostoma duodenale*
  - *Ascaris lumbricoides*
  - *Wuchereria brancrofti*
  - *Drancunculus medinensis*
- Applied Parasitology, Diagnostic Procedures and Overview **(2 Lectures)**
- Parasitic Opportunistic Infection in AIDS cases and nosocomial Parasitic infection **(3 Lectures)**

HUMAN PARASITOLOGY (PRACTICAL)
Course Code: MIC.510P
Credit Hours: 3

- Stool Examination
- Laboratory Diagnosis of Parasitic Infection

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
TOTAL MARKS				**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
TOTAL MARKS		**100**

DIAGNOSTIC BIOCHEMISTRY (THEORY)
Course Code: BIO.511T
Credit Hours: 3
Semester: III

UNIT- I **(5 Lectures)**

Enzymes related disorders: Alkaptonuria, Phenylketonuria, Xanthinuria

UNIT- II **(5 Lectures)**

Disturbances in Acid- Base Balances: Introduction, factors affecting acid-base balances, metabolic acidosis and alkalosis, respiratory acidosis and alkalosis.

UNIT- III **(5 Lectures)**

- *Lipoproteins & its disorders:* Definition, structure, Classification, Metabolism,
- Disorders: Hyperlipoproteinemias and Hypolipoproteinemias

UNIT- IV **(5 Lectures)**

Diabetes: Introduction, Classification, Causes, Management and clinical diagnosis

- *Arthrosclerosis:* Introduction, Causes and Clinical significance

UNIT- V: Organ Function Tests **(40 Lectures)**

- *Cardiac Function:* Acute coronary syndrome, angina, coronary artery disease ischemia, myocardial infarction, plaque.
- Cardiac markers, Methods used to measure cardiac markers
- *Renal Functions:* Macroscopic and microscopic anatomy of renal system.Nephrone, glomerular filtration rate, plasma renal flow, hemodialysis,hemostasis, erythropoietin. Functions of renal system. End stage renal disease, acute renal failure, acute nephritis syndrome, pyelonephritis, and urinary tract obstructions.
- *Liver Functions:* Macroscopic and microscopic anatomy of hepatic System. Hepatic Lobule, Portal triad, jaundice, viral and chronic hepatitis,cirrhosis, cholestasis, cholecystitis. Major functions of liver.Enzymes synthesized by liver, their functions and clinical significance.
- *Gastric,pancreatic and intestinal Function:*ulcer,cystic fibrosis. Hormones and enzymes in the GI Tract, their functions and clinical significance. Zollinger-Elison, gastritis,pancreatic,pancreatic tumour,lactose intolerance and diabetes mellitus
- *Thyroid Function:*Follicle, Colloid, Thyroglobulin, reverse T3, goitre, euthyroid, thyrotropin releasing hormone. Structure and function of thyroid gland. Synthesis, regulation and metabolism of thyroid hormones. Effects of increased and decreased concentration of thyroid hormones on TSH levels. Laboratory tests to access thyroid gland function. Hashimoto's disease, Grave's disease, Secondary hyperthyroidism and thyroid antibodies.
- *Adrenocortical Functions:*Hormones synthesized by specific zone of adrenal cortex and their function. Adrenal disorders- Addison's disease, conn's disease, cushing's syndrome, congential adrenal hyperplasia. Laboratory tests to access adrenocortical functions.

DIAGNOSTIC BIOCHEMISTRY (PRACTICAL)
Course Code: BIO.511P
Credit Hours: 2
Semester: III

- Different estimations as per theory syllabus

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
SEC -A: MCQ'S	20	20	1	20
SEC -B: Short Answer Questions	7	5	6	30
SEC -C: Long Answer Questions	7	5	10	50
			TOTAL MARKS	**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
	TOTAL MARKS	**100**

BLOOD BANK PROCEDURES & COAGULATION STUDIES (THEORY)
Course Code: PAT.512T
Credit Hours: 3
Semester: III

UNIT- I **(10 Lectures)**

- Basic Principles in Blood Banking: Organization, Planning & Documentation
- Human Blood Group Sytem
- Inheritance of Blood Group System genetics
- Quantitative Test for ABO Grouping with antisera & Tube Method.
- Quantitative test for the recognition of the D (Rho) antigen on red Blood Cells
- Determination of D (Rho) antigen on red Blood Cells by Slide Method
- Determination of D^U by Tube method
- Coomb's Test : Direct & Indirect
- Compatibility Test (the cross matching) by Saline Tube Method
- Blood Transfusion and Transfusion Reaction
- Selection of donor and Collection of blood from Donor

UNIT-II: Haemostasis **(5 Lectures)**

- Definition, Basic concept and principle, Basic steps involved in haemostasis.
- Basic Physiology, coagulation factors.
- Mechanism of blood coagulation.
- Extrinsic Pathway.
- Intrinsic Pathway.
- Regulators of blood coagulation.

UNIT- III : **Haematological Tests** **(30 Lectures)**

- Routine Coagulation Test
- Congential Deficiencies of Hemostatic Factors
- Other clinical conditions affecting hemostasis(Liver Disease)
- Diagnosis of Bleeding Disorders
- Routine Hemorrhagic Disorder Test
- Determination of Bleeding Time
- Determination of Blood Clotting Time
- Determination of Clotting Time by Lee- White Method
- Determination of Clot Retraction and Lysis Time
- Determination of Prothrombin Time (Quick's Method)
- Determination of Plasma Recalcification Time
- Determination of Partial Thromplastin Time
- Determination of Activated Partial Thromplastin Time
- Determination of Thrombin Time

- Determination of Fibrinogen
- Automated Coagulation System

UNIT-IV: Quality Assurance for routine Heamostasis Laboratory. (5 Lectures)

- Sample collection technique (Phelbotony)
- Sample preparation, Anticoagulant used, Importance of use of Sodium Citrate.

UNIT-V: Role in Diseases, Bleeding disorders (10 Lectures)

- Platelet disorder - Thrombocytopenias - causes including aplastic anemia.
- D I C
- IT P
- Hemophilia

BLOOD BANK PROCEDURES & COAGULATION STUDIES (PRACTICAL)
Course Code: PAT.512P
Credit Hours: 2

- Precautions to prevent hemolysis
- Storage of blood specimens
- Bleeding time & clotting time estimation
- Prothrombin time estimation
- aPTT (activated partial thromboplastin time) estimation.
- Clot retraction time

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
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TOTAL MARKS				**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	Marks
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
TOTAL MARKS		**100**

CLINICAL PATHOLOGY (THEORY)
Course Code: PAT.513T
Credit Hours: 3
Semester: III

UNIT-I: Urine **(8 Lectures)**

Collection of urine and its preservation, 24 hour urine collection for protein. Physical examination of urine- examination of urine for colors, cloudiness, specific gravity, reaction and pH. Chemical examination of urine. Microscopic examination of urine- Urine sediment preparation, types of sediments and its examination.

UNIT-II: Faeces **(7 Lectures)**

Collection and preservation, examination of motion for color, mucus, consistency, ova, ameba, cysts, parasites, pus cells, RBC and crystals. Detection of occult blood in stool, concentration techniques.

UNIT-III: Sputum **(7 Lectures)**

Method of collection for various purposes including AFB fugal, malignant cells and others. Microscopic examination of sputum, sputum for AFB.

UNIT-IV: Semen **(8 Lectures)**

method of collection examination of semen for time for liquefaction, volume, colour, reaction pH, motility of spam, sperm count and other findings staining and morphological study of spermatozoa, semen fructose determination, Antisperm antibodies

UNIT-V: CSF **(8 Lectures)**

General introduction method of CSF collection, Transport of CSF, examination of CSF, colour, turbidity and fibrin clot (Cob web), total and differential leukocyte count. CSF examination by Gram's staining and acid fast staining, biochemical tests, clinical significance of CSF analysis in various meningitis and encephalitis and interpretations.

UNIT-VI: Other body fluids **(7 Lectures)**

Methods of collection, transport and macroscopic and microscopic examination of ascetic fluid, pleural fluid, pericardial fluid and synovial fluid.

UNIT-VII: Pregnancy tests **(5 Lectures)**

Different methods of testing and chronic gonadotropin assay with urine

CLINICAL PATHOLOGY (PRACTICAL)
Course Code: PAT.513P
Credit Hours: 3

- Urine-collection, processing, physical, chemical and microscopic examination.
- Collection, preservation and examination of stool
- Sputum collection and microscopy. Examination of sputum for AFB.
- Analysis and examination of semen-physical examination, sperm motility, morphological study of sperms, fructose determination in semen.
- Analysis of CSF, microscopic and chemical examination of CSF.
- Macroscopic and microscopic examination of Ascetic fluid, Pleural fluid, pericardial fluid and synovial fluid.

SCHEME OF EXAMINATION - THEORY

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		TOTAL MARKS		**100**

SCHEME OF EXAMINATION - PRACTICALS

	Particulars	**Marks**
INTERNAL	Log Book	10
	Clinical Posting(attendance)	20
	Internal (1st ,2nd Hourly & mid-term)	20
EXTERNAL	Viva-voce	50
	TOTAL MARKS	**100**

ENFORCEMENT OF INTELLECTUAL PROPERTY RIGHTS (THEORY)
Course Code: CBR.518T
Credit Hours: 2
Semester: III

1.Introduction to IPR, History, Types of IP and their protection **(4 Lectures)**
2.Patent protection laws, world Intellectual Property Rights Organization (WIPO), World Trade Organization (WTO) **(10 Lectures)**
3.Protection & transfer of copyrights, infringement and law protecting copyrights **(6 Lectures)**
4.Trade marks, rights protection of goodwill, infringement and defense **(6 Lectures)**
5.Designs and their assignment, infringement, defense of design infringement **(6Lectures)**
6.Licensing & infringement, protection from infringements, deterrents to infringements **(6 Lect.)**
7. IP in the cyber world **(4 Lectures)**

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
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TOTAL MARKS				**100**

MOLECULAR DIAGNOSTIC TECHNIQUES (THEORY)
Course Code: CBR.519T
Credit Hours: 2
Semester: III

UNIT-I: Recombinant DNA Technology **(20 Lectures)**

- Historical Perspectives
- Synthetic DNA
- The Polymerase Chain Reaction
- Gel Electrophoresis
- Cloning Vectors and Creating Recombinant DNA
- Construction of Genomic Libraries
- Inserting Recombinant DNA into Host Cells
- Expression of foreign gene in the host cells
- Applications of Genetic Engineering
- Social impact on Recombinant DNA Technology

UNIT-II: Microbial Genomics **(15 Lectures)**

- Introduction
- Determining DNA Sequences
- Whole genome shotgun sequencing
- Bioinformatics
- Functional Genomics
- Comparative Genomics
- Proteomics
- Insights from Microbial genomes

SCHEME OF EXAMINATION - THEORY

Types of Questions	Total No. of Questions	No. of Questions to be attempted	Marks Assigned	Subtotal
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