

**SARDAR PATEL UNIVERSITY  
VALLABH VIDYANAGAR**



**SYLLABUS EFFECTIVE FROM: 2019-20  
M. Sc. (BIOMEDICAL SCIENC)  
SEMESTER-I**

**PT01CBMC21: Cell and Molecular Biology**

**Unit I**

An overview of cell organization; Structure of pro-and eukaryotic cell. Experimental approaches for studying cells: Various types of light microscopy, Electron microscopy, fixation and staining, cytochemical methods and cell fractionation (flow cytometry).

**Unit II**

Cell organization: Structure and functions of membranes- various transport mechanisms and transports, nucleus Chloroplast, Mitochondria, Endoplasmic reticulum, Golgi complex, Ribosomes, Lysosomes, Peroxisomes and Glyoxysomes. The cytoskeleton and cell motility – Microtubules, Microfilaments and Intermediate filaments. Cell cycle and cell division. Basic histology of various tissues.

**Unit III**

Nucleic acids as carries of genetic information; Physical properties and structure of DNA and RNA. Replication of DNA: Enzyme and proteins involved in replication. DNA repair mechanisms.

**Unit IV**

Transcription of DNA, post transcriptional modifications of RNA and control of transcription. Genetic code and its properties. Translation of RNA in pro and eukaryotes. Control of translation and protein targeting.

**References Books:**

1. Molecular biology of the cell: Bruce Alberts et al
2. Cell and molecular biology: Gerald Karp, John Wiley
3. Cell and molecular biology: DeRobertis and DeRobertis, Lee and Febiger,
4. Molecular cell biology: Lodish et al

## **PT01CBMC22: Instrumentation**

### **Unit I**

Visualization techniques: Principle of working and applications of bright field microscopy, phase contrast microscopy, fluorescence microscopy, confocal microscopy, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy. Principle and applications of cytophotometry and flow cytometry. Formatting

### **Unit II**

Separation and analytical techniques: Basic principle and application of centrifugation, chromatography and electrophoreses

Principle, instrumentation and applications of UV, Visible, IR (including FTIR and ATR), AAS, NMR, fluorescence and CD spectroscopy

### **Unit III**

Medical Sensors and their classification: Medically significant measurands, sensing methods for biological signals; Sensor characteristics: linearity, repeatability, hysteresis, drift; Sensor models in the time and frequency domains; Sensors for physical measurands: strain, force, pressure, acceleration, flow, volume, temperature and biopotentials. Sensors for measurement of chemicals: potentiometric sensors, ion selective electrodes, ISFETS; Amperometric sensors, Clark Electrode; Catalytic biosensors, immunosensors

### **Unit IV**

Transducers for Biomedical Applications. Sources of Bioelectric potentials; Resting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials Electrodes, electrodes theory, Bio-potential Electrodes, Bio Chemical Transducers, Imaging techniques used to study Cardiovascular System

### **References Books:**

1. Instrumental methods of analysis: D A Skoog, Krishna
2. An introduction to practical Biochemistry: Plummer
3. Instrumentation: Chatwal and Anand
4. Modern experimental Biology: Boyer
5. Biomedical Instrumentation and Measurements: Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer
6. Handbook of Bio-Medical Instrumentation: R. S. Khandpur, Tata McGraw Hill.
7. Bioinstrumentation: J. Webster, Wiley and Sons
8. Applied Bio Sensors: D. L. Wise.

## **PT01CBMC23: Enzymology**

### **Unit I**

Introduction to enzymology and historical developments in enzymology Enzyme Structure and classification.

Practical Enzymology: Enzyme Activity, assay, factors affecting enzyme activity, progress curve, rate enhancement, enzyme activators, coenzyme and cofactors,

Enzyme specificity Enzyme purification: Objectives and strategy, separation techniques, test of purity, case study

### **Unit II**

Enzyme Kinetics: Chemical reaction kinetics and catalysis, Single substrate kinetics: Equilibrium and Steady state kinetics, significance of  $K_m$ ,  $V_{max}$  &  $K_{cat}$ , and enzyme efficiency

Multisubstrate kinetics: General rate equation, compulsory order, random order and ping-pong mechanisms and their primary and secondary plots.

Enzyme inhibition and its kinetics: Reversible and irreversible inhibition, competitive, non-competitive and uncompetitive, mixed, partial, substrate and allosteric inhibition.

Thermal kinetics: Effect of temperature on reaction rate, enzyme stability, Arrhenius equation and activation energy.

### **Unit III**

Mechanism of Enzyme Action: Enzyme mechanisms: Factors affecting catalytic efficiency, Mechanism of Lysozyme, Chymotrypsin, Carboxypeptidase, Restriction endonuclease, Aspartate transcarbomylase. Allosteric enzymes and sigmoidal kinetics: Protein ligand binding, Co-operativity, MWC & KNF models, Multienzyme enzyme complexes

### **Unit IV**

Methods to study enzymes and its mechanisms

Enzyme engineering: Chemical modification of enzymes: methods of modification of primary structure, catalytic and allosteric properties, use of group specific reagents.

Enzymes in non-conventional media, Enzymes as analytical reagents.

Isoenzymes and its physiological significance, Ribozymes and Abzymes

### **Reference Books:**

1. Fundamentals of Enzymology: Nicholes C. Price and Lewis Stevens,
2. Enzyme Structure and mechanism: Alan Fersht,
3. Understanding Enzymes: Trevor Palmer
4. The chemical kinetics of enzyme action: K. J. Laidler and P. S. Bunting,
5. Enzymes: M. Dixon, E. C. Webb, CJR Thorne and K. F. Tipton, Longmans, London Proteins: Thomas Creighton
6. Biochemistry: Lubert Stryer.

## **PT01EBMC21-Human Physiology**

### **Unit I**

Digestive system – Composition, functions and regulation of saliva, gastric, pancreatic intestinal and bile secretions – digestion and absorption of carbohydrates, lipids, proteins nucleic acids, minerals and vitamins. Gastro-Intestinal Hormones

The Muscular System – Types of muscles and their functions. Physiology of muscle contraction in striated and non-striated muscle

### **Unit II**

Homeostasis and the organization of body fluids, Control of Homeostasis, Positive and negative Feedback systems, Homeostatic Imbalances. An overview of human circulatory system. Anatomy of heart, cardiac cycle, cardiac output, blood pressure and regulation, ECG. The arterial system, venous system, the microcirculation and mechanics of capillary fluid exchange. Control of blood flow to the tissues. Portal circulations. Arterial pressure and its regulation. Blood-components and functional significance. Blood buffer systems, Blood coagulation and factors involved in coagulation. Laboratory tests to measure coagulation and thrombolysis. Hemopoiesis and blood groups, Disorders of circulatory system: coagulation disorders, hypertension, thalassemia and anemia.

### **Unit III**

Excretory system – structure of Kidney, types of nephrons, formation of urine, glomerular filtration, GFR, tubular reabsorption of glucose. Renal and pulmonary control of blood pH, renal clearance. Blood supply to kidneys, Micturition, Hormonal control of urine formation.

### **Unit IV**

Nervous System- Structure of neuron, function and organization of nervous system, Blood- brain barrier, Neurotransmitters, Nerve impulse transmission.

Reproductive physiology – secretion and function of reproductive hormones, pregnancy and lactation. Hormonal disturbances.

### **Reference Books:**

1. Text book of Medical Physiology : A. C. Guyton and J. E. Harcourt
2. Text book of Medical Physiology: Ganong.
3. Principles of anatomy and physiology : Gerard Tortora and Bryan Derrickson,

## **PT01EBMC22-Biomolecules and Bioenergetics**

### **Unit I**

Carbohydrates and glycobiology : Monosaccharide - structure of aldoses and ketoses, ring structure of sugars, conformations of sugars, mutarotation, anomers, epimers and enantiomers, structure of biologically important sugar derivatives, oxidation of sugars. Formation of disaccharides, reducing and non-reducing disaccharides. Polysaccharides – homo- and hetero-polysaccharides, structural and storage polysaccharides. Structure and role of proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides). Carbohydrates as informational molecules, working with carbohydrates, Industrial importance of carbohydrate.

### **Unit II**

Amino acids: Structure and classification, physical, chemical and optical properties of amino acids, Classification of amino acids, Protein sequencing and alignment

Building blocks of lipids - fatty acids, glycerol, ceramide. Storage lipids - triacyl glycerol and waxes, Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids and sterols, structure, distribution and role of membrane lipids. Lipids as signals, cofactors and pigments

Nucleic acids: Structure of major species of RNA - mRNA, tRNA and rRNA. Nucleic acid chemistry – UV absorption, effect of acid and alkali on DNA.

### **Unit III**

Acid-Base Equilibrium & Henderson and Hasselbalch equation, Buffers and their importance, pKa of amino acid and their relevance, Importance of discontinuous buffer system used in SDS PAGE.

Common reaction mechanism in biological reaction: Peptide bond formation, oligonucleotide and oligosaccharide synthesis, disulphide bond, group-specific chemical modification for amino acid

### **Unit IV**

Bioenergetics: The laws of thermodynamics, concept of entropy and free energy; ATP synthesis and hydrolysis, Biological oxidations—oxygenases, hydrolases, dehydrogenases, free energy changes and redox potentials, Gibbs energy,

The mitochondrial respiratory chain, order and organization of carriers, proton gradient, iron sulphur proteins, cytochromes and their characterization (Animals, Plants, and Bacteria), ATP-synthetase complex, Chemiosmotic theory of Energy Coupling, Inhibitors of ETC, Regulation of body temperature

### **References Book:**

1. Chemistry of Biomolecules : S. P. Bhutani
2. Lehninger's Principles of Biochemistry: D. L. Nelson and M. M. Cox, Macmillan
3. Biochemistry: Lubert Stryer W H Freeman & Co.
4. Harper's Biochemistry: R. K. Murray and others..
5. Text book of Biochemistry with clinical correlations: Delvin.

## **PT01EBMC23-Introduction of Biostatistics and Bioinformatics**

### **Unit I**

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram

### **Unit II**

Descriptive statistics: Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, Regression and Correlation; t-test

### **Unit III**

Basics of Drug Action: Energy concept and its importance in drug action. First, Second and Third laws of thermodynamics and the principles derived from these laws which are of significance to drug action. Inter- and intra-molecular interactions. Covalent, ion-ion, Hydrogen bonding, C-H hydrogen bonding, dihydrogen bonding, Vander Waals interactions and the associated energies.

### **Unit IV**

Molecular Docking: Introduction to drug discovery, Computers in discovery process, Drug properties, Drug properties, Introduction to molecular docking, Rigid docking, Flexible docking, manual docking, Advantage and disadvantage of docking software.

### **Reference Book:**

1. The Organic Chemistry of Drug Design and Drug Action: R.B. Silverman
2. Molecular Mechanism of Drug Action: C.J. Coulson
3. A primer of Drug Action: R.M. Julien
4. Drug-Receptor Thermodynamics: R.B. Raffa
5. Principles of Drug Action: W.B. Pratt, P. Taylor
6. Medicinal Chemistry How Drugs Act and Why: A. Gring
7. Biometry: The Principles and Practices of Statistics in Biological Research: Sokal, R.R. and Rohlf, F.J.

**PT01CBMC24: Practical based on PT01CBMC01 and PT01CBMC02**

1. Separation of amino acids by TLC
2. DNA estimation by DPA method
3. RNA estimation by orcinol method
4. Isolation of chromosomal DNA
5. Separation of proteins by PAGE
6. Estimation of Protein By Folin-Lowry Method
7. Estimation Of Reducing Sugar By Dns Method
8. Localization Of Cell Organelle
9. Vital staining of mitochondria using JENUS GREEN B
10. Mitosis–Squash preparation of Onion root-tip
11. Meiosis-Squash preparation of anther lobes
12. LVDT transducer
13. Strain gauge characteristic
14. Thermal sensor
15. Pressure sensor
16. Demonstration of HPLC
17. Determination of molecular weight of polymer by GPC and Particle size analyzer
18. Visit to research Lab

**PT01CBMC25: Practical based on PT01CBMC01 and PT01CBMC02**

1. Determination of invertase activity
2. Effect of enzyme concentration on enzyme catalyzed reaction
3. Effect of pH on enzyme catalyzed reaction
4. Effect of temperature on enzyme catalyzed reaction
5. Effect of time on enzyme catalyzed reaction
6. Effect of substrate concentration on enzyme catalyzed reaction and determination of  $K_m$  and  $V_{max}$  of enzyme
7. Demonstration of immobilization of enzyme/whole cell using appropriate method
8. Determination of hemoglobin
9. Determination of RBCs by hemocytometer
10. Determination of WBCs by hemocytometer
11. Differential count
12. Estimation of cholesterol.
13. Estimation of creatinine in serum.
14. Measurement of blood glucose by using glucometer ( biosensor based technique)
15. Measurement of Blood pressure by digital sphygmomanometer.
16. Measurement of heart rate by stethoscope.
17. Measurement of lung capacity (pulmonary function) by spirometer.

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**SYLLABUS EFFECTIVE FROM: 2019-20  
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SEMESTER-II**

**PT02CBMC21: Medical Microbiology**

**Unit I**

Basics in Medical Microbiology: Sources of infection, Modes of transmission, Factors predisposing to microbial pathogenicity, Types of infectious diseases, Prevention and Control of Hospital acquired infections. Immunoprophylaxis: Types of vaccines and schedule of vaccination. Recent advances in diagnostic microbiology: Automation, Nucleic acid based detection methods.

**Unit II**

Bacteriology: Morphology, Cultural Characteristics, Antigenic structures, Pathogenesis, Laboratory Diagnosis of following bacteria: *Staphylococcus*, *Streptococcus including Pneumococcus*, *Bacillus*, *Corynebacterium*, *Clostridium*, *Mycobacteria*, *Vibrios*, *E. coli*, *Salmonella*, *Shighella*, *Spirochaetes*, *Neisseria*,

**Unit III**

Virology: The Nature and classification of viruses, Morphology: virus structure and Virus replication. General properties, diseases caused, lab diagnosis and prevention of Pox, Herpes (HSV), Hepatitis (HAV & HAB), Picorna (Polio virus), Orthomyxo (Influenza), Paramyxo (Mumps and Measles), Rabdo (Rabies), Ebola, Zika and HIV virus. Viral vaccines and antiviral agents.

**Unit IV**

Parasitology & Mycology: **Parasitology:** Laboratory techniques in parasitology. Morphology, life cycle, laboratory diagnosis of following parasites  
*Parasites: Entamoeba, Giardia, Leishmania, Plasmodium, Helminths: Taenia, Ascaris, Wuchereriabancrofti, Schistosomes*, Mycology: Morphology, diseases caused and lab diagnosis of: Opportunistic fungi -*Cryptococcus, Candida, Aspergillus*. Fungi causing Cutaneous mycoses-*Dermatophytes*, Subcutaneous mycoses -*Mycetoma*, Systemic mycoses-*Histoplasma*

**References Books**

1. Textbook of Microbiology: Surinder Kumar
2. Medical Parasitology: R. Karyakarte.
3. Text Books of Medical Laboratory Technology: P. B. Godkar.
4. A Text Book of Medical Microbiology: Anathanarayana & Panikar
5. A Text Book of Microbiology: P. Chakraborty
6. Parasitology: Chatterjee, KD
7. Medical Microbiology, A guide to Microbial Infections, Pathogenesis, Immunity, Laboratory Diagnosis and control: Danial Greenwood et al,
8. Textbook of medical mycology: Jagdish Chander
9. Understanding Viruses: Teri Shores
10. Biswas SB and Biswas A An Introduction to Viruses.



## **PT02CBMC22: Biomaterial and Tissue Engineering**

### **Unit I**

Biomaterials: Introduction-definition of biomaterials, applications of biomaterials, classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials. Biological responses (extra and intra-vascular system). Surface properties of materials, physical properties of materials, mechanical properties.

### **Unit II**

Types of implant materials:

- i. Metallic implant materials: Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking, corrosion behavior and the importance of passive films for tissue adhesion.
- ii. Polymeric implant materials: types, general classification; some commonly used polymers: Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetals. (Classification according to thermosets, thermoplastics and elastomers). Importance of molecular structure, hydrophilic and hydrophobic surface properties, Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes, Biopolymers in controlled release systems. Synthetic polymeric membranes and their biological applications.
- iii. Ceramic implant materials: Definition of bioceramics. Common types of bioceramics: Aluminium oxides, Glass ceramics, Carbons. Bioresorbable and bioactive ceramics. Importance of wear resistance and low fracture toughness. Host tissue reactions: importance of interfacial tissue reaction (e.g. ceramic/bone tissue reaction).
- iv. Composite implant materials: different reinforcement materials, Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Mechanics of improvement of properties by incorporating different elements.

### **Unit III**

Tissue engineering Introduction, Stem cells, Morphogenesis, Generation of tissue in the embryo, Tissue homeostasis, Cellular signaling, Extracellular matrix as a biologic scaffold for tissue engineering, Scaffold fabrication, bioactive scaffold, Natural polymers in tissue engineering applications, Degradable polymers for tissue engineering.

### **Unit IV**

Basic Biology Of Stem Cells: Stem Cells : Introduction, hematopoietic differentiation pathway Potency and plasticity of stem cells, sources, embryonic stem cells, hematopoietic and mesenchymal stem cells, Stem Cell markers, FACS analysis, Differentiation, Stem cell systems- Liver, neuronal stem cells, Types & sources of stem cell with characteristics: embryonic, adult, haematopoietic, fetal, cord blood, placenta, bone marrow, primordial germ cells, cancer stem cells induced pluripotent stem cells.

### **Reference Books**

1. Tissue Engineering: Bernhard O Palsson, Sangeeta N. Bhatia.
2. Fundamentals of Tissue Engineering and Regenerative Medicine: Meyer, U.; Meyer, Th.; Handschel, J.; Wiesmann, H.P .
3. Science and Engineering: J B Park, Biomaterials.
4. Biomaterials: Sujata V. Bhat

## **PT02CBMC23: Immunology**

### **Unit I**

Innate and adaptive immunity: role of cells, receptors and proteins in innate immunity, ubiquity of the innate system. Cells and organs of the immune system: Hematopoiesis, primary and secondary lymphoid organs. Complement: components of the system, activation, regulation, biological consequences and deficiency diseases. Inflammation and anti-inflammatory agents.

### **Unit II**

Antigens and antibodies: properties of immunogens, haptens, epitopes, structure and classes of immunoglobulins, biological activities and effector functions, monoclonal antibodies and enzymes. Antibody diversity: models, organization of Ig genes, mechanism of gene rearrangement, generation of diversity; expression, synthesis and class switching, antibody engineering. Production of polyclonal and monoclonal antibodies: Principles, Techniques and applications. Antigen-antibody interactions: Agglutination and precipitation techniques, Radio Immunoassay, ELISA, Immunofluorescence assays: Fluorescence activated cell sorter (FACS) technique, Cytotoxicity assay, Cytokines assays: ELISA and ELISPOT

### **Unit III**

Major histocompatibility complex and antigen presentation: MHC- organization, inheritance, genes, molecules and peptide binding, expression, disease susceptibility, immune responsiveness, self MHC restriction, cytosolic and endocytic pathway for antigen processing. T-cell receptor, T-cell maturation, activation and differentiation: TCR- genetic organization and rearrangement of genes, TCR-complex, peptide binding, thymic selection, activation and differentiation of T cells. Generation, activation and differentiation of B cells: B cell maturation, activation and proliferation, germinal centers, regulation of the responses. Cell mediated cytotoxicity: Effector T cells, cytotoxic T cells, NK cells, ADCC.

### **Unit IV**

Hypersensitivity reactions: classification and types of hypersensitivity reactions. Immune tolerance and autoimmunity: establishment and failure of tolerance, autoimmune diseases, mechanisms for the induction, animal models, treatment. Transplantation immunology: basis and manifestation of graft rejection, immunosuppressive therapy, immune tolerance. Experimental systems in immunology.

### **Reference Books**

1. Kuby immunology: Owen, J. A., Punt, J., & Stranford, S.
2. Janeway's Immunobiology: Murphy, K., & Weaver, C.
3. Immunology: Male, D., Brostoff, J., Roth, D., & Roitt,
4. Cellular and molecular immunology: Abbas, A. K., Lichtman, A. H., & Pillai, S.

**PT02EBMC21: Molecular Medicine****Unit I**

Genome Biology: Genome anatomy, Human Genome project, Bioinformatic analysis of human genome, genome variation, personalized medicine, DNA Genetic Testing, OMIC technologies

**Unit II**

Molecular and Cellular Physiology : History of Molecular Medicine, Recombinant DNA Products in health and diseases, Gene Transfer, Regenerative Medicine, fundamentals of cytometry, Cell based therapy

**Unit III**

Biochemical and molecular basis of pathogenesis, clinical course, diagnosis and treatment of diseases: Liver diseases like jaundice, hepatitis, fibrosis, necrosis and cirrhosis; Haemoglobinopathies, other anemias, plasma protein abnormalities; Multifactorial diseases. Like Diabetes, Atherosclerosis and Arthritis; Thyroid disorders, infertility and neurodegenerative disorders including Alzheimer's and Parkinson's disease.

**Unit IV**

Cancer Biology : Development, Aging and Cancer, Genomic instability in Cancer, Molecular diagnosis of cancer, molecular medicine in targeted therapy of cancer, Drug resistance in cancer, Pharmacogenomics

**Reference Books**

1. Molecular Medicine Genomics to Personalized Healthcare: Ronald J Trent.
2. Teitz's Fundamentals of Clinical Chemistry: Burtis, C. A. & Ashwood, E. R,
3. Biochemical Basis of Diseases: Cohn R. M. and Roth K. S.
4. Biochemistry in Clinical Practice: Williams D. L. and Marks V.
5. Clinical Chemistry: Marshall W. J.
6. Basic Pathology: Robbinand Kumar
7. Text book of Biochemistry with Clinical Correlations: Devlin T. M

**PT02EBMC22: Clinical and Applied Physiology****Unit I**

Physiology of nervous and muscular system: Basic principles of Neurophysiology: components of Nervous system- CNS, PNS, ANS; diseases of nervous system; Physiology of Muscular System: basic anatomy of muscular system, functions of muscular system and diseases of muscular system

**Unit II**

Physiology of circulation: Structure and functions of heart, Physiology of cardiac muscle, Cardiac cycle, Rhythmical excitation of heart, Regulation of heart pumping, Control of excitation and conduction in heart. Physical characteristics and basic theory of circulation, Capillary fluid exchange, interstitial fluid and lymph flow. Circulatory regulation: Local control of blood flow by tissues and humoral regulation, Nervous regulation of circulation; blood components and functions; diseases of heart and circulation

**Unit III**

Physiology of Urinary and Reproductive Systems: Structure and functions of kidneys, structure and function of reproductive systems, diseases of renal systems; diseases of reproductive systems

**Unit IV**

Physiology of Endocrine glands: An overview of human endocrine system, hormones of the endocrine system, diseases of endocrine glands

**Reference Books**

1. Hall J. E., Guyton & Hall Text Book of Medical Physiology,
2. Barrett K E., Barman S. M., Boitano S., Brooks H. L., Ganong's Review of Medical Physiology, McGraw-Hill Medical
3. Tortora G. J., Derrickson B. H., Principles of Anatomy and Physiology,

**PT02EBMC23: Bio-Safety and Biomedical Waste Management.****Unit I**

Waste disposal management, Hospital waste management, Biosafety- regulatory frame work for GMOs, bioethics and its socio economic impact, Hazards associated with poor health care waste management

**Unit II**

Characterization of medical waste- Bio-medical wastes (Management and Handling) Rules, 1998, Amendments and guidelines, segregation, packaging, storage, transport of infectious waste. Techniques of Biomedical waste management. Health and safety rules. Protocols, issues and challenges in transportation of Biomedical waste.

**Unit III**

Treatment method- Autoclave, Hydroclave, Microwave, Chemical Disinfection, Solidification and stabilization, Bioremediation, Thermal Conversion Technologies, accumulation and storage of hazardous waste, land disposal of hazardous waste, other treatment and disposal method. Common Hazardous Waste Treatment facilities (TSDF).

**Unit IV**

Biomedical waste management rule: Biomedical wastes categories and their segregation, collection, treatment, processing and disposal options, Standards For Treatment and Disposal Of Bio-Medical wastes, Standards for autoclaving of bio-medical waste, standards of microwaving, standards for deep burial, standards for efficacy of chemical disinfection, standards for dry heat sterilization, standards for liquid waste,

**Reference Books**

1. Biomedical Waste Management: R. Radharisham
2. Hospital Waste Management's-A guide for self assessment and review: Shishir Basarkar
3. Biomedical Waste Disposal: Anantpreet Singh and Sukhjit Kaur
4. Medical Waste Management and Disposal: V. J. Landrum

### **PT02CBMC24: Practical based on PT02CBMC21 and PT02CBMC22**

1. Serial Dilution and Pour Plate method for isolation and enumeration of microorganisms
2. Isolation of bacteria by Streak Plate Method and Spread Plate Method
3. Simple Staining (Monochrome Staining)
4. Negative Staining
5. Metachromatic Granule Staining
6. Spirochete Staining
7. Gram's Staining
8. Endospore Staining
9. Cell Wall Staining
10. Capsule Staining
11. 1478Preparation of media and Sera
12. Primary cell culture
13. Preparation of established cell line
14. MTT assay ( Animal cell culture)
15. Synthesis of Biomaterial
16. Mechanical characterization of Biomaterial
17. Thermal characterization of Biomaterial
18. Microstructure analysisof Biomaterial
19. Corrosion studies of metallic implant
20. Determination of Viscosity of biomaterial by rheological studies

### **PT02CBMC25: Practical based on PT02CBMC23 and PT02EBMC21**

1. ABO and Rh typing of blood cells
2. Rocket Immuno electrophoresis.
3. To perform RPR test
4. To perform sandwich Dot ELISA test for antigen.
5. To learn the technique of Redial Immunodiffusion.
6. To perform double immune diffusion by using ouchterlony method
7. WIDAL test
8. Hb estimation
9. Blood glucose estimation
10. Demonstration of Micro plate reader
11. Genomic DNA isolation from Blood
12. DNA elution
13. Transformation of plasmid DNA by using CaCl<sub>2</sub>.
14. Introduction to genome sequence database
15. Protein and DNA sequence database
16. Visit to hospital.
17. Estimation of Urea by DAM method.
18. Estimation of Triglyceride by GPO method.

