M.Sc.MICROBIOLOGY

(Semester with Choice Based Credits System)

Subjects in M.Sc.Microbiology

I Year

I SEMESTER

S.NO.	SUBJECTS
1.	Microbial Taxonomy
2.	General Microbiology & Lab Animal Science
3.	Immunology
4.	Metabolic Pathways
5.	Microbial Diversity
6.	Computing Skills (Softskill)
7.	General Microbiology, Microbial Physiology & Immunology- Practical

II SEMESTER

S.NO.	SUBJECTS
1.	Virology
2.	Medical Bacteriology
3.	Medical Mycology & Parasitology
4.	Industrial & Pharmaceutical Microbiology
5.	Biostatistics & Bioinformatics
6.	French for Beginners (Softskill)
7.	Systematic Bacteriology, Mycology & Parasitology & Virology-Practicals

II Year

III SEMESTER

S.NO.	SUBJECTS
1.	Microbial Genetics
2.	Genetic Engineering
3.	Molecular Biology
4.	Soil & Agricultural Microbiology
5.	Environmental Biotechnology
6.	Spoken & Presentation Skills(Softskill)
7.	Internship
8.	Microbial Genetics ,Molecular Biology &Genetic Engineering- Practical

IV SEMESTER

S.NO.	SUBJECTS
1.	Food, Dairy & Environmental Microbiology
2.	Research Methodology
3.	Soil, Agriculture, Food & Environmental Microbiology-Practical
4.	Dissertation
5.	Life & Managerial Skills (Softskill)

SEMESTER - I

CORE PAPER I - MICROBIAL TAXONOMY (MDT1A)	
The content of the syllabus is to study about different techniques or methods followed for classification and grouping of microbes and also helps to know the general characteristics and habitat of microorganisms.	
CO I	This unit provides knowledge on methods to study taxonomy and the phenotypic characteristics which are used to identify microorganisms at genus level and genotypic characteristics that genotypes provide to study at species level.
CO II	This unit provides knowledge about the Bergey's Manual used to identify the bacterial species and its classification based on the structure and functional characteristics.
CO III	This unit provides the knowledge to focus on morphological characteristics and genotypic characteristics of fungi.
CO IV	This unit provides the knowledge about the different classification methods and genotypic characteristics of protozoa.
CO V	This unit provides knowledge about classification based on morphological and genotypic characteristics of algae and viruses.

CORE PAPER II - GENERAL MICROBIOLOGY AND LABORATORY ANIMAL SCIENCE (MDT1B)	
The candidate will gain knowledge about the structure of bacteria, fungi, algae, protozoa and viruses along with the basic principles of microscopy; Principles and operation of instruments along with staining and sterilization techniques. The animals used in the laboratory, their management, care, breeding and maintenance are also studied in detail.	
CO I	The students will learn about the principles, operation, maintenance and uses of instruments including microscopy (basic light microscopy, special microscopes and electron microscope-TEM and SEM), also study about staining techniques and sterilization methods.
CO II	The students will learn about the bacterial anatomy, structure, properties, biosynthesis, sporulation, growth and nutrition.
CO III	The students will learn about the distribution, thallus structure, reproduction and life cycle of algae including *Chlamydomonas, Volvox, Nostoc, Spirogyra* etc.
CO IV	The students will learn about the management, care, breeding and maintenance of laboratory animals – rabbits, mice, rats, guinea pigs, monkeys, hamsters, fowl and sheep. Nutrition, handling and uses of laboratory animals are also discussed.
CO V	The students will learn about the germ-free animals and their breeding, handling, maintenance and uses, also study about the laboratory uses of animals – pathogenicity testing, antibody production, toxin/toxoid testing, hypersensitivity testing.

CORE PAPER III – IMMUNOLOGY (MDT1C)	
This syllabus deals with a detailed account on structure and functions of human body defense system, their mechanism of actions and their regulations, Immune disorders and dysfunction and therapeutic methods	
CO I	This unit provides knowledge about history of Immunology and types of defense mechanisms.
CO II	This part of the syllabus provides knowledge about the foreign (Non-self) particles, their properties, structure and about the defense proteins.
CO III	The unit contains the information about Antigen and Antibody reactions, types and their application in immunodiagnostic and non-immunological fields.
CO IV	The content imparts the information about the mechanism of collateral effects due the hyper immune response and self-immune response and their prevention methods.
CO V	This part of the syllabus provides information about the preparation of vaccines, vaccination schedule and their importance.

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CORE PAPER IV - PRACTICALS - I - GENERAL MICROBIOLOGY, PHYSIOLOGY AND IMMUNOLOGY (MDT11)	
The candidate will gain hands-on training and acquire adequate skill required to observe microorganisms under microscope using different staining techniques, to sterilize media and to prepare, inoculate observe and distinguish the growth patterns in different media.	
CO I	The students will learn to handle microscope, observe microorganisms under different microscopy – light microscopy (hay infusion broth-wet mount and hanging drop), dark field microscopy for spirochetes and fluorescent microscopy.
CO II	The students will learn the methods of washing and cleaning glass wares, different sterilization methods which includes moist heat, dry heat, filtration and their quality control.
CO III	The students will learn the procedure for smear preparation, different staining techniques which includes: simple staining, differential staining and special staining techniques.
CO IV	The students will learn the about different media preparation – liquid, solid, semisolid medium, agar deeps, slants, plates and also the preparation of basic, special media and their quality control. Hands on training for the preparation of biochemical media and media to demonstrate enzymatic activities also are studied.
CO V	The students will learn about the physiology of microbes using techniques like purification and maintenance of microbes (streak plate, pour plate), aseptic transfer of microbes, enumeration of microbial cells, methods of isolation of microbes and growth curve.
CO VI	This unit provides the candidates about the practical knowledge in the preparation of immune substances that are used for their detection and diagnosis.
CO VII	This unit provides practical knowledge about antigen-antibody reactions, their practical demonstrations and their applications. The demonstration like preparing and showing the reactions on various methods in liquid or in gels, also provides technical knowledge on applications of these reactions for the sero-diagnosis of various diseases
CO VIII	This part of the practical syllabus provides practical knowledge about the various advanced techniques in Blood cells and other blood proteins separations.

ELECTIVE – I - METABOLIC PATHWAYS (MDTAA)	
The subject on metabolic pathway provides information on metabolism of carbohydrates, lipids and proteins and also helps the students to recognize the enzymatic reactions and basic catabolism, anabolism of various substrates by enzyme actions.	
CO I	Students gain knowledge about enzymes that are good biological catalysts, how the enzymes recognize their substrate and increase reaction rate by many factors.
CO II	Students understand the energy transformation in living organisms, study on the metabolic processes through which energy is produced and utilized.
CO III	To understand the connections between glycolysis, gluconeogenesis and pentose pathway; acquire knowledge about microorganisms obtaining their energy from oxidation of glucose and other carbohydrates.
CO IV	To learn about the fats (lipids) and energy giving substance (proteins) – its nature, properties, functions and metabolism.
CO V	Students acquire knowledge in the biosynthesis of bacterial polymers and biomolecules;understand that proteins are of great nutritional value, role in the chemical process that are essential for life and able to differentiate glucogenic and ketogenic, aminoacids and steps involved in synthesis of purines and pyrimidines.

ELECTIVE – II- MICROBIAL DIVERSITY (MDTAB)	
The subject on Microbial diversity provides information about the diverse nature of microbes in the environment, its occurrence ecological role and importance. It also provides knowledge about extremophiles including thermophiles, alkalophiles, acidophiles, methanophiles and halophiles. It also gives information about space microbiology, Martian environment and its microbial flora.	
CO I	This unit gives knowledge about diversity of microbes in different ecological niches (Air, Water, and Soil). It also provides information about bacteria of both primitive and recent organisms and its habitat.
CO II	This unit offers knowledge about the organism that lives at high temperature, classification, habitats and ecological importance. It also provides information about methanogens and application of enzymes from primitive bacteria.
CO III	This unit offers knowledge about the organisms of acid, alkali and salt lover, its classification and habitat. It also provides knowledge about extremozymes and its application.
CO IV	This unit provides information about microbes in space and its life detection methods.
CO V	This unit gives knowledge about Martian environment, life searching experiments in Mars; it also provides information about astronauts' microbial flora.

SEMESTER - II

CORE PAPER V –VIROLOGY (MDT2A)	
CO I	This unit explains about the classification of viruses, general characteristics, structure, and other medically important viral structures. It also gives basic knowledge on viral diseases and diagnostic methods.
CO II	This unit offers knowledge about the viruses infecting bacteria, its life cycle and its application.
CO III	This unit offers knowledge about the plant viruses, its structure and disease causing nature, transmission and control measures. It also provides knowledge about viruses of cyanobacteria, algae, fungi and insects.
CO IV	This unit provides knowledge about human and animal infecting viruses, its characteristic features, disease cycle, clinical features and control measures.
CO V	This unit provides knowledge about spreading nature of viral diseases, how to treat them and its diagnostic methods and preventing measures.

CORE PAPER VI - SYSTEMATIC MEDICAL BACTERIOLOGY (MDT2B)	
The candidate will acquire knowledge about the basic principles; structure and growth of bacteria on culture media. The content includes many etiological agents responsible for infectious diseases in humans. It provides the basis for understanding pathogenic microorganisms and their fundamental mechanisms of their pathogenicity. It also helps to develop diagnostic skills in bacteriology, including the practical application and interpretation of laboratory tests for the diagnosis of infectious diseases.	
CO I	The student will learn about the various clinical syndromes, normal microbial flora of human body, and various virulence factors of bacteria causing infections.
CO II	The students will learn about the relationship between host and parasite and the defense mechanism the host produce against the infections. The unit also includes various procedures for collection of clinical materials collected from patients for diagnosis in laboratory.
CO III	The students will learn about the morphology, the manner of development of the disease, the clinical outcome (symptoms), the diagnostic laboratory test and the principles of controlling diseases like skin and respiratory infections, genital infection (gonorrhea), tuberculosis and related diseases.
CO IV	The students will learn about the characteristics of intestinal and genital infections caused by bacteria.
CO V	The students will learn about various diseases that are transmitted by animals and caused by bacteria, infections acquired in hospital environment and their control, along with hospital infection control committee, ethical committee for hospital waste disposal and its functions.

CORE PAPER VII - MYCOLOGY AND PARASITOLOGY (MDT2C)	
It provides a systematic knowledge about medically important fungi and parasites, diseases they cause and their diagnosis and treatments; provides basic laboratory skills and understand the morphology of different fungi and parasites; provides the knowledge to understand the mode of transmission and control measures and also to understand the actions of antifungal, antihelminthics, self-hygienic practices in control of infections.	
CO I	Students can understand the history of fungi, structure and its association. Students can classify the fungi on the basis of taxonomy, reproduction, macroscopic and microscopic morphology and also learn about the properties of different fungi.
CO II	Students gain knowledge on fungal diseases that occur in skin, deep tissues and other organs and understand the causative agents of these diseases through symptoms, source, transmission & diagnostic methods.
CO III	Students can gain knowledge about appropriate sample collection methods from the infected patients based on their symptoms and understand the methods of transportation. They theoretically understand to identify the fungi by various laboratory methods and how the antifungal agents are used in treatment of fungal diseases.
CO IV	Students learn to classify the parasites as ciliates, protozoan, flagellates based on their habitat, structure, disease cycle, transmission and symptoms and also understand about the relationship with their host.
CO V	Students learn to differentiate flat and round worms based on the habitat, structure, transmission, different stages in their life cycle of different hosts & theoretically understand the basic laboratory skills to detect the parasites from the stool samples of infected patients based on the different morphology through microscopic observation, also gain knowledge in identifying and differentiating the blood parasites causing malarial and filarial diseases.

CORE PAPER VIII – PRACTICAL II - SYSTEMATIC BACTERIOLOGY, MYCOLOGY, PARASITOLOGY AND VIROLOGY (MDT21)	
The candidate will gain enriched training and also to learn the techniques in collection and transport of clinical specimens; Isolation and identification of different pathogens like bacteria, fungi (yeast and moulds), protozoans, helminthes and viruses.	
CO I	The students will learn the methods of collection and transport of various clinical specimens with hands on training on direct examinations and staining methods (simple, differential and special) of various clinical specimens.
CO II	The students will learn about the isolation and identification methods of bacteria from clinical specimens using basal, differential, selective and special media; biochemical identification and test for the respective bacteria upto species level.

CO III	The students will learn about the methods of antibiotic sensitivity tests by disc diffusion and agar dilution methods, along with MBC/MIC and their quality control.
CO IV	Students are trained in appropriate sample collections methods from the infected patients with safety measures; to find and differentiate the fungi from the samples based on isolation, cultivation and identification of fungi by microscopic methods such as basic and special staining methods. They also trained in performing the various biochemical tests to analyze the characteristics of different fungi to interpret the result.
CO V	Students are trained to collect the clinical samples; trained to differentiate ova and cyst of different parasites from stool specimen by direct microscopic and concentration methods and also to differentiate morphological existence of malarial parasites in infected cells of blood samples by thin and thick smear preparations.
CO VI	This unit provides hands-on training on isolation of bacteriophage (virus infecting bacteria), titration, Egg inoculation, ELISA and Western blotting analysis and also gives practical knowledge on animal tissue culture and fibroblast culture preparation.

ELECTIVE III - INDUSTRIAL & PHARMACEUTICAL MICROBIOLOGY (MDTAC)	
The content of the syllabus is to focus on the basic and advanced techniques that are used in the Industrial and Pharmaceutical Microbiology. This gives knowledge to know about the production and applications of primary and secondary metabolites from microbes of commercial importance.	
CO I	This unit provides knowledge about the isolation and strain improvement and the microorganisms that are used in industrial fermentations and also know about the methods of fermentation.
CO II	This unit gives knowledge about the fermenters which is used in fermentation process and also knows about the production and applications of recombinant proteins.
CO III	This unit gives knowledge about the industrially important microorganisms like yeasts, *Spirulina* and also focused on the cultivation of microbial protein (mushroom), and to study about the devices made using microbial products.
CO IV	This unit gives knowledge about the industrial products of microbial primary metabolites like alcohols, beverages, amino acids etc.
CO V	This unit gives knowledge about the industrial production of secondary metabolites from microbes like antibiotics, vitamins, steroids, enzymes and also to study on microbial polymers and preservatives.

EXTRA DISCIPLINARY ELECTIVE I – BIOSTATISTICS AND BIOINFORMATICS (MDTBA)	
This syllabus contains two major areas of study such as Biostatistics and Bioinformatics. Biostatistics provides knowledge to understand the basic concepts of statistical methods and the applications of statistics in biology and to understand about collection, sorting, and handling of various biological data using statistical methods. The Bioinformatics part provides knowledge about computational predictions of structure and functions of biomolecules and their properties.	
CO I	Students will learn about and be able to use basic techniques in modern statistics, learn about the collection of data and they can be able to present the data by diagrams and graphs. They also learn to calculate the basic measures, basic probability concept and probability distributions**.**
CO II	In this section students learn about the bivariate analysis and testing based on mean and variance.
CO III	Student will learn about the various sampling methods and their advantages, disadvantages and their limitations, also they learn about the sampling and non-sampling errors.
CO IV	This part of the syllabus provides basic knowledge about Bioinformatics especially genomics. It gives information about types of biological data banks, their functions and retrieving information including human genome data base from the data stores
CO V	This part of the syllabus provides knowledge about the handling of retrieved biological data. The handling methods like arranging, comparing, detection of structure, application of various techniques

SEMESTER III

CORE PAPER - MICROBIAL GENETICS (MDT3A)	
To understand the fundamental concepts in Microbial Genetics; to study the gene functions of microorganisms; the physical ,chemical properties and transmission of the hereditary material; gene expression ; to understand the relevance of microbial genetics in genetic engineering; explain how microorganisms are used to study the genetic mechanisms .	
CO I	This unit teaches the history and development from the past to till date in the field of Microbial Genetics, observations and experiments which led to the conclusion that DNA and RNA are responsible for the hereditary characters, describes the biochemical structure of deoxyribonucleotides and the properties**.**
CO II	This unit describes the basic structure and features of genes and chromosomes in prokaryotes and eukaryotes, organization of DNA in the form of repetitive and unique sequences, control of gene expression in prokaryotes and Transposition.
CO III	This unit explains the characteristics and uses of extra-chromosomal genetic elements in Genetic Engineering and describes the role of transfer of genes from one bacteria to another and the process of injection of foreign DNA by a bacteriophage.
CO IV	This unit explains how mutations occur in the genome, changes in the gene level of nucleic acid molecules and proteins, effect of mutation in environment, methods for evaluating chemical carcinogens and detection of mutants.
CO V	This chapter is concerned with recombination of genetic material, its analysis and to understand genetic features of the life cycle of phages and explains how gene regulation occurs in model organisms.

CORE PAPER X - GENETIC ENGINEERING (MDT3B)	
The subject on genetic engineering provides knowledge about the genetic engineering tools methods and applications. It also offers the knowledge of DNA finger printing, RAPD, RFLB analysis.	
CO I	This unit delivers the information about principles and methods of genetic engineering and it also provides knowledge on enzymes used in genetic engineering.
CO II	This unit gives information about the characteristic features of carrier of genetic material (vectors) and its role in genetic engineering.
CO III	This unit provides knowledge about gene cloning steps, methods of gene transfer, screening methods. It also offers knowledge about cloning in different bacterial cells.
CO IV	This unit provides knowledge about the analysis of Recombinant DNA, Principle and techniques of amplification of DNA/RNA sequences and nucleic acid hybridization analysis.
CO V	This unit offers information about DNA and protein sequencing and its importance. It also provides knowledge about applications of genetic engineering to human and their nature.

CORE PAPER XI - MOLECULAR BIOLOGY (MDT3C)	
The study on molecular biology helps in nuanced understanding of the key concepts of the Molecular Biology to understand the mysterious inheritance and maintenance of the DNA and protein structure. To learn the sequential steps involved in DNA replication.	
CO I	To gain knowledge about the chemistry of biomolecules (Protein, Lipid, sugar, Nucleic acid) and its role in the biology of a cell and its suitability for various biological functions.
CO II	To get an extended understanding of the primary principle and error proof mechanisms of replication of genetic material and extra chromosomal element (plasmid) and to understand erroneous combination of gene, the extent of repair mechanisms.
CO III	To acquire knowledge about the process of coding of messages from the DNA and its role through the transcription process and various enzymes, factors involved in transcription.
CO IV	To get a detailed understanding of the step by step process of decoding of RNA by translation into a magic bullet.
CO V	To acquire a wholesome knowledge about the protein synthesis and compare the expressions in phage, bacteria, viruses and eukaryotic cell and its regulatory mechanisms in compliance with the requirement of the cell.

CORE PAPER XII - PRACTICAL - III - MICROBIAL GENETICS, MOLECULAR BIOLOGY AND GENETIC ENGINEERING (MDT31)	
CO I	To gain skills in the step wise procedure of isolation and demonstration of DNA from the bacterial cell; to understand the estimation of nucleic acid (DNA) in the unknown sample by its chemical properties and physical properties against DPA, and UV light respectively.
CO II	To get hands-on training about the isolation and demonstration of RNA from the yeast cell; to understand the estimation of RNA in the unknown sample by its chemical properties against orcinol, also to observe and isolate the mutant organism by exposure to the antibiotic treatment.
CO III	To learn about the technical skills about the estimation of proteins using Lowery's method; to learn about the methods to find the molecular weight of the proteins by electrophoresis and separation of amimoacids by chromatography technique.
CO IV	To learn about the separation of proteins from the mixture by chromatography technique; to gain knowledge about the immobilization technique of enzymes and whole cell; to gain technical skills to develop the cell wall less bacteria; to get knowledge about the separation and identification of proteins from the mixture based on molecular weight, and thus by type, through gel electrophoresis and also to study gene regulation and expression.
CO V	To gain practical knowledge in the preparation of competent cell, and to get a technical knowledge on PCR and the operational procedure for the amplification of DNA, and the estimation of the final product through electrophoresis andto gain knowledge about the cleavage site using the specific enzyme in a particular DNA.

ELECTIVE IV – SOIL AND AGRICULTURAL MICROBIOLOGY (MDTAD)	
This subject introduces students to the diverse world of microbiology of environment and the roles that microorganisms play in all aspects of agriculture, including animal, plant and soil science, also to study about the role that microorganisms play within the environment and soil micro-organisms along with pathogenic forms and their effect on plants are discussed.	
CO I	This unit is intended to describe the structure of soil, properties and types of soil, soil microbes and their role in soil fertility and also to classify and explain the effect of interactions exist between microbes and microbes with higher plants.
CO II	This unit teaches the need for nitrogen fixation and its processes, imparts knowledge on the concept and the role of microbes in cycling and recycling of minerals, and application of substances that helps in improving the crop yield.
CO III	This unit introduces students to the basic principles and concepts of plant pathology, how the pathogen recognizes its host and its fighting mechanisms.
CO IV	This unit explains the plant diseases, disease causing agents, its cycle, prevention and treatment methods.
CO V	This unit provides a framework to follow various strategies of plant disease management.

EXTRA DISCIPILINARY ELECTIVE - II - ENVIRONMENTAL BIOTECHNOLOGY (MDTBB)	
This course provides knowledge about the theory and fundamental principles of microbiological and biotechnological process to understand the pollution monitoring, remediation of contaminated environment and energy productions mechanism using microbes.	
CO I	To understand the biofilm formation in natural environment, causes, effects and role of biofilm in reactors to get products and in waste water treatment.
CO II	To understand the design, concepts and operation of different types of bio reactors for recycling of liquid wastes.
CO III	To understand the microbes involved in waste water treatment system and different methods of water purification; to understand the design of anaerobic sludge digester for methane production and also gain practical knowledge of drainage system in home (septic tank) etc.
CO IV	To acquire knowledge in the microbial metabolism of degradation of environmental contaminants and detoxification of hazardous chemicals.
CO V	This unit helps the students to understand the strategies of bio remediation and techniques to monitor the pollution in environment and learn about the uses of biotechnological process for pollution control, bio remediation of toxicant and treatment of domestic and industrial wastes.

SEMESTER IV

CORE PAPER XIII - FOOD, DAIRY AND ENVIRONMENTAL MICROBIOLOGY (MDT4A)	
To get knowledge about the importance of food such as milk and milk products, vegetables, meat, poultry, fish and sea foods and its preservation techniques , the spoilage characteristic of foods. To gain knowledge about the value of air and its importance, the value of water and its management to preserve the biota of the nature.	
CO I	To get knowledge about food, and its spoilage characteristics with reference to Bacteria, Fungi, Viruses, Algae, and Protozoa.
CO II	To acquire knowledge about the milk, milk products and its flora with reference to the product, spoilage and milk borne disease of milk and milk products, and also to understand the role of controlling agencies with reference to the milk and milk product.
CO III	To get an insight into the air and the importance of air with reference to the assessment of air in various places also to get an elaborate understanding about the aquatic habitat and its influence to the environmental biota.
CO IV	To get a knowledge about the waste water and its importance of various treatment to develop a good environment
CO V	To understand the role and importance of various xenobiotic compounds in the environment and its degradation efficiency using microorganisms.

CORE PAPER XIV - PRACTICAL-IV - SOIL, AGRICULTURAL, FOOD AND ENVIRONMENTAL MICROBIOLOGY (MDT41)	
This syllabus has been framed to give the practical knowledge about relationship of microorganism towards microbial soil fertility and agriculture, air and water quality, plant diseases, food production, food spoilage and preservation, and environment.	
CO I	This unit provides practical knowledge about isolation of microorganisms from the soil in order to determine the microbial fertility of soil. Besides, provides knowledge to isolate, identify and maintain the microbes related with enriching soil fertility.
CO II	This part of the practical syllabus gives practical oriented training in detections, isolation, identification of bacterial, fungal and viral infections of plants.
CO III	This part of the syllabus provides the practical idea to check the microbial quality assessment of various types of foods by isolation and identification of the microbial food contaminants and other indirect methods of assessments. This assessment helps to prevent the food from spoilage by preservation.
CO IV	The content of this practical provides knowledge about the direct and indirect microbial quality assessment of air.
CO V	This part gives practical knowledge about the quality analysis of the water and also their physicochemical and biological factors.

ELECTIVE – V - RESEARCH METHODOLOGY (MDTAE)	
The subject on Research methodology provides knowledge about the research, how to conduct, how to write, interpret and analyze data. It also gives knowledge about the basic and advanced instruments used in research.	
CO I	This unit provides information about research, its meaning and types, provide knowledge of research design, data collection and processing of data.
CO II	This unit provides intensive knowledge about research report preparation and writing of both thesis and publications.
CO III	This unit offers information about Molecular Biology techniques. It also provides knowledge about purification of protein, lipid and carbohydrates used for research.
CO IV	This unit provides knowledge about principles and applications of Histochemical and Immunotechniques used for research.
CO V	This chapter offers information about radiolabeling techniques; it also provides knowledge about principles and applications of Microscopes and specimen preparation for microscopical observation.