M.Sc. Immunology & Microbiology

(2017 onwards)

Course Code	Course Title	Hours	Credits	Marks
	Semester I			
MIM 4621	Principles of Microbiology	6	6	120
MIM 4523	Biological Chemistry	5	5	100
MIM 4325	Lab. in Biological Chemistry	3	3	60
MIM 4527	Molecular Biology and Microbial Genetics	5	5	100
MIM 4329	Lab. in Molecular Biology & Microbial Genetics	3	3	60
MIM 4531	Immunology	5	5	100
MIM 4333	Lab. in Immunology	3	3	60
	Total	**30**	**30**	**600**
	Semester II			
MIM 4622	Medical Microbiology	6	6	120
MIM 4324	Lab. in Medical Microbiology	3	3	60
MIM 4526	Immunology of Infectious Diseases	5	5	100
MIM 4328	Lab in Immunology of Infectious Diseases	3	3	60
MIM 4530	Food and Industrial Microbiology	5	5	100
MIM 4332	Lab. in Food and Industrial Microbiology	3	3	60
MIM 4534	Molecular Immunology & Immunogenetics	5	5	100
	Total	**30**	**30**	**600**
	Semester III			
MIM 5631	Environmental and Agricultural Microbiology	6	6	120
MIM 5333	Lab. in Environmental and Agricultural Microbiology	3	3	60
MIM 5535	Veterinary Microbiology and Veterinary Immunology	5	5	100
MIM 5337	Lab in Veterinary Microbiology and Vaccinology	3	3	60
MIM 5539	Vaccinology	5	5	100
MIM 5441	Biostatistics and Bioinformatics	4	4	80
MIM5443	Research Project	4	4	80
	Total	**30**	**30**	**600**
	Semester IV			
MIM 5532	Microbial Gene Technology	5	5	100
MIM 5334	Lab. in Microbial Gene Technology	3	3	60
MIM 5536	Immunotechniques and Technology	5	5	100
MIM 5338	Lab. in Immunotechniques and Technology	3	3	60
MIM 5540	Animal Cell Culture	5	5	100
MIM 5342	Lab. in Animal Cell Culture	3	3	60
MIM 5644	Research Project	6	6	120
	Total	**30**	**30**	**600**

MIM 4621 Principles of Microbiology 6Hrs/Wk – 6Cr

Framed as an initiative course in Microbiology, it provides students a better understanding about the fundamental basis on which the subject is built upon. The course includes contributions of eminent scientists in the various fields of microbiology, classifications, microscopic techniques, growth, culturing and control of microorganisms. The laboratory component includes sterilization techniques, isolation, staining and growth properties of bacterial population.

To understand the basis of Microbiology, classification and the structure and functions of organelles
To educate about the bacterial growth and their control measures
To undertake cultivation, isolation and identification of microorganisms from various samples

Basics of Microbiology: Historical background – discovery of microorganisms, contributions of scientists, Germ theory of diseases; the role of microorganisms in diseases, special fields of microbiology – the future scope.

Microbial Evolution and Taxonomy: Classification – Binomial and numerical, phylogenetic tree, Haeckel's three kingdom, Whittaker's five kingdom; classification of bacteria, Bergey's classification; molecular taxonomy- polyphasic taxonomy and species concept. Classification of viruses – Baltimore system;
classification of fungi –Recent system.

Microscopy and structure of bacteria: Simple, compound, light, phase contrast microscope, TEM and SEM. Characteristics of bacteria – principles of staining - Size, shape and arrangement; overview of structure – cell wall, cell membrane, flagella, capsule, slime layer, S – layer, ribosomes and gas vesicles.

IV. Nutrition and bacterial growth: Cell division – phases of growth, factors affecting growth; nutritional requirements; nutritional classification – phototroph and auxotroph; Transport across membrane – physiology of sporulation, survival at extreme conditions.

Control of microorganisms: Sterilization – physical and chemical control methods; antibiotics – classification, mode of action, determination of their efficacy; antifungal and antiviral drugs.

Laboratory component includes the following

Methods of sterilization and Preparation of culture media
Isolation and identification of bacteria from various samples
Isolation and identification of fungi from different samples
Staining methods:
- Simple staining
- Differential staining

Biochemical and cultural characteristics
Motility by Hanging drop method

Lacto phenol cotton blue staining for fungi
Determination of bacterial growth curve
Effect of temperature on bacterial growth
Effect of pH on bacterial growth
Determination of antimicrobial susceptibility tests
Minimum inhibitory concentration
Kirby Bauer method
Agar well diffusion method

Text Books

Jacquelyn G Black. (2013). Microbiology. 8th edn. John Wiley and Sons, Singapore Inc.

Cappucino R. (2001). Microbiology - A Laboratory Manual. 6th edn. Benjamin/Cumming Pub. Co. California.

References:

Prescott M, John P. Harley and Ronald A. Klein. (2000). Microbiology. 3rd edn. WMC Brown Pub, Iowa, USA.

Gunasekaran P. (1995). Lab. Manual in Microbiology. New Age International Pvt. Ltd. Madras.

MIM 4523 Biological Chemistry 5 Hrs/Wk – 5 Cr

Course on biological chemistry includes physical and chemical concepts in biology, composition, structure and functions of carbohydrates, proteins, lipids and vitamins. Other topics are enzyme and enzyme kinetics, carbohydrate and vitamin metabolism, and metabolism of amino acids and lipids. It also includes biosynthesis and degradation of purines and pyrimidines.

To learn the physical and chemical concepts in biology
To understand the chemistry and metabolism of biomolecules
To gain knowledge on enzyme kinetics and bioenergetics

Physical and chemical concepts in biology: Structure of atoms, molecules and chemical bonds; Biomolecule interaction– vander Waals, electrostatic, hydrogen bonding, hydrophobic interaction and covalent bond; Principles of biophysical chemistry- pH, buffer, reaction kinetics, thermodynamics,colligative properties.

Biomolecules: Composition, structure, classification and function of carbohydrates, lipids, proteins and vitamins; Conformation of proteins- Ramachandran plot, secondary structure, domains, motif and folds.

Enzymes and bioenergetics: Enzymes and Enzyme kinetics, regulation of enzymatic activity, mechanism of enzyme catalysis, Michaelis Menten equation, isozymes; Bioenergetics, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducer.

IV. **Carbohydrate and vitamin metabolism**: Types of metabolism; Carbohydrate metabolism-glycolysis, TCA cycle, Gluconeogenesis, glycogen metabolism, Glycogenolysis, HMP shunt, uronic acid pathway; Vitamin metabolism.

Amino acid, nucleic acid and lipid metabolism: Amino acid metabolism; Nucleotides-Biosynthesis and degradation of purine &pyrimidine; Fatty acid oxidation, Ketone bodies, biosynthesis of fatty acid, metabolism of Phospholipids, Glycolipids, Cholesterol,HDL.

Text Book

Nelson, D. L., and Cox, M. M. (2017). Lehninger Principles of Biochemistry. 7th edn.W. H. Freeman.

References:

Stryer L. (1995). Biochemistry. 4th edn.WH Freeman and Co, New York.

Voet D and Voet G. (1995). Biochemistry. 2nd edn. John Wiley and sons, New York.

R.K. Murray, D.K. Grammer. (2007). Harper's Biochemistry. 25th edn. McGraw Hill, Lange Medical Books.

MIM 4325 Lab in Biological Chemistry 3Hrs/Wk – 3Cr

This course is a supportive one to the theory course Biological chemistry offered in the same semester. Lab. work includes acidic and alkali metry ,colorimetric estimation of biomolecules, centrifugation,chromatographic separation of amino acids, electrophoresis and enzyme kinetics.

To learn the principle of basic instruments
To undertake qualitative analysis and quantitative estimation of biomolecules.
To analyse the separation of biomolecule and to study enzyme kinetics

Acidic and Alkali metry
Preparation of biological buffer
Colorimetry
Estimation of Glucose -Anthrone method
Estimation of Protein - Lowry's method
Estimation of DNA by Diphenylamine reaction
Estimation of RNA by Orcinol reagent
Centrifugation technique - Types

9. Electrophoresis – (a) Agarose Gel (b) SDS PAGE
10. Chromatography–(a) Paper (b) Thin Layer

Enzyme assay - alkaline phosphatase activity
Enzyme kinetics using alkaline phosphatase enzyme

References:

Jayaraman J. (1996). Laboratory Manual in Biochemistry. 5th edn. New Age International Pub, New Delhi.

Plummer D.T. (1997). An Introduction to Practical Biochemistry. Tata McGraw Hill Pub Co, New Delhi.

Palanivelu P. (2009). Analytical Biochemistry & Separation Techniques - Lab Manual. 4th edn. Twenty first Century Publications.

MIM 4527 Molecular Biology andMicrobial Genetics5Hrs/Wk – 5Cr

This course will develop an understanding of the key concepts of the molecular biology of the cell, integrating principles of cell structure and function with the underlying molecular mechanism(s). Discussions will focus on aspects of gene regulation, genomics, cell cycle control, protein synthesis, intracellular protein trafficking and protein degradation in eukaryotic cells. Mechanisms behind stability and change in microbial genomes; Mechanisms behind the information flow from DNA to proteins and the multiple levels at which gene expression can be regulated; Genetic aspects of extrachromosomal elements such as plasmidsandbacteriophages – are also detailed.

To develop basic knowledge and skills in molecular biology and microbial genetics

To gain an understanding of chemical and molecular processes that occur in and between cells

To learn the most significant molecular and cell-based methods used today to expand our understanding of biology

Cellular and Genome Organization: Features of cell; Diversity of genomes - Cell division and cycle in prokaryotes and higher organisms; Nucleic acid: Composition, structure, types and functions– DNA and RNA; Organization and structure of chromosome.

Flow of Genetic information: Central Dogma of the Cell; DNA Replication – types, mechanisms and enzymatic apparatus for DNA replication; Ribosome – structure – production;Genetic Code – Features, hypothesis and evolution; Transcription of gene- molecular basis of initiation, elongation and termination, prokaryotic and eukaryotic differences; RNA processing; Molecular events of Protein synthesis – post-translational modifications and protein degradation.

Regulation of Gene Expression: Concept of operon – Inducible, Repressible – Lac, Trp operon models; Gene regulation in eukaryotes: Britten-Davidson Model; mRNA Regulation – RNAi – Riboswitch – CRISPR– Ribozymes.

IV. Changing the DNA Blueprint: Mutagenesis – Mutations, Causes, Types, Detection, DNA Repair; Extrachromosomal DNA – Properties, types, amplification, gene transfer; Mobile DNA – terminology, types, detection, mechanism; Retroposons; Mu DNA.

Essentials of Microbial Genetics: Transformation- discovery, mechanism and significance; Conjugation- F factor- R factor, chromosome transfer by plasmids and integrative conjugative elements; Transduction- discovery, mechanism, specialized transduction, generalized transduction and significance.

Textbooks:

Freifelder, D. (1990). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.

Maloy, S. R., Cronan, J. E., and Freifelder, D. (1994). Microbial Genetics. Jones and Bartlett Publishers

References:

Clark, D. P., and Pazdernik, N. J. (2013). Molecular Biology. Elsevier.

Krebs, J. E., Lewin, B., Goldstein, E. S., and Kilpatrick, S. T. (2014). Lewin's Genes XI. Jones & Bartlett Publishers.

MIM 4329 Lab. in Molecular Biology and Microbial Genetics 3 Hrs/Wk – 3 Cr

The laboratory component includes isolation of nucleic acids from prokaryotes and eukaryotes, replica plate technique for isolation of mutants, preparation of competent *E.coli*cells, transformation, conjugation, coliphage, isolation and purification of plasmid DNA.

To provide hands-on experience on many molecular biological tools used in the context of a real research project

To learn fundamental aspects of experimental designused to discern molecular mechanisms

Todistinguish between different molecular biology techniques that are used to isolate, separate, and probe for specific proteins, nucleic acids, and their interactions

Isolation of genomic DNA from bacteria.

Isolation of Genomic DNA from Human blood.

Isolation and purification of plasmid.

Isolation of RNA from mammalian tissue and yeast.

Mutation by UV

Detection of antibiotic resistant mutant by Gradient plate technique.

Isolation of auxotrophs and revertant of auxotrophs – Replica plating method.

Detection of β-galactosidase enzyme.

Conjugation in *E.coli*.

Isolation of coliphage.

References:

Microbial Genetic Lab. Manual. (1999). Institute of Microbial Technology, Chandigarh.

Scheppler JA, Cassin PE and RM Gambier. (2000). Biotechnology Explorations-Applying the Fundamentals. ASM press, Washington DC.

MIM 4531 Immunology 5Hrs/Wk – 5Cr

This course introduces the fundamental concepts of Immunology, with an emphasis on immune system and diseases. Topics covered are the basic elements of immune system including lymphoid tissues/ organs and cells with immune functions; principles of natural immunity and acquired immunity; cellular and molecular basis of B cell and T cell development and activation, cytokines, immune tolerance. This course also highlights the clinical aspects of immunology including autoimmunity; transplantation immunology; Hypersentivity reactions; Immune deficiency disorders; tumour immunology and Immunoprophylaxis.

To understand the elements of immunity organs and cells of the immune system
To learn the regulations and tolerance of immune response
To analyse the disorders of immune response and clinical aspects of Immunology

Overview and Components of Immune System: Cells, tissues and organs of immune system; Innate and adaptive immunity;Antigens – types and properties; Immunoglobulins - structure, isotypes and biological properties; Antigen and antibody interaction – Kinetics of immune response – Complement system.

B, T lymphocytes & MHC molecules: Biology & activation of T & B lymphocytes; Cytokines – properties –functional categories – receptors– role in therapy; MHC molecules – variability – structure - antigen processing & presentation.

Immune tolerance, Autoimmunity and Transplantation Immunology: Immune tolerance – types – mechanism – immunologically privileged sites; Autoimmunity – factors – organ-specific & systemic diseases – mechanism – therapeutic strategies; Transplantation –types of grafts – allograft rejection & its mechanism – immunosuppression – Graft-vs host disease – foetus as allograft.

IV. Hypersensitivityreactions: Gell and Coombs Classification; Immediate Type I Hypersensitivity – components – factors – consequences; Antibody mediated (Type II)hypersensitivity reactions –transfusion and hemolytic disease; Immune complex-mediated (Type III) Hypersensitivity –systemic and localizeddiseases;Delayed type (Type IV) Hypersensitivity – Mechanism and examples of DTH.

Immune deficiency disorders and Tumor Immunology: Primary Immunodeficiency; Secondary immunodeficiency and AIDS; Immunoprophylaxis; Malignant transformation of cells – Tumour antigens – Effector response to tumour cells – cancer immunodiagnosis and immunotherapy.

Text Book(s):

Owen .J. A., Punt .J and Stranford S.A. (2009). Kuby Immunology. 7th edn. W. H. Freeman and Company, New York.

References:

Coico R. and Sunshine. G. (2015). Immunology – A Short Course. 7th edn. Wiley Blackwell, UK.

Abbas A.K. and Lichtman A.H. (2011). Basic Immunology – Functions and Disorders of Immune System. 3rd edn. Saunders Elsevier Inc.

Murphy K. and Weaver C. (2017). Janeway's Immunobiology. 9th edn. Garland Science, New York and London.

MIM 4333 Lab. in Immunology 3Hrs/Wk - 3 Cr

This laboratory course includes preparation of antigens, various bleeding techniques, serological reactions, identification and counting of different types of cells. Surveys of lymphoid organs are also done. Students are taught to immunize animals and assay antibody response by complement mediated hemolysis. Isolation of macrophage and *in vitro* phagocytosis are done.

To involve in the basic experiments in Immunology such as preparation of antigen, serum separation and isolation of immunoglobulins.

To analyse the cellular immune response

To undertake experiments involving lymphoid organs, complement and macrophages

Preparation of Antigens – Soluble, insoluble and adjuvant antigens.

Routes of administration and repetitive bleeding.

Separation of serum and plasma from whole blood

Isolation and purification of Immunoglobulins – Ammonium Sulphate precipitation

Antigen – antibody interactions – Precipitation reactions

Antigen – antibody interactions – Haemagglutination assay

Differential staining of white blood cells.

Isolation of lymphocytes – Density gradient centrifugation

Viable Cell count – Trypan blue dye exclusion test.

Enumeration of RBC and WBC

Survey of lymphoid organs of fish.

Complement mediated hemolysis

Serum bactericidal activity

Isolation of macrophage from peritoneal cavity of fish.

In vitro phagocytosis.

References:

Myers R.L. (1989). Immunology: A Laboratory Manual. Wm. C. Brown, Dubuque, Iowa.

Frank C. Hay and Olwyn M. R. Westwood. (2003). Practical Immunology. 4th edn. Blackwell Science UK.

Garvey J.S, Cremer N.E and D.H Sussdof. (1993). Methods in Immunology – A Laboratory Text for Instruction and Research. 3rd edn. The Benjamin/Cummings Publisher, London.

MIM 4622 Medical Microbiology 6Hrs/Wk – 6Cr

This course is to provide the students with detailed insight in epidemiology, pathogenesis, prevention and treatment of important infectious diseases, and contemporary issues and novel developments in the field of Medical Microbiology. As the (re-)emergence of infectious diseases and antimicrobial resistance development, the course will also address the global health aspects of infectious diseases.

To demonstrate a basic understanding of the pathogenesis of some important fungal infections of humans, and be able to identify the causative agents

To demonstrate an understanding of infections (microbial causes, pathogenesis, transmission of infection, diagnosis, prevention and treatment)

To able to recognize the nature of infecting organisms, the pathogenesis of infectious diseases,diagnostics and treatment

Introduction to Medical Microbiology: History; Epidemiology – Infection: stages and types, Host-microbe interactions, microbial pathogenesis; Human microbiome in health and disease: Nosocomial infections, Antimicrobial resistance; Bioterrorism; collection and processing of clinical specimens.

Medical Bacteriology: Epidemiology, pathogenesis, clinical manifestation, diagnosis, treatment and prevention of *Staphylococcus*; *Streptococcus*; *Neisseria*; *Corynebacterium*; *Bacillus*; *Enterobacteriaceae, Vibrio, Mycobacterium*; *Spirochetes*; *Mycoplasma; Rickettssia*; *Chlamydia*.

Medical Mycology: Epidemiology, pathogenesis, clinical manifestation, diagnosis, treatment and prevention of superficial and cutaneous mycoses; subcutaneous mycoses; systemic mycoses caused by dimorphic fungi; opportunistic mycoses; fungal and fungal-like infections of unusual or uncertain etiology; mycotoxins and mycotoxicoses.

IV. **MedicalVirology:** Epidemiology, Pathogenesis, Clinical Manifestation, Diagnosis, Treatment and Prevention of Adenoviruses, Human Herpesviruses, Poxviruses,Picornaviruses, Paramyxoviruses**,** Orthomyxoviruses, Rhabdoviruses, Reoviruses, Retroviruses, Hepatitis Viruses, Unconventional Slow Viruses: Prions, Recent evolutions – Zika, Dengue, Chikungunya, MERS, SARS, Ebola

Medical Parasitology: Epidemiology, pathogenesis, clinical manifestation, diagnosis, treatment and prevention of Protozoans; Amoeba; Flagellates; Ciliates; Helminths; Nematoda; Trematoda and Cestoda

Text Book:

Tille, P. (2015). Bailey & Scott's Diagnostic Microbiology. 14thedn. Elsevier Health Sciences.

References:

Murray, P. R., Rosenthal, K. S., and Pfaller, M. A. (2015). Medical Microbiology,8thedn. Elsevier Health Sciences.

Paniker, A. A. (2005). Ananthanarayan and Paniker's Textbook of Microbiology (reprint edn.). Orient Blackswan.

MIM 4324 Lab. in Medical Microbiology 3 Hrs/Wk – 3Cr

This lab. course is designed to give the students clinical experience in the area of bacteriology, mycology and parasitology. Test procedures routinely applied are covered with an emphasis on the isolation, identification, and antimicrobial susceptibility testing of pathogenic microorganisms.

To understand the scientific and administrative direction of a clinical microbiology laboratory

To learn the provisions of the investigation, diagnosis, and treatment of patients suffering from infectious diseases.

To understand the epidemiology of public health and communicable disease and prevention

Collection of specimen, transportation & storage

Nosocomial infections (HAI)

Culturing of specimens

- Examination of normal sterile body fluids
- Culturing of upper and lower respiratory tract microbes
- Examination of urine

Examination of dermatophytes

Staining and microscopic detection of dermatophytes

Culturing of specimen for fungi

Antimicrobial susceptibility of bacteria & fungi from clinical specimens

Examination of specimens for parasites

Examination of stool (occult blood) for parasites

Laboratory Visit

Text Book:

World Health Organization. (2003). Manual of Basic Techniques for a Health Laboratory.

References:

John A. Washington, Laboratory procedures in Clinical Microbiology, 2nd edn, Springer-Verlag New York Heidelberg Berlin Tokyo.

Forbes, B. A., Sahm, D. F., & Weissfeld, A. S. (2007). Bailey & Scott's Diagnostic Microbiology (12th ed.). Elsevier Mosby.

MIM 4526 Immunology of Infectious Diseases 5Hrs/Wk -5Cr

This course deals with basic immune responses which would arouse due to bacterial(extracellular and intracellular), viral, parasitic, fungal and spirochete infections in human beings. Emphasis is given on the in-depth study of innate and adaptive immune responses and also the evasion strategies of specific infectious agents.

To precisely acquire knowledge about the extreme sensitivity of immune response against invading pathogens

To enlighten the minds of young learners with surprising molecular aspects of immune signaling, innate and adaptive immune response and evasion strategies of various pathogens

Immune responses to extracellular bacteria: Extracellular bacteria - host defenses and immune responses at epithelial surfaces, clearance and non-specific host defenses, innate and acquired immune defenses at mucosal surfaces, pattern recognition molecules, dendritic cells, lymphocytes, PMNs, macrophages, AMPs, Immunoglobulins; immune responses during local, systemic invasion; sepsis – enhancement of immune responses to extracellular bacteria; vaccines and immune modulation.

Immune responses to intracellular bacteria: Features of intracellular bacteria - diseases caused, intracellular niches - innate and adaptive immune responses; role of NK cells, macrophage activation and effector mechanisms, TLRs, NODs, Th1 activation, antigen processing and T-cell activation; bacterial killing by ROI and RNI; genetics of host resistance to intracellular bacteria; microbial evasion.

Immune responses to viruses: Viral entry and infection; Innate and adaptive immunity against viruses; sensors of viral infection; principles of antiviral immunity, major antiviral innate defense mechanisms; antiviral T- and B-cell immunity – HIV – Zika – Flu; immune evasion, immunologic memory; immunity to chronic viral infections; immune pathology and autoimmunity.

IV. **Immune responses to parasites:** Principal mechanisms of innate and acquired immunity – basic host defenses, evasion strategies; *Plasmodium spp., Leishmania spp., Trypanosomacruzi, Toxoplasma gondii, Entamoeba histolytica, Trichomonas vaginalis.* Helminths - Spectrum of host-parasite interactions, prototypical host responses to helminths, protective immunity against helminthes, pathology associated with immune responses; mechanisms of evasion and immune regulation; regulation of allergy and autoimmunity in helminth infection; vaccines against helminth parasites.

Immune responses to fungi and spirochetes: Multifaceted interaction of fungi with mammalian hosts; fungal recognition and immune activation; innate immune receptors, dendritic cells, acquired antibody and cell-mediated immunity - th1/th2/th17 cells; Spirochetes – Characteristics, major diseases caused, immune responses to *Borrelia burgdorferi*; innate immunity – phagocytic cell recruitment, complement, adaptive immune responses- mechanisms of immune evasion.

Text Books:

Robert R. R., Thomas A. F., William T. S., Harry W. S., Anthony J. F., and Cornelia M. W.,(2008). Clinical immunology – Principles and Practices. 3rd edn. Mosby Elsevier Publisher.

Kaufmann S. H. E, Rouse B. T and D. L. Sacks. (2011). Immune Response to Infection. 1st Edition. ASM Press, Washington D.C.

Reference:

John B. Z., Essential Clinical Immunology (2009), Cambridge University Press, New York.

MIM 4328 Lab. in Immunology of Infectious Diseases 3Hrs/Wk – 3Cr

This course is the laboratory part for the theory course Immunology of infectious diseases. Laboratory components includes isolation of samples from hospitals, study of microflora of human and immunodiagnostic assays for various infectious diseases.

To ensure the opportunity for students to have hands on experience to carry out various immune reaction assay and experiments

Laboratory handling of mice
Isolation of pathogenic bacteria from hospital environment
Preparation of bacterial toxin from gram-negative bacteria
Study of normal microbial flora of human body
Analysis of serum bactericidal activity
NBT assay
RPR test for syphilis

Identification of host response by DOT - ELISA
WIDAL test – Detection of typhoid fever
Isolation of fungus causing dandruff on human scalp.

References:

Kaufman S. H . E and Dieter Kabelitz.(2010). Methods in Microbiology - Volume 37. Immunology of Infection. 3rd edn. Academic Press, U.K.

Garvey J.S., Cremer N.E. and D.H Sussdorf. (1983). Methods in Immunology - A laboratory text for instruction and research. 3rdedn. The Benjamin/Cummings Pub Co, London.

Thompson R.A., (1997).Techniques in Clinical Immunology. 2ndedn. Blackwell Sci., Pub, Oxford.

MIM 4530 Food and Industrial Microbiology 5 Hrs/Wk – 5Cr

This course deals with the basicsof food, their composition and factors responsible for spoilage. Emphasis will be given to preservative methods, their merits, contamination, and spoilage of various foods. It also provides knowledge about foodborne diseases. Equal importance is given to the basic concepts of fermentation, isolation, improvement of microbial strains, designing of media, fermentor and their types. This course also highlights the recovery of products and production of fermented foods and other products.

To understand the contamination, preservation and spoilage of various foods.
To learn the basic of fermentation technology
To gain knowledge about how foods are made through fermentation

Food and its preservation: Classification of foods; composition of food – intrinsic and extrinsic factors for spoilage; Principle methods of preservation – asepsis, removal, anaerobic conditions, uses of high temperature and low temperature, drying, radiation, food additives, antimicrobials, inorganic and organic preservatives.

Contamination, preservation and spoilage of foods: Contamination, preservation and spoilage of vegetables, fruits, meat and meat products, fish and other sea foods, egg, poultry, cereals and its products, milk and milk products; food borne diseases - Bacterial, fungal and viral

Fermentation technology: Isolation, preservation and strain improvement of industrially important microorganisms; formulation of media; fermentor design – control of temperature, pH and foam, computer applications in fermentor; Types of fermentor - Batch, continuous and air lift fermentor.

IV. Downstream process: Recovery of fermented products – separation, centrifugation, filtration and flocculation; Extraction; Purification – concentration, precipitation, ultrafiltration and reverse osmosis; Drying and crystallization.

Fermented foods and other products: SCP; beverages; pickles – Sauerkraut; cheese, yogurt; bakery products; antibiotics; enzymes; organic acids; amino acids and vitamins; probiotics.

Text Books:

Doyle MP, Beuchat LR and TJ Montville et al (1997) Fundamentals and Frontiers, ASM Press, Washington DC.

Patel A. H. (2012) Industrial Microbiology, 2nd edn. Macmillan India Limited.

References:

Frazier WC and DCWesthoff (1997) Food Microbiology 4th edn. Tata McGraw Hill, New Delhi.

Adams, K (2000) Food Microbiology 2nd edn. Panima, New Delhi.

Peter F. Stanbury, Allan Whitaker, Stephen J. Hall (2003) Principles of Fermentation Technology, 2nd edn.Butterworth-Heinemann Elsevier Ltd, Oxford, United Kingdom.

MIM 4332 Lab. in Food and Industrial Microbiology 3 Hrs/Wk – 3Cr

This course offers practicals in microbial analyses of different types of food such as milk, bakery products, cool and soft drinks, pickles, eggs and examination of spoiled foods. Similarly it offers immobilization technique, fermentation of wine and production of industrially important enzymes. The students will be required to visit training centres regarding food and industrial microbiology.

To involve in the basic experiments in microbialanalysis of various foods
To isolate and identify microorganisms form spoiled foods
To produce wine and industrially important enzymes

Qualitative and Quantitative analysis of milk
Microbial analysis of raw and processed foods
Microbial analysis of canned foods
Isolation and identification of microbes from spoiled foods
Immobilization of enzymes and microbial cells
Wine fermentation
Production of Industrially important enzymes
Industrial visit

Reference:

Cappucino R (2001) Microbiology - A Laboratory Manual, 6th edn. Benjamin/Cumming Pub Co, California.

MIM 4534 Molecular Immunology and Immunogenetics 5Hrs/Wk – 5Cr

This course is designed to introduce the molecular approach of Immunology, which includes genetic animal strains; genomic organization and gene rearrangement of Immunoglobulins and T – cell receptors; genetic map of MHC; genomic organization and clinical significance of HLA. Special emphasize is given to transfusion genetics of major and minor blood groups in man, genetic basis of tumor antigens and complement components.

To survey the strains of animals used in immunological laboratories
To gain knowledge in genetics of MHC, TcR and transfusion genetics
To learn Immunogenetics of cancer and complement components

Genetics of laboratory strains and Immunoglobulins: Properties, types and genetic characterization of inbred, outbred and genetically modified strains; Immunoglobulin gene structure – somatic and germ-line cell theory – multigene organization – mechanism of gene rearrangement – generation of antibody diversity – allotypes and idotypes.

Genetics of T- cell surface receptors: Genetic basis, multigene organization and mechanism of TCR gene rearrangement – TCR diversity; Cell surface alloantigens of T cells – genetics and phenotypic expression; CD marker – TcR cloning and T cell hybridoma.

Genetics of MHC: Gene mapping – structure of MHC molecules – HLA system – genomic organization – HLA haplotypes – Expression of HLA genes – Clinical HLA testing – Significance of HLA system in transplantation, transfusion therapy and disease association.

IV. Transfusion genetics and Immunology: Genetic basis of Major blood groups in man – ABO, Rh, Lewis system – chemistry, genotypes and phenotype, Significance of ABO in transplantation, transfusion and forensic studies; Genetic basis, chemistry and clinical importance of minor blood group systems.

Immunogenetics of cancer and complement components: Genetic basis and expression of oncofetal, oncoviral, cancer-testis, overexpressed, lineage restricted and mutated tumour antigens; Immune polymorphism against tumour antigens. Genetic basis of complement components.

Text Book:

Owen AJ, Punt J and SA Stranford. (2009). Kuby Immunology. 7th edn, W.H. Freeman and Company, New York.

References:

Zaleski MB, Dubiski S, Niles EG and RK Cunningham. (1983). Immunogenetics, Pitman, Toronto.

Ratchiffe JHM. (2016). Encyclopedia of Immunobiology. Elsevier Publications, Oxford.