VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MEDICAL TECHNOLOGY (MICROBIOLOGY / BIOCHEMISTRY)
(In force from July 2010)

1. Eligibility for Admission: B.Sc. with Microbiology / Medical Technology / Bioscience / Biochemistry subject or PG DMLT of this university or of any other recognized university there to may be admitted to the course.

   The Institute will conduct an entrance test and admission will be given on the basis of marks obtained at degree examination and in entrance test.

2. Total there are four semester (I, II, III & IV) in a two years course.

3. There are four theory papers and corresponding practicals in semester I & II. The external examination will be taken semester wise.

4. For each semester the ratio between the internal assessment and external assessment will be 30:70.

5. For internal assessment one test will be held at the end of each semester. In addition to the test, seminars will be conducted for internal assessment in the theory course. In practicals the internal marks will be given based on the test conducted during the semester, regularity and journals.

6. All PG rules of the VNSG University are applicable to students admitted to M.Sc. Medical Technology course.

Following is the summary of the semester scheme of Ist and IInd semester.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MEDICAL TECHNOLOGY (MICROBIOLOGY / BIOCHEMISTRY) Part-I
(Semester Scheme)

Teaching and Examination Scheme for Semester - I

Paper	Teaching Schedule Hrs./wk	University Exam Theory/Practical		Internal Exam Theory/Practical	Total Theory/Practical
		Duration (hrs)	Mark		
Theory					
MT101:General Microbiology	3	3	70	30	100
MT102: General Immunology	3	3	70	30	100
MT103: General Biochemistry	3	3	70	30	100
MT104: Microbial Genetics / MT105: Enzymology	3	3	70	30	100
Practical					
MT106: Practical-I Microbiology & Immunology Practical-II Biochemistry	12	21	140	60	200
TOTAL	**24**		**420**	**180**	**600**

Teaching and Examination Scheme for Semester - II

Paper	Teaching Schedule Hrs./wk	University Exam Theory/Practical		Internal Exam Theory/Practical	Total Theory/Practical
		Duration (hrs)	Mark		
Theory					
MT201:Principles of Medical Microbiology	3	3	70	30	100
MT202: Advance Immunology	3	3	70	30	100
MT203: Advance Biochemistry	3	3	70	30	100
MT204: Microbial Technology / MT205: Clinical Enzymology & Endocrinology	3	3	70	30	100
Practical					
MT206: Practical-I Microbiology & Immunology Practical-II Biochemistry Practical-III Microbial Technology / Clinical Enzymology & Endocrinology	12	30	140	60	200
TOTAL	**24**		**420**	**180**	**600**

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MEDICAL TECHNOLOGY (MICROBIOLOGY / BIOCHEMISTRY)
SYLLABUS FOR SEMESTER – I
(In force from July 2010)
MT 101 : GENERAL MICROBIOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1
Cellular Microbiology
Description and mechanism of Cellular Organelles of Prokaryotic and Eukaryotic microorganisms
Morphological changes - Cell division, Cell grouping, Life cycle changes

Unit-2
Methods of studying Microorganisms
Design and Operation of various types of Microscopes – Electron Microscope, Atomic Force Microscope, Scanning Tunneling Microscope, Interference Microscope, Confocal Scanning Tunneling Microscope.

Unit-3
Isolation and Identification of Microorganisms
Isolation of bacteria – Selective culture techniques
Isolation of fungi – Fungal culture techniques
Maintenance and preservation of microbial cultures
Identification of Bacteria – Phenotypic based, metabolic activity based, Chromatography – Introduction, principles and applications, Molecular methods: Phylogenetic methods

Unit-4
Microbial Growth and Reproduction
Microbial growth kinetics, Factors affecting microbial growth, Techniques to measure microbial growth, synchronous growth, continuous culture, microbial culturing techniques.
Bacteria – Aerobic, Anaerobic and Fastidious
Fungi and Yeast, Protozoa – Introduction, general characteristics and classification
Transport of nutrients – Endocytosis and Exocytosis, Active, Passive, Facilitated diffusion

Unit-5
Control of Microorganisms
Effect of physical and chemical agents, Evaluation of effectiveness of antimicrobial agents, Sterilization and Disinfection – methods of sterilization

REFERENCE BOOKS:

1. General Microbiology, Roger Y. Stanier, Edward A. Adelberg and John L. Ingraham, 4th ed., Prentice Mall, Inc.
2. Mackie and McCartney Medical Microbiology, Aguide to Laboratory Diagnosis and Control of Infection, 13th ed., J.P.Duguid, B.P. Marmion and R.H.A. Swain, The English Language Book Society and Churchill Livingstone.
3. Fundamentals of Microbiology, Frobisher, Hinsdill, Crabtree and Goodheart, 9th ed., W.B. Saunders Company.
4. Diagnostic Microbiology, Finegold and Martin, 6th ed., The C.V. Mosby Co.
5. Bailey and Scott's Diagnostic Microbiology, Sydney M. Finegold and Ellen Jo Baron, 7th ed., The C.V. Mosbey Co.
6. Microbiology, Pelzar, Reid, Chah, 4th ed., Tata McGraw Hill Publishing Co. Ltd.
7. Practical Medical Microbiology, Collee Duguid, Fraser, Marmion, 24th ed., Churchill Livingstone.
8. Microbiology, Davis, Dulbecco, Eisen and Ginsberg, 3rd ed., Harper International Edition.
9. Manual of Clinical Microbiology, Murray, Baron, Pfaller, Tenover, Yolken, 6th ed., American Society for Microbiology.
10. (Brock) Biology of Microorganisms by Paulette W. Royt and George And rykovitch, 2004.
11. Bergy's Manual of Determinative Bacteriology by D. Bergy, Williams, James Staley, Noel R. Kreig and Peter Sneath, 9th ed., 1994, Lippincott Williams & Wilkins
12. The Physiology and Biochemistry of Prokaryotes by David White, 3rd ed., Oxford University Press.
13. Microbial Physiology by Albert G. Moat (Editor), John W. Foster and Michael P. Spector, 2002.

MT 102 : GENERAL IMMUNOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

a)Introduction to Immunity

immunity – types of immunity – innate and acquired.

b) Organelles and cells of immune system

Immune system: Anatomy of lympho- reticular system – Primary lymphoid organ. Secondary lymphoid tissue, cells of the immune system – Immune cell receptor – CD nomenclature

c) Antigen

Antigen: Types, properties, Super antigens, haptens, epitopes, adjuvants

Unit-2

a) Immunoglobulin

Immunoglobulin - Structure, types and properties. Organization and expression of Immunoglobulin genes, generation of antibody diversity, Monoclonal antibodies and their applications, Chimeric antibodies and it's applications

b) Antigen - antibody interactions

Antigen-Antibody interaction: Types, nature, Affinity, avidity, cross-reactivity. Antigen - antibody reactions: Principles and application of Agglutination, Precipitation and Complement fixation

Unit-3

Cytokines

Properties, Receptors, Cytokine antagonists, Cytokine secretion and Cytokine related diseases

Unit-4

Complement and inflammation

Functions and components, complement activation pathways, complement activation regulation, consequences of complement activation and complement deficiencies, chemokines and other mediators of inflammation, inflammatory process

Unit-5

a) Laboratory techniques

Hybridoma technology, Western blotting, Immuno-fluorescence, Chemiluminescence, ELISA, RIA, microarrrays, Flow cytometer, in vivo methods-

b) Immunohematology

Blood cells and their generation, ABO & Rh Blood Group systems, blood grouping and cross matching tests, Anti-human globulin test, Rh incompatibility, blood banking

REFERENCE BOOKS:

1. Kuby Immunology, Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne, Janis Kuby, W H Freeman & Co.; 4th edition, 2000

2. Cellular and Molecular Immunology, Abul K. Abbas, Andrew H. Lichtman, Jordan S. Pober, Abdul K. Abbas. W B Saunders Co; 4th edition, 2000

3. Immunobiology, Charles Janeway (Editor), Paul Travers, Garland Pub; 5th edition, 2001

4. Roitt's Essential Immunology, Ivan M. Roitt, Peter J. Delves, Blackwell Science Inc; 10th edition, 2001

5. Immunology: A Laboratory Manual, Richard L. Myers, McGraw-Hill 2nd edition, 1994

6. Manual of Immunological Methods, P. Brousseau (Editor), M. Beaudet (Editor), Yves Payette, Barry R. Blakely, CRC Press; 1998

7. Immunology (The Clinical Laboratory Manual Series), Juanita A. Smith, Delmar Learning; 1st edition, 1995

8. Antibody engineering – Methods and Protocols, Benny K. C. Lo, Volume 248, Humana Press, 2004

MT 103 : GENERAL BIOCHEMISTRY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

Basic Concepts of Biochemistry

a) Units of measurements, CGS, MKS and SI systems, Solutions, Acid base aspects, Ion product of water, pH and pK, Hendersen Hasselbalch equation, Acids and bases and conjugate acid-base pairs

b) Buffers and buffer action, Buffers, Mechanism action of buffer system, Fundamental principles and applications of pH meter, and Spectrophotometer

Unit-2

a) Acid Base Metabolism

Major body buffers, Maintenance of acid base balance- role of lungs and kidney, Acid base disorders

b) Specimen Collection and Preservation

Types of body fluids used for analysis, Anticoagulants, Types, Mode of action, Selection of appropriate anticoagulant, Application, Changes in blood on keeping, Collection, preservation and other aspects of other fluids

Unit-3

a) Carbohydrates

Monosaccharides and Reactions of monosaccharides, Importance of various monosaccharides, Disaccharides, Homo and heteropolysaccharides

b) Lipids

Biomedical importance of simple, compound, derived and miscellaneous lipids, Eicosanoids (Prostaglandins)

c) Amino Acids

Classification of Amino acids, Structural and functional aspects of various amino acids, Physical properties of amino acids, Reactions of amino acids

Unit-4

a) Nutrition

Nutritional importance of Carbohydrates, fats, proteins, Calorific values, Respiratory quotient, Basal metabolic rate, its measurement and factors affecting it, Specific dynamic action, Biological value, Balanced diet, Obesity, Nutritional implications of disease

b) Hormones

Brief introduction to hormones, Mechanism of hormone action, Classification of hormones

c) Molecular Biology and Bioinformatics

Introduction to terminology of molecular biology, Introduction to bioinformatics

Unit-5

Vitamins

General nature, structural, functional aspects, requirement and deficiency manifestations of Water Soluble vitamins (Thiamin, Riboflavin, Niacin, Pyridoxine, Pantothenic acid, Folic acid, Cobalamin, Biotin, Ascorbic acid) and Fat soluble vitamins (Vitamin A, Vitamin D, Vitamin K, Vitamin E)

REFERENCE BOOKS

1. Lehninger's Principles of Biochemistry by Nelson & Cox, 3rd Ed., 2000, MacMillan Press.
2. Biochemistry by L Stryer, 3rd ed., W.H. Freeman & CO.
3. Harper's Biochemistry by RK Murray, DK Granner and PA Mayes, 27th Ed., 2006, McGraw Hill.
4. Principles of Biochemistry by R Horton, LA Moran and D Rawn, 4th Ed., 2005, Prentice Hall
5. Textbook of Biochemistry by TM Devlin, 4th Ed., 1997, John Wiley & Sons.
6. Fundamental of Clinical Chemistry by NW Tietz, 3rd Ed., W.B. Saunders.

MT 104 : MICROBIAL GENETICS

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

Introduction of Microbial Genetics

Mendelian genetics: Law of segregation, independent assortment, dominance, Co-dominance, semi-dominance, Epitasis, Lethal genes, Pleiotropic genes, Linkage, Crossing over, One gene -one polypeptide hypothesis, Chromosomal theories of inheritance, Genetic mapping

Unit-2

Structure and Function of Chromosomes and Nucleic Acids

Structures and functions of Bacterial, Viral and Eukaryotic chromosomes, DNA as a genetic material, chloroplasts and mitochondrial DNA and their functions

Unit-3

Organization of DNA into chromosomes: Packaging of DNA and organization of chromosome in bacterial cells; Packaging of DNA in eukaryotic nucleosome and chromatin condensation, assembly of nucleosomes upon replication, Chromatin modification and genome expression.

Unit-4

a) Plasmid Biology: Types, compatibility, replication, control of copy number and plasmid segregation

b) Transposable elements: Types of transposable elements, Structure, genetic organization and mechanism of transposition of Tn5, Tn3 and related transposons, Bacteriophage Mu, Tn7 and IS911, Integrons, Retrotransposons, Conjugative and Mobilizable transposons, Assays of transposition.

Unit-5

Restriction-Modification systems: Role of Restriction-Modification systems, Types of RM systems, Modification, Restriction and Regulation.

REFERENCE BOOKS

1. Genomes, 3rd Edition by Terry Brown, Published by Garland Science, 2007
2. Gene IX by Benzamin Lewin, Published by Pearson Education, Inc., 2007
3. Modern Microbial Genetics, 2nd Edition by Uldis N. Streips & Ronald E. Yasbin, Published by Wiley & Sons, Inc., 2002
4. Molecular Biology of the Gene 5th Edition by James D Watson, Published by Pearson Education, Inc. 2003
5. Principles of Genetics, Eighth Edition by Gardner, Published by Wiley & Sons, Inc., 2005
6. Molecular Biotechnology, Third Edition by Bernard R Glick and Jack J Pasternak, Published by ASM Press, Washington, 2007
7. Essential Molecular Biology Vol. I & Vol. II, Second edition by TA Brown, Published by Oxford, 2000
8. Microbial Genetics by D Freifelder, JE Croman and SR Maloy, 2nd Ed., 1994, Jones & Bartlett.
9. Molecular Biology by D Freifelder, 1987, Jones & Bartlett.

MT 105 : ENZYMOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

General Aspects of Enzymes

a) Introduction, Protein enzymes, Non protein enzymes (Ribozymes), Distribution of enzymes in cells, Nature and function as a catalyst, Nomenclature and classification

b) Mechanism of enzyme action, Enzyme specificity (Substrate specificity, Stereo specificity, Reaction specificity), Factors affecting enzyme catalyzed reactions

Unit-2

Enzyme Kinetics

a) Energy barriers for chemical reactions, Role of catalysis, Catalytic site, Nature of Enzyme Catalysis- Transition state theory (proximity and orientation, oribital steering, acid base catalysis, covalent catalysis, metal ion catalysis, nueleophilic and electrophoilic catalysis), intramolecular catalyses, entropy effects.

b) Principles of kinetics, Chemical kinetics, Enzyme kinetics, Michaelis-Menten equation, Derivation of the Michaelis-Menten equation, Lineweaver-Burk Equation, Meanings of Km, Kinetic constants regarding enzyme, activity and Specificity, Measurement of Km and Vmax,

Unit-3

a) Ezymes Involved in Biological Oxidation

Oxidases, Aerobic dehydrogenases, anaerobic dehydrogenases, Hydroperoxidases, Oxygenases,

b) Isoenzymes

Lactate dehydrogenase (LDH), Creatine phosphokinase (CPK), Alkaline phosphatase, Acid phosphatase

Unit-4

a) Immobilized enzymes

Introduction, Properties of Immobilized Enzymes, Benefits of Immobilizing an Enzyme, Methods of immobilization (Physical adsorption onto an inert carrier, Inclusion in the lattices of a polymerized gel, Cross-linking of the protein with a bifunctional reagent, and Covalent binding to a reactive insoluble support)

b) Measurement of Multisubstrate reactions: Cleland's notation with examples of ordered, pingpong, and random, Multienzyme Complexes and Multifunctional Enzymes

Unit-5

a) Enzyme Inhibition

Reversible enzyme inhibition, Competitive inhibition, Uncompetitive inhibition, Non competitive inhibition, Irreversible enzyme inhibition, Allosteric inhibition, Suicide inhibition, Uses of enzyme inhibition

b) Regulation of Enzyme Activity

Non-covalent modification (control of enzyme activity by Non-covalent modifier-Allosteric regulation), covalent modification, Regulation by induction and repression, Regulation by proteolytic cleavage, Difference between various types of regulation

REFERENCE BOOKS:

1. Fundamentals of Enzymology: Nicholes C. Price and Lewis Stevens, Oxford Univ. Press.

2. Comprehensive Enzyme Kinetics, by Vladimir Leskovac. Kluwer Academic Publishers New York, Boston, Dordrecht, London, Moscow.

3. Enzymes by Trevor Palmer and Philip Bonner, II edition, EWP

4. Isoenzymes By D. W. Moss

5. Enzyme Kinetics, Principles and Methods, Hans Bisswanger, II edition, WILEY-VCH

6. Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis. Robert A. Copeland, II edition, WILEY-VCH.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MEDICAL TECHNOLOGY (MICROBIOLOGY / BIOCHEMISTRY)
SYLLABUS FOR SEMESTER – I
(In force from July 2010)
MT 106 : PRACTICAL

Marks: 200 (140 Marks Ext. + 60 Marks Int.)

I Microbiology & Immunology

A Microbiology

1. Basic microbiological techniques
2. Cleaning and sterilization of glass wares
3. Study of bacterial motility
4. Methods of sterilization
5. Negative staining
6. Gram staining
7. Acid fast staining
8. Spirochete staining
9. Cell wall staining
10. Endospore staining
11. Capsule staining
12. Metachromatic granule staining
13. Flagella staining
14. Lactophenol cotton blue staining
15. Preparation and sterilization of media (solid and liquid)
16. Cultivation and isolation of bacteria (streak, spread and pour plate techniques)
17. Cultivation and isolation of fungi
18. Cultivation and isolation of yeast
19. Effect of chemicals and antibiotics on bacterial growth
20. Effect of antiseptic and disinfectants on the growth of microorganism

B Immunology

1. Widal agglutination qualitative and quantitative tests
2. Mantoux test
3. Demonstration of Phagocytic activity of macrophage
4. C-Reactive Protein (CRP) test
5. Rheumatoid Arthritis (RA) test
6. Rapid Plasma Reagin (RPR) test
7. Dot immunoassay for HIV 1+2
8. One step pregnancy test
9. One step Hepatitis test
10. Flow through HCV test
11. Flow through HIV 1+2 test
12. Gel precipitation tests – Demonstration only

13. Counter immunoelectrophoresis (CIEP) - Demonstration only
14. ABO & Rh grouping
15. Titration of anti A, anti B and anti D
16. Direct and indirect Coombs test
17. Crossmatching

II Biochemistry

1. Basic Aspects of Practical Laboratory

Hazards from dangerous chemical in the clinical chemistry laboratory, Precautions to take to avoid the accidents, Fire, infection, Corrosive chemicals, Toxic fumes, Broken glassware, Burns caused by heat, Carcinogens

2. Basics of laboratory techniques

Methods of measuring liquids, Cleaning glassware, Methods of weighing, Chemical and reagents, pH, Buffers and preparation of buffers, Measurement of pH of a solution, Indicators, Titration

3. Specimen Collection and Handling

Anti coagulants, Collection and preservation of urine samples, Cerebrospinal fluid and other fluids

4. Estimations Based on Spectrophotometry

a. Estimation of glucose by GOD-POD enzymatic method.
b. Estimation of total proteins and albumin and calculation of A/G ratio
c. Estimation of serum cholesterol by chemical and enzymatic methods.
d. Estimation of HDL Cholesterol, triacylglycerol and calculation of VLDL and LDL.
e. Estimation of Calcium by Cresolphthalein complexone method
f. Estimation of Phosphorous by the phosphomolybdic acid method
g. Estimation of serum Creatinine by End point method and Kinetic method
h. Estimation of blood urea by DAM method and enzymatic method.
i. Estimation of Bilirubin by Modified diazo method and Jendrassik &Grof method
j. Estimation of uric acid by chemical and enzymatic methods
k. Estimation of microprotein in urine by pyrogallol red method

REFERENCE BOOKS:

1. Clinical Laboratory Methods, 9th ed., 1982 by J.D. Bauer, C.V. Mosby Company, St. Louis, Toronto, Landon.
2. Clinical Diagnosis by Laboratory Methods by Davidson Henry, 15th ed. (S.G. Wasaniper, Macmillan Company St. Lousis, Toronto, London.
3. Clinical Laboratory Methods and Diagnosis, Vol.I & II, 8th ed. by Sonnenwirtn and Barett, The C.V. Mosby Company, St. Louis, Toronto, Landon.
4. Collection and Handling of Laboratory Technology Specimens by Slockbower.
5. Handbook of Medical Laboratory Technology, Chitra Bharucha, 1987.
6. Medical Laboratory Technology, Methods & Interpretations, R. Sood, 3rd ed., Jaypee Brothers.
7. Methods in Microbiology, Microscopy & Staining, J.D. Desai and A.J. Desai, Prashant Publishers, Vallabh Vidyanagar.
8. Medical Laboratory Technology, Vol. I-III, K.L. Mukherjee, Tata McGraw-Hill Publishing Company Ltd.
9. Illistrated Laboratory Techniques, Nozoma Kasaki, 2nd ed., Igaku Shoin Ltd, Tokyo
10. A Handbook of Practical Immunology, G.P. Talwar, Vikas Publishing House Ltd.
11. Medical Laboratory Technology, Vol. I-III, Kanai L. Mukherjee, Tata McGraw-Hill Publishing Co. Ltd.
12. Tietz Textbook of Clinical Chemistry by CA Burtis & ER Ashwood. 3rd Ed., 1999, W.B. Saunders Co.
13. Clinical Chemistry; Theory, Analysis, Correlation by LA Kaplan, AJ Pesce 7 SC Kazmierczak, 4th Ed., 2003, Mosby.
14. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics by CA Burtis & ER Ashwood. 4th Ed., 2006, W.B. Saunders Co.
15. Clinical Chemistry: Interpretation and Techniques by A Kaplan & LL Szabo, 2nd Ed.,1983, Lea & Febiger.
16. Practical Clinical Biochemistry by H Varley & AH Gowenlock, 5th Ed., 1984, William Heinemann Medical Book Ltd.
17. Practical Biochemistry by G Rajagopal & BD Toora, 2001, Ahuja Book Co. Pvt. Ltd.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MEDICAL TECHNOLOGY (MICROBIOLOGY / BIOCHEMISTRY)
SYLLABUS FOR SEMESTER – II
(In force from July 2010)
MT 201 : PRINCIPLES OF MEDICAL MICROBIOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1
Principles of Parasitology
Characteristics and Classification of Protists, Fungi, Helminthes and Arthropods

Unit-2
Bacterial Viruses
Bacterial Viruses: Structure and Functions, Mode of Multiplication- Lytic and lysogenic cycle, Classification and Naming

Unit-3
Animal Viruses
Structure and Functions, Mode of Multiplication, Classification and Naming
Medical Importance of Viruses, Cultivation and assay of viruses, Virus like Agents – Satellite, Viroids, Prions
Collection, Transport and Laboratory Diagnostic Techniques in the diagnosis of viral diseases

Unit-4
Principles of Microbial Diseases
Host Parasite Relationships, Indigenous Flora of Human Host, Kinds of Diseases
Progress of Disease- Signs, Symptoms and Syndrome
Establishments of Diseases and Pathogenicity Islands
Non-Specific Defense Mechanisms: Predisposing factors of host resistance
Physical Barriers, Chemical Barriers and Biological Mechanisms

Unit-5
Epidemiology and Nosocomial Infections
Epidemiology of infectious diseases: Epidemiological techniques, Role of host in infectious disease, Transmission of diseases through - air, water, food, arthropod and direct contact, Lab procedure for epidemiologic analysis of microorganisms
Nosocomial Infections: Sources, susceptibility and transmission, Surveillance and control, Handling and disposal of biohazard

REFERENCE BOOKS:

1. General Microbiology, Roger Y. Stanier, Edward A. Adelberg and John L. Ingraham, 4th ed., Prentice Mall, Inc.
2. Mackie and McCartney Medical Microbiology, Aguide to Laboratory Diagnosis and Control of Infection, 13th ed., J.P.Duguid, B.P. Marmion and R.H.A. Swain, The English Language Book Society and Churchill Livingstone.
3. Fundamentals of Microbiology, Frobisher, Hinsdill, Crabtree and Goodheart, 9th ed., W.B. Saunders Company.
4. Diagnostic Microbiology, Finegold and Martin, 6th ed., The C.V. Mosby Co.
5. Bailey and Scott's Diagnostic Microbiology, Sydney M. Finegold and Ellen Jo Baron, 7th ed., The C.V. Mosbey Co.
6. Microbiology, Pelzar, Reid, Chah, 4th ed., Tata McGraw Hill Publishing Co. Ltd.
7. Practical Medical Microbiology, Collee Duguid, Fraser, Marmion, 24th ed., Churchill Livingstone.
8. Microbiology, Davis, Dulbecco, Eisen and Ginsberg, 3rd ed., Harper International Edition.
9. Manual of Clinical Microbiology, Murray, Baron, Pfaller, Tenover, Yolken, 6th ed., American Society for Microbiology.
10. (Brock) Biology of Microorganisms by Paulette W. Royt and George And rykovitch, 2004.
11. Bergy's Manual of Determinative Bacteriology by D. Bergy, Williams, James Staley, Noel R. Kreig and Peter Sneath, 9th ed., 1994, Lippincott Williams & Wilkins
12. The Physiology and Biochemistry of Prokaryotes by David White, 3rd ed., Oxford University Press.
13. Microbial Physiology by Albert G. Moat (Editor), John W. Foster and Michael P. Spector, 2002.

MT 202 : ADVANCE IMMUNOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

a) Antigen processing and presentation

Antigen presenting cells and antigen processing pathways

b) T cell

Structure of T cell receptor, T cell receptor complex, T cell accessory membrane molecules, TCR Peptide MHC ternary complex, T cell maturation, Activation and Differentiation, effector T cells, cytotoxic T cells, NK T cells

c) B cell maturation and response

B cell maturation, activation and proliferation, Humoral response

Unit-2

a) Immunity to infection

Viral infections, Bacterial infections, Protozoan infections and Helminthes infections

b) Hypersensitivity - Mechanisms and Detection

IgE mediated (Type I) Hypersensitivity, Antibody mediated (Type II) Hypersensitivity, Immune complex mediated (Type III) Hypersensitivity, Delayed type (Type IV) Hypersensitivity, Stimulatory Hypersensitivity (Type V), Skin tests

Unit-3

a) Immunity to tumors and transplants

Cancer, oncogenes, tumor antigens, cancer immunotherapy

b) Immunodeficiency

Primary immunodeficiency, AIDS and other acquired or secondary immunodeficiency

c) Autoimmunity

Organ specific and systemic autoimmune diseases

Unit-4

Vaccines development

Active and Passive immunization, Types of vaccines – whole organisms, Purified macromolecules, recombinant vector vaccines, DNA vaccines, Multivalent subunit vaccines

Unit-5

Major histocompatibility complex

Major histocompatibility complex: Major histocompatibility complex genes and molecules and their functions, various groups of HLA system, HLA typing and applications

REFERENCE BOOKS:

1. Kuby Immunology, Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne, Janis Kuby, W H Freeman & Co.; 4th edition, 2000

2. Cellular and Molecular Immunology, Abul K. Abbas, Andrew H. Lichtman, Jordan S. Pober, Abdul K. Abbas. W B Saunders Co; 4th edition, 2000

3. Immunobiology, Charles Janeway (Editor), Paul Travers, Garland Pub; 5th edition, 2001

4. Roitt's Essential Immunology, Ivan M. Roitt, Peter J. Delves, Blackwell Science Inc; 10th edition, 2001

5. Immunology: A Laboratory Manual, Richard L. Myers, McGraw-Hill 2nd edition, 1994

6. Manual of Immunological Methods, P. Brousseau (Editor), M. Beaudet (Editor), Yves Payette, Barry R. Blakely, CRC Press; 1998

7. Immunology (The Clinical Laboratory Manual Series), Juanita A. Smith, Delmar Learning; 1st edition, 1995

8. Antibody engineering – Methods and Protocols, Benny K. C. Lo, Volume 248, Humana Press, 2004

MT 203 : ADVANCE BIOCHEMISTRY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

Structure and Functions of Proteins and Enzymes

a) Protein structure (Primary structure, Secondary structure, Tertiary structure, and Quaternary structure), Denaturation and renaturation of proteins, Determination of primary structure, Plasma proteins, Types of plasma proteins, Importance of plasma proteins,

b) General aspects of enzymes, coenzymes and cofactors, Isolation, extraction and purification of proteins and enzymes

Unit-2

a) Introduction, Various types nitrogenous bases and their structural aspects, Nucleosides, Nucleotides, Structural and functional aspects of DNA, Forces stabilizing DNA structure, Helix parameters, Forms of DNA (A, B, C, D, T, and Z),

b) Watson –Crick base pairing, Physical properties of ds DNA (UV-Absorption spectra, Denaturation and Renaturation, DNA supercoiling, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication), Nucleosomes,

Unit-3

Structural and functional aspects of RNA, Messenger RNA, Transfer RNA, Ribosomal RNA, Other types of RNA and Ribonucleoproteins, Ribosomes, Retrovirus and adenovirus

Unit-4

Transcription and Translation: Promoter region**,** RNA polymerase**,** Transcription (Initiation, elongation, termination), genetic code, translation (Initiation, elongation, termination), molecular mechanism of transcription and translation,

Unit-5

Gene expression and its regulation: regulatory mechanisms of Gene expression in microbes and Operon concept, positive and negative regulation, effect of antimicrobials on translation

REFERENCE BOOKS

1. Genomes, 3rd Edition by Terry Brown, Published by Garland Science, 2007

2. Gene IX by Benzamin Lewin, Published by Pearson Education, Inc., 2007

3. Molecular Biology of the Gene 5th Edition by James D Watson, Published by Pearson Education, Inc. 2003

4. Lehninger's Principles of Biochemistry by Nelson & Cox, 3rd Ed., 2000, MacMillan Press.

5. Biochemistry by L Stryer, 3rd ed., W.H. Freeman & CO.

6. Harper's Biochemistry by RK Murray, DK Granner and PA Mayes, 27th Ed., 2006, McGraw Hill.

MT 204 : MICROBIAL TECHNOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

DNA replication: Mechanism of DNA polymerase catalyzed synthesis of DNA, Types of DNA polymerases in bacteria and their role. Initiation of chromosomal DNA replication and its regulation in prokaryotes, assembly of replisome and progress of replication fork, termination of replication.

Unit-2

Modes of Genetic exchange in bacteria

a) **Transformation:** Mechanism of Natural competence and transformation. Transformation by inducing artificial competence, Gene linkage and mapping by transformation

b) **Conjugation:** Conjugation by E. coli F factor (Regulation of F-factor fertility, establishment of cell contact, DNA mobilization and transfer and separation of mating pair, Hfr conjugation and chromosomal transfer, F-prime conjugation and merodiploids, Conjugation of fertility inhibited F-like plasmids), Nonconjugative, mobilizable plasmids, Broad Host Range self-transmissible plasmids, Chromosome mobilization by Non-F plasmids, Plasmid based conjugation in other bacteria

c) **Transduction:** Generalized transduction in bacteriophages, measuring transduction (cotransduction of markers, marker effects, abortive transduction, transduction of plasmids) Applications of generalized transduction. Specialized transduction in λ and its applications

Unit-3

Recombination: Types of recombinations, Models for Homologous recombination, Molecular mechanism of homologous recombination, Homologous recombination in eukaryotes, Molecular mechanism for site-specific recombination, Biological roles of site specific recombination

Unit-4

Mutation & DNA Repair: Mutation, Spontaneous mutations (Randam v/s adaptive nature of mutation, Luria and Delbruck experiment, Newcombe experiment, Lederberg's experiment, mutation rate and its determination, Origin of spontaneous mutations), molecular basis of mutation, effects of mutation on the translation process and phenotype selection, DNA damages (Deamination of bases, alkylation, damage due to reactive oxygen, UV induced damage) and it repair pathways (Methyl-directed mismatch repair, Nucleotide excision repair, Base excision repair, recombinational repair, SOS inducible repair, specific repair for oxidative DNA damage, pyrimidine dimers and alkylation induced damage and adaptive response).

Unit-5

a) Basic tools and technique in genetic engineering

DNA and RNA extraction, introduction to cloning, gel electrophoresis, RFLP, DNA Fingerprinting, PCR, RT-PCR, Real-time PCR, blotting techniques (southern, Northern, western blotting), DNA Micro Array, fluorescent based in situ hybridization (FISH)

b) Gene Technology

DNA as a probe in diagnostic tests, Role of chromosomes, Plasmids and other genetic materials in diagnosis

REFERENCE BOOKS

1. Genomes, 3rd Edition by Terry Brown, Published by Garland Science, 2007
2. Gene IX by Benzamin Lewin, Published by Pearson Education, Inc., 2007
3. Modern Microbial Genetics, 2nd Edition by Uldis N. Streips & Ronald E. Yasbin, Published by Wiley & Sons, Inc., 2002
4. Molecular Biology of the Gene 5th Edition by James D Watson, Published by Pearson Education, Inc. 2003
5. Principles of Genetics, Eighth Edition by Gardner, Published by Wiley & Sons, Inc., 2005
6. Molecular Biotechnology, Third Edition by Bernard R Glick and Jack J Pasternak, Published by ASM Press, Washington, 2007
7. Essential Molecular Biology Vol. I & Vol. II, Second edition by TA Brown, Published by Oxford, 2000
8. Microbial Genetics by D Freifelder, JE Croman and SR Maloy, 2nd Ed., 1994, Jones Bartlett.
9. Molecular Biology by D Freifelder, 1987, Jones & Bartlett.
10. Essential Molecular biology, T A Brown, Vol 1 & 2, 2nd edition, Oxford Publications
11. Experimental Microbiology, R J Patel and K R Patel, Vol 1 & 2, 4th edition, Aditya Publications
12. Laboratory Exercises in Microbiology, M J Pelczar jr, 2nd edition, McGraw Hill Publications

MT 205 : CLINICAL ENZYMOLOGY & ENDOCRINOLOGY

Marks: 100 (70 Marks Ext. + 30 Marks Int.) **Total Periods: 45**

Unit-1

Enzymes as diagnostic reagents, Measurement of enzyme activity, Basis of modern diagnostic kits development, Enzymes as diagnostic markers, Enzymes as probes in biochemical studies and investigations, Enzymes as therapeutic agents, Enzymes in clinical diagnosis and prognosis of disease, Factors affecting presence and removal of intracellular enzymes from plasma

Unit-2

a) Functions and Clinical significance of Liver Enzymes

Alanine transaminase (ALT), Asparatate transaminase (AST), Alkaline Phosphatase (ALP) Gamma glutamyl transferase (GGT), Ceruloplasmin, Serum Cholinesterase, Glutamate dehydrogenase, 5'Nucleotidase (NTP)

b) Functions and Clinical significance of Red Cell enzymes

Glucose 6-phosphate dehydrogenase, Pyruvate Kinase

Unit-3

a) Functions and Clinical significance of Pancreatic Enzymes

Amylase, lipase, Trypsin, Chymotrypsin,

b) Functions and Clinical significance of Muscle Enzymes

Creatine Kinase (CK), Lactate Dehydrogenase (LDH), Aldolase, Glycogen phosphorylase

Unit-4

a) General characteristics of hormones, Hormone receptors, Mechanism of action of hormones, Action of hormones,

b) Hypothalamus-Pituitary system: Hypothalamic hormones, Growth hormone, Thyroid stimulating hormone, Adrenocorticotropin, Prolactin, Gonadotropinns

Unit-5

a) Hormones of adrenal Medulla, Hormones of adrenal cortex, Hormones of thyroid gland

b) Gastrointestinal Hormones- Cholecystokinin, Gastrin, Secretin, Gastric inhibitory peptide, Hormones of pancreas- Insulin, Glucagon, Anti-diuretic Hormones

REFERENCE BOOKS

1. Harper's Biochemistry by RK Murray, DK Granner and PA Mayes, 27th Ed., 2006, McGraw Hill.

2. Medical Biochemistry by NV Bhagwan, 4th Ed., 2001, Academic Press.

3. Enzyme Structure and Mechanism by A Fersht, 2nd ed., 1985, W.H. Freeman & Co.

4. Enzyme Chemistry by Sucking CJ

5. Medical Biochemistry by JW Baynes and MH Dominiczek, 2nd ed., 2004, Mosby.

6. Manual of Endocrinology and Metabolism by N Levin, 3rd Ed., 2002, Lippincott Williams & Wilkins.

7. Clinical Chemistry; Theory, Analysis, Correlation by LA Kaplan, AJ Pesce and SC Kazmierczak, 4th Ed., 2003, Mosby.

8. Fundamental of Clinical Chemistry by NW Tietz, 3rd Ed., W.B. Saunders.

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT
M.Sc. MEDICAL TECHNOLOGY (MICROBIOLOGY / BIOCHEMISTRY)
(In force from July 2010)
SYLLABUS FOR SEMESTER – II
MT 206 : PRACTICAL

Marks: 200 (140 Marks Ext. + 60 Marks Int.)

I Microbiology & Immunology

A Microbiology

1. Cultivation and isolation of anaerobic bacteria
2. Antibiotics sensitivity tests
3. Different biochemical tests for identification of pathogens
4. Isolation and identification of microorganisms
5. Pure culture study of bacteria
6. Sterility testing of pharmaceutical products
7. Cultivation of bacteriophage - λ Phage

B Immunology

1. Elisa for T3/T4/TSH (Quantitative)
2. Elisa for HIV 1+2
3. Elisa for HBsAg
4. Determination of sensitivity of ELISA.
5. Demonstration of complement inactivation
6. Determination of Antigen/Antibody concentration by ELISA
7. Immunoblotting – Demonstration only
8. Western Blot assay

II Biochemistry

1. Protein precipitation and comparative estimation by
   (a)TCA b) Acetone c) Ammonium sulfate d) metal ions
2. Fractionation of protein by Gel filtration method.
3. Fractionation of proteins by ion-exchange chromatography
4. Analysis of protein on SDS-PAGE
5. Total DNA and RNA estimation by spectrophotometric analysis
6. Differentiation of DNA, RNA and protein samples by spectrophotometric analysis
7. Determination of Km and Vmax values

III Microbial Technology / Clinical Enzymology & Endocrinology

Microbial Technology

1. **Extraction of Nucleic Acids**
   a. Purification of DNA from Bacteria
   b. Estimation of DNA on Spectrophotometer and determination of quality of DNA
   c. Agarose Gel electrophoresis and determination of molecular weight of isolated DNA
   d. Isolation of Total RNA

2. Cloning of DNA fragments
   a. Purification of DNA fragments of desired size from agarose gel
   b. Extraction of Plasmid
   c. Restriction Digestion
   d. Cloning of DNA (demonstration)
   e. Transformation (demonstration)
   f. Amplification of target DNA using PCR (demonstration)

Clinical Enzymology & Endocrinology

1. Estimation of following enzymes by various methods
   a. Alkaline phosphatase
   b. Acid phosphatase
   c. Alanine transaminases
   d. Aspartate transaminases
   e. Lactate dehydrogenase
   f. Creatine phosphokinase
   g. Amylase

2. **Estimation of Isoenzymes**

   a. LDH
   b. Alkaline phosphatase
   c. CKNAC, CKMB

REFERENCE BOOKS:

1. Clinical Laboratory Methods, 9th ed., 1982 by J.D. Bauer, C.V. Mosby Company, St. Louis, Toronto, Landon.
2. Clinical Diagnosis by Laboratory Methods by Davidson Henry, 15th ed. (S.G. Wasaniper, Macmillan Company St. Lousis, Toronto, London.
3. Clinical Laboratory Methods and Diagnosis, Vol.I & II, 8th ed. by Sonnenwirtn and Barett, The C.V. Mosby Company, St. Louis, Toronto, Landon.
4. Collection and Handling of Laboratory Technology Specimens by Slockbower.
5. Handbook of Medical Laboratory Technology, Chitra Bharucha, 1987.
6. Medical Laboratory Technology, Methods & Interpretations, R. Sood, 3rd ed., Jaypee Brothers.
7. Methods in Microbiology, Microscopy & Staining, J.D. Desai and A.J. Desai, Prashant Publishers, Vallabh Vidyanagar.
8. Medical Laboratory Technology, Vol. I-III, K.L. Mukherjee, Tata McGraw-Hill Publishing Company Ltd.
9. Illistrated Laboratory Techniques, Nozoma Kasaki, 2nd ed., Igaku Shoin Ltd, Tokyo
10. A Handbook of Practical Immunology, G.P. Talwar, Vikas Publishing House Ltd.
11. Medical Laboratory Technology, Vol. I-III, Kanai L. Mukherjee, Tata McGraw-Hill Publishing Co. Ltd.
12. Clinical Chemistry; Theory, Analysis, Correlation by LA Kaplan, AJ Pesce and SC Kazmierczak, 4th Ed., 2003, Mosby.
13. Clinical Chemistry by LA Kaplan and AJ Pesce
14. Fundamental of Clinical Chemistry by NW Tietz, 3rd Ed., W.B. Saunders
15. Essential Molecular biology, T A Brown, Vol 1 & 2, 2nd edition, Oxford Publications
16. Experimental Microbiology, R J Patel and K R Patel, Vol 1 & 2, 4th edition, Aditya Publications
17. Laboratory Exercises in Microbiology, M J Pelczar jr, 2nd edition, McGraw Hill Publications