

<b>M.Sc. in Microbiology</b>		<b>(SECOND SEMESTER)</b>	
<b>COURSE CODE: MMB 201</b>		<b>COURSE TYPE: CCC</b>	
<b>COURSE TITLE: IMMUNOLOGY</b>			
<b>CREDIT: 7</b>		<b>HOURS: 135</b>	
<b>THEORY: 5</b>	<b>PRACTICAL: 2</b>	<b>THEORY: 90</b>	<b>PRACTICAL: 45</b>
<b>MARKS: 100</b>			
<b>THEORY: 70 CCA: 30 PRACTICAL: 33</b>			
<b>OBJECTIVE:</b>			
<p>The main aim of this course is to cater the students the information regarding the body's defense mechanism, components of defense system, genetic control and the consequences arising due to failure of defense mechanism. The course also includes immunotechniques for providing modern insights regarding the subject.</p>			
<b>UNIT-1</b> <b>(15 Hrs)</b>	<p>Introduction, history of immunology. Types of immunity – innate, acquired, passive and active. Primary and secondary immune response. Antigens – properties and types. Immunogenicity and antigenicity. Factors affecting immunogenicity. Antigenic epitopes, adjuvants, haptens, superantigens</p>		
<b>UNIT-2</b> <b>(20Hrs)</b>	<p>Cells and organs of immune system: Hematopoiesis and differentiation, B and T lymphocytes and their activation, natural killer cells, mononuclear cells, granulocytes, dendritic cells. Lymphatic system: Primary and secondary lymphoid organs. Cell mediated cytotoxicity: mechanism of T cell and NK cell mediated lysis and ADCC</p>		
<b>UNIT-3</b> <b>(20Hrs)</b>	<p>Antibody structure and function isotype, allotype and idiotype. Immunoglobulin classes and sub classes. Antigen and antibody interactions and Immuno-techniques - ELISA, RIA, and Immuno-fluorescent techniques. Major histocompatibility complex, HLA. The complement system.</p>		
<b>UNIT-4</b> <b>(20Hrs)</b>	<p>Antigen processing and presentation, generation of humoral and cell mediated immune responses, cytokines and their role in immune regulation, T- cell regulation, MHC-regulation, Immunological tolerance, Hypersensitivity, Autoimmunity,</p>		

<b>UNIT-5</b> <b>(15 Hrs)</b>	Transplantation, Immunity to infectious agents (intracellular parasites, helmenths& viruses,)Tumor Immunology, Vaccines, Hybridoma Technology and Monoclonal Antibodies
<b>COURSE CODE: BTC113 LABORATORY</b> <b>WORK</b>	<ol style="list-style-type: none"> <li>1. Grouping of blood and Rh typing.</li> <li>2. Latex agglutination test for rheumatoid factor and pregnancy.</li> <li>3. ELISA - demonstration</li> <li>4. Total RBC count, Total WBC count, Total platelet count</li> <li>5. Ouchterloney Double Diffusion for antigen and antibody pattern</li> <li>6.Ouchterloney Double Diffusion for antibody totrotation</li> <li>7RadialImmuno diffusion.</li> <li>8Isolation and purification of IgG from serum or IgY from chicken Egg.</li> <li>9.Demonstration of lymphocyte subpopulation</li> <li>10. Immuno-electrophoresis</li> <li>11.Widal test for diagnosis of enteric fever – slide test and semi quantitative method.</li> </ol>
<b>SUGGESTED READINGS</b>	<ol style="list-style-type: none"> <li>1. <i>Richard A. Goldsby, Thomas J. Kindt and Barbara A. (2005) Kuby Immunology Osborne 6 Ed. Edition</i></li> <li>2. <i>Male D., Champion B. Cooke A. and Owen M. (1991) Advanced Immunology</i></li> <li>3. <i>Roitt, I.M. (1998). Essential Immunology, ELBS, Blackwell Scientific Publishers, London.</i></li> <li>4. <i>Abdul, K., Abbas, Andrew K. L., Jordan, S. P. (1998). Cellular and Molecular Immunology. Sanders College Pub.</i></li> <li>5. <i>Benjamine, E., Cocoi., Sunshine. (2000). Immunology 4 th edition- Wiley- Liss. Publ. NY.</i></li> <li>6. <i>Tizard I.R. (1995). Immunology, 4thedition, Saunder College Pub.</i></li> <li>7. <i>William E Paul (1989). Fundamentals in Immunology, Raven Press. NY.</i></li> </ol>

M.Sc. in Microbiology		(SECOND SEMESTER)
COURSE CODE: MMB202		COURSE TYPE: CCC
COURSE TITLE: MEDICAL MICROBIOLOGY AND PARASITOLOGY		
CREDIT: 7		HOURS: 135
THEORY: 5	PRACTICAL: 2	THEORY: 90 PRACTICAL: 45
MARKS: 100		
THEORY: 100		PRACTICAL: 33
OBJECTIVE:		
The main objective of this paper is to inform students regarding the emerging concepts of microbial pathology and mechanism of pathogenesis of different microbes.		
UNIT-1 (20 Hrs)	<p><b>Infection:</b> Definition, Types, stages of infection, process of infection.</p> <p><b>Establishment of pathogenic microorganisms:</b> Entry, spread and tissue damage. Mechanism of bacterial adhesion, colonization and invasion of mucous membranes of respiratory, enteric and urogenital tracts. Aggressins and toxins.</p>	
UNIT-2 (20 Hrs)	<p><b>Pathogenic Bacteria:</b> Morphological characteristics, Pathogenesis and Laboratory diagnosis including rapid methods of following pathogenic bacteria; <i>Klebsiella pneumoniae</i>; <i>Proteus Vulgaris</i>; <i>Proteus mirabilis</i>; <i>Shigella dysenteriae</i>; <i>Pseudomonas aeruginosa</i>; <i>Vibrio Cholerae</i>; <i>Streptococcus pneumoniae</i>.</p>	
UNIT-3 (20 Hrs)	<p><b>New emerging infections:</b> -<i>Streptococcus suis</i>; community associated <i>Methicilin resistant Staphylococcus aureus</i> (MRSA), <i>Bordetella pertussis</i>, <i>Clostridium difficile</i>, Emergence of drug resistant strains and mechanism of drug resistance</p>	
UNIT-4 (15 Hrs)	<p><b>Pathogenic Fungi:</b> Morphological characteristics, pathogenesis and laboratory diagnosis of following pathogenic fungi;- <i>Microsporium</i>; <i>Trichophyton</i>; <i>Histoplasma capsulatum</i>; <i>Blastomyces dermatitidis</i>; <i>Candida albicans</i>; <i>Cryptococcus neoformans</i>; <i>Pneumocystis carinii</i>.</p>	

**UNIT-5****(20Hrs)****Parasitology****Parasites:** *Entamoeba histolytica; Giardia Lamblia; Plasmodium vivax; Leishmania donovani.***Helminths:** *Taenia saginata; Taenia solium; Hymenolepis nana; Schistosoma haematobium***SUGGESTED READINGS**

1. *Medical Microbiology*. By: G.F. Brooks, J.S. Butel, S.A. Morse.
1. *Text book of Microbiology*. By: Ananthanarayan and Panikar.
2. *Medical Microbiology*. By: B.S. Nagoba and A. Pichare.
3. *Clinical Microbiology and Infection control*. By: Elaine Larson.
4. *Bacterial Pathogenesis; Molecular and cellular mechanism*. By: Camilla Loch and Michel Simonet.
5. *Medical Microbiology*. By: David Greenwood.
6. *Medical Microbiology*. By: J.P. Duguid.
7. *Small DNA tumor viruses*. By: Kevin Gaston.
8. *Viruses and Interferon; current research*. By: Karen Mossam

M.Sc. in Microbiology		(SECOND SEMESTER)	
COURSE CODE:MMB203		COURSE TYPE: CCC	
COURSE TITLE: MICROBIAL PHYSIOLOGY AND METABOLISM			
CREDIT: 7		HOURS: 135	
THEORY: 5	PRACTICAL: 2	THEORY: 90	PRACTICAL: 45
MARKS: 100			
THEORY: 100		PRACTICAL: 34	
<b>OBJECTIVE:</b>			
The main objective of the paper is to acquaint students with the principles of biophysics and instrumentation based on biophysics as a result of which the student are expected to have basic knowledge about the functioning of analytical instruments and to deal with possible instrumental errors and malfunctioning during working.			
<b>UNIT-1 (15 Hrs)</b>	<b>Growth and cell division:</b> Measurement of growth, growth physiology, cell division, growth yields, growth kinetics, steady state growth and continuous growth. <b>Solute Transport:</b> Primary and Secondary transport: Introduction, Kinetics, ABC transporters, Phosphotransferase system, Drug export systems, amino acid transport.		
<b>UNIT-2 (20Hrs)</b>	<b>Central Metabolic Pathways and Regulation:</b> Glycolysis, PPP, ED pathway, Citric acid cycle: Branched TCA and Reverse TCA, glyoxylate cycle. Utilization of sugars other than glucose and complex polysaccharides. <b>Nitrogen metabolism:</b> Metabolism of amino acids: Amino acid biosynthesis and utilisation, lysine and glutamine overproduction, stringent response, polyamine biosynthesis and regulation.		
<b>UNIT-3 (15 Hrs)</b>	<b>Metabolism of nucleotides:</b> Purine and pyrimidine biosynthesis, regulation of purine and pyrimidine biosynthesis, inhibitors of nucleotide synthesis.		
<b>UNIT-4 (20 Hrs)</b>	<b>Metabolism of lipids and hydrocarbons:</b> Lipid composition of microorganisms, biosynthesis and degradation of lipids, lipid accumulation in yeasts, hydrocarbon utilization, PHA synthesis and degradation		

UNIT-5 (15 Hrs)	<p><b>Physiological Adaptations and Intercellular signaling:</b> Introduction to two component system, regulatory systems during aerobic- anaerobic shifts: Arc, Fnr, Nar, FhlA regulon, response to phosphate supply: The Pho regulon Quorum sensing: A and C signaling system, sporulation in <i>Bacillus subtilis</i>, control of competence in <i>Bacillus subtilis</i>. Heat-Shock responses pH homeostasis, osmotic homeostasis.</p>
LABORATORY WORK (MMB213)	<ol style="list-style-type: none"> <li>1. Isolation and purification from microbes</li> <li>2. Enzyme immobilization</li> <li>3. Spectroscopic measurement of enzyme activity</li> <li>4. Determining the optimum temperature for activity</li> <li>5. Determining the optimum pH for activity</li> <li>6. To determine the following enzyme activities in the soil sample: amylase, cellulase, xylanase, protease, and phosphatase</li> <li>7. To study the production of lignocellulolytic enzymes (cellulases, hemicellulases and lignin degrading</li> <li>8. To study the fungal degradation of lignocellulosic biomass ( Crop byproducts).</li> <li>9. To study the application of lignocellulolytic enzymes in bleaching of paper pulp.</li> <li>10. To study the use of cellulases in saccharification of cellulosic material.</li> <li>11. To study the microbiological quality of water samples from different sources.</li> <li>12. To study the decolorization of distillery or textile industrial waste.</li> <li>13. To study microbial degradation of hydrocarbon(s) or pesticides(s).</li> </ol>
SUGGESTED READINGS	<ol style="list-style-type: none"> <li>1. Biochemistry by Geoffrey L. Zubay. Fourth Edition, Addison-Wesley educational publishers Inc., 2008</li> <li>2. Lehninger Principles of Biochemistry by David L. Nelson and Michael M. Cox. Fifth Edition, W.H.</li> <li>3. Freeman and Company; 2008.</li> <li>4. Microbial lipids edited by C. Ratledge and SG Wilkinson, second edition, Academic Press; 1988.</li> <li>5. Microbial Physiology by Albert G. Moat and John W. Foster. Third edition, John Wiley and Sons; 2002</li> <li>6. The Physiology and Biochemistry of Prokaryotes by David White. Second Edition, Oxford University Press; 2000</li> </ol>

<b>M.Sc. in Microbiology</b>		<b>(SECOND SEMESTER)</b>
<b>COURSE CODE:MMB A01</b>		<b>COURSE TYPE : ECC</b>
<b>COURSE TITLE: FOREST AND ENVIRONMENTAL LAWS</b>		
<b>CREDIT: 06</b>	<b>HOURS : 90</b>	
<b>THEORY: 06</b>	<b>THEORY: 90</b>	
<b>MARKS : 100</b>		
<b>THEORY: 70</b>	<b>CCA : 30</b>	
<b>OBJECTIVE:</b>		
<ul style="list-style-type: none"> <li>- Understands the concept and place of research in concerned subject</li> <li>- Gets acquainted with various resources for research</li> <li>- Becomes familiar with various tools of research</li> <li>- Gets conversant with sampling techniques, methods of research and techniques of analysis of data</li> <li>- Achieves skills in various research writings</li> <li>- Gets acquainted with computer Fundamentals and Office Software Package .</li> </ul>		
<b>UNIT - 1</b> 18 Hrs	<b>EVOLUTION OF FOREST AND WILD LIFE LAWS</b>	
	<ul style="list-style-type: none"> <li>a) Importance of Forest and Wildlife</li> <li>b) Evolution of Forest and Wild Life Laws</li> <li>c) Forest Policy during British Regime</li> <li>d) Forest Policies after Independence.</li> <li>e) Methods of Forest and Wildlife Conservation.</li> </ul>	
<b>UNIT - 2</b> 18 Hrs	<b>FOREST PROTECTION AND LAW</b>	
	<ul style="list-style-type: none"> <li>a) Indian Forest Act, 1927</li> <li>b) Forest Conservation Act, 1980 &amp; Rules therein</li> <li>c) Rights of Forest Dwellers and Tribal</li> <li>c) The Forest Rights Act, 2006</li> <li>d) National Forest Policy 1988</li> </ul>	
<b>UNIT - 3</b> 18 H rs	<b>WILDLIFE PROTECTION AND LAW</b>	
	<ul style="list-style-type: none"> <li>a) Wild Life Protection Act, 1972</li> <li>b) Wild Life Conservation strategy and Projects</li> <li>c) The National Zoo Policy</li> </ul>	

<b>UNIT - 4</b> <b>18 Hrs</b>	<p><b>CHAPTER – BASIC CONCEPTS</b></p> <ol style="list-style-type: none"> <li>a. Meaning and definition of environment.</li> <li>b. Multidisciplinary nature of environment</li> <li>c. Concept of ecology and ecosystem</li> <li>d. Importance of environment</li> <li>e. Meaning and types of environmental pollution.</li> <li>f. Factors responsible for environmental degradation.</li> </ol> <p><b>CHAPTER– INTRODUCTION TO LEGAL SYSTEM</b></p> <ol style="list-style-type: none"> <li>a. Acts, Rules, Policies, Notification, circulars etc</li> <li>b. Constitutional provisions on Environment Protection</li> <li>c. Judicial review, precedents</li> <li>d. Writ petitions, PIL and Judicial Activism</li> </ol> <p><b>CHAPTER – LEGISLATIVE FRAMEWORK FOR POLLUTION CONTROL LAWS</b></p> <ol style="list-style-type: none"> <li>a) Air Pollution and Law.</li> <li>b) Water Pollution and Law.</li> <li>c) Noise Pollution and Law.</li> </ol>
<b>UNIT - 5</b> <b>18 Hrs</b>	<p><b>CHAPTER- LEGISLATIVE FRAMEWORK FOR ENVIRONMENT PROTECTION</b></p> <ol style="list-style-type: none"> <li>a) Environment Protection Act &amp; rules there under</li> <li>b) Hazardous Waste and Law</li> <li>c) Principles of Strict and absolute Liability.</li> <li>d) Public Liability Insurance Act</li> <li>e) Environment Impact Assessment Regulations in India</li> </ol> <p><b>CHAPTER – ENVIRONMENTAL CONSTITUTIONALISM</b></p> <ol style="list-style-type: none"> <li>a. Fundamental Rights and Environment <ol style="list-style-type: none"> <li>i) Right to Equality .....Article 14</li> <li>ii) Right to Information .....Article 19</li> <li>iii) Right to Life .....Article 21</li> <li>iv) Freedom of Trade vis-à-vis Environment Protection</li> </ol> </li> <li>b. The Forty-Second Amendment Act</li> <li>c. Directive Principles of State Policy &amp; Fundamental Duties</li> <li>d. Judicial Activism and PIL</li> </ol>



Bharucha, Erach. Text Book of Environmental Studies. Hyderabad : University Press (India) Private limited, 2005.

Doabia, T. S. Environmental and Pollution Laws in India. New Delhi: Wadhwa and Company, 2005.

Joseph, Benny. Environmental Studies, New Delhi: Tata McGraw-Hill Publishing Company Limited, 2006.

Khan. I. A, Text Book of Environmental Laws. Allahabad: Central Law Agency, 2002.

Leelakrishnan, P. Environmental Law Case Book. 2<sup>nd</sup> Edition. New Delhi: LexisNexis Butterworths, 2006.

Shastri, S. C (ed). Human Rights, Development and Environmental Law, An Anthology. Jaipur: Bharat law Publications, 2006.

Environmental Pollution by Asthana and Asthana, S, Chand Publication

Environmental Science by Dr. S.R.Myneni, Asia law House

Gurdip Singh, Environmental Law in India (2005) Macmillan.

Shyam Diwan and Armin Rosencranz, Environmental Law and Policy in India – Cases, Materials and Statutes (2<sup>nd</sup> ed., 2001) Oxford University Press.

**JOURNALS :-**

Journal of Indian Law Institute, ILI New Delhi.

Journal of Environmental Law, NLSIU, Bangalore.

**MAGAZINES :-**

Economical and Political Weekly

Down to Earth.

<b>M.Sc. in Microbiology</b>		<b>(SECOND SEMESTER)</b>
<b>COURSE CODE: MMB B02</b>		<b>COURSE TYPE: ECC</b>
<b>COURSE TITLE: MICROBIAL TECHNOLOGY FOR RURAL DEVELOPMENT</b>		
<b>CREDIT: 6</b>	<b>HOURS: 90</b>	
<b>THEORY: 6</b>	<b>THEORY: 90</b>	
<b>MARKS: 100</b>		
<b>THEORY: 100</b>		<b>PRACTICAL: 00</b>
<b>OBJECTIVE:</b>		
<p>The real India lives in the Indian villages. The main occupation of villagers is agriculture and animal and related works. Till the date not much change is evidenced in the village scenario. The problem of waste management, hygiene, balanced food etc and yet more still prevails in our villages, in this regards this paper aims to give the students insights of some simple yet efficient techniques to deal with such problems and comfort the life, raise the life standards and present new options for the economic growth.</p>		
<b>UNIT-1 (20 Hrs)</b>	<p>Microbial inoculants- Selection &amp; establishment of nitrogen fixing bacteria. Production of Rhizobium, Azotobacter, Azospirilla, cyanobacteria and other nitrogenfixing bacterial cultures. Quality control of bio inoculants; Phosphate solubilising bacteria; mycorrhiza; plant growth promoting rhizobacteria (PGPR); Biocontrol microbial inoculants.</p>	
<b>UNIT-2 (20 Hrs)</b>	<p>Role of microorganisms for biomonitoring of various quality-parameters related to water and wastewater - Indicator organisms, single species laboratory bioassays and biosensors. Brief introduction to various stages of wastewater treatment: Primary, secondary and tertiary treatment. Control of pathogens in water and wastewater. Use of microorganisms for removal of various toxins and metallic ions from wastewater.</p>	
<b>UNIT-3 (20Hrs)</b>	<p>Vermiculture: definition, scope and importance - common species for culture, culture methods, wormery breeding techniques - indoor and outdoor cultures - monoculture and polyculture - relative merits and demerits. Vermin-composting, use of vermicastings in organic farming / horticulture - earthworms for management of biomedical solid wastes - feed / bait for capture / culture fisheries - forest regeneration</p>	
<b>UNIT -4</b>	<p>Single cell protein: microorganisms used; raw material used as substrate; condition for growth and production; nutritive value and uses of SCP. Baker's yeast; Production of probiotic</p>	

	<p>biomass; and mold cultures. Mushroom production: cultivation of different types of mushroom; edible mushroom; diseases of mushrooms therapeutic value of an edible mushroom; production of pectin and microbial conversion of woody biomass.</p>
<p><b>UNIT-5</b> <b>(20Hrs)</b></p>	<p>Mass cultivation of cyanobacteria under outdoor and indoor conditions. Cyanobacteria as a source of fine chemicals, polysaccharides, bioactive molecules, pigments, antioxidants, lipids and polyunsaturated fatty acids. Cyanobacteria as biofertilizer for paddy cultivation. Hydrogen production by cyanobacteria: Mechanism, progress and prospects. Cyanobacterial and algal fuels; Fine chemicals (restriction enzymes etc) and nutraceuticals from algae</p>
<p><b>SUGGESTED READINGS</b></p>	<ol style="list-style-type: none"> <li>1. Sultan Ahmed Ismail, 2005, <i>The Earthworm Book, Second Revised Edition. Mother India Press, Goa.</i></li> <li>2. Edwards, C.A. and Bohlen, P.J 1996, <i>ecology of earthworms - 3rd Edition, Chapman and hall.</i></li> <li>3. Jsmail, S.A., 1970, <i>Vermicology, The biology of earthworms, Orient Longman, London.</i></li> <li>4. Lee, K.E., 1985. <i>Earthworms - Their ecology and Relationship with Soil and Land use, Academic Press, Sydney.</i></li> <li>5. Robert A Andersen. 2005. <i>Algal Culturing Techniques. Academic Press.</i></li> <li>6. L. M. Prescott, J. P. Harley and D. A. Klein. <i>Microbiology-, McGraw Hill</i></li> <li>7. N. J. Pelczar, S. Chand, R. Krieg. <i>Microbiology- Tata McGraw Hill</i></li> <li>8. Casida, <i>Industrial microbiology-, L.E. New age international Ltd, Publishers. New Delhi:</i></li> <li>9. Frazier, <i>Food microbiology. W.C. Tata McGraw Hill.</i></li> <li>10. Carr NG &amp; Whitton BA. 1982. <i>The Biology of Cyanobacteria. Blackwell.</i></li> <li>11. Bergerson F J. 1980. <i>Methods for Evaluating Biological Nitrogen Fixation. John Wiley &amp; Sons</i></li> </ol>

M.Sc. in Microbiology		(SECOND SEMESTER)	
COURSE CODE: MMB B03		COURSE TYPE: ECC	
COURSE TITLE: CODE: MICROBIAL GENETICS			
CREDIT: 6		HOURS: 90	
THEORY: 6	PRACTICAL:0	THEORY: 90	PRACTICAL:
MARKS: 100			
THEORY: 70 CCA: 30PRACTICAL:00			
<b>Objective:</b>			
The main aim of this course is to cater the students the information regarding genetics of microbial system and understanding the mechanism of gene transfer in microbes			
UNIT-1 (15 Hrs)	<p><b>Genetic analysis of bacteria:</b> Importance and uses of mutation analysis. Inheritance in bacteria, types of mutations, spontaneous and induced mutagenesis, isolating mutants, selecting mutants, mutant enrichment. Reversions versus suppression. Complementation tests, recombination tests and gene replacements. Cloning genes by complementation. Cloning genes by marker rescue</p>		
UNIT-2 (20Hrs)	<p><b>Gene transfer and mapping by conjugation:</b> Basis of fertility in bacteria. Self-transmissible and mobilizable plasmids. Molecular mechanism of gene transfer by conjugation – genes and proteins involved. Regulation of gene transfer by conjugation. Hfr strains. Mapping bacterial genomes using Hfr strains. Chromosomal DNA transfer by plasmids – by integrated plasmids, by chromosome mobilization and by creation of prime factors. Ti plasmid transfer system and its application in creating transgenics.</p>		
UNIT-3 (20Hrs)	<p><b>Lytic bacteriophages</b> Lytic development cycle using phages T4 and T7 as models. Regulation of expression T4 – transcriptional activators, antitermination, a new sigma factor and replication-coupled transcription. Regulation of gene expression in phage T7 – a phage-encoded RNA polymerase. Replication of T4versus T7. Replication and packaging of filamentous phages M13 and f1.<b>Lysogenic phages:</b> Lambda phage – gene and promoter organization. Lytic cyle – regulation of gene expression – very early, early and late genes.Role of cI, cII and cIII proteins. Lambda immunity region and immunity to superinfection. Events leading to induction – role of cI and cro repressors in regulating.</p>		

<b>UNIT-4</b> <b>(20Hrs)</b>	<p><b>Gene transfer by transformation and transduction:</b> Natural transformation and competence. Molecular basis of natural transformation – DNA uptake competence systems in gram positive and gram negative bacteria. Regulation of competence in <i>B.subtilis</i>. Importance of natural transformation. Artificially induced competence. Generalized versus specialized transduction - T4 and lambda phage. Mapping bacterial genes by transduction.</p>
<b>UNIT-5</b> <b>(15 Hrs)</b>	<p><b>Transposons:</b> Discovery of transposition. Classes of bacterial transposons. Regulation of transposition activity. Effects of transposition in bacteria. Genetic requirements for transposition. Assays to analyze transposition events – suicide vectors and mating out assays. Molecular mechanisms of transposition – genetic evidence supporting the mechanisms. Conjugative transposons. Mu transposon, Mud transposons and gene fusions, mini-Mu elements and their use in <i>in vivo</i> cloning. Yeast Ty-1 transposon. Site-specific recombination – <i>loxP</i>-Cre system, phase variation system in <i>Salmonella</i>.</p>
<b>COURSE CODE: BTC212</b> <b>LABORATORY WORK</b>	<ol style="list-style-type: none"> <li>1. Amplification of DNA by PCR</li> <li>2. RAPD analysis</li> <li>3. Overexpression of proteins and analysis by SDS-PAGE</li> <li>4. Purification of recombinant protein</li> <li>5. Western Blotting analysis</li> <li>6. Preparation of competent cells and determination of transformation efficiency</li> <li>7. Alpha-complementation</li> <li>8. Phage titration</li> <li>9. Bacterial transduction</li> <li>10. Bacterial conjugation</li> <li>11. Bacterial transposition</li> </ol>
<b>SUGGESTED READINGS</b>	<ol style="list-style-type: none"> <li>1. <i>Molecular Genetics of Bacteria</i> by Larry Snyder and Wendy Champness, 3rd edition; ASM press; 2007.</li> <li>1. <i>Fundamental Bacterial Genetics</i> by Nancy Trun and Janine Trempy, 1st edition; Blackwell Science Publishers; 2004.</li> <li>2. <i>Modern Microbial Genetics</i> by U.N. Streips and R.E. Yasbin, 2nd edition; Wiley Publishers; 2002.</li> <li>3. <i>Microbial Genetics</i> by Stanly R. Maloy, John E. Cronan, Jr. &amp; David Freifelder, 2nd edition; Narosa Publishing House; 1987.</li> </ol>

<b>M.Sc. in Microbiology</b>		<b>(SECOND SEMESTER)</b>
<b>COURSE CODE: MMB B04</b>		<b>COURSE TYPE: ECC</b>
<b>COURSE TITLE: MICROBIAL METABOLITE PRODUCTION</b>		
<b>CREDIT: 6</b>	<b>HOURS: 90</b>	
<b>THEORY: 6</b>	<b>THEORY: 90</b>	
<b>MARKS: 100</b>		
<b>THEORY: 100</b>	<b>PRACTICAL: 00</b>	
<b>OBJECTIVE:</b>		
The main objective of this paper is to inform students regarding the emerging concepts of microbial pathology and mechanism of pathogenesis of different microbes.		
<b>UNIT-1 (20 Hrs)</b>	Microbial products as primary and secondary metabolites; trophophase- Ideophase relationships in production of secondary metabolite; Role of secondary metabolites in physiology of organisms producing them; Pathways for the synthesis of primary and secondary metabolites of commercial importance;	
<b>UNIT-2 (20 Hrs)</b>	Metabolic control mechanisms: substrate induction; catabolic regulation; feedback regulation; amino acid regulation of RNA synthesis; Energy charge regulation and permeability control; Bypassing/ disorganization of regulatory mechanisms for overproduction of primary and secondary metabolites	
<b>UNIT-3 (20Hrs)</b>	Organic feedstock: ethanol; Acetone; Ethanol Organic acids: Production of Citric acid; Acetic acid; Lactic acid; Gluconic acid; Kojic acid; itaconic acid; Amino acids: Use of amino acids in industry; methods of production; Production of individual amino acids (L-Glutamic acid; L-Lysin; L-Tryptophan).	
<b>UNIT-4 (15 Hrs)</b>	Enzymes: commercial applications; production of Amylases; Glucose Isomerase; L-Asparaginase Proteases Renin; Penicillin acylases; Lactases; Pectinases; Lipases; Structure and biosynthesis Nucleosides Nucleotides and related compounds.	

**UNIT-5****(20Hrs)**

Vitamins- Vitamin B12; Riboflavin; B carotene; Antibiotics: beta-Lactam antibiotics; aminoacid and peptide antibiotics; Carbohydrate antibiotics; Tetracycline and antracyclines; Nucleoside antibiotics; Aromatic antibiotics; bioplastics (PHB; PHA); biotransformation of steroids

**SUGGESTED READINGS**

1. *Biotechnology. A Textbook of Industrial Microbiology*, by W. Crueger and A. Crueger. Publisher :Sinauer Associates.
2. *Industrial microbiology* by G. Reed, Publishers: CBS
3. *Biology of Industrial microorganisms* By A. L. Demain.
4. *Stanbury P.F.A. Whitaker and Hall. Principles of fermentation technology*
5. *Fermentation and Biochemical Engineering Handbook: Principles, Process Design, and Equipment* by H.C. Vogel, C.L. Todaro, C.C. Todaro. Publisher: Noyes Data Corporation/ Noyes Publications.
6. *New Products and New Areas of Bioprocess Engineering (Advances in Biochemical Engineering/Biotechnology, 68)* by T. Scheper. Publisher : Springer Verlag.