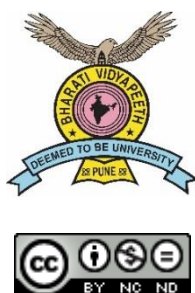


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**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

**M.Sc. Microbiology  
(CBCS- 2018 COURSE)**

**Semester: I**

**PG MB 101: BIOCHEMISTRY**

**Total Credits: 4**

**Total Lectures: 60**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Understand basic concepts in biochemistry.
2. Understand structural features and chemistry of macromolecules.
3. Know membrane transport mechanism in bacteria.

**Course contents:**

**UNIT I      INTRODUCTORY BIOCHEMISTRY      02**

1. The scope of Biochemistry
  - What is Biochemistry?
  - Goals of Biochemistry.
  - The roots of Biochemistry.
  - Biochemistry as a discipline and an interdisciplinary science.
  - Biochemistry as a chemical science.
  - Biochemistry as a biological science.
  - New tools in Biological revolution
  - The uses of Biochemistry.

**UNIT II      BASIC CONCEPTS IN BIOCHEMISTRY      04**

1. Common organic compounds found in living system

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- Common functional groups in biochemistry. OH, CHO, C = O, NH<sub>2</sub>, C – NH<sub>2</sub>, SH, ester, ethers, methyl, ethyl, phospho, guanidino, imidazole etc).
- Common ring structures in biochemistry.
- Isomerism.
- Isotopes.
- Energetics.
- Redox systems.
- High energy compounds.

**UNIT III WATER 02**

1. Structure and properties.
  - Water as a solvent.
  - Ionization.
  - Ionic equilibrium.

**UNIT IV STRUCTURAL FEATURES AND CHEMISTRY OF MACROMOLECULES 10**

1. Nucleic acids:
  - Tautomeric forms of bases and their implication in pairing of bases.
  - Structure of polynucleotides, DNA structure, DNA and RNA (t -RNA, r- RNA, m- RNA etc).
  - Structure of DNA double helix.
  - R and L handed forms.
  - A, B, C and Z forms of DNA.
  - Denaturation and Renaturation of DNA and T<sub>m</sub> value.
2. **Proteins 12**
  - Amino acids.
  - Peptides – Prepeptide linkage, partial double bond nature of peptide linkage.
  - Proteins – structural classification of Proteins, primary structure, secondary structure, tertiary structure, Quarternary structure.
  - Determination of primary structure of polypeptide (N terminal determination, C terminal determination, Partial hydrolysis, Overlapping sequence etc.) α helix of polypeptide.
  - Structure and functions of globular proteins.
  - Immunological techniques to investigate proteins.
  - Artificial synthesis of polypeptides.
3. **Membrane transport 10**
  - Overview of membrane transport.
  - ATP powered pumps and intracellular ionic environment.
  - Non gated Ion channels and the resting membrane potential.
  - Co-transport – symport, antiport.
  - Neurotransmitters.
  - ATP driven active transport system for Sodium and Potassium ions.
  - Proton gradient in *Halobacteria*.
  - Transport of antibiotics that increase the ionic permeability of membranes.

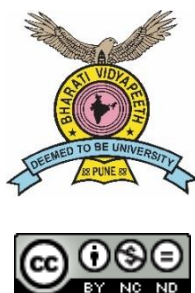
- 4. Carbohydrates** **08**
- L forms and D forms of sugar.
  - Reducing and non reducing sugars.
  - Aldoses / ketoses.
  - Alpha and Beta, ring forms of sugars.
  - Glycosidic linkages.
  - Sugar derivatives – sugar alcohol, amino sugars, dextro sugars, sugar acids
  - Polysaccharides (starch, glycogen, cellulose)
- 5. Lipids** **12**
- Fatty acids – Types and nomenclature.
  - Saturated and unsaturated fatty acids,
  - Structure and function of Triglycerides, Phospholipids, Sphingolipids.
  - Structure and function of steroids, terpenes, prostaglandins.

### References:

1. Doelle, H.W. (1975) Bacterial Metabolism 2<sup>nd</sup> Edition Academic Press, Inc. N.Y.
2. Jayraman – Laboratory manual in Biochemistry, New Age International publishers, New Delhi.
3. Lehninger A.L. (1984): Principles of Biochemistry, 1<sup>st</sup> Indian Edition, LBS publishers and distributors Pvt. Ltd. New Delhi.
4. Lehninger A.L. (2000) Principles of Biochemistry II Edition by D.KL. Nelson and M.M. Cox Mcmillan Worth Pub. Inc. N.Y.
5. Mehler H.R. (1968) Basic biological chemistry, Harper and Row publisher, Inc. New York.
6. Murray R..K., Harper's Biochemistry, Appleton and Lange Stanford, 25<sup>th</sup> Edition.
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10. West E.S., W.R. Todd, H.S. Mason. J.T.V. Burgger (1966) Text book of biochemistry, 4<sup>th</sup> Edition, MacMillan, New York.
11. White A., P. Handler. E.L. Smith (1973) Principles of Biochemistry, 5<sup>th</sup> Edition.
12. Wilson K. and J. Walker, (1999) Cambridge University Press. Principles and techniques at Practical biochemistry

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**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

**M.Sc. Microbiology  
(CBCS- 2018 COURSE)**

**Semester : I**

**PG MB 102: IMMUNOLOGY**

**Total Credits: 04**

**Total Lectures: 60**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Understand classes of immunoglobulin, organization and expression of immunoglobulin genes.
2. Know details of major histocompatibility complex and disease susceptibility.
3. Understand cytokines and their medical significance.
4. Understand hypersensitivity reactions.
5. Know immunodeficiencies and auto immunity.
6. Understand details of transplantation immunology and immunity to cancer.

**Course contents:**

**UNIT I IMMUNOGLOBULINS**

**10**

1. Fine Structure
2. Classes & biological activities
3. Organization & expression of immunoglobulin genes
  - Genetic model compatible with Ig structure
  - Multigene organization of Ig Genes.
  - Variable region gene rearrangements
  - Mechanism of Variable region DNA rearrangements
  - Generation of Antibody diversity

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- Expression of Ig Genes
- Regulation of Ig - Gene transcription.
- Antibody genes and antibody engineering

## **UNIT II MAJOR HISTOCOMPATIBILITY COMPLEX**

**07**

1. General Organization and Inheritance of the MHC
2. MHC molecules and Genes
3. Detailed Genomic Map of MHC genes
4. Cellular Distribution of MHC molecules
5. Regulation of MHC Expression.
6. MHC and Immune Responsiveness
7. MHC and Disease susceptibility

## **UNIT III IMMUNE EFFECTOR MECHANISMS**

**15**

1. Cytokines – properties, receptors, antagonists, Cytokine secretion, related diseases, Therapeutic uses.
2. Complement system - Functions, Components, activation, Regulation, Biological consequences, Deficiencies.
3. Leukocyte Migration & Inflammation- Lymphocyte re-circulation, Cell Adhesion molecules, Neutrophils Extravasation, Lymphocyte Extravasation, Mediators of Inflammation, The inflammatory process, Anti inflammatory agents.
4. Hypersensitive Reactions - Type I, Type II, Type III and Type IV hypersensitivity reactions.

## **UNIT IV IMMUNODEFICIENCIES, AUTOIMMUNITY & AIDS**

**10**

1. Primary Immunodeficiencies
  - X- linked Agammaglobunaemia
  - Common Variable Immuno Deficiency (CVID)
  - Di George Syndrome
  - Wiskott Aldrich Syndrome
2. Acquired or Secondary Immunodeficiencies.
  - Down's syndrome
  - AIDS
  - Hodgkins disease
3. Organ Specific autoimmune diseases
  - Graves Disease
  - Myasthenia gravis
  - Insulin Dependent Diabetes
4. Systemic Autoimmune diseases.
  - Goodpasteure's Syndrome,
  - Rheumatoid Arthritis,
  - Systemic Lupus Erythematosus
5. Animal models for Autoimmune Disease
6. Proposed Mechanism for Induction of Autoimmunity
7. Treatment of Autoimmune Diseases.

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**UNIT V TRANSPLANTATION IMMUNOLOGY 08**

1. Immunologic Basics of Graft Rejection.
2. Clinical manifestation of Graft rejection
3. General Immunosuppressive Therapy
4. Specific Immunosuppressive Therapy
5. Clinical Transplantation

**UNIT VI CANCER & THE IMMUNE SYSTEM 10**

1. Cancer origin & Terminology
2. Malignant transformation of cells
3. Oncogenes & cancer induction.
4. Tumors of the Immune system
5. Tumor antigens.
6. Immune response to tumors.
7. Tumor Evasion of the Immune system
8. Cancer Immunotherapy.

**References:**

1. Cruse J and R. Lewis (2004) Atlas of Immunology 2<sup>nd</sup> Edn. CRC Press.
2. David Male, Jonathan Brostoff, David B Roth, Ivan Roitt.(2006).Immunology 7<sup>th</sup> edition.
3. Goldsby R.A. Kindt T.S. and B.A. Osborne Kuby (2000) Immunology Fourth Edition W.H. Freeman & Co New York.
4. Reed R; Holmes D; Weyers J and A Jones (1998) Practical skills in Biomolecular Sciences Adison Wesley Longman Ltd.
5. Tizard; I.R. (1995) Immunology an Introduction 4<sup>th</sup> Edn. Saunders College Publishing. Harcourt Brace College Publishers.



**BHARATI VIDYAPEETH  
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**M.Sc. Microbiology  
(CBCS- 2018 COURSE)**

**Semester –I**

**PG MB 103:– GENETICS AND MOLECULAR BIOLOGY**

**Total Credits: 04**

**Total Lectures: 60**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Understand structure of chromosomes, expression and regulation of genes.
2. Understand techniques and applications of genetic engineering.

**Course contents:**

**UNIT I STRUCTURE OF EUKARYOTIC CHROMOSOME**

**15**

1. Genome complexity.
2. Chemical composition.
3. Packaging the giant DNA molecules into chromosome
4. Euchromatin and heterochromatin.
5. Repetitive DNA and sequence organization.
6. Replication of Eukaryotic chromosome.
7. Comparison with structure and replication of prokaryotic chromosome.
8. Effect of different antibiotics on chromosome structure and replication.
  - Antibiotics that affect replication and DNA structure.
  - Antibiotics that block precursor synthesis.
  - Antibiotics that block polymerization of Nucleotides.
  - Antibiotics that affect DNA structure.
  - Antibiotics that affect Gyrase.

**UNIT II GENE EXPRESSION**

**20**

1. Evolution of the one gene one polypeptide concept.
2. Genetic control of metabolism.
  - **Transcription.**
    - a. The transcription process. RNA synthesis, Classes of RNA and the Genes that code for them.

- b. Transcription of protein coding genes. Prokaryotes, Eukaryotes, mRNA molecules.
- c. Transcription of other genes, Ribosomal RNA and Ribosomes, Transfer RNA.
- **Protein structure.**
  - a. Chemical structure of proteins.
  - b. Molecular structure of proteins.
- **Nature of the Genetic code.**
  - a. Genetic code is a triplet code.
  - b. Deciphering the genetic code.
  - c. Nature and characteristic of the genetic code.
- **Translation of the genetic message.**
  - a. Aminoacyl t-RNA molecules.
  - b. Initiation of translation.
  - c. Elongation of the polypeptide chain.
  - d. Termination of Translation.
- **Protein sorting in the cell.**
  - a. Proteins distributed by the endoplasmic reticulum.
  - b. Proteins transported into mitochondria and chloroplast.
  - c. Proteins transported into the nucleus.

### UNIT III REGULATION OF GENE EXPRESSION

08

#### 1. Positive regulation.

- *E. coli* maltose operons.
- The *tol* operons.

#### 2. Feedback inhibition.

- Isoleucine – Valine operon.
- Histidine operon.
- Leucine operon.
- Phenylalanine operon.
- Threonine operon.

### UNIT IV GENETIC ENGINEERING

17

#### 1. Basic techniques.

- Agarose gel electrophoresis.
- Nucleic acid blotting.
- Transformation of *E. coli*.
- The polymerase chain reaction (PCR)

#### 2. Cutting and joining DNA molecules.

- Cutting DNA molecules.
- Joining DNA molecules.

#### 3. Vectors used for cloning

- Plasmids.
- Phages.
- Vectors for cloning large fragments of DNA.
- Specialist purpose vectors.

#### 4. Cloning strategies.

- Cloning genomic DNA.



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- c -DNA cloning.
- Screening strategies.
- Difference cloning.

**5. Applications of recombinant DNA technology.**

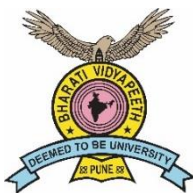
- Nucleic acid sequences as diagnostic tool.
- New drugs and new therapies for genetic diseases.
- Combating infectious diseases.
- Protein Engineering.
- Metabolic Engineering.
- Transgenic technology.
  - a. Transgenic plants.
  - b. Transgenic animals.

**References:**

1. Alberts. B.; Johnson. A, Lewis J. Raff, M. Roberts. K. and P. Walter (2002) Molecular Biology of the cell 4<sup>th</sup> Edition. Garland Science, Taylor & Francis Group.
2. Clayton. J and C. Dennis. (2003) 50 years of DNA. Nature Publishing group.
3. Elliott. W.H. and D.C. Elliot (2001) Biochemistry and molecular Biology. 2<sup>nd</sup> Edn. Oxford University Press.
4. Gardner E.J., Simmons, M.J and D.P. Snustad. (1991) Principles of Genetics. 8<sup>th</sup> Edition. John Willey & Sons. Inc.
5. Hartl. D.L. and E.W. Jones. (1999) Essential Genetics. Second Edition. Jones and Bartlett Publisher.
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11. Russel. P. (1998) Genetics Fifth edition. Addison. Wesley Longman Inc.
12. Sambrook. J and D.W. Russel. (2001) Molecular cloning. A Laboratory Manual. 3<sup>rd</sup> Edn. Vol. 1,2,3. Cold Spring Harbor laboratory Press.
13. Sheeler P. and Bianchi D.E. (1987) Cell and Molecular Biology 3<sup>rd</sup> Edn. John Wiley and Sons. Inc.
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15. Watson J.D. Baker T.A., Bell S.P. Gann A, Levine M. and R. Losick. (2004) Molecular Biology of the Gene. 5<sup>th</sup> Edn. Low Price edition. Pearson Education.
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**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

**M.Sc. Microbiology  
(CBCS- 2018 COURSE)**

**Semester –I**

**PG MB-104: MICROBIAL ECOLOGY**

**Total Credits: 04**

**Total Lectures: 60**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Understand microbial ecology, assimilation, bioleaching, production and recovery of fuels.
2. Know in details biodeterioration and biofilms.
3. Understand basics of plant pathology and details of biopesticides.

**Course contents:**

<b>UNIT I</b>	<b>INTRODUCTION TO BASIC CONCEPTS OF ECOLOGY</b>	<b>02</b>
<b>UNIT II</b>	<b>MICROBIAL ECOLOGY</b>	<b>15</b>
	<ol style="list-style-type: none"><li>1. Historical Developments</li><li>2. Microbial evolution and Biodiversity</li><li>3. Types of Biodiversity</li><li>4. Biodiversity concept -<ul style="list-style-type: none"><li>• Alpha and Beta biodiversity.</li><li>• Steps to preserve biodiversity.</li></ul></li><li>5. Genetic basis for evolution and Ribosomal RNA analysis for tracing microbial evolution</li><li>6. Biodiversity conservation and Species conservation</li><li>7. Microbial communities and ecosystem<ul style="list-style-type: none"><li>• Development of microbial communities</li><li>• Succession within microbial communities</li><li>• Diversity and stability of microbial communities</li><li>• Risk of introducing genetically modified microorganisms</li></ul></li><li>8. Quantitative ecology<ul style="list-style-type: none"><li>• Sample collection</li><li>• Sample processing</li><li>• Detection of microbial populations</li></ul></li></ol>	

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- Determination of microbial numbers
- Measurement of microbial metabolisms

**UNIT III      MICROBIAL LIFE IN EXTREME ENVIRONMENT      12**

1. Abiotic limitations to microbial growth
2. Effects of environmental determinants
  - Extreme pH.
  - Temperature.
  - Pressure.
  - Salt and solute.
  - Heavy metals.
  - Radiations.
  - Water activity
  - Movement
  - Magnetic poles
  - Redox potential
  - Organic and inorganic compounds.
  - Examples of extreme environments
    - a) Hot springs.
    - b) Acid springs and Lakes.
    - c) Sea and salt lakes.
    - d) Antarctica and ocean bottom.

**UNIT IV      MICROORGANISMS IN MINERAL AND ENERGY RECOVERY      10**

1. Microbial assimilation of metals
2. Bioleaching of metals-Gold, Uranium, Copper.
3. Metal and metallic transformation- Mercury, Arsenic, Lead.
4. Recovery of petroleum
5. Production of fuels – ethanol, methane, hydrogen

**UNIT V      BIODETERIORATION      03**

1. Concept of biodeterioration.
2. Biodeterioration of –
  - Wood.
  - Stone work.
  - Pharmaceutical products.
  - Metal Corrosion.
  - Rubber.
  - Plastic.
  - Concrete
  - Paper & Textile.
  - Paints.
  - Computer diskette and cassette films.
  - Lubricants and Adhesives, cosmetics.
3. Control of biodeterioration.

**UNIT VI BIOFILMS**

**02**

1. Population within biofilms
2. Fouling Biofilms
3. Control of Biofilms

**UNIT VII PLANT PATHOLOGY**

**08**

1. Pathogenesis, Entry through various routes.
2. Enzymes and toxins in plant diseases – different enzymes and toxins and their role in diseases.
3. How plants defend themselves against infections, different modes of defense.
4. Effect of environmental factors and nutrition on disease development.
5. Management of plant diseases.-
  - Microbial amensalism and parasitism to control microbial pathogens-antifungal amensalism and antibacterial amensalism
  - Bacterial biopesticides
  - Fungal biopesticides
  - Viral biopesticides

**UNIT VIII CASE STUDIES**

**08**

**References:**

1. Arora. M.G. and M. Singh (1994) Industrial Chemistry Vol. I & II. Anmol Publications Pvt. Ltd.
2. Asthana D.K. and M. Asthana (2003) Environment Problems & Solutions. S. Chand and Co. Ltd. New Delhi.
3. Barnum. S.R. (1998) Biotechnology: An introduction. Wadsworth Publishing company. An International Thomson Publishing company.
4. Bathra Atlas (2007) Microbial Ecology Fundamentals and Application 4th edition, Pearson Education Publication
5. De. A.K. (1994) Environmental Chemistry, New Age International (P) Limited, Publishers.
6. Gray. N.F. (2000) Water Technology. An Introduction for Environmental Scientists and Engineers. Viva Books Pvt. Ltd. New Delhi.
7. Jadhav H.V. (1992) Elements of Environmental Chemistry. Himalaya Publishing House.
8. Kormondy E J. (2007) Concepts in Ecology, 4<sup>th</sup> edition, Pearson Education Publication
9. Moore J.W. and E.A. Moore (1976) Environmental Chemistry Academic Press, New York.
10. Mukherjee N. and T. Ghosh (1995) Agricultural Microbiology. First Edition. Kalyani Publishers, New Delhi, Ludhiana, Hyderabad, Madras, Calcutta Cuttack.
11. Rao. C.S. (1991) Environmental pollution control Engineering Wiley Eastern Limited New Delhi. Bangalore, Bombay, Calcutta, Guwahati, Hyderabad, Lucknow Madra & Pune.
12. Rittman B.E. and P.L. Mc Garty. (2001) Environmental Biotechnology. Principles & Applications. McGraw Hill International Editions. Biological Sciences Series.
13. Santra. S.C. (2001) Environmental Science, New Central Book Agency (P) Ltd.
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15. Subbarao N.S., Soil Microbiology Fourth Edition of Soil Micro-organisms and plant growth. Published by Raju Primlani for oxford and JBH Publishing. Co. Pvt. New Delhi.

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**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE, INDIA  
M.Sc. – Microbiology  
(CBCS- 2018 COURSE)  
SEMESTER-I**

**PG MB 105: ENVIRONMENTAL MICROBIOLOGY**

**Total Credits: 04**

**Total Lectures: 60**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Understand concept of aeromicrobiology, biosafety and waste water management.
2. Understand bioremediation and biodegradation processes.
3. Know environmental laws.

**Course contents:**

**UNIT I AEROMICROBIOLOGY 06**

1. Nature of Bioaerosols
2. Sampling of bioaerosols
3. Bioaerosol control
  - Extramural Aeromicrobiology
  - Intramural Aeromicrobiology
  - General Pathological effects of air pollution.
  - Biosafety in laboratory

**UNIT II WASTE WATER MICROBIOLOGY (DOMESTIC AND INDUSTRIAL) 15**

1. **Waste water types.**
  - Characteristics.
  - Nature of pollutants and their effects
  - Microbial pollution and its effects.
2. **Treatment.**
  - Principles of waste water treatment.
  - Disposal of waste water
  - Aerobic processes
    - a. Activated sludge process.
    - b. Fixed film systems.
    - c. High rate filters.
    - d. Trickling filters
    - e. Rotating biological contactors.

- f. Fluidized bed reactors.
- g. Oxidation ditch.
- h. Aerated lagoons.
- Anaerobic digestion
  - a. Anaerobic lagoons and covered anaerobic lagoons.
- Biosorption – N and P removal.
- Biofilms and kinetics
  - a. Root zone process.
  - b. Reverse osmosis.
  - c. Waste water disposal by dilution.
- Difficulties encountered in operation of different methods of waste treatment.
- Economics of waste treatment and feasibility.

**UNIT III BIOREMEDIATION 12**

1. Bioremediation of Metals
  - Metal toxicity effect on microbes
  - Mechanisms of microbial resistance to metals, metal -microbe interactions
  - Methods to detect metal – microbe interactions
  - Microbial remediation of metal contaminated soils
  - Microbial remediation of metal contaminated aquatic systems
2. Bioremediation of petroleum
3. Bioremediation of waste gases

**UNIT IV BIODEGRADATION OF XENOBIOTIC AND INORGANIC POLLUTANTS: 14**

1. Recalcitrant organic compounds and their presence in natural ecosystem
2. Concept and Consequence of biomagnifications.
3. Biomagnification of hydrocarbons and pesticides.
4. Process of Biodegradation
5. Relationship between Contaminant Structure, Toxicity and biodegradability
6. Environmental factors affecting biodegradability
7. Biodegradation of recalcitrant xenobiotic and toxic compounds
8. Recalcitrant Halocarbons
9. Recalcitrant Nitro aromatic compounds
10. Polychlorinated Biphenyl's
11. Radionuclide
12. Pesticides

**UNIT V ENVIRONMENTAL LAWS 05**

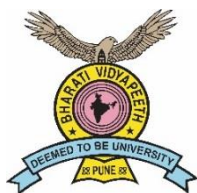
1. Introduction
2. Environmental legislation in India
3. Legal aspects of waste treatment and disposal.
4. Notification relating to hazardous microorganisms and genetically modified organisms.
5. Rules for management of Bio medical wastes

**UNIT VI CASE STUDIES 08**

## References:

1. Arora. M.G. and M. Singh (1994) Industrial Chemistry Vol. I & II. Anmol Publications Pvt. Ltd.
2. Asthana D.K. and M. Asthana (2003) Environment Problems & Solutions. S. Chand and Co. Ltd. New Delhi..
3. Bathra Atlas (2007) Microbial Ecology Fundamentals and Application 4th edition, Pearson Education Publication.
4. Agarwal A K , Q A Shammi, Purohit S S,(2007), Environmental Science – A New Approach, Agrabios Jodhapur.(India)
5. De. A.K. (1994) Environmental Chemistry, New Age International (P) Limited, Publishers.
6. Gray. N.F. (2000) Water Technology. An Introduction for Environmental Scientists and Engineers. Viva Books Pvt. Ltd. New Delhi.
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14. Ranade D.R. and R.V. Gadre (1988) Microbiological aspects of anaerobic digestion. Laboratory Manual. Maharashtra association for cultivation of sciences
15. Rao. C.S. (1991) Environmental pollution control Engineering Wiley Eastern Limited New Delhi. Bangalore, Bombay, Calcutta, Guwahati, Hyderabad, Lucknow Madra & Pune..
16. S. C. Santra(2001) Environmental Science, New Central Book Agency, Calcutta.
17. Sharma B.K. and H. Kaur (1994). Water pollution Goel Publishing House Meerut..
18. Tripathi A.K. (1993) Understanding Environmental Disruption. Volume-I & II. Ashish Publishing House, New Delhi.
19. Trivedi R K (1998) Advances in Wastewater Treatment Technologies vol.1, Global Science, Aljgarh.
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**BHARATI VIDYAPEETH  
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M.Sc. Microbiology  
(CBCS- 2018 COURSE)**

**SEMESTER -I**

**PGMB 111: Practical course-1**

**Total Credits: 02**

**Total Lectures: 120**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Handle different instruments
2. Develop skills needed to run blood transfusion and serological experiments.

**Course contents:**

<b>UNIT I</b>	<b>INSTRUMENTATION &amp; BIOCHEMISTRY</b>	<b>2P</b>
	1. Study of different instruments in the laboratory. <ul style="list-style-type: none"><li>• Laminar airflow, Microfuge, UV. Spectrophotometer, Incubator shaker, Cooling incubator, Deepfreeze, colorimeter, pH meter, lyophilizer (visit).</li><li>• Laboratory Safety.</li></ul>	
	2. Preparation of buffers and molar solutions.	<b>2P</b>
	3. Estimation of protein by Lowry's / Biuret method.	<b>2P</b>
	4. Separation & identification of amino acids, carbohydrates by TLC.	<b>2P</b>
	5. Estimation of reducing sugars by DNSA.	<b>2P</b>
	6. Estimation of lipids / fats	<b>3P</b>
	7. Beer Lambert's law.	<b>1P</b>
<b>UNIT II</b>	<b>IMMUNOLOGY</b>	
	1. <b>Blood transfusion related techniques.</b> <ul style="list-style-type: none"><li>• Blood grouping.</li><li>• Cross matching.</li><li>• Visit to blood bank.</li></ul>	<b>3P</b>
	2. <b>Study of Immunological reactions.</b> <ul style="list-style-type: none"><li>• Agglutination reactions.</li><li>• Haemagglutination Inhibition Test</li><li>• Immunodiffusion</li><li>• Demonstration / visit.</li></ul>	<b>5P</b>

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- a) RIA, ELISA,
- b) Study of vaccination schedule.

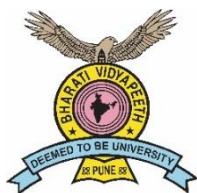
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**22P**

### **References:**

1. 1Alberts. B.; Johnson. A, Lewis J. Raff, M. Roberts. K. and P. Walter (2002) Molecular Biology of the cell 4<sup>th</sup> Edition. Garland Science, Taylor & Francis Group.
2. Benjamin Cunnings publishing Co. Inc. 2<sup>nd</sup> Edition
3. Boyer. R. (2000) Modern Experimental Biochemistry. 3<sup>rd</sup> Edition. Pearson Education Asia.
4. Cruse J and R. Lewis (2004) Atlas of Immunology 2<sup>nd</sup> Edn. CRC Press
5. Elliott. W.H. and D.C. Elliot (2001) Biochemistry and molecular Biology. 2<sup>nd</sup> Edn. Oxford University Press.
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9. Plummer D.T, (1992)An introduction to Practical Biochemistry Tata cGraw Hill Publisher,New Delhi
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\* Students are supposed to refer to “Current Contents” and periodicals for recent & additional information.

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**BHARATI VIDYAPEETH  
(DEEMED TO BE UNIVERSITY), PUNE, INDIA**

**M.Sc. Microbiology  
(CBCS- 2018 COURSE)**

**SEMESTER I**

**PGMB 112: Practical course-2**

**Total Credits: 02**

**Total Lectures: 120**

**Course Outcomes:**

**At the end of this course the students will be able to:**

1. Cultivate extremophiles.
2. Conduct experiment for detection of pollution strength.

**Course contents:**

- |                                                                                                      |             |
|------------------------------------------------------------------------------------------------------|-------------|
| 1. Cultivation of Extremophiles.(any two)                                                            | <b>10 P</b> |
| • Acidophiles.                                                                                       |             |
| • Alkalophiles.                                                                                      |             |
| • Halophiles.                                                                                        |             |
| • Psychrophiles.                                                                                     |             |
| • Thermophiles.                                                                                      |             |
| 2. Systematic study of the extremophile isolates using 'Bergey's Manual of Systematic Bacteriology'. | <b>6 P</b>  |
| 3. Study of Microbial diversity                                                                      | <b>2 P</b>  |
| 4. Sewage decomposition by aerobic and anaerobic microorganisms.                                     | <b>1 P</b>  |
| 5. Determination of BOD and COD of a given sample.                                                   | <b>2 P</b>  |
| 6. Determination of TS, TSS and MLSS.                                                                | <b>1 P</b>  |

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**22 P**

**References:**

1. Bathra Atlas (2007) Microbial Ecology Fundamentals and Application 4th edition, Pearson Education Publication

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2. Kormondy H.J(2007) Concepts of Ecology .fourth Edn .Pearson, Prentice
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