

**VEER NARMAD SOUTH GUJARAT UNIVERSITY**  
**M.Sc. – ENVIRONMENTAL CHEMISTRY**  
**SEMESTER-2**

TO COME IN FORCE FROM JUNE-2008  
**PAPER- (I) Water pollution and Analysis**  
**COURSE NO. - CES- 201**

Max. Marks: 70

Total Periods: 60

**SECTION -1**

**UNIT-I Water Pollution (10 Periods)**

- The properties of water
- Characteristics of bodies of water
- Aquatic life- Eutrophication
- Water pollution- Definition, Sources, Categories
- Criteria for water purity- Water parameters
- Adverse effects of water pollution.

**UNIT-II Water treatment (10 Periods)**

- Water purification; Preliminary treatment,
- Primary treatment: Sedimentation, Flocculation
- Secondary treatment: Trickling filters, Activated Sludge
- Tertiary treatment: Chlorination, Wet Oxidation, adsorption, Reverse Osmosis, Electro dialysis Ion exchange and water disinfection.

**UNIT-III Water treatment plant for Municipal waste water (10 Periods)**

- Sewage treatment
- Industrial waste water treatment
- Removal of Solids
- Removals of metals (Ca, Fe, Mn)
- Removals of dissolved organics
- Removals of dissolved inorganics
- Nitrogen removal
- Sludge: Sludge dewatering and disposal.

**SECTION -2**

**UNIT-IV Sampling methods and preservation, Determination of Parameters -**

Color, pH, Test, Odour, Hardness, TDS, Alkalinity, Chloride, Fluoride, Sulphate,  
Ammonical Nitrogen, Nitrite, Nitrate, Phosphate, Iron, Fluoride , Heavy Metals, Silica

**UNIT-VI Instrumental Methods of analysis (10 Periods)**

- Dissolved Oxygen
  - General consideration
  - Signification of DO
  - Collection of Sample for determination of DO
  - Standard reagents for measuring DO
  - Methods of determining DO

- The Winkler method
  - The azide modification of Winkler method
  - Rideal –Stewart modification of Winkler method
- Biological Oxygen Demand
  - General consideration
  - Signification of BOD
  - Methods of measuring BOD
    - Direct method
    - Dilute method
  - Interferences and their elimination
- Chemical Oxygen Demand
  - General consideration
  - Chemical oxygen demand by dichromate
  - Interferences and their elimination

**UNIT-VI Industrial Water Pollution and Remedies**

**(10 Periods)**

- Pharmaceutical Industry
- Fertilizers Industry
- Pulp and Paper Industry
- Sugar Industry
- Distillery Industry
- Textile Industry.

**Reference Books:**

1. Basic Concept of environmental Chemistry by Des. W. Connell.
2. Chemistry for environmental Engineering 4<sup>th</sup> Ed., By sawyer, McCarty and Parkin.
3. Water pollution Biology, By Richard J. Schmitz.
4. Environmental Pollution Monitoring and control by S. M. Khopkar.

**VEER NARMAD SOUTH GUJARAT UNIVERSITY**  
**M.Sc. – ENVIRONMENTAL CHEMISTRY**  
**SEMESTER-2**

TO COME IN FORCE FROM JUNE-2008

**PAPER- (II) Environmental biochemistry and Bioremediation**  
**COURSE NO. - CES- 202**

Max. Marks: 70

Total Periods: 60

**SECTION -1**

**UNIT-I      Cell and Enzyme      (10 Periods)**

- Cell structure
  - Structure of prokaryotic and eukaryotic cells
  - Intracellular organelles and their functions
  - Comparison of plant and animal cells
  - Over view of metabolic processes- Catabolism and Anabolism
  - ATP- the biological energy currency
- Enzymes
  - Introduction and Chemical and biological catalysis, Remarkable properties of enzymes like catalytic power, Specificity and Regulation, Nomenclature and Classification, Fischer's lock and key and Khoshland's induced fit hypothesis
- Co- Enzymes
  - Cofactor as derived from vitamins, Coenzymes, Prosthetic groups, Apoenzymes, Structure and biological Functions of coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, NAD<sup>+</sup>, NADP<sup>+</sup>, FMN, FAD, Lipoic acid, Vitamin B<sub>12</sub>.
- Biological application of Enzymes
  - Large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, Effect of immobilization on enzyme activity, Application of immobilized enzymes,

**UNIT-II      Biomolecules      (10 Periods)**

- Protein
  - Structure and nomenclature of Peptide and Proteins and Classification
  - Chemical and enzymatic hydrolysis of proteins to peptides
  - Amino acid sequencing
  - Secondary structure of proteins
  - Tertiary structure of protein- folding and domain structure
- Carbohydrates
  - Structural determination of starch and cellulose, their conformations
  - Carbohydrate metabolism - Kreb's cycle, glycolysis, glycogenesis and glycogenolysis, glyconeogenesis, pentose phosphate pathway.
- Lipids
  - Fatty Acid, Essential fatty acids Structure and function of triglycerols, Glycerophospholipids, Sphingolipids, Cholesterol, Bile acids, Prostaglandins, Lipoproteins- composition and function, Biological membranes, Fluid mosaic model of membrane structure. Lipid metabolism-  $\beta$ -oxidation of fatty acids.

**UNIT-III      Nucleic acid      (10 Periods)**

- Purine and Pyrimidine bases of nucleic acids
- Structure of ribonucleic acids (RNA) and Deoxyribonucleic acid (DNA)
- Double helix model of DNA and force responsible for holding it
- Chemical and enzymatic hydrolysis of nucleic acids



**VEER NARMAD SOUTH GUJARAT UNIVERSITY**  
**M.Sc. – ENVIRONMENTAL CHEMISTRY**  
**SEMESTER-2**

TO COME IN FORCE FROM JUNE-2008  
**PAPER- (III) SEPARATION TECHNIQUES**  
**COURSE NO. - CES- 203**

Max. Marks: 70

Total Periods: 60

**SECTION -1**

**UNIT-I : Adsorption and Partition Chromatography (10 Periods)**

Classification, Definition of terms, Principle and basic theory.

Technique and Applications of

- Column
- Paper
- Thin Layer Chromatography.
- Selection of stationary and mobile phase
- Detection techniques –Elementary idea of HPTLC.

**UNIT-II : Gas Chromatography: (10 Periods)**

Selection of mobile phase – Selection of stationary phase in GLC and GSC – Detectors: FID (with modifications), TCD and ECD, Their comparison, Packed column, WCOT, SCOT (advantages and disadvantages) –Temperature programming – Derivatisation in GC – Quantitative Analysis.

**UNIT-III : High Performance Liquid Chromatography: (10 Periods)**

Review of components of Instrument – Criteria in selection of mobile phase – Stationary phases including bonded phase supports used in LSC and LLC – Normal phase and Reversed phase chromatography – Isocratic and Gradient Elution – Detectors : UV absorption and RI detector – Method of introducing sample.

**Hyphenated Techniques** : GC-MS, LC-MS Principle and Applications.

**SECTION -2**

**UNIT-IV : Ion Exchange Chromatography (10 Periods)**

Resins used – Principle of exchange – Factors affecting the exchange – Capacity of resin and its determination, Ion selective Electrodes, Techniques – IEC with eluent suppressor columns – Applications.

**UNIT-V Supercritical Fluid Chromatography and Extraction (10 Periods)**

Introduction, Supercritical Fluid Chromatography- Instrumentation and Operating Variables, Comparison of Supercritical to other types of Chromatography, Supercritical Fluid Extraction- Advantages, Instrumentation, Supercritical Fluid Choice, Off line and On line Extractions, Applications of Supercritical Fluid Chromatography.

**UNIT-VI Capillary Electrophoresis and Capillary Electro chromatography (10 Periods)**

Electrophoresis- Types of electrophoresis, The basis of electrophoresis Separations

Capillary electrophoresis, Electroosmotic Flow, Instrumentation for capillary electrophoresis, Application of capillary Electrophoresis- capillary zone electrophoresis, capillary gel electrophoresis, Capillary isotachopheresis, Capillary Electrochromatography- Packed column chromatography, Micellar Electro kinetic capillary chromatography.

**Reference books:**

1. Instrumental Analysis by R. D. Braun, McGraw-Hill.
2. Modern Methods of Chemical Analysis (2nd ed.), Pecsok, Shields, Cairns & McWilliam, John Wiley & Sons.
3. Principles of Instrumental Analysis (5th ed.) by Skoog, Holler and Nieman (Saunders College Publishings).
4. Thin Layer Chromatography, E. Stahl.
5. High Performance Liquid Chromatography, Dr. P.D. Sethi.