ENVIRONMENTAL CHEMISTRY – I

Sub Code : 10 EV 32   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1   **4 Hours**
1.1 Significance of Environmental Chemistry for Water Supply Engineering
1.2 Significance of Environmental Chemistry for Wastewater Engineering
1.3 Importance of Environmental Chemistrty for Solid and Hazardous Wastes

UNIT 2   **8 Hours**
Basic Concepts from Physical Chemistry
2.1. Osmosis
2.2. Dialysis
2.3 Principles of Solvent Extraction
2.4. Oxidation and Reduction
2.5. Electrochemistry
2.6. Catalysis
2.7. Adsorption
2.8. Colourimetry
2.9. Light Absorption and Beer's Law.

UNIT 3   **10 Hours**
Basic Concepts of Equilibrium and Colloidal Chemistry
3.1 Introduction
3.2 Solution to equilibrium problems
3.3 Acids and Bases
3.4 Buffers.
3.5 Introduction to colloidal chemistry
3.6 Colloidal dispersions in liquids
3.7 Colloidal dispersions in air

UNIT 4   **4 Hours**
pH – General Considerations
4.1 Theoretical considerations,
4.2 Measurement of pH, and interpretation of pH data

PART – B

UNIT 5   **8 Hours**
Pollution Parameters of Wastewater
Definitions and estimation of ;
5.1 COD
5.2 BOD
5.3 DO
5.4 TOC
5.5 Nitrogen – 5.5.1 Different Forms, 5.5.2 Environmental
Significance, 5.5.3 Methods of Analysis.

UNIT 6   **4 Hours**
Fluoride
6.1 General considerations
6.2 Chemistry of fluoride and its compounds
6.3 Methods of determining Fluoride.

UNIT 7   **6 Hours**
Sanitary Significance of Sulphate, Nitrate and Phosphate
7.1 Phosphorous Cycle
7.2 Carbon Cycle
7.3 Nitrogen Cycle
7.4 Sanitary significance N & P

UNIT 8   **8 Hours**
Instrumental Methods of Analysis
Optical Methods, Electrical Methods,
Chromatographic Methods and other Instrumental Methods
Description of UV-Vis Spectrophotometer, GC, HPLC with MS, AAS and
Plasma Emission Spectrometer

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Sawyer G.N., McCarty, P.L. and Parkin, G.F., and Science, (2003),**Chemistry for
   Environmental Engineering**, 5th Edition, Tata McGraw Hill
2. Stumn & Morgan, (1981), **Aquatic Chemistry,** Second Edition, John Wiley Publisher

3. Banerjee (2008), **Environmental Chemistry**, 2nd Edition, PHI Learning Publications

REFERENCES
 1.American Water Works Association, (2001), "**Standard Methods for Examination of
   Water and Wastewater**", 20th Edition.
2. Khopkar S.M**, (2007) Basic Concepts of Analytical Chemistry,**. New Age Science ltd
3. De, A.K **, (**1989**),Environmental Chemistry,**., Wiley Eastern Ltd.,
4. Ronald L Droste, **(**1996),**Textbook of Environmental Engineering**
5. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), **Environmental
   Engineering**, McGraw Hill Book Co.

STRENGTH OF MATERIALS

Sub Code : 10 EV 33	IA Marks : 25
Hrs/ Week : 04	Exam Hours : 03
Total Hrs. : 52	Exam Marks : 100

PART – A

UNIT 1   **7 Hours**
Simple Stress and Strain
1.1 Introduction
1.2 Properties of Materials
1.3 Stress, Strain, Hook's law
1.4 Poisson's Ratio
1.5 Stress – Strain Diagram for structural steel and non ferrous materials
1.6 Principles of superposition
1.7 Total elongation of tapering bars of circular and rectangular cross sections. Elongation due to self – weight

UNIT 2   **6 Hours**
Simple Stress and Strain continued...
2.1 Composite section
2.2 Volumetric strain, expression for volumetric strain
2.3 Elastic constants, relationship among elastic constants
2.4 Thermal stresses (including thermal stresses in compound bars)

UNIT 3   **8 Hours**
Compound stresses
3.1 Introduction
3.2 Stress components on inclined planes
3.3 General twodimensional stress system
3.4 Principal planes and stresses,
3.5 Mohr's circle of stresses.
3.6 **Thin cylinders** subjected to pressure, change in length, diameter and volume,
3.7 **Thick cylinders** - Lame's equations (excluding compound cylinders).

UNIT 4   **7 Hours**
Bending moment and shear force in beams
4.1 Introduction,
4.2 Types of beams loadings and supports,
4.3 Shearing force in beam,
4.4 Bending moment,
4.5 Sign convention, 4.6 Relationship between loading, shear force and bending moment,
4.7 Shear force and bending moment equations, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams considering point loads, UDL, UVL and Couple.

PART – B

UNIT 5   **6 Hours**
Bending stress, shear stress in beams
5.1 Introduction – Bending stress in beam,
5.2 Assumptions in simple
bending theory,
5.3 Pure bending derivation of Bernoulli's equation,

5.4Modulus of rupture, section modulus, 5.5 Flexural rigidity, 5.6 Expression for horizontal shear stress in beam,

5.7 Shear stress diagram for rectangular, symmetrical 'I' and 'T' section (Flitched beams not included).

UNIT 6   **6 Hours**
Deflection of beams
6.1 Introduction – Definitions of slope, deflection,
6.2 Elastic curvederivation of differential equation of flexture,
6.3 Sign convention
6.4 Slope and deflection for standard loading classes using Macaulay's method for prismatic beams and overhanging beams subjected to point loads, UDL and Couple.

UNIT 7   **6 Hours**
Torsion of circular shafts
7.1 Introduction – Pure torsion-torsion equation of circular shafts,
7.2 Strength and stiffness,
7.3 Torsional rigidity and polar modulus,
7.4 Power transmitted by shaft of solid and hollow circular sections.

UNIT 8   **6 Hours**
Elastic stability of columns
8.1 Introduction – Short and long columns,
8.2 Euler's theory on columns,
8.3 Effective length slenderness ration,
8.4 radius of gyration, buckling load,
8.5 Assumptions, derivations of Euler's Buckling load for different end conditions,
8.6 Limitations of Euler's theory, 8.7 Rankine's formula and problems.

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Subramanyam ,(2008), **Strength of Materials**, Oxford University Press
2. Punmia B.C., Ashok Jain and Arun Jain, (2004), **Mechanics of Materials**, Lakshmi Publications, New Delhi.
3. Basavarajaiah B.S.,and Mahadevappa P**, (**2009**), Strength of Materials** , Universities Press, New Delhi.

REFERENCE BOOKS
1. Singer, F.L.,(1962),**Strength of Materials,** Harper and Row Publications.
2. Timoshenko and D.H.Young, (2003),**Elements of Strength of Materials**, Affiliated East-West Press.
3. James M. Gere (2000),**Mechanics of Materials**, (5th Edition), Thomson Learning publication.

SURVEYING

Sub Code : 10 EV 34   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1   **4 Hours**

Introduction
1.1 Definition of Surveying
1.2 Classification of Surveys,
1.3 Uses of Surveying Units of Measurements,
1.4 Map & Classification,
1.5 Survey of India topographical Maps and their numbering
1.6 Basic principles of surveying,
1.7 Errors, Classification, 1.8 Precision and accuracy.

UNIT 2   **5 Hours**
Measurement of horizontal distances.
2.1 Chain and types,
2.2 Tape and types,
2.3 EDM devices,
2.3 Ranging of lines 2.4 Direct and Indirect,
2.5 Measurement of distances over sloping grounds,
2.6 Chain and Tape corrections - Numerical problems.

UNIT 3   **7 Hours**
Chain Surveying
3.1 Accessories required,
3.2 Selection of stations and lines,
3.3 Offsets and types
3.4 Setting out of right angles,
3.5 Working principle and use of optical square, prism square, cross staff.,
3.6 Linear methods of setting out right angles,
3.7 Booking of chain survey work,
3.8 Field book, entries, conventional symbols, 3.9 Obstacles in chain survey, Numerical
    problems,
3.10 Errors in chain survey and precautions to be taken.

UNIT 4   **6 Hours**
Compass Surveying
4.1 Meridians and bearings,
4.2 Principle, working and use of – Prismatic compass
4.3 Surveyor's compass,
4.4 Magnetic bearing, true bearings,
4.5 WCB and Reduced bearing.
4.6 Dip and Declination
4.7 Accessories required for compass surveying,
4.8 Traverse - closed and open traverse
4.9 Computation of bearings of legs of closed traverse given the bearing of one of the legs,
4.10 Computation of included angles given the bearings of legs of a closed traverse.

PART – B

UNIT 5   **8 Hours**
Compass Traversing continued....
5.1 Local attraction, determination and corrections,
5.2 Dependent and independent co-ordinates,
5.3 Checks for closed traverse and determination of closing error and its direction
5.4 Bowditch's graphical method of adjustment of closed traverse,
5.5 Bowditch's rule and transit rule,
5.6 Omitted measurements (Only Length and corresponding bearing of one line).

UNIT 6   **7 Hours**
Introduction to Levelling
6.1 Principles and basic definitions,
6.2 Fundamental axes and part of a dumpy level,
6.3 Types of adjustments and objectives,
6.4 Temporary adjustments of a dumpy level,
6.5 Sensitiveness of bubble tube,
6.6 Curvature and refraction correction,
6.7 Type of leveling, 6.8 Simple leveling,
6.9 Reciprocal leveling,
6.10 Profile leveling,
6.11 Cross sectioning,
6.12 Fly leveling,

UNIT 7   **4 Hours**
Reduction of Levelling continued....
7.1 Booking of levels
7.2 Rise and fall method and Height of instrument method
7.3 comparison Arithmetic checks
7.4 Fly back leveling.,
7.5 Errors and precautions.

Contouring
7.6 Contours and their characteristics,
7.7 Methods of contouring,
7.8 direct and indirect methods,
7.9 Interpolation techniques,
7.10 Uses of contours
7.11 Numerical problems on determining intervisibility,
7.12 Grade contours and uses.

UNIT 8   **5 Hours**
Plane Table Surveying
8.1 Plane table and accessories,
8.2 Advantages and limitations of plane table survey,
8.3 Orientation and methods of orientation,
8.4 Methods of plotting – Radiation, Intersection, Traversing,
8.5 Resection method,
 8.6 Two point and three point problems,
8.7 Solution to two point problem by graphical method,
8.8 Solution to three point problem Bessel's graphical method,
8.9 Errors in plane table survey.

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS

1. Punmia, B.C.,(1991),**'Surveying'** Vol–1**,** , Laxmi Publications, New Delhi.
2. Chandra, A.M.,(2002),'**Plane Surveying** Vol-1-, Newage International ® Ltd.
3. Alak De (2000),**'Plane Surveying'**, S. Chand & Company Ltd., New Del.
4. Roy, S.K., (2009), **Fundamentals of Surveying,** Prentice Hall of India

REFERENCE BOOKS:
1. Milton O. Schmidt, Milton O Wong,(1985), **Fundamentals of Surveying**, Thomson Learning
   Publisher.
2 Subramnian R., (2007), **"Surveying and Levelling",** Oxford University Press
3. Duggal, S.K. **(2000), Surveying Vol. I**, Third edition, ,Tata Macgraw Hill Publishing Company
   Limited, New Delhi.
4. Venkataramaiah C., (2009), "Text Book of Surveying", Unversities Press
* Survey of India Publication on maps.

ENVIRONMENTAL FLUID MECHANICS - I

Sub Code : 10 EV35   IA Marks : 25
Hrs/ Week : 04   Exam Hours : 03
Total Hrs. : 52   Exam Marks : 100

PART – A

UNIT 1   9 Hours
INTRODUCTION
1.1 Scope and importance of Subject
1.2 Definition of Fluid, Distinction between solids & fluid
1.3 Distinction between liquid & gas fluid continuum
FLUID PROPERTIES AND CLASSIFICATION OF FLUID
1.4 Mass density, Specific Volume
1.5 Specific Weight Relative density
1.6 Definition, units and Dimensions
1.7 Viscosity, Newton's law of viscosity
1.8 Newtonian and Non-Newtonian Fluids
1.9 Ideal and Real fluids
1.10 Compressibility
1.11 Vapour pressure
1.12 Surface tension, Definitions, units and dimensions
1.13 Equation for stability of bubble
1.14 Capillarity, theory and problems
1.15 Problems on Newton's law of viscosity

UNIT 2   6 Hours
FLUID PRESSURE AND ITS MEASUREMENT
2.1 Definition of pressure, units and dimensions
2.2 Pressure at a point
2.3 Pascal's law
2.4 Hydrostatic pressure law
2.5 Absolute and Gauge pressure
2.6 Measurement of pressure, Simple Manometer theory and problems
2.7 Differential manometer theory & Problems
2.8 Mechanical pressure gauges

UNIT 3   6 Hours
HYDROSTATICS
3.1 Definition of total pressure, Center of pressure, Centroid, centroidal depth, depth of center of
     pressure
3.2 Equation for hydrostatic force and depth of center of pressure on plane surfaces (vertical and
     inclined)
3.3 Problems on hydrostatic force vertically submerged surfaces
3.4 Problems on inclined submerged surfaces
3.5 Hydrostatic force on submerged curved surfaces, problems, 3.6 Pressure diagram, problems

UNIT 4   **7 Hours**
KINEMATICS OF FLUIDS
4.1 Description of fluid flow
4.2 Lagrangian and Eulerian approaches
4.3 Classification of flow, steady & unsteady, uniform and non-uniform
4.4 Definition of path line, streamline, streak line, stream tube, one, two, three dimensional flows
    Rotational and irrotational flow
4.5 Acceleration of flow
4.6 One dimensional flow, derivation of continuity equation in differential form
4.7 Definition of velocity potential, stream functions, stream line, equipotential line
4.8 Relation between velocity potential and stream function, Laplace equation
4.9 Problem on continuity equation
4.10 Problem on velocity potential and stream function

PART – B

UNIT 5   **7Hours**
DYNAMICS OF FLUID FLOW
5.1 Concept of Inertia force and other forces causing motion
5.2 Derivation of Euler's equation and Bernoulli's equation with assumption and limitation
5.3 Modification of Bernoulli's equation, problem on Bernoulli's equation without and with losses
5.4 Application of Bernoulli's equation - Pitot tube, problems
5.5 Venturimeter, problems
5.6 Momentum equation, problems

UNIT 6   **7 Hours**
FLOW THROUGH PIPES
6.1 Flow through pipes, Reynolds number, classification of flow
6.2 Definition of hydraulic gradient, energy gradient
6.3 Major and minor losses in pipe flow
6.4 Equation for head loss due to friction (Darcy-Weishbach equation). –Friction factor for
    commercial pipes
6.5 Minor losses (types), equation for head loss due to sudden expansion. – Problem on minor
    losses
6.6 Pipes in series, pipes in parallel and equivalent pipe
6.6 Problems

UNIT 7   **5 Hours**
FLOW MEASUREMENTS
7.1 Flow through Orifices; classification
7.2 Hydraulic co-efficients of an Orifice and relation between them.
7.3 Equation for co-efficient of velocity, problems
7.4 Submerged and large rectangular Orifices
7.5 Flow through mouth pieces, classification, equation for discharge and pressure head for an
    external cylindrical mouth piece

UNIT 8   **5 Hours**
FLOW MEASUREMENTS Continued...
8.1 Flow over notches, classification
8.2 Equation for discharge over rectangular and trapezoidal notches
8.3 Equation for discharge over Vnotch, problems
8.4 Cippoletti notch, problems
8.5. Types of Nappe, ventilation of weirs
8.6 Broad crested weirs, problems
8.7.Submerged weirs, equation for discharge, problems

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1.. Modi P.N and. Seth, S.M., (2002), **Hydraulics and Fluid Mechanics,** Standard Book House, New Delhi.
2. Bansal, R.K. (2005), **Fluid Mechanics and Hydraulic Machines**, Lakshmi Publications, New Delhi.
3. Jain, A.K. (2004), **"Fluid Mechanics"**, 37th Edition, Khanna Publishers, New Delhi.

4. Mohanty A.K., (2009), **"Fluid Mechanics",** 2nd Edition, PHI Learning Pvt. Ltd., New Delhi

REFERENCE BOOKS
1. James F Cruise, Vijay P. Singh, Mohsan M. Sherif,(2006), **Elementary Hydraulics ,**1st Edition,Civil engineering publishers.
2. Arora, K.R. (2005), **Fluid Mechanics, Hydraulic and Hydraulics** , Standard Book House, New Delhi.
3. John F. Douglas et al**, (**2005), **Fluid Mechanics**, Pearson Prentice Hall, India.

ENVIRONMENTAL BIOLOGY

Sub Code : 10 EV 36   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1   **6 Hours**
Introduction to Environmental Biology
1.1 Concepts of Environment, Public Health and Eco system health
1.2 General Microbiology.
1.2.1 Microscopic fauna and flora concern to Environmental Engineers, Water as their natural
      habitat.
1.2.2 Systematic study of important group / subgroups for sizing the problems they cause.

UNIT 2   **8 Hours**
Plant Kingdom
2.1 Algae – basic characteristics and classification upto classes.
2.2 Salient characteristics of Chlorophyceae – Bascillariophyceae, Cyanophyceae and
    Euglinaeceae,
2.3 Economic importance of Algae. Problems caused by algae and methods of control.
2.4 Water Hyacinth – Morphology, anatomy and life cycle.
2.5 Environmental significance of plant kingdom.

UNIT 3   **8 Hours**
3.1 **Animal Kingdom**: Group Protozoa - basic character. Group Rotifers - basic character.
    Subgroup Crustaceans - basic character.
3.2 **Group Fungi**: Basic characteristics of the group and classification upto classes and class
    schizomycetes.
3.3 **Morphology of Bacteria**: Bacteria exhibiting variation in shapespherical, rod and helices.
    Cytoplasmic appendages of bacteria, celia and flagella, spore and spore formation.

UNIT 4   **8 Hours**
Metabolism and Principles
4.1 Nutritional requirements of bacteria.
4.2 Autotrophic and heterotrophic requirements. Photosynthesis.
4.3 Definition of Metabolism - Difference of anabolism and
catabolism.
4.4 Dependence of metabolism on biological catalysts and enzymes.

PART – B

UNIT 5   **6 Hours**
Air and Water Microbiology
5.1 Bacteria in water and air
5.2 Indicator organisms and their testing techniques – MPN, Multiple Fermentation and
    membrane filter methods:
5.3 Importance in Environmental Studies.

UNIT 6   **8 Hours**
Microbiology of Soil
6.1 Physical Characteristics,
6.2 Microbial flora,
6.3 Interaction among microorganisms,
6.4 Biogeochemical roles of soil microorganisms.

UNIT 7   **4 Hours**
Virology
7.1 Types,
7.2 Characteristics and enumeration methods.
7.3 Effects of virus on cells.

UNIT 8   **8 Hours**
Microbial Metabolism of Heavy Metals and pesticides
8.1 General interaction between Mircobes and Metals.
8.2 Microbial transformation of Arsenic, Mercury, Lead, Cadmium, Selenium, Tin, Tellurium.
8.3 Microbial metabolism of Hydrocarbons (HC) and Pesticides – Petroleum, HC, Benzene,
    toluene, xylene, DDT, BHC.
8.4 Bioconcentration, Biomagnification and Depuration.

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Mckinney R.E, (1962**), Microbiology for Sanitary Engineers**, McGraw Hill.
2. Pelczar Michael, (2004**, Microbiology,** Tata McGraw Hill.
3. Atlas R.M. and Bortha R., (1998), "**Microbial Ecology – Fundamentals and Applications",**
   Pearson Education (Singapore) Pvt. Ltd.,

REFERENCES
1. Gopal B.,(1987), **Water Hyacinth, (**1987)**,** Elsevier Publishers, Amsterdam.
2. Mishustin Y., and Petrobvskaya M.,(1979), **Sanitary Microbiology of Soil,** NAUKA
   Publishers, Russia.
3. Verschueren K, Van Nostrand, (1983),**Handbook of Environmental Data on Organic
   Chemicals,** II Edition,.
4. Mitchell R, (1978), **Water Pollution Microbiology**,Vol. 2, , Wiley Interscience, New York.
5. Philip Herries Gregory, (1976), **Aerobiology,** , Oxford University Press, London.

ENVIRONMENTAL ANALYSIS LABORATORY – I

Sub Code : 10 EVL 37   **IA Marks : 25**
Hrs/ Week : 03   **Exam Hours : 03**
Total Hrs. : 42   **Exam Marks : 50**

Introduction – Lab layout, lab apparatus, washing & sterilization methods.

Preparation of culture media.

Plate count, multiple tube fermentation and membrane filter technique for coliforms.

Different Coliform groups – faecal coliform and faecal streptococci.

Bacteriological examination of recreational water.

Rapid detection methods for coliform.

Bacterial cell immobilization and mixed culture tests.
Detection of fungi.

Microscopic Identification of aquatic organisms – Blue-green algae, Diatoms, Green Algae.

Microscopic Identification of Plankton, Periphyton, Macrophytes.

REFERENCES
1. American Water Works Association, (2001), "**Standard Methods for Examination of Water and Wastewater**", 20th Edition.
2. Pepper, Gerba and Brendecke, ,(1995), **Environmental Microbiology: A laboratory manual** Academic Press, San Diego.
3. **Relevant I.S. codes**.

SURVEYING PRACTICE

Sub Code : 10 EVL 38   **IA Marks : 25**
Hrs/ Week : 03   **Exam Hours : 03**
Total Hrs. : 42   **Exam Marks : 50**

Exercise – 1
a) To measure distance between two points using direct ranging
b) To set out perpendiculars at various points on given line using cross staff, optical square and tape.
Exercise – 2
Setting out of rectangle, hexagon using tape/chain and other accessories
Exercise – 3
Measurement of bearing of the sides of a closed traverse & adjustment of closing error by Bowdich method and Transit method
Exercise – 4
To set out rectangles, pentagon, hexagon, using tape /chain and compass.
Exercise – 5
To determine the distance between two inaccessible points using chain/tape & compass.
Exercise – 6
To locate points using radiation and intersection method of plane tabling
Exercise – 7
To solve 3-point problem in plane tabling using Bessel's graphical solution
Exercise –8
To determine difference in elevation between two points using fly leveling technique & to conduct fly back leveling. Booking of levels using both HI and Rise & Fall methods.
Exercise – 9
To determine difference in elevation between two points using reciprocal leveling and to determine the collimation error
Exercise – 10
To conduct profile leveling for water supply /sewage line and to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level.

Demonstration
Minor instruments – Clinometer, Ceylon ghat tracer, Hand level, Box sextant, Planimeter and Pantagraph, Total Station.

TEXT BOOKS
1. Punmia , B.C. (1991**),'Surveying'** Vol.–1 **,** Laxmi Publications, New Delhi.
2. Chandra, A.M. (2002) **"Plane Surveing"** Vol-1**-**, Newage International ® Ltd.
3. ALAK , (2000),**"Plane Surveying"**, S. Chand and Company Ltd., New Delhi.

REFERENCE BOOKS
1. Roy, S.K. (2009), **Fundamentals of Surveying**, Prentice Hall of India.
2. Milton O. Schimidt, Milton O Wong**, (**1985), **Fundamentals of Surveying**-, Thomson Learning.
4. Duggal, S.K. (2000), **Surveying Vol. I**, Third edition,Tata Macgraw Hill Publishing Company Limited

ADVANCED MATERIALS OF CONSTRUCTION

Sub Code : 10 EV 42   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1: BUILDING STONES
1.1. Common building stones and their uses
1.2. Quarrying of stones
1.3. Deterioration of stones
1.4. Preservation of stones
1.5. Dressing of stones

7 Hours

UNIT 2: BRICKS & TILES
2.1. Classification of bricks
2.2. Manufacture of bricks
2.3. Tests on bricks
2.4. Types of tiles
2.5. Quality of tiles & their uses   **7 Hours**

UNIT 3: TIMBER
3.1. Varieties & uses
3.2. Defects in Timber
3.3. Tests for good Timber
3.4. Seasoning of timber
3.5. Plywood & its uses
3.6. Wood wool boards   **7 Hours**

UNIT 4: LIME & CEMENT
4.1. Types of lime
4.2. Manufacture of Hydraulic & Fat Limes
4.3. Activated Lime – Pozzolana mixture
4.4. Chemical Composition of Portland Cement and Hydration
     of Cement
4.5. Manufacture of Portland Pozzolana Cement
4.6. Types of Cements and their uses
4.7. Lime & cement mortar   **7 Hours**

PART – B

UNIT 5: CONCRETE INGREDIENTS
5.1. Testing of Cement-field testing, fineness by sieve test and
     Blaine's air permeability test.
5.2. Normal consistency, setting time, soundness.
5.3. Compression strength of cement and grades of cement, quality
     of mixing water.
5.4. Fine aggregate – grading, analysis.
5.5. Specific gravity, bulking, moisture content, deleterious
     materials.
5.6. Coarse aggregate- importance of size, shape and texture.
5.7. Grading of aggregates-sieve analysis, specific gravity. Flakiness
     and elongation index, crushing impact and abrasion tests.

6 Hours

UNIT 6: FRESH CONCRETE
6.1. Workability – factors affecting workability,

6.2. Measurement of workability – slump. Flow tests.
6.3. Compaction factor and vee-bee consistometer tests.
6.4. Segregation and bleeding.
6.5. Process of manufacture of concrete: Batching .
6.6. Mixing.
6.7. Transporting
6.8. Placing
6.9. Compaction
6.10. Curing
6.11. Chemical admixtures- plasticizers, accelerators, retarders and
     air entraining agents.
6.12. Mineral admixtures – fly ash.
6.13. Silica fumes and rice husk ash.

6 Hours

UNIT 7: HARDENED CONCRETE
7.1. Factors affecting strength, w/c ratio, gel/space ratio, maturity
     concept.
7.2. Effect of aggregate properties, relation between compressive
     strength, and tensile strength, bond strength, modulus of
      rupture.
7.3. Accelerated curing, aggregate-cement bond strength.
7.4. Elasticity- Relation between modulus of elasticity, Poission
     ratio.
7.5. Shrinkage – plastic shrinkage and drying shrinkage, factors
     affecting shrinkage.
7.6. Creep- measurement of creep, factors affecting creep, effect
     of creep.
7.7. Durability – definition, significance, permeability, sulphate
     attack, chloride attack, carbonation, freezing and thawing..
7.8. Factors contributing to cracks in conrete-plastic shrinkage,
     settlement cracks, construction joints
7.9. Thermal expansion, transition zone, structural design
     deficiencies.
7.10. Testing of hardened concrete-compressive strength, split
      tensile strength.
7.11. Flexural strength, factors influencing strength test results.

6 Hours

UNIT 8: OTHER BUILDING MATERIALS: Properties & uses of
8.1. Reinforcing steel, structural steel
8.2. Cast Iron, Plain carbon steel
8.3. Glasses
8.4. Electrical, Thermal & Sound Insulating Materials
8.5. Paints, Varnish & Enamels
8.6. Plastics, Composites, Polymers, Geosynthetics
8.7. Rubber and water proofing materials
8.8. Bitumen & Asphalt   **6 Hours**

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEST BOOKS
1. Rangawala R.C., (2000), **Engineering Materials,** Charotar Publishing House, Anand, India.
2. Sushil Kumar, **Engineering Materials,** , Standard Publication and Distributors, New Delhi
3. Shetty M..S, (2002), **Concrete technology – Theory and practice,** , S. Chand and
   Co, New Delhi.
4. Varghese P.C., (2007), **Building Construction**, PHI Learning Pvt. Ltd.,

REFERENCE BOOKS

1. Varghese. P.C. (2007), **A Text Book Building Materials** , Prentice-Hall of India Pvt. Ltd.,
   Publication.
2. Mohan Rai and M.P. Jain Singh (1986**), Advances in Building Materials and Construction,**
   CBRI Publication, Roorkee.
3. Neville A.M and Brooks J.J ,(1987), **Concrete Technology,** ELBS Edition, London
4. Gambhir M.L , (1995), **Concrete Technology,** Tata McGraw-Hill Publishing Company Limited,
   New Delhi.

ENVIRONMENTAL CHEMISTRY - II

Sub Code : 10 EV 43   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1: Basic concepts from organic chemistry
1.1 Aliphatic
1.2 Aromatic
1.3 Carbocyclic
1.4 Heterocyclic compounds

                                                                          6 Hours

UNIT 2: Basic properties of organic compounds
2.1 Equations for estimation of Molecular Weight.
2.2 Molecular volume
2.3 Critical volume
2.4 Boiling and melting points
2.5 Density

                                                                          10 Hours

UNIT 3: Environmental characteristics of organic compounds
3.1 Methods for calculation of saturation concentration
3.2 Solubility
3.3 Octanal / water distribution coefficient

                                                                          5 Hours

UNIT 4: Properties and applications of common organic compounds
4.1 Ethyl benzene
4.2 Carbon tetra chloride
4.3 DDT.
4.4 BHC.
4.5 Aldehydes
4.6 Ketones

                                                                          5 Hours

PART – B

UNIT 5: Basic concepts of stability and reactivity of organic compounds
5.1 Reaction mechanisms
5.2 Structure – Activity relationships.

                                                                          6 Hours

UNIT 6: Toxicity estimation from structure activity
6.1 Toxic substances, Introduction
6.2 Principal physico – chemical components and analysis

                                                                          8 Hours

UNIT 7: Estimation of chemical loss rate
7.1 Hydrolysis
7.2 Photolysis
7.3 Volatilization and decay
7.4 Half-life concept

                                                                          6 Hours

UNIT 8: Types of nuclear and radioactive waste
8.1 Low level
8.2 Medium level
8.3 High level
8.4 Environmental effects of the above

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Sawyer C.N., McCarty P.L. and Parkin G.F**(.,** 2003),.**Chemistry for Environmental Engineering and Science,** , 5th Edition, Tata McGraw Hill,
2. Morrison and Boyd., (1992), **Organic Chemistry,(**, 5th Edition, Eastern Economy Edition, Prentice Hall of India, New Delhi.

REFERENCES
1. Lymann W.J., Reehl W.F., and Rosenblatt D.H. (Eds.), **(**1982), **Handbook on Chemical Property Estimation Methods – Environmental Behaviour of Organic Compounds,** McGraw Hill, New York.
2. Verschueren K, (1983), **Handbook of Environmental Data on Organic Chemicals,** 2nd Ed. New York, NY: *Van Nostrand* Reinhold Co.
3. Tewari, Mehrotra and Vishnoi **, (**1980), **A Text Book of Organic Chemistry,** Vikas Publishing House Pvt. Ltd., New Delhi, India.
4. Bahl and Bahl, (2001), **Text Book of Organic Chemistry**,.16th Edn., S. Chand & Company Ltd., New Delhi.

ELEMENTS OF ENVIRONMENTAL PROTECTION

Sub Code : 10 EV 44   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1: Definition of Environment, Engineering and Environmental Engineering
1.1 Environmental Systems
1.2 Environmental Ethics
1.3 Definition of Pollution and Contamination. Water, Air and Land
    Pollution
1.4 Engineering Activities and Environmental Control – Protection
    Environmental Legislation and Regulation
1.5 Role of Environmental Protection in India and Karnataka

                                                                      8 Hours

UNIT 2: Human Population
2.1 Growth and Trend in Developed and Developing Countries in
    India.
2.2 Projection of Food and Resource Needs and Related
    Environmental Effects.
2.3 Environment and Human Health
2.4 Food Chain, Chemicals in Food
2.5 Hazardous Wastes

                                                                      6 Hours

UNIT 3:Quality Factors for Environmental Protection
3.1 Epidemiology,
3.2 Water Resources – Human Needs,
3.3 Residential Wastewater Collection and Disposal,
3.4 Industrial Water Needs and Wastewater Generation.
3.5 Air and Noise Environment in Work Place and Community.
3.6 Occupational Hazards and their effects.

                                                                      6 Hours

UNIT 4:Vector Control
4.1 Host-Vector Relationship
4.2 Mechanism of Transmission
4.3 Malaria and Filariasis Management
4.4 Rodents and their Control Measures
4.5 Guinea Worm Disease and Eradication

                                                                      8 Hours

PART – B

UNIT 5: Milk and Food Sanitation
5.1 Milk-borne Diseases
5.2 Testing and Sanitation Measures.
5.3 Food Protection from Source to Use
5.4 Sanitizing Food Processing Equipment
5.5 Tests and Inspection for Food Protection

                                                                      6 Hours

UNIT 6: Ionizing Radiation and Control
6.1 Origin
6.2 Emissions
6.3 Damage to Human Beings
6.4 Radiation Protection.

                                                                      5 Hours

UNIT 7:Environmental Sanitation
7.1 Swimming Pool Sanitation
7.2 Institutional Sanitation – School and College
7.3 Health Centre and Hospital
7.4 Sanitation in Markets, Shopping Areas and Bus Stand
7.5 Fair and Festival Sanitation

8 Hours

UNIT 8: Energy of Heat and Sound
8.1 Effects on Human Body,
8.2 Changes
8.3 Developments.

5 Hours

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Salvato J.A., (1982), **Environmental Engineering Sanitation,** 3rd edition, J. Wiley & sons,
   New York.
2. Masters Gilbert M, (2004), **Introduction to Environmental Engineering and Science,**
   Pearson Education Limited.
3. Chanlett E.T., (1979), **Environmental Protection,** McGraw Hill Co., New York, NY
3.

REFERENCES

2 Turk J.,(1985), **Introduction to Environmental Studies** , 2nd Edition, Holt Saunders,
   International Edition.
3 Taylor Miller Jr., (1994), **Living in the Environment – Concepts,** Wordsworth,
   California,
4. Ehlers V.M.,and Steel E.W., (1972), **Municipal and Rural Sanitation**, McGraw Hill,
    New York.
6 Awata, **Environmental Sanitation**
7 Glynn Henry, J.n and Gary W. Heinke (1996), **Environmental Science and
   Egineering**Prentice Hall Publication.

ENVIRONMENTAL FLUID MECHANICS-II

Sub Code : 10 EV 45   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1: FLOW IN OPEN CHANNELS
1.1 Definition of open channels
1.2 classification
1.3 difference between pipe flow & open channel flow
1.4 types of flow, 1.5 Geometric properties of open channels
1.6 Uniform flow in open channels
1.7 Chezy's and Manning's formulae
1.8 Problems on uniform flow, Most economical open channels
1.9 Derivation of conditions for rectangle, triangle and trapezoidal
      sections, Problems on most economical sections, Most economical
      circular channels derivations and problems

                                                            7 Hours

UNIT 2: FLOW IN OPEN CHANNELS
2.1 Specific energy, definitions, specific energy curve, conditions for
      minimum specific energy and maximum discharge
2.2 Critical flow in rectangular channels, problems
2.3 Hydraulic jump in rectangular channels, derivations with Froude
      number concept, 2.4 Problems on Hydraulic Jump, venturi flume

WATER HAMMER IN PIPES
2.5 Definition, Equation for pressure rise due to gradual closure of valves
2.6 Equation for pressure due to sudden closure of valves in rigid & Elastic
      pipes, problems
2.7 Surge tanks, their functions & types

                                                            7 Hours

UNIT 3: DIMENSIONAL ANALYSIS & MODEL SIMILITUDE
3.1 Introduction to Dimensional Analysis, units & dimensions, table of
      Dimensions
3.2 Dimensional Homogeneity
3.3 Methods of Analysis (Raleigh's & Buckingham's method
3.4 Problems on Raleigh's & Buckingham's methods
3.5 Model Studies, Introduction, comparison with Dimensional Analysis
3.6 Similitude, Dimensionless parameters
3.7 Types of models
3.8 Froude's models theory & problems
3.9 Reynold's models,Theory problems, Scale effects

                                                            6 Hours

UNIT 4: IMPACT OF JET ON FLAT VANES
4.1 Introduction to Impulse – momentum equation and its applications
4.2 Force exerted by a jet on a fixed target, Derivations
4.3 Force exerted by a Jet on a moving target, Derivations

                                                            6 Hours

PART – B

UNIT 5: IMPACT OF JET ON CURVED VANES Continued....
5.1 Force exerted by a jet on a series of curved vanes
5.2 Concept of velocity triangles
5.3 Equation for work done & efficiency
5.4 Problems o force exerted by a Jet on a series of curved valves

HYDRAULIC TURBINES (Impulse turbines)
5.5 Introduction, Types and classifications
5.6 Pelton Wheel, theory, equation for work done and efficiency, design parameters
5.7 Problems on Pelton Wheel

6 Hours

UNIT 6: HYDRAULIC TURBINES (Reaction turbines)
6.1 Francis Turbine – Theory, equation for work done and efficiency, design
    parameters
6.2 Problems on Francis turbine
6.3 Kaplan turbine – Theory, equation for work done & efficiency, Design parameters
6.4 Problems on Kaplan turbine

6 Hours

UNIT 7: HYDRAULIC TURBINES (Performance)
6.5 Draft tubes: types, Equation for efficiency problems
6.6 Cavitations in turbines, Governing of turbines, Governing of turbines
6.7 Specific speed of a turbine, Equation for the specific speed, problems
6.8 Unit quantities of a turbine, definitions, equations and problems
6.9 Characteristics curves of a turbine, general layout of an hydroelectric plant

7 Hours

UNIT 8: CENTRIFUGAL PUMPS
8.1 Definition of pump, classification
8.2 Description & general principle of working, priming & methods
8.3 Work done & efficiencies of a centrifugal pump
8.4 Minimum starting speed
8.5 Cavitation in centrifugal pumps
8.6 Multistage pumps
8.7 Problems on Centrifugal pumps

7 Hours

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the
students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Modi & Seth., (2002), **Hydraulics & Fluid Mechanics ,**Standard Book House,
   New Delhi
2. Raghunath. H M., (1987), **Fluid Mechanics & Machinery,**CBS Publishers & Distributors, Delhi
3. Bansal R.K., (2002), **Text Book on Fluid mechanics & Hydraulic Machines,** Laxmi
   publications Pvt. Ltd.
4. Mohanty A.K., (2009), **"Fluid Mechanics",** 2nd Edition, PHI Learning Pvt. Ltd., New Delhi

REFERENCE BOOKS
1. Gupta, S.C., (2006), **Fluid Mechanics and Hydraulic Machines,** Pearson Education, India
2. **Elementary Hydraulics'(2006),** 1st Edition, James F Cruise, Vijay P. Singh, Mohsan M. Sherif,
   CL Engineering Publisher.
3. Arora **K.R., (2005), Hydraulics & Fluid Mechanics,** Standard Book house, New Delhi.

APPLIED ENGINEERING GEOLOGY

Sub Code : 10 EV 46   **IA Marks : 25**
Hrs/ Week : 04   **Exam Hours : 03**
Total Hrs. : 52   **Exam Marks : 100**

PART – A

UNIT 1
INTRODUCTION
Geology and its importance in Civil Practices, – Internal structure of the earth
and its Composition
MINERALOGY
Rock forming and economic minerals, - Physical properties of minerals,
chemical composition and uses of the following minerals.
Description of Quartz varieties, Rock crystal, Rose quartz, Milky quartz,
Amethyst, Agate, Flint, chert, chalcedony, jasper, bloodstone and
opal.Feldspars: orthoclase, plagioclase & Mirocline,

5 Hours

UNIT 2
Mica group: Muscovite, Biotite.Amphibole Group: Hornblende, Pyroxene
Group: Augite, Silicates: Olivine, serpentine, Asbestos, Kaoline,Talc,
Garnete, Sulphites: Barite, Gypsum, Oxides: Corundum.Carbonate Group:
Calcite, Dolomite, Magnesite., Ore- Minerals: Magnetite, Haematite,
Limonite, Iron pyrite, Chalcopyrite, Pyrolusite, Chromite, Galena & Bauxite

5 Hours

UNIT 3
PETROLOGY
Introduction, Definition and Classification, – IGNEOUS ROCKS: Forms,
Classifications, Textures, Descriptions and Engineering uses of Granite,
Syenite, Dionite, Gabbro, Dunite, Porphyries, Pegmatite, Dolerite, Basalt,
Rhyolite, and Pumice – SEDIMENTARY ROCKS: Definition
Classification, Primary structures. Description and engineering uses of
Sandstones, Limestones, shale, Conglomerate, Breccia, & Laterite. –
METAMORPHIC ROCKS: Definition kinds of Metamorphism, Description
and Engineering uses of Gneiss, Quartzite, Marble, Slate, Phyllite, Schists,
and Charnokite.

8 Hours

UNIT 4
GEOMORPHOLOGY AND GEODYNAMICS:
Epigine and Hypogene geological agents, weathering of Rocks and its, Soil and Soil Profile,
Classification, Erosion, Conservation, Marine Geology
Geological actions of Rivers & wind – Land slides - Causes and Remedial measures, –
Earth Quakes - Causes and effects, Concept of Plate tectonics, Engineering
consideration and Seismic resistant structures.

7 Hours

PART – B

UNIT 5
STRUCTURAL GEOLOGY
Definition – Outcrops, Dip and strike, Compass clinometer. – Description of
Folds, Faults, Joints, Unconformities and their recognition in field and
Considerations in Civil engineering Projects.

6 Hours

UNIT 6
GEOLOGICAL SITE INVESTIGATION
Selection of sites for Dams and Reservoir, Silting up of Reservoirs and remedies.s – Selection of sites for Tunnels, – Selection of sites for Bridges and Highways. – Rocks as a materials for Construction as Foundation, Decorative, Flooring and Roofing, Concrete, Aggregate, Road Metal, Railway Ballast with examples.

8 Hours

UNIT 7
GROUND WATER GEOLOGY
Hydrological cycle, water Bearing Properties of Rocks and Soils. Aquifer and its types, – Geological and Geophysical methods of Ground water Exploration. – Electrical Resistivity method. Seismic method. Interpretation of resistivity curves for ground water studies and Civil Engineering Works, – Selection of Well sites, Artificial Recharge of Ground Water by different method

7 Hours

UNIT 8
GEOMATICS AND ENVIRONMENTAL GEOLOGY
Application of Remote Sensing and GIS Techniques in Civil Engineering Projects. – GPS (Global Positioning System) and its uses, – Study of Toposheets – Impact of Mining, Quarrying and Reservoirs on Environment

6 Hours

QUESTION PAPER PATTERN
In the examination EIGHT full questions shall be set out of which the students shall answer FIVE full questions, selecting atleast TWO questions from each Part

TEXT BOOKS
1. Blyth F. G. H and M.H. De Freitas **A Geology for Engineers,(1984)** (7th Edition) by, Elsevier Science Pub., New York.
2. **A Text Book of Geology,(1998),** P.K. Mukerjee, World Press Pvt., Ltd.,Calcutta.
3. **Engineering and General Geology, (1987),** Parbin Singh, Katson Publishing House, Ludhiana

REFERENCE BOOKS
1. **Engineering Geology for Civil Engineers, (1995),** D. Venkat Reddy, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2.. **Principles of Petrology, (1963)** by G.W. Tyrrell, Asia Publishing House -Bombay
3.. Ravi P. Gupta, (2003**), Remote Sensing Geology)**, Springer Verlag New York.
4. Billings M.P. (1972), **Structural Geology, 3rd Edition,** Prentice-Hall, NJ
5**. Physical Geology,(1978)** by Arthur Holmes, Wiley Publisher
6.. Valdiya K.S **, (2004),Environmental Geology,** Universities Press
7. Wlathom T, (2009), **Foundations of Engineering Geology**, Universitites Press

ENVIRONMENTAL ANALYSIS LABORATORY – II

Sub Code : 10 EVL 47   **IA Marks : 25**
Hrs/ Week : 03   **Exam Hours : 03**
Total Hrs. : 42   **Exam Marks : 50**

Analysis of Water and Wastewater Samples
Laboratory layout and equipment. Safety precautions.
1. Determination of Colour and Turbidity.
2. Determination of Solids – suspended, dissolved, inorganic, volatile and
total.
3. Alakalinity, Acidity, pH.
4. Determination of Chloride and Conductivity.
5. Hardness – Total, permanent and temporary, Ca and Mg hardness.
6. Estimation of Manganese.
7. Determination of Fluoride.
8. Ammonia, Nitrite, Nitrate and Total Kjeldahl Nitrogen.
9. Determination of Sulphate.
10.Determination of Phosphorous.

REFERENCE BOOKS:
1. American Water Works Association, (2001), "**Standard Methods for Examination of Water and Wastewater**", 20th Edition.
2.Sawyer, C.N., Mc Carty, P.L., and Parkin, G.F., (2003), "**Chemistry for Environmental Engineering and Science**", V Edn., Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. **I.S. Codes –** 2490 (1974), 3306 (1974), 3307 (1976), 10,500 (1990).
4. **Manual on Water and Wastewater Analysis,** NEERI, Nehru Marg, Nagpur.
5. Kotaiah, B., **Examination of water and wastewater manual.**

ENVIRONMENTAL HYDRAULICS LABORATORY

Sub Code : 10 EVL 48   **IA Marks : 25**
Hrs/ Week : 03   **Exam Hours : 03**
Total Hrs. : 42   **Exam Marks : 50**

Experiments on Orifices and Mouthpieces: Determination of hydraulic coefficient
of circular orifice and internal and external mouth pieces –determination of co-efficient of
discharge of submerged orifice.

Calibration of Notches: Rectangular, triangular and Cippoletti notches.

Calibration of Weirs: Broad crested weir and ogee weir.

Calibration of venturi meter and orifice meter.
Friction in pipes.

Experiments on venturi flume.

Determination of minor losses in pipes due to sudden expansion, sudden
contraction, bends and elbows.

Impact of jet on vanes (flat, conical and hemispherical)

Test on centrifugal pumps: Single stage and multi stage centrifugal pumps.

Demonstration of: (1) flow visualization apparatus and (2) Apparatus for verification of Bernoulli's
equation
.
Demonstration of pitot tube and current meters, turbines

REFERENCES:
1. **Relavent I.S. Codes**.
2. **"Hydraulics and Fluid Mechanics",(2002),** Modi P.N., and Seth S.M., Standard Book House,
   New Delhi.
3. **"Hydraulics"**, Jagadish Lal, Metropolitan Book Company Pvt. Ltd., New Delhi.
4. **"Engineering Fluid Mechanics",(1995),** Kumar K.L., - Eurasia Publishing House Pvt. Ltd.,
   New Delhi.