

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

Credit Based Grading System

Civil Engineering, III-Semester

ES-3001 Energy, Environment, Ecology & Society

Unit –I

Energy- Sources of Energy : Renewable & Non Renewable, Fossil fuel, Biomass Geothermal, Hydrogen, Solar, Wind, hydal, nuclear sources.

Unit –II

Ecosystem – Segments of Environment: Atmosphere, hydrosphere, Lithosphere, biosphere. Cycles in Ecosystem – Water, Carbon, Nitrogen. Biodiversity: Threats and conservation,

Unit –III

Air Pollution & Sound Pollution -

Air Pollution: Air pollutants, classification, (Primary & secondary Pollutants) Adverse effects of pollutants. Causes of Air pollution chemical, photochemical, Green house effect, ozone layer depletion, acid Rain.

Sound Pollution: Causes, controlling measures, measurement of sound pollution (deciblage), Industrial and non – industrial.

Unit –IV

Water Pollution– Water Pollution: Pollutants in water, adverse effects. Treatment of Domestic & Industrial water effluent.

Soil Pollution – Soil Profile, Pollutants in soil, their adverse effects, controlling measures.

Unit –V

Society, Ethics & Human values– Impact of waste on society. Solid waste management (Nuclear, Thermal, Plastic, medical, Agriculture, domestic and e-waste). Ethics and moral values, ethical situations, objectives of ethics and its study . Preliminary studies regarding Environmental Protection Acts , introduction to value education, self exploration, sanyam & swasthya.

References:

1. Harris, CE, Prichard MS, Rabin's MJ, "Engineering Ethics"; Cengage Pub.
2. Rana SVS ; "Essentials of Ecology and Environment"; PHI Pub.
3. Raynold, GW "Ethics in information Technology"; Cengage.
4. Svakumar; Energy Environment & Ethics in society; TMH
5. AK De "Environmental Chemistry"; New Age Int. Publ.
6. BK Sharma, "Environmental Chemistry" ; Goel Publ. House.
7. Bala Krishnamoorthy; "Environmental management"; PHI
8. Gerard Kiely, "Environmental Engineering" ; TMH
9. Miller GT JR; living in the Environment Thomson/cengage
10. Cunningham WP and MA; principles of Environment Sc; TMH

11. Pandey, S.N. & Mishra, S.P. Environment & Ecology, 2011, Ane Books , Pvt. Ltd, New Delhi
12. Joseph, B. Environmental Studies, 2009 Tata Mcgraw Hill, Edu India Ltd. New Delhi.
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Civil Engineering, III-Semester

CE-3002 Fluid Mechanics

COURSE OBJECTIVE

To understand the basic concepts of fluid mechanics for undergraduate students in Civil Engineering. The course will begin with the fundamental concepts of fluid flow and proceed to cover various flow phenomena and approaches to analyse the flow phenomena. Some important applications shall also be covered.

COURSE CONTENT

Fundamental Fluid Properties: Engineering units of measurement, mass, density, specific weight, specific volume, specific gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapour pressure. **Fluid Statics:** Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on Gravity Dams and Tainter Gates), buoyant force, stability of floating and submerged bodies, relative equilibrium.

Kinematics and Dynamics of Flow: Introduction to basic lines - Streamlines, Streaklines, Pathlines. Various types of fluid flow. Velocity potential function, Stream function, Vorticity and Circulation, Flow net. Basic equations of fluid flow like Energy equation, continuity equation and momentum equation. Bernoulli's equation and its applications.

Laminar Flow and Turbulent Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number. Velocity distribution, Laminar and turbulent boundary layers and laminar sublayer, boundary layer concept, aging of pipes. Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes. Concept of Water Hammer transmission of power.

Open channels: Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity, Normal and critical slopes, Economical sections. Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, rapidly varied flow hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing.

Forces on immersed bodies: Types of drag, drag on a sphere, a flat plate, a cylinder and an aerofoil development of lift, lifting vanes, Magnus effect.

Fluid Machines: Turbines: Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton-wheel turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves. Reaction turbines: construction & setting, draft tube theory, runaway speed, simple theory of design and characteristic curves, cavitation.

COURSE OUTCOME:-

- Knowledge of the basic concepts and principles of fluid mechanics.
- Ability to analyze fluid flow problems with the application of momentum and energy equations.

- Ability to distinguish between various types of fluid flow.
- Ability to find solutions to typical pipe flow problems
- Basic knowledge of hydraulic machines.

REFERENCES

- *Modi & Seth, Hydraulics & Fluid Mechanics, Rajson's Publication Pvt Ltd*
- *A K Jain, Fluid Mechanics: Including Hydraulic Machines, Khanna Publisher.*
- *Subramanyam, Fluid Mechanics & hydraulic machines - - Tata McGraw-Hill*
- *R.J.Garde, Engg Fluid Mechanics, SCITECH Publishers Pvt Ltd*
- *Merle C. Potter, David C. Wiggert, Bassam H. Ramadan, Mechanics of Fluid, Cengage Learning.*
- *John F. Douglas, J.M. Gasoriek, John Swaffield, Lynne Jack, Fluid Mechanics, Pearson Education.*
- *K.R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers Distributors..*
- *Balchandran, Engg Fluid Mechanics, PHI Learning Pvt Ltd*
- *Ojha & Chandramouli, Fluid Mechanics & Machinery, Oxford University Press*
- *Fox, Mc Donald, Pritchard Fluid Mechanics– Wiley India, New Delhi.*
- *Narsimhan S Fluid Mechanics –. – University Press, Mumbai.*
- *Ratnam Chanamala kothapalli A.V. Fluid Mechanics & Machinery — I.K. International, New Delhi.*
- *Flow Through Open Channel -- Tata McGraw-Hill*
- *S K Som, G Biswas, Suman Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education.*

LIST OF EXPERIMENTS:-

1. To Verify Bernoulli's equation.
2. To verify Impulse Momentum equation.
3. To find out the terminal velocity of a spherical body in water.
4. Calibration and study of Venturimeter.
5. Determination of C_c , C_v , C_d of Orifices
6. Draw characteristics Curves of Pelton Wheel Turbine.
7. Draw characteristics Curves of Francis Turbine.
8. Draw characteristics Curves of Kaplan Turbine.
9. Calibration of Nozzle meter and Mouth Piece
10. Reynolds experiment for demonstration of stream lines & turbulent flow
11. Determination of metacentric height
12. Determination of Friction Factor of a pipe
13. Determination of coefficient of discharge for a broad crested weir & to plot water surface profile over weir

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Civil Engineering, III-Semester

CE-3003 Strength of Materials

COURSE OBJECTIVE

To familiarize the student with the various stresses that may act on a material such as compressive stress, tensile stress, tangential stress, etc and the response of a material to each of these types. The course will define basic concepts and calculations that will come handy in long-term to civil engineering students.

COURSE CONTENT

Simple Stress and Strains: Concept of Elastic body stress and Strain, Hooke's law, Various types of stress and strains, Elastic constants, Stresses in compound bars, composite and tapering bars, Temperature stresses. Complex Stress and Strains- Two dimensional and three dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and Strains, Mohr's circle of stresses.

Bending and Shearing Stresses: Theory of simple bending, Concept of pure bending and bending stress, Equation of bending, Neutral axis, Section-Modulus, Differential equation of the elastic curve, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading, Bending stress distribution across a section of beam, Shearing Stress and shear stress distribution across a section in Beams.

Determination of Slope and Deflection of beams by Double Integration Method, Macaulay's Method, Area Moment Method, Conjugate Beam Method, and Strain Energy Method, Castiglione's Method, and Unit Load Method.

Columns and Struts: Theory of columns, Slenderness ratio, Direct and bending stresses in short columns, Kern of a section. Buckling and stability, Euler's buckling/crippling load for columns with different end conditions, Rankin's formula, Eccentric loads and the Secant formula-Imperfections in columns. Thin Pressure Vessels: cylinders and spheres. Stress due to internal pressure, Change in diameter and volume. Theories of failure.

Torsion of Shafts: Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Torsion of solid and hollow circular shafts, Analyses of problems based on combined Bending and Torsion. Unsymmetrical Bending: Principal moment of Inertia, Product of Inertia, Bending of a beam in a plane which is not a plane of, symmetry. Shear center; Curved beams: Pure bending of curved beams of rectangular, circular and trapezoidal sections, Stress distribution and position of neutral axis.

COURSE OUTCOME

An ability to identify and compute various mechanical stresses in material and the material's response to each. An ability to apply this knowledge in science and engineering models.

REFERENCE

1. Punmia B.C., *Mechanics of Materials*, , Laxmi Publications (P) Ltd.
2. S.S Bhavikaati, *Strength of Materials*, Vikas Publisher, new Delhi
3. Rajput R. K., *Strength of Materials*, S. Chand.
4. S. Ramamrutham, R. Narayanan, *Strength of Materials*, Dhanpat Rai Publications.
5. R. Subramaniam, *Strength of Materials*, Oxford University Press.
6. Sadhu Singh , *Strength of Material* , Khanna Publishers
7. Mubeen A , *Mechanics of solids* , Pearsons
8. D.S Prakash Rao, *Strength of Material* , University Press , Hyderabad
9. Debrath Nag, *Strength of Material* , Wiley
10. Jindal , *Strength of Material* , Pearsons.
11. Bansal R.K, *Strength of Materials*, Laxmi Publisher, New Delhi.
12. Nash, W.A., *Strength of Materials*, Mcgraw hills, New Delhi.
13. Chandramouli, *Strength of Materials*, PHI learning
14. Dongre A.P., *Strength of Materials*, Scitech, Chennai
15. Negi L. S ,*Strength of Materials*, McGraw Hill Professional.
16. Raj Puroshattam, *Strength of Material* , Pearsons
17. J.M. Gere, J. G. Barry *Mechanics of Material*, Cengage Learning

LIST OF PRACTICALS

1. Study of Universal testing Machine
2. To determine the Compressive and Tensile Strength of Materials.
3. To determine the Brinell Hardness of Materials.
4. To determine the Rockwell Hardness of Materials
5. To determine the Toughness of the materials.
6. To determine the stiffness of the spring.
7. To determine the deflection of Beam by the use of deflection-beam apparatus.

CE-3004 Advance Surveying & Remote Sensing

COURSE OBJECTIVE

To introduce the student to the importance and objectives of surveying. The course would begin with the basic concepts of surveying and move on to discuss advancements such as GIS and Remote Sensing.

COURSE CONTENTS

Introduction :Basic Definitions of Surveying and Levelling , Principles , Classification of surveying ,Methods of Linear Measurement Ranging , Accessories for linear measurement ,Chain Surveying , Compass Surveying , Plane Table Surveying , Computation of Area and Volumes

Theodolite Traversing & Types:Digital levels and theodolites, Electronic Distance measurement (EDM), Total Station and Global Positioning Systems (GPS), Digital Planimeter.

Control Surveys:Providing frame work of control points, triangulation principle, co naissance, selection and marking of stations, angle measurements and corrections, baseline measurement and corrections, computation of sides, precise traversing

GPS Surveying: Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datums, GPS receivers, GPS observation methods and their advantages over conventional methods.

Remote Sensing & GIS : Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. GIS-Definition, components and advantages.

COURSE OUTCOME

- The student will be able to understand the basic principles of surveying and how they are implemented in practice.
- The student will be able to adjust for errors that occur in practising of various surveying methods.
- The student will be able to plan a survey for applications such as road alignment and height of the building.

Surveying Project - Student will go for a week-long Surveying Camp and carry out a Project Work.

REFERENCES

1. *B.C Punmia , Surveying Vol-II & III ,Laxmi Publication.*
2. *S.K. Duggal, Surveying Vol. II McGraw Hill Publishing Company Ltd.*
3. *Saikia MD, Das BM, Das MM, Surveying, McGraw hill*
4. *T.P. Kanetkar and S.V. Kulkarni Surveying and Leveling-Part-I & II , Pune Vidyarthi Griha Prakashan, Pune.*
5. *Gopi A, Satikumar R- Advance surveying, Pearson*
6. *Remote Sensing and image interpretation by Lillesand T.M. and Kiefer R.W.*
7. *R.Agor, Advance Surveying ,Khanna Publisher*
8. *Chandra AM, Higher Surveying, New Age International, new Dwlhi*

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10. *Venkatramaiah, Surveying, University Press, Mumbai*
11. *Bhatta Basudeb, , Remote Sensing and GIS, Oxford, New Delhi.*
12. *Subramanaian, Surveying & levelling, Oxford, New Delhi.*
13. *Joseph George Fundamentals of Remote Sensing*

List of Practical

1. Measurement of Distance by Chaining and Ranging.
2. Locating Various Objects by Chain or Cross-Staff Surveying.
3. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
5. Fixing bench mark with respect to temporary bench mark with dumpy level by fly levelling and check levelling.
6. Measurement of vertical angles with theodolite.
7. Determination of horizontal distance between two inaccessible points with theodolite.
8. Locating given building by theodolite traversing.

COURSE OBJECTIVE

To study geological science and apply the same in the field of civil engineering. The course begins with history of earth's formation. It moves on to the different types of soil found on earth and finally describes the various applications of geological science in civil engineering. Also to make the students familiar with remote sensing and geographical information system.

COURSE CONTENT

Introduction and Physical Geology- Objects and scope of geology. The crust and the interior of the earth, origin and age of the earth, sub-aerial land, sub-terrain weathering, denudation and deposition, wind, river, glacial and marine erosion, volcanoes, soil, formation of soil profile ,geological classification of soil and concept of earthquake, Plate- tectonics.

Mineralogy and Crystallography- Fundamentals of mineralogy, study of common rock forming minerals, ores and minerals of economic importance to civil engineering. elements of crystallography and introduction to crystal systems.

Petrology: Composition of earth's crust, study of igneous, sedimentary and

Metamorphic rocks and their formation, characteristics classification, Rocks of civil engineering importance.

Geology of India: Physical features of India, Brief geological history of India, occurrence of important ores and minerals in India.

Structural Geology: Structures related to rocks, Dip, Strike and outcrops, Classification and detailed studies of geological structures i.e. folds, Faults, Joints, Unconformity and their importance in Civil Engineering.

Applied Geology: Introduction to applied geology and its use in civil engineering, properties of rocks, selection of sites for roads, bridges, dams, reservoirs and tunnels. Prevention of Engineering structures from seismic shocks, stability of hill sides, water bearing strata, artesian wells, Use of remote-sensing techniques in selection of above sites.

COURSE OUTCOME

1. Understanding of the role of geology in design and construction processes.
2. Ability to apply geological concepts and approaches to rock engineering projects.
3. Ability to identify and classify rocks using basic geological classifications and understand the formation and properties of each category.
4. Ability to use the geological literature to establish the Geo-technical framework needed to properly design and construct heavy civil engineering projects.
5. Understanding the application of remote sensing and geographical information system in civil engineering projects.

REFERENCE

1. Parbin Singh – “Engineering and General Geology”
2. S.K. Garg – “A text Book of Physical and Engineering Geology”
3. Varghese P.C., Engineering Geology for civil engineering, PHI
4. A. Parthasarthy- Engineering Geology, Wiley
5. Duggal, Pandey and Rawal- Engineering Geology, Macgra Hill
6. Duggal SK, pandey, Rawal, Engineering Geology, Mc Graw Hills
7. Kamith Vasudev, Engineering Geology, University Press
8. Alam MM. Engineering Geology and Geo- Engineering, Axiom Books
9. Gangopadhy S., Engineering Geology, Oxford
10. Gulati ; Geotechnical Engineering; TMH
11. P.K. Mukerjee – “A text Book of Geology”
12. Das and Sobhan, Principles of Geo-technical Engineering, Cengage Learning
13. Kueffer and Lillesand, Remote sensing and Image interpretation
14. . Understanding GIS, ISRI Publications.
15. Valdiya K. S., Environmental Geology in Indian Context –Tata Mc Graw Hill

LIST OF EXPERIMENT

1. Identification of simple rock-forming minerals and important ores.
2. Identification of rocks.
3. Simple map Exercises.
4. Field Visit / Geological Excursion.