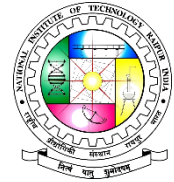


National Institute of Technology Raipur

Course of Study and Scheme of Examination							B. Tech. 4th Semester				Branch: Civil Engg.	
S. No.	Subject Code	Subject Name	Periods per Week			TA	Examination Scheme				Total Marks	Credits
			L	T	P		MSE/MTR		ESE/ESVE			
							Theory	Prac.	Theory	Prac.		
1	CV104101CV	Structural Analysis I	3	1	0	20	30		50		100	4
2	CV104102CV	Fluid Mechanics II	3	1	0	20	30		50		100	4
3	CV104103CV	Geotechnical Engineering-I	3	1	0	20	30		50		100	4
4	CV104104CV	Civil Engineering Drawing	3	1	0	20	30		50		100	4
5	CV104105CV	Water Resource Engineering	3	1	0	20	30		50		100	4
6	CV104001MA	Mathematics IV	3	1	0	20	30		50		100	4
7	CV104401CV	Geotechnical Engineering Lab	0	0	2	40		20		40	100	1
8	CV104402CV	Fluid Mechanics Lab	0	0	2	40		20		40	100	1
												26

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Structural Analysis I

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	3-1-0, (4)	EPR	CV104101CV
[Pre Requisite- Engineering Mechanics (Basic Engineering Course I), Mechanics of Solids]			

Course Objectives

1. To understand the concept of analysis of indeterminate structures by various classical methods
2. To understand different structural systems like trusses, frames, arches, cable and suspension bridges.
3. To analyze indeterminate structures using energy methods.
4. To analyze structures for gravity loads and moving loads.

Course Content

Unit-I: Concept of Structural Analysis

General Introduction on Concept of Analysis, Concept of Force Method of Analysis, Statically Determinate vs. Indeterminate Structures, Static Indeterminacy, External and Internal Static Indeterminacy, Analysis of Pin Jointed Plane and Space Truss, Method of Substitution and Method of Tension Coefficient.

Unit-II: Deflection and Slope

Moment Curvature Relation, Elastic Curve, Relation Between Loading, Shear Force, and Bending Moment. Slope and Deflection, Deflection and Slopes of Statically Determinate Beams by Double Integration Method, Macaulay's Method, Area Moment Method, and Conjugate Beam Method.

Unit-III: Strain Energy

Concepts of Strain Energy, Strain Energy Due to Axial, Bending, Shear and Torsion Effects, Castigliano's Theorem, Unit Load and Strain Energy Method for Determination of Deflections of Statically Determinate Beams, Trusses And Frames.

Unit-IV: Rolling Loads and Influence Lines

Introduction to Rolling Loads, Concept of Influence Lines, Influence Lines for Reaction, Shear Force and Bending Moment of Simply Supported Beams, Influence Lines for Forces in Trusses, Analysis for Different Types of Rolling Loads, Single Concentrated Load, Several Concentrated Loads, Uniformly Distributed Load, Absolute Maximum Bending Moment.

Unit-V: Arches, Cables & Suspension Bridges

Theory of Arches, Eddy's Theorem, Analysis of Three-Hinged and Two-Hinged Arches, Effect of The Settlement and Temperature, Influence Line Diagram, Analysis of Forces in Cables with Concentrated and Continuous Loadings, Suspension Bridges.

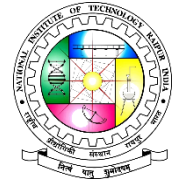
Course Materials

Required Text: Text books

1. Reddy, Basic Structural Analysis, Tata McGraw Hill, Third Edition
2. Wang, Intermediate Structural Analysis, Tata McGraw Hill, Second Edition
3. Prakash Rao, Graphical Method of structural Analysis, Universities Press, First Edition

Optional Materials: Reference Books

1. Kassimali, Structural Analysis, Cengage, Fifth Edition
2. Hibbler, Structural Analysis, Pearson Publication, Ninth Edition
3. Willbur and Norris, Elementary Structural Analysis, Literary Licensing, First Edition
4. Menon, Structural Analysis, Narosa Publication, Third Edition
5. Negi, Structural Analysis, Tata McGraw Hill, Second Edition



Fluid Mechanics II

[4th Semester, Second Year]

Course Description

Offered by Department

Civil Engineering

[Pre Requisite- Fluid Mechanics I]

Credits

3-1-0, (4)

Status

EPR

Code

CV104102CV

Course Objectives

1. To compute drag and lift coefficients using the theory of boundary layer flows
2. To compute the flow profiles in channel transitions
3. To design experimental procedure for physical model studies
4. To design the working proportions of hydraulic machines.

Course Content

Unit -I:

Turbulent flow in pipes: Nature of turbulence, free and wall turbulence, turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, energy and momentum correction factor, resistance coefficient (friction factor) and its variation, Colebrook-White equation, Moody's diagram, explicit equation for friction factors.

Unit-II:

Boundary layer analysis: Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, and laminar sub layer, application of momentum equation, local and average friction coefficient, boundary layer separation, fluid flow past submerged bodies: drag and lift, drag on sphere, cylinder, Magnus effect.

Unit-III:

Dimensional analysis and hydraulic similitude: Dimensional analysis, Rayleigh method, Buckingham's π theorem, important dimensionless numbers and their significances, geometric, kinematics and dynamic similarity, model study.

Unit-IV:

Non-uniform flow in open channel: Specific energy, critical low, analysis of flow over hump and transition, broad crested weir, equation of gradually varied flow, classification of GVF profiles, Specific force and hydraulic jump, evaluation of its elements in rectangular channel.

Unit-V:

Hydraulic machines: Turbines, classification of turbines, draft tube, specific speed, unit quantities, and characteristics curves of turbines, and governing of turbine, Introduction to pumps, classification of pumps, types, efficiencies, specific speed, selection, cavitations, characteristic curves.

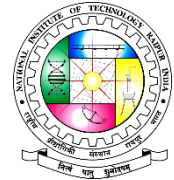
Course Materials

Required Text: Text books

1. Fluid Mechanics and Machines - Dr. A.K. Jain
2. Fluid Mechanics - Streeter V.L. & Wylie E.B.
3. Fluid Mechanics - F M White.

Optional Materials: Reference Books

1. Fluid Mechanics - P.N. Modi, S. N. Seth.
2. Mechanics of Fluid - Irving H. Shames
3. Introduction to Fluid Mechanics - James A. Fay
4. Fluid Mechanics - R.J. Garde
5. Fluid Mechanics - John F Douglas.



Geotechnical Engineering-I

[4th Semester, Second Year]

Course Description

Offered by Department

Civil Engineering
[Pre Requisite- -]

Credits

3-1-0, (4)

Status

EPR

Code

CV104103CV

Course Objectives

1. To understand the importance of soil, soil types classification, and its properties
2. To understand role of water in soil behavior and stresses, permeability and seepage including flow net, and stress distribution.
3. To understand the fundamental concepts of compressibility and its significance in Civil Engineering projects.
4. To understand the importance of shear parameters and stress changes in soil due to foundation Loads.

Course Content

Unit-I: Introduction

Introduction to Engineering Geology, Soil Mechanics, Rock mechanics and Geotechnical Engineering; Unique nature of soil and rock; Soil and rock formation and soil types.

Index Properties of Soil: Basic definitions; phase relations; physical and engineering properties of soil, properties of coarse and fine grained soils, Stoke's law, method of fine grained analysis.

Unit-II: Soil Classification and Effective Stress

Soil and rock mineralogy, soil structure, Indian standard soil classification system, Purpose of soil Classification, Field Identification, Principal of Effective Stress and Related Phenomena, Types of soil moisture; capillarity; seepage force and quicksand condition.

Unit-III: Compaction, Permeability and Seepage Analysis of Soil

Compaction theory, laboratory compaction tests, method of compaction control, permeability, one dimensional flow, permeability of soil, Darcy's law, laboratory methods of determination, pumping out tests for field determination of permeability, seepage through soils, two-dimension flow problems, confined flow and unconfined flow, flow nets and their characteristics, exit gradient and failure due to piping, criteria for design of filters.

Unit-IV: Stresses Due to Applied Loads and Consolidation

Stresses due to applied Loads, Boussinesq equation of vertical pressure under concentrated loads, rectangular loaded area, circular Loaded Area Newmart's Chart, Westergaurd's equation, compressibility, effects of soil type, stress history and effective stress on compressibility, consolidation, factors affecting consolidation and compressibility parameters, normally consolidated and over consolidated soils, different forms of primary consolidation equation – transient flow condition, Terzaghi theory of one-dimensional consolidation and time rate of consolidation.

Unit-V: Shear Strength and Soil Exploration

Introduction, stress at a point and Mohr's stress circle; Mohr-Coulomb Failure criterion: shear strength parameters; UU, CU and CD tests and their relevance to field problems; Shear strength characteristics of normally consolidated, over-consolidated and reconsolidated soil.

Soil Exploration, Various Method of field Exploration, Undisturbed Soil Sampling equipments and Field test (Static & Dynamic Penetration Test, Field Vane Shear Test), modern electronic test of site characterization.

Course Materials

Required Text: Text books

1. Text Books:- Basic and Applied Soil Mechanics – Gopal Ranjan & Rao A.S.R. (New Age International, New Delhi, 1998)
2. Braja M. Das, Fundamentals of Geotechnical Engineering, Thomson Asia Pvt. Ltd., Singapore, 2005.
3. Murthy, V.N.S., A text book of Soil Mechanics and Foundation Engineering, UBS Publishers Distributors Ltd., New Delhi, 1999.

Optional Materials: Reference Books

1. Geotechnical Engineering: Gulhati S.K., Datta, M. (Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005).
2. Soil Mechanics and Foundation Engineering – S.N. Murthy (Dhanpat Rai Publications)
3. Soil Engineering in Theory and Practice (Vol-II) – Alam Singh (Asia Publishing House, New Delhi)

4. Design Aids in Soil Mechanics and Foundation Engineering – S.R. Kaniraj (Tata McGraw Hill, New Delhi)
5. Geotechnical Engineering Principles and Practice – Donald P. Coduto (Prentice Hall of India, New Delhi)



Civil Engineering Drawing

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering [Pre Requisite- Engineering Graphics]	3-1-0, (4)	EPR	CV104104CV

Course Objectives

1. To create ability in understanding fundamental principles of building planning, National building code guidelines and Building byelaws.
2. To create ability in understanding and envisaging the fundamental concepts in designing and drawing plans, sections and elevations of various types of buildings, doors, windows and roofs.
3. To create ability in implementing the scientific, technical, analytical and drawing skills in Civil Engineering building planning for benefit of society.

Course Content

UNIT-I: Principles of Building Planning

General Principles of planning; National Building code, Municipal regulations and bye-laws for different types of buildings; Different types of Plans; terminology, symbols and notations of building elements; Site selection and requirements for different types of buildings, Building rating systems.

UNIT-II: Plan, Section and Elevation of Buildings

Single line plan, Double line plan, Sectional detailing and elevation for different types of buildings.

UNIT-III: Perspective Drawing

Elements and methods of perspective drawing; Applications, Examples on blocks and buildings.

UNIT-IV: Doors, Windows and Roofs

Drawing of flush shutter, paneled shutter, fully glazed, half glazed and half paneled doors and Windows; Drawing and detailing of Trusses and Roofs, Industrial Roof.

UNIT-V: Computer Aided Drawing

Basic commands; working with commands in executing simple drawings; Drawing various plans, sections and elevations using computer aided drawing tools, BIM.

Course Materials

Required Text: Text books

1. Building Drawing- Shah M.G., Kale M. & Patki S.Y., Tata McGraw Hill, New Delhi, 2000
2. Civil Engineering Drawing- V.B. Sikka, Katson Books, New Delhi, 2013.
3. CAD Manual.

Optional Materials: Reference Books

1. Civil Engineering Drawing and Design- D.N. Ghosh, CBS Publishers, New Delhi, Second edition, 2015
2. Civil Engineering Drawing- Malik R. S., Meo G.S., New Asian Publishers, New Delhi, 2009.



Water Resource Engineering

[4th Semester, Second Year]

Course Description

Offered by Department

Civil Engineering
[Pre Requisite- --]

Credits

3-1-0, (4)

Status

EPR

Code

CV104105CV

Course Objectives

1. To understand fundamental concepts of water cycle and hydrology
2. To be able to perform estimation of various hydrological parameters
3. To understand the fundamental concepts of irrigation engineering

Course Content

Unit-I:

Introduction: Hydrologic cycle, water budget, catchment and its characteristics, sources of hydrological data.

Precipitation: Mechanism of formation, forms of precipitation, measurement of precipitation, types of rain gauges, rain gauge network, presentation of rainfall data, average precipitation over an area, methods of computing missing rainfall data, test for consistency of rainfall record.

Unit-II:

Infiltration: Introduction, factors affecting infiltration, measurement of infiltration, infiltration indices.

Evaporation and evapotranspiration: Introduction, factors affecting evaporation, estimation of evaporation, reducing evaporation from water surfaces; Evapotranspiration, estimation of evapotranspiration.

Unit-III:

Stream-flow measurement: Introduction, measurement of stage & discharge by various methods, stage-discharge relationships, rating curve, stream gauging network.

Runoff: Introduction, classification of runoff, factors affecting runoff, methods of estimating runoff volume, rainfall-runoff relationships and Soil conservation services curve number method.

Unit-IV:

Hydrographs: Introduction, storm hydrograph, unit hydrograph, derivation of unit hydrograph from complex storms, S-hydrograph, synthetic unit hydrograph, hydrologic and hydraulic routing.

Unit-V:

Ground water: Introduction, occurrence and movement of ground water, flow through porous media- Darcy's law, flow through confined and unconfined aquifer, steady state well hydraulics, Sea water intrusion.

Irrigation: Introduction, irrigation methods, crop water requirements, Duty, Delta, factors affecting duty and delta, intensity of irrigation, canal irrigation.

Course Materials

Required Text: Text books

1. Subramanya K, Engineering Hydrology, McGraw Hill Education
2. Reddy P Jaya Rami, A Text Book of Hydrology, Laxmi Publication
3. Modi P N, Irrigation, Water Resources & Water Power Engineering, Standard Book House
4. Garg S K, Hydrology and Water Resources Engineering, Khanna Publishers

Optional Materials: Reference Books

1. Chow VenTe, Mays LW &Maidment DR, Applied Hydrology, McGraw Hill Education
2. Raghunath H M, Hydrology Principles & Analysis, New Age Intern. Publication
3. Goyal Manish Kumar, Engineering Hydrology, PHI Learning pvt. Ltd
4. Mays Larry W, Water Resources Engineering, Wiley
5. Todd David K & Mays Larry W, Ground Water Hydrology
6. Ralph A Wurbs& Wesley P James, Water Resources Engineering, PHI Learning pvt. Ltd



Mathematics IV

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Mathematics	3-1-0, (4)	EPR	CV104001MA

[Pre-requisite: Mathematics-I, Mathematics-II]

Course Objectives

To enable the students to apply the knowledge of Mathematics in various fields:

1. Introduce the method to solve the algebraic, transcendental and simultaneous linear equations and its application.
2. Introduce the method to solve the problems related to data appear equal or unequal intervals and to obtain a functional relationship between the observed values.
3. Introduce the method to calculate the derivative of the function and evaluate the definite Integral from set of numerical values.
4. Introduce the method to solve the ordinary differential equations using different numerical techniques.

Course Content

UNIT-I: Numerical Solution of Algebraic, Transcendental and Simultaneous Linear Equations

Errors in numerical computation, Error type, Bisection Method, Regula – Falsi Method, Secant Method, Newton-Raphson Method, Direct Methods: Gauss Elimination, Gauss-Jordan & Crout's Triangularization Method, Iterative Methods: Jacobi's, Gauss- Seidel & Relaxation Methods.

UNIT-II: Interpolation and Curve Fitting

Finite differences, Forward, Backward & Central Difference Interpolation Formulae, Lagrange's Formula and Newton's Divided Difference Formula, Principle of Least Squares, Fitting a Straight Line, Fitting a Parabola, Exponential Function, Method of Group Averages.

UNIT-III: Numerical Differentiation and Integration

Derivatives using Forward, Backward and Central Difference Formulae, Derivatives using unequally spaced values, Newton-Cote's Quadrature Formula, Trapezoidal rule, Simpson's 1/3 rules, Simpson's 3/8 rules, Weddle's rule.

UNIT-IV: Numerical Solution of Ordinary Differential Equations

Picard's method, Taylor's Series method, Euler's Modified method, Runge-Kutta method of Fourth Order, Milne's method, Adams–Bashforth method to solve ODE.

Course Materials

Required Text: Text books

1. M. K. Jain, S. R. K. Iyengar & R. K. Jain Numerical Methods for Scientific and Engineering Computation, New Age International (P) Limited, Publisher.
2. B. S. Grewal, Numerical Method in Engineering and Science, Khanna Publisher.
3. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw-Hill, Inc. Publisher.

Optional Materials: Reference Books

1. P. Kandasamy, K. Thilagavathy, & K. Gunavathi, Numerical Methods, S. Chand Publisher.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons Inc. Publisher.
3. S. S. Sastry, Introductory methods of numerical analysis, PHI, Publisher.



Geotechnical Engineering Lab

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering [Pre Requisite- Geotechnical Engineering]	0-0-2, (1)	EPR	CV104401CV

Course Objectives

1. To create ability in understanding the significance of various properties of soil for civil engineering construction practices.
2. To develop ability in performing various laboratory experiments related to soil for infrastructure projects.
3. Develop an understanding to use soil properties for implementation of Geotechnical Engineering problems in real time practice for benefit of society.

Course Content

List of Experiments:

1. Determination of moisture content and Specific Gravity of Soil.
2. Determination of grain size distribution of soil by dry and wet analysis.
3. To determine Atterberg's (Consistency) Limit of Soil.
4. To determine in-situ density of soil by core cutter and sand replacement method.
5. To determine MDD and OMC of soil by compaction test.
6. To determine California bearing ratio value of soil.
7. To determine coefficient of Permeability by permeability tests of soil.
8. To determine shear strength parameters by Direct shear test of soil
9. To determine shear strength parameters of soil by Unconfined compression test.
10. To determine shear strength parameters of soil by Tri-axial test.
11. To determine shear strength parameters by vane shear test of soil.
12. To determine coefficient of consolidation of soil by odeometer test.
13. To determine swelling index and swelling pressure of soil
14. To determine density index of cohesion less soil.
15. To determine resilient modulus of soil by cyclic triaxial test.
16. To determine properties of geosynthetics by universal testing machine

Course Materials

Required Text: Text books

1. Basic and Applied Soil Mechanics – Gopal Ranjan & Rao A.S.R. (New Age International, New Delhi, 1998)
2. Geotechnical Engineering Laboratory Manual, Civil Engineering Department NIT Raipur.
3. Relevant IS Codes.

Optional Materials: Reference Books

1. Geotechnical Laboratory Measurements for Engineers- John T. Germaine, Amy V. Germaine, John Wiley & Sons
2. Soil Mechanics and Foundation Engineering – S.N. Murthy (Dhanpat Rai Publications).



Fluid Mechanics Lab

[4th Semester, Second Year]

Course Description

Offered by Department	Credits	Status	Code
Civil Engineering	0-0-2, (1)	EPR	CV104402CV

[Pre Requisite- Fluid Mechanics I & Fluid Mechanics II]

Course Objectives

1. To calibrate flow discharge measuring device used in pipes, open channels and tanks
2. To characterize laminar and turbulent flows
3. To determine losses during flow in pipes.
4. To test the performance of pumps and turbine and select appropriate Hydraulic Machines

Course Content

List of Experiments:

1. To determine the metacentric height of a ship model.
2. To study the transition from laminar to turbulent flow and to determine the lower critical Reynold's number.
3. Verification of Bernoulli's equation.
4. Verification of momentum equation.
5. To calibrate a venturimeter and study the variation of the coefficient of discharge with the Reynolds number.
6. To calibrate a orificemeter and study the variation of the coefficient of discharge with the Reynolds number.
7. To study the velocity distribution in pipe and to compute the discharge by integrating velocity profile.
8. To study the energy loss due to friction for pipe flow.
9. Determination of head loss coefficient due to sudden expansion in pipe, sudden contraction in pipe, pipe bends.
10. To calibrate a triangular notch, rectangular notch, trapezoidal notch.
11. To obtain the surface profile of a forced & free vortex.
12. Study of the hydraulic jump in an open channel.
13. To determine the coefficient of discharge of a spillway.
14. To study the performance characteristics of Pelton wheel turbine.
15. To study the performance characteristics of Francis turbine.
16. To study the performance characteristics of variable speed centrifugal pump.
17. To study the performance characteristics of rated speed centrifugal pump.
18. To study the performance characteristics of multistage pump.
19. To study the performance characteristics of reciprocating pump
20. Study of cavitation.
21. Study on Hydro pneumatic pumping

Course Materials

Required Text: Text books

1. Fluid Mechanics and Machines - Dr. A.K. Jain
2. Engineering Fluid Mechanics Experiments - K.L.Kumar

Optional Materials: Reference Books

1. Hydraulic Machines- Jagdish Lal,
2. Hydraulics Laboratory Manual - S.K. Likhi