



| National Institute of Technology Raipur | | | | | | | | | | | | |
|---|--------------|--|------------------|---|---|-----------------------|--------------------|-------|----------|---------------------|-------------|---------|
| Course of Study and Scheme of Examination | | | | | | B. Tech. 3rd 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 | CV103101CV | Fluid Mechanics-I | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 2 | CV103102CV | Mechanics of Solids | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 3 | CV103103CV | Surveying | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 4 | CV103104CV | Civil Engineering Construction and Materials | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 5 | CV103105CV | Concrete Technology | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 6 | CV103001MA | Mathematics III | 3 | 1 | 0 | 20 | 30 | | 50 | | 100 | 4 |
| 7 | CV103401CV | Material Testing Lab & Concrete Lab | 0 | 0 | 2 | 40 | | 20 | | 40 | 100 | 1 |
| 8 | CV103402CV | Surveying Lab | 0 | 0 | 2 | 40 | | 20 | | 40 | 100 | 1 |
| | | | | | | | | | | | 26 | |

Fluid Mechanics I

[3rd Semester, Second Year]

Course Description

Offered by Department

Civil Engineering

[Pre-requisites: Intermediate Physics and Mathematics]

Credits

3-1-0, (4)

Status

EPR

Code

CV103101CV

Course Objectives

To Compute hydrostatic forces acting on submerged surfaces for Applying conservation laws to solve steady state fluid flow problems, the basic laws of mechanics in the fields of hydrology, irrigation engineering and hydraulic structures and Analyze the characteristics of flow through pipes, open channel flow.

Course Content

Unit-I:

Fluid and continuum, physical properties of fluids ideal and real fluid, Newtonian and Non-Newtonian fluid, pressure density height relationship, pressure measurement, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, metacentric height, fluid mass subjected to uniform accelerations.



Unit-II:

Kinematics of fluid flow: Types of flow, streamlines, streak lines and path lines, circulation and vorticity, rotational and irrotational flow, velocity potential and stream function, flow nets, continuity equation.

Dynamics of fluid flow: Euler's equation of motion along a streamline and its integration, Navier Stroke Equation, Bernoulli's equation and its applications - Pitot tube, Venturimeter, Orificemeter, Nozzles, momentum equation and its application to stationary and moving plates/vanes, impact of jets, pipe bends, problems related to combined application of energy and momentum equations.

Unit-III:

Flow in pipes: Reynold's experiment, experimental determination of critical velocity, transition from laminar to turbulent flow, concept of equivalent length, pipes in series and parallel, Energy losses in pipe lines, analysis of pipe network (Hardy-Cross method), two & three reservoir problem, siphon, transmission of pressure waves in rigid and elastic pipes, water hammer, and analysis of simple surge tank excluding friction.

Unit-IV:

Flow in open channel: Comparison between open channel and pipe flow, definition of uniform and non-uniform flow, uniform flow formulae, Chezy's and Manning's Formula, Hydraulically efficient channel section of rectangular, trapezoidal and circular type, Economical Sections, Compound Sections.

Unit-V:

Flow through mouthpieces and orifices: Hydraulic coefficients of orifice, bell method orifice, mouthpieces, Borda's mouthpieces, running free and submerged.

Notches and weirs: Rectangular, triangular and trapezoidal notches and weir, Cippoletti and broad crested weir, aeration of nappe, cavitations submerged weir.

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 - Dr. P.N. Modi
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

Mechanics of Solids

[3rd Semester, Second Year]

Course Description

Offered by Department

Civil Engineering

[Pre-requisites: Engineering Mechanics (Basic Engineering Course I)]

Credits

3-1-0, (4)

Status

EPR

Code

CV103102CV

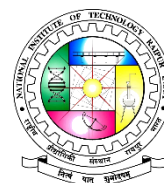
Course Objectives

1. To Identify modes of deformation (axial, shear, bending, and torsional) and associated stress states and check stress distribution over cross sections.
2. To determine principal stresses and strains in structural members.
3. To draw shear force and bending moment diagrams for determinate structures and students will be able to solve the problems of combined stresses, and column failure.
4. To understand the unsymmetric loading and its response in symmetric and unsymmetric sections. Effect of torsion in shafts, power transmission by hollow and solid circular shafts

Course Content

Unit-I: Stress Strain Relations

Types of Stresses and Strains, Hooke's law, Uniaxial Tensile Test, Strain-Stress Curve for Different Materials, Poisson's Ratio, Elastic Modulus, Bulk Modulus, Shear Modulus, and Their Relations, Thermal Effects, Elongation of Bars of Constant and Varying Sections.



Unit-II: Analysis of Stresses and Strains

Components of Stresses in Rectangular Co-Ordinates, Plane Stresses, Principal Stresses, Plane Strains, Principal Strains, Shear Stresses and Strains. Mohr's Circle for Stresses and Strains, Stresses in Thin Cylinders and Spherical Shells, Elastic Theories of Failure; Maximum Principal Stress, Maximum Shear Stress, Maximum Principal Strain, Total Strain Energy Theory and Maximum Distortion Energy Theory.

Unit-III: Bending of Beams

Shear force and Bending Moment Diagrams for Statically Determinate Beams and Plane Frames. Theory of Simple Bending; its Assumptions and Limitations, Variation of Bending and Shear Stresses in Different Cross-Sections, Beams of Uniform Strength, Flitched Beams.

Unit-IV: Columns and Combined Stresses

Stable and Unstable Equilibrium, Short Columns, Euler's Formula for Long Columns, Rankine's Formula, Secant Formula. Beams Subjected to Bending and Shear, Eccentrically Loaded Short Column, Kern of Rectangular Sections, Middle Third and Middle Quarter Rule.

Unit-V: Unsymmetrical Bending and Torsion

Unsymmetrical Bending, Location of Neutral Axis, Shear Flow, Shear Centre, Determination of Shear Centre for Simple Sections, Theory of Pure Torsion in Solid and Hollow Circular Shafts, Torsional Shear Stresses and Angle of Twist, Transmission of Power.

Course Materials

Required Text: Text books

1. Timoshenko and Gere, Mechanics of Materials, CBS Publishers, Second Edition
2. Subramanian, Strength of Materials, Oxford Higher Education, Third Edition

Optional Materials: Reference Books

1. Beer and Johnston, Mechanics of Materials, McGraw Hill International, Seventh Edition
2. Shames and Pitarresi, Introductions to Solid Mechanics, Prentice Hall of India, Third Edition
3. Popov, Engineering Mechanics of Solid, Pearson Publication, Second Edition
4. Gambhir, Fundamentals of Solid Mechanics, PHI Learning Pvt. Ltd., First Edition.
5. Schaum's Outline Series, Strength of Materials, McGraw Hill, Fourth Edition.

Surveying

[3rd Semester, Second Year]

Course Description

Offered by Department

Civil Engineering

[Pre-requisites: Intermediate Mathematics]

Credits

3-1-0, (4)

Status

EPR

Code

CV103103CV

Course Objectives

1. To understand the importance of surveying and calculation of distance and direction.
2. To undertake the survey project related to leveling and preparation of contour map.
3. To perform traversing by using Theodolite and Tacheometer and their applications.
4. To understand the procedure of Triangulation, Errors and their corrections and application of curves in highway and railway.
5. To understand the basic concept of photogrammetry, GIS and to fix the absolute positions of a point using astronomical observation.

Course Content

Unit –I: Distance and Angular Measurement

Principle of surveying, Chain surveying; Ranging, Errors & Adjustment, Electronics Distance Measurement (EDM); Compass surveying: Bearing systems, Calculation of Angles and Bearings, Local attraction. Plane table surveying, Resection by various methods; Two point and Three point.



Unit –II: Levelling and Contouring

Levelling, Types of levelling, Longitudinal and Reciprocal levelling, Temporary & Permanent adjustments of levels, Checks, Errors and Adjustments, Automatic level, Trigonometrical levelling; Contouring, Methods, Interpolation, Drawing section from contour map.

UNIT-III: Theodolite Traversing

Theodolite, Temporary and Permanent adjustment, Different methods for measurement of Horizontal and Vertical angles, Methods of traversing, Balancing a traverse, Errors, Checks and Adjustment, Omitted measurements. Tacheometry, Principles and methods of Tacheometry, Range finding; Total station survey.

UNIT-IV: Triangulation, Theory of Errors and Curves

Triangulation, Classifications, Satellite station, Base line measurement, Trilateration. Theory of errors, Triangulation adjustments, Distribution of errors; Normal equation, Adjustment of triangles; Curves, Classification, Methods for setting out curves.

UNIT-V: Photogrammetry, GIS and Field astronomy

Introduction to photogrammetry, Scale, Flying height, Photo interpretation; Introduction to remote sensing, Geographical information system and Global positioning system; Field astronomy: Astronomical triangle, Astronomical co-ordinate system, Azimuth determination, Application of DGPS.

Course Materials

Required Text: Text books

1. R. Agor, Surveying and leveling, Khanna Publishers
2. Kanetker and Kulkarni, Surveying and leveling, Pune Vidhyarthi, GrihaPrakashan, Pune.
3. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Seventeenth edition, Laxmi Publications, 2016.
4. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Higher Surveying, Fifteenth edition, Laxmi Publications, 2010.

Optional Materials: Reference Books

1. Charles D Ghilani, Paul R Wolf., Elementary Surveying, Prentice Hall, 2012
2. T. M. Lillisand and R. W. Kaifer, Remote Sensing & Image Interpretation, John Wiley & Sons Inc. 6th Edition, 2007.
3. Kang-tsuang Chang, Introduction to Geographical Information System, Mc-Graw Hill Education, Fourth Edition, 2017.
4. James, M Anderson & Edward M Mikhail., Surveying Theory and Practice, Seventh edition, Mc Graw Hill, 2012
5. I. Heywood, S. Cornelius and S. Carver, An Introduction to Geographical Information System, Person Education, Third Edition, 2010.
6. S. K. Duggal, Surveying, Volume I& II, Fourth edition, Mc-Graw Hill Education Private Limited, 2016.

Civil Engineering Materials and Construction [3rd Semester, Second Year]

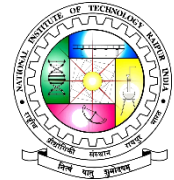
Course Description

| Offered by Department | Credits | Status | Code |
|---|------------|--------|------------|
| Civil Engineering [Pre-requisites: Basic Sciences] | 3-1-0, (4) | EPR | CV103104CV |

Course Objectives

1. To understand the nature, characteristics, performance, and behavior of civil engineering materials used in buildings and infrastructure.
2. To evaluate their physical and mechanical properties.
3. Learn how to select materials based on their properties and their proper use for a particular facility under prevailing environmental conditions
4. Develop construction layout skills.

Course Content



Unit –I: Timber, Plywood and Paints, Glass

Characteristics of good timber, defects in timber, density moisture relationship, seasoning and preservation, types and species of structural timber and their suitability, codal provision for design, Types and uses of plywood, veneers and hardboards. Uses of Plastics and PVC. Composition and use of paints, varnishes and distempers. Introduction to Composite materials, types and applications in construction.

Other materials for construction – Cost effective materials, industrial byproducts, agricultural byproducts, Construction & demolition waste Commercially available varieties of ceramics, glass and their uses, types of tiles, method of Manufacturing and tests for suitability, Introduction to new materials (Survey and study), and locally available materials.

Unit –II: Foundations

Types of foundations and their construction practices for normal and adverse site conditions.

Unit -III: Brick, stone and other masonry: materials and construction practices

Walls: Load bearing, cavity-walls, partition walls and their construction practices, Plastering and Pointing.

Joints: Construction, Contraction and Expansion Joints in buildings.

Doors, Windows and Lintels: Types, Materials and construction.

Unit -IV : Floors, Roofs and Stairs

Floors: Types, their suitability, construction details of concrete and terrazzo floors, Floor tiles.

Roofs: Types of pitched and flat roofs. Various roof coverings for pitched and flat roofs.

Stairs: Types based on geometry and material, suitability, proportioning of stairs, lifts and escalators.

Unit -V: Formwork

Scaffolding, Shuttering including new shuttering materials, Slip-form; types and construction practices, Damp Proofing, Sound Proofing and Fire Proofing construction practices.

Course Materials

Required Text: Text books

1. National Building Code of India (IS SP 7) 2016
2. Building Materials –S.K. Duggal 3rd Edition
Building Materials – S. C. Rangwala 33rd Edition
3. Building Construction – B.C. Punmia A.K Jain and A. Jain 11th Edition
Building Construction – Sushil Kumar 20th Edition
4. Relevant Bureau of Indian Standard Codes

Optional Materials: Reference Books

1. Civil Engineering Materials and Construction R.K Gupta
2. Civil Engineering Construction Materials Paperback –S. K. Sharma

Concrete Technology

[3rd Semester, Second Year]

Course Description

Offered by Department

Civil Engineering

[Pre-requisite: Basic Sciences]

Credits

3-1-0, (4)

Status

EPR

Code

CV103105CV

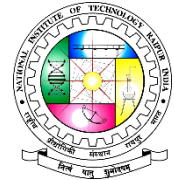
Course Objectives (CO)

1. To Test and identify good materials for making good concrete
2. To carryout Mix design of cost effective and durable concrete
3. To acquire knowledge of latest advances in concrete technology

Course Content

Unit –I: Concrete Materials

Cement; Composition and types of Cement, Hydration of cement, tests on properties of cement. Aggregates-Classification, properties and tests. Blending of aggregates, Rheology of concrete and Microstructure, Cement and lime mortar, New concrete materials.



Unit –II: Properties of Concrete and Admixtures

Properties of fresh concrete and hardened concrete, Creep and shrinkage, Variability of concrete strength. Effect of temperature, Corrosion, Chemical and mineral admixtures.

Unit -III: Concrete Mix Design

Principles of concrete mix design, Particle packing theories, Methods of concrete mix design, Testing of concrete.

Unit -IV: Concreting Methods

Process of manufacturing of concrete, mixing, methods of transportation, transportation, placing, compaction, External and Internal curing, Extreme weather concreting, special concreting methods, Vacuum dewatering - underwater concrete, special form work.

Unit -V: Special Concrete

Light weight concrete, Fly ash concrete, Polymer concrete, Geopolymer Concrete, Super plasticized concrete, Epoxy resins and screeds for rehabilitation - Properties and Applications - High performance concrete, Green concrete, Self-Compacting Concrete, Shotcrete, grouting, guniting. Types of Fibers and fiber reinforced concrete.

Course Materials

Required Text: Text books

1. Properties of Concrete – Neville, A.M., (Pitman Publishing Limited, London)
2. Advanced Concrete Technology – Li (Wiley)

Optional Materials: Reference Books

1. Concrete – Mehta, P. K. and Monteiro, J. M. (Tata McGraw Hill)
2. Concrete Durability – Dyer Thomas (CRC Press, Taylor and Francis)

Mathematics III

[3rd Semester, Second Year]

Course Description

Offered by Department

Mathematics

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

Credits

3-1-0, (4)

Status

EPR

Code

CV103001MA

Course Objectives

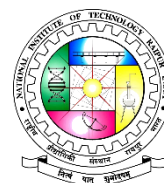
To enable the students to apply the knowledge of Mathematics in various fields:

1. Introduce the Fourier Series and Fourier Transform
2. Introduce the concepts Laplace Transform and its application in solution of differential equations and improper integral
3. Able to form and solve the partial differential equation using different analytical techniques with application in solution of wave and Laplace equations
4. Introduce to probability and basic statistical data analysis.

Course Content

Unit-I: Fourier Series and Fourier Transform

Expansion of function as Fourier series, Functions having points of discontinuity, Change of interval, Even & Odd functions, Half-range series, Harmonic analysis, Fourier Transformation, Inverse transformation, Finite cosine and sine transform.



Unit-II: Laplace Transform

Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives and integrals, Multiplication by t^n , Division by t , Evaluation of Integrals, Periodic functions, Inverse Laplace transform, Convolution theorem, Application of Laplace transform to solutions of ordinary differential equations.

Unit-III: Partial Differential Equation

Formation, Solutions by direct integration method, Linear equations of first order, Homogeneous linear equations with constant coefficients, Non-homogeneous linear equations, Method of separation of variables with application in solution of Wave, Heat and Laplace equations.

Unit-IV: Introduction to Probability and Statistics

Definitions of Probability, Conditional Probability, Random Variables, Discrete and continuous probability distributions, Expectation, Mean & Standard deviation, Moment Generating Function, Binomial, Poisson and Normal distributions, Descriptive Statistics: Collection and classification of data, Measure of Central Tendency, Measure of Dispersion, Correlation, Line of Regression.

Course Materials

Required Text: Text books

1. Advanced Engg. Mathematics by R. K. Jain and S. R. K. Iyengar–Narosa Publishing House.
2. Advanced Engineering Mathematics by Erwin Kreyszig - John Wiley & Sons.

Optional Materials: Reference Books

1. Higher Engineering Mathematics by B. S. Grewal - Khanna Publishers.
2. Higher Engineering Mathematics by B. V. Ramana, McGraw Hill

Material Testing Lab & Concrete Lab

[3rd Semester, Second Year]

Course Description

| Offered by Department | Credits | Status | Code |
|--|------------|--------|------------|
| Civil Engineering [Pre-requisite: Basic Sciences] | 0-0-2, (1) | EPR | CV103401CV |

Course Objectives

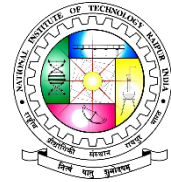
To study of various instruments/apparatus used in testing of building materials

Course Content

List of Experiments

1. Tests on Brick
2. Tests on Aggregate
3. Tests on Tiles
4. Tests on Steel
5. Tests on Cement

6. Concrete mix design and Tests on Concrete
7. Tests on Timber.



Course Materials

Required Text: Text books

Relevant Bureau of Indian Standard (BIS) codes and guidelines

Optional Materials: Reference Books

Relevant American Standard for Testing Materials (ASTM), British Standard (BS) codes and guidelines

Surveying fieldwork

[3rd Semester, Second Year]

Course Description

| Offered by Department | Credits | Status | Code |
|-----------------------|------------|--------|------------|
| Civil Engineering | 0-0-2, (1) | EPR | CV103402CV |

[Pre-requisite: --]

Course Objectives

To study of various instruments used in surveying and their uses for execution of projects related to topographical surveying.

Course Content

List of Experiments

1. Measurement of distances and area. (Cross staff survey), to plot a closed traverse with the help of Prismatic compass.
2. Measurement of elevation difference by various methods eg. Fly leveling, differential leveling. (Automatic level and Dumpy level), Preparation of contour map

3. Triangulation surveying.
4. Measurement of horizontal and vertical angle by using Theodolite
5. Measurement of distance, elevation, coordinate by using Total Station
6. Setting out of simple circular and transition curve by angular and linear method.
7. Practical demonstration of DGPS, Drone and LIDAR survey.

Course Materials

Required Text: Text books

1. James, M Anderson & Edward M Mikhail., Surveying Theory and Practice, Seventh edition, Mc Graw Hill, 2012
2. I. Heywood, S. Cornelius and S. Carver, An Introduction To Geographical Information System, Person Education, Third Edition, 2010.

Optional Materials: Reference Books

1. Charles D Ghilani, Paul R Wolf., Elementary Surveying, Prentice Hall, 2012.
2. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Seventeenth edition, Laxmi Publications, 2016