B. Tech. Civil Engineering
Semester-III

L-2 T-1 P-2 C-4

CVE-110: Surveying -I

Course Objectives

- Apply the principles and classifications of surveying.
- Develop proficiency in conducting linear and angular measurements using both direct and indirect methods.
- Demonstrate an understanding of leveling and contouring concepts and terminology.
- Acquire the necessary skills and knowledge to work with Theodolite and conduct traverse surveys while accounting for potential closing errors.
- Develop proficiency in the calculation of areas and volumes, as well as the determination of embankments, cutting, reservoir capacity, and volumes.

Course Outcomes (COs)

After completion of course, students will be able to:-

1. Apply the principles and methods of linear and angular measurements to accurately measure distances and angles in surveying, using direct and indirect methods and recognizing potential errors due to local attraction.
2. Analyze the characteristics and uses of contouring, and apply the methods of conducting contour surveys and their plotting to create accurate topographic maps.
3. Evaluate the use of Theodolite in traverse surveying, and calculate horizontal and vertical angles with appropriate temporary and permanent adjustments, including the use of trigonometry to solve height and distance problems.
4. Analyze the elements and methods of setting out simple and compound curves, reverse curves, and transition curves in order to create accurate road designs and construction plans.
5. Evaluate the areas and volumes using direct field measurement methods and select appropriate methods for computing areas along irregular boundaries, as well as the capacity of reservoirs and volume of barrow pits.

Articulation Matrix

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3	2	2	2	2	2	-	-	1	-	-	1	1	2	1	1	2	2	2
CO2	3	2	2	2	2	2	-	-	1	-	-	1	-	-	-	-	-	2	-
CO3	3	2	2	2	2	2	-	-	1	-	-	1	-	-	-	-	-	2	-
CO4	3	2	2	2	2	2	-	-	1	-	-	1	-	-	3	-	-	2	-
CO5	3	2	2	2	2	2	-	-	1	-	-	1	-	-	-	2	3	2	2

High-3 Medium-2 Low-1

COURSE CONTENT:

Unit - I Linear and Angular Measurements 8 Hours

Definitions, primary divisions of surveying, objectives, principles and classifications, plan and map, errors due to wrong scale. Linear and angular measurements; Direct and in direct methods, use of chain and tape, errors in chaining, meridians, azimuths and bearings, declination, dip, computation of angle, errors due to local attraction

Unit – II Leveling and Contouring **8 Hours**

Leveling: Concept and terminology, temporary and permanent adjustments, method of leveling, height of instrument and rise and fall method; contouring: Characteristics and uses of contours; Methods of conducting contour surveys and their plotting

Unit – III Theodolite and Traverse Surveying **8 Hours**

Theodolite, description of transit theodolite, definitions and terms, temporary and permanent adjustments, measurement of horizontal and vertical angles. Trigonometrically leveling height and distance problems, traverse survey and methods of traversing, closing errors in traversing.

Unit - IV Curves **8 Hours**

Elements of simple and compound curves, Method of setting out, Elements of Reverse curve, Transition curve, length of curve, Elements of transition curve, Vertical curves.

Unit - V Computation of Areas and Volumes **8 Hours**

Computation of areas directly from field measurements methods, computation of areas along irregular boundaries and regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

PRACTICAL

1. Measurement of an area by chain survey
2. Calculation of distance between two points with compass survey.
3. Corrections for local attraction by prismatic compass
4. Radiation method and intersection methods by plane table survey.
5. An exercise of longitudinal section and cross section and plotting.
6. Measurement of horizontal angles.
7. Curve setting: different methods.
8. Determination of an area using total station
9. Determination of remote height using total station

Total: 60 Hours

Reference(s)

1. Duggal S. K., ―Surveying (Vol-1and 2), Tata McGraw-Hill Publishers, New Delhi.
2. Punmia BC- Surveying (Vol-1and 2), Laxmi Publishers, New Delhi.
3. C. Venkatramaiah, ―Textbook of Surveying‖, Universities Press Pvt. Ltd., India.
4. Reddy, M., "Remote sensing and Geographical information system", B. S. Publications.
5. Dr A. M. Chandra, ―Surveying Problem Solving with theory and objective type questions‖, New Age International Pvt. Ltd. Publishers, New Delhi, 2nd Edition, 2005

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/

B.Tech Civil Engineering

Semester-III

L-4 T-0 P-4C-6

CVE120: Strength of Materials

Course Objectives

- To establish an understanding of the fundamental concepts of mechanics of deform able solids including static equilibrium, geometry of deformation, and material constitutive behavior.
- To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.
- To build the necessary theoretical background for further structural analysis and design courses.

Course Outcomes (COs)

1. Understand failure of a material using various theories of failure, and their relative applications, types of springs and their different conditions.
2. Apply the formulae for beams under different loading condition.
3. Apply the torsion equation formulas for circular shafts
4. Analyze the shear force and bending moment diagrams of beams and relationship between them, principal stresses and strains using analytical and graphical solutions for the safety using failure theories.
5. Evaluate the flexural and shear stresses for various beam cross sections.

Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	-	-	-	-	-	-	-
CO2	3	1	1	1	1	-	-	-	-	-	-	-
CO3	2	1	1	1	-	-	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	-	-	-	-
CO5	2	1	1	1	-	-	-	-	-	-	-	-

High-3 Medium-2 Low-1

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	-	1	1	-	1	-
CO2	3	-	1	-	-	1	-
CO3	3	-	2	-	-	1	-
CO4	3	-	2	-	-	-	-
CO5	3		-	-	1	-	-

High-3 Medium-2 Low-1

Unit - I 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, Theories of failure.

Unit-11 Bending & Deflection:

Theory of simple bending: Concept of pure bending and bending stress, Equation of bending. Neutral axis, Section-Modulus, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed loading. Bending & shear stress distribution across a section in Beams. Deflection of beams: Double Integration Method. Conjugate Beam Method, Macaulay's Method, Area Moment Method.

Unit III **Torsion of Shafts**:
Concept of pure torsion, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow shafts, Pressure Vessels: Thin and Thick-walled cylinders and spheres. Stress due to internal pressure, Change in diameter and volume

Unit - IV Unsymmetrical Bending:
Principal moment 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.

Unit – V Columns and Struts:
Classification of column, Effective Length, various end conditions, slenderness Ratio, Euler's & Rankin formulae, Stress in columns, Eccentric loading on columns

PRACTICAL

1. To perform tensile test on a specimen material using universal testing machine (UTM).
2. To perform the compression test on a specimen material and find the compressive strength (UTM).
3. To perform the bending test on a specimen material and find the bending strength (UTM).
4. To perform torsion test on a specimen and find the modulus of rigidity of the material.
5. To determine the hardness of a specimen material using Brinell's hardness test.
6. To determine the hardness of a specimen material using Rockwell hardness test.
7. To determine the impact strength of a specimen material using Charpy's test;
8. To determine the impact strength of a specimen material using Izod test.
9. To perform tensile test on a specimen material using universal testing machine (UTM).
10. To perform the compression test on a specimen material and find the compressive strength (UTM).

Total: 90 Hours

Reference(s)

1. . F. Beer, E. R. Johnston, J. De Wolf, "Mechanics of Materials", Tata McGraw-Hill Publishing Company Limited, New Delhi, Indian 1st Edition, 2008
2. . B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications Private Limited, New Delhi, 4th Edition, 2007.
3. R. K. Rajput, "Strength of Materials: Mechanics of Solids", S. Chand & Co Limited, New Delhi, 3rd Edition, 2007.

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/

B. Tech (Civil)
Semester- III

L-2 T-1 P-2 C-4

CVE 250: Building Drawing

Course Description: This course introduces students to the fundamentals of building drawing, covering various aspects of architectural drawings and their importance in the construction industry. Students will learn the principles and techniques of creating accurate and detailed building drawings using industry-standard tools and software.

Course Objectives:

- To develop an understanding of architectural drawings and their role in the construction process.
- To familiarize students with the conventions, symbols, and standards used in building drawings.
- To enable students to create detailed plans, elevations, sections, and other building drawings.
- To provide hands-on experience with relevant tools, software, and techniques used in building drawing.
- To develop the ability to interpret and analyze building drawings for construction and design purposes.

Course Outline: Course Outcomes: Upon successful completion of the course, the student will be able to-

CO1: Understand the definition and importance of building drawing and Familiarize with the conventions and standards used in building drawings
CO2: Create room layouts and functional spaces that adhere to design principles
CO3: Create cross-sectional views and details of buildings.
CO4: Create site plans and incorporate landscaping elements effectively.
CO5: Create accurate and comprehensive working drawings for construction purposes.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2	2	-	1	1	-	-	-	-	2	-	2	3	1	1	1	1	1	1
CO 2	1	1	-	1	1	-	-	-	-	2	-	2	-	-	-	-	-	-	-
CO 3	1	1	-	2	1	-	-	-	-	2	-	2	-	-	-	-	-	-	-
CO 4	1	1	-	1	1	-	-	-	-	2	-	2	-	-	-	-	-	-	-
CO 5	1	1	-	1	1	-	-	-	-	2	-	2	-	-	-	-	-	-	-

High-3 Medium-2 Low-1

Unit 1: Introduction to Building Drawing-Definition and importance of building drawing
Types of building drawings: plans, elevations, sections, details, etc.
Conventions and standards in building drawings
Understanding scales, dimensions, and annotations
Introduction to building information modeling (BIM) software

Unit 2: Plan Development-Reading and analyzing architectural floor plans
Developing floor plans from line plans and concept sketches
Incorporating architectural elements: walls, doors, windows, and partitions
Creating accurate room layouts and functional spaces
Introduction to space planning and circulation design

Unit 3: Elevation and Section Drawing
Understanding and creating building elevations
Representing building facades, materials, and finishes
Developing cross-sectional views and details
Annotations and labeling in elevation and section drawings
Applying shading and rendering techniques for visual representation

Unit 4: Site Planning and Landscape Design
Site analysis and selection
Designing site plans and landscaping elements
Plotting contours, topographic features, and grading plans
Integration of site elements with building design
Sustainable site planning and environmental considerations

Unit 5: Construction Details and Working Drawings
Developing construction details for building components
Representation of structural elements: foundations, columns, beams, etc.
Creating working drawings for construction purposes
Coordination with other disciplines: electrical, plumbing, HVAC, etc.
Principles of architectural presentation and visual communication
Creating perspectives and 3D visualizations

Recommended Resources:

- Ching, F. D. K., & Adams, C. (2014). Building Construction Illustrated. Wiley.
- Architectural Graphic Standards. (2016). Wiley.
- Neufert, E., Neufert, P., & Bousmaha Baiche, N. (2012). Neufert Architects' Data. Wiley.

B. Tech (Civil Engineering)

Semester-III

L-3 T-0 P-0 C-3

CVE100: Transportation Engineering-I (Railways, Bridges & tunnels)

Course Objectives

- To study railway track, its component parts, geometric design etc.
- To study about bridges, their component parts, substructure and superstructure, loading conditions and other characteristics.
- To study about tunnel, alignment of tunnel, tunnel construction on different types of ground.

Course Outcomes (COs) remaining

1. Understand the railway track components, their materials, size, function and importance. And the function and purpose of railway sleepers. And the different types of rails used in railway construction and maintenance, such as flat-bottomed rails, bullhead rails.
2. Understand the various components in diverging, merging and crossing of railway tracks, station, yards, signalling, interlocking and control system.
3. Understand about different types of bridge, their components, load/stresses acting on bridges, requirement and function of the components and maintenance of bridge.
4. Understand the different types of foundation such as piles and wells, and apply the knowledge to the design and construction of bridges.
5. Understand about importance, types, methods of construction, ventilation, lining and lighting in Tunnels.

Articulation Matrix

CO/PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	1	1	2	-	-	-	-	-	-	-	-	2	2	-	3	2	1	2	-
CO2	2	2	1	-	-	-	-	-	-	-	-	2	2	-	3	-	1	2	-
CO3	2	3	2	-	-	-	-	-	-	-	-	2	2	-	3	2	3	2	-
CO4	2	3	2	-	-	-	-	-	-	-	-	2	2	-	3	2	2	2	-
CO5	2	3	2	-	-	-	-	-	-	-	-	2	2	-	3	2	2	2	-

High-3 Medium-2 Low-1

UNIT I: Introduction to Railway Engineering 10 Hours

Tractive resistances & Permanent way: Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations, Route surveys and alignment, railway track, development and gauges, Hauling capacity and tractive effort, Rails (types, welding of rails, wear and tear of rails, rail creep), Sleepers (types and comparison, requirement of a good sleeper, sleeper density), Rail fastenings (types, Fish plates, fish bolts, spikes, bearing plates, chain keys, check and guard rails), Ballast (Requirement of good ballast, various materials used as ballast, quantity of ballast, different methods of plate laying, material trains, calculation of materials required, relaying of track).

UNIT II: Geometric Design of a Railway Track 07 Hours

Station & Yards; Points and Crossings & Signaling and interlocking: Formation, cross sections, Super elevation, Equilibrium, Cant and Cant deficiency, various curves, speed on curves. Types, locations, general equipment, layouts, marshalling yards, Definition, layout details, design of simple turnouts, Types of signals in stations and yards, principles of signaling and interlocking.

UNIT III: Bridge Site Investigation and Planning 08 Hours

Loading Standards & Component parts: Selection of site, alignment, collection of bridge design data: essential surveys, hydraulic design, scour, depth of bridge foundation, Economical span, clearance, afflux, type of road & railway bridges. : Design loads and forces, Impact factor, Indian loading standards for Railways Bridges and Highway Bridges, Bridge superstructures and substructures, abutments, piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

UNIT IV: Bridge Foundations **08 Hours**

Construction, Testing and Strengthening of Bridges, Different types of foundation: piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles cofferdams, Erection of bridges, girders, equipment and plants. inspection and Data collection, strengthening of bridges, Bridge failure.

UNIT V: Tunnels **08 Hours**

Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts, Construction of tunnels in soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation, Examples of existing important tunnels in India and abroad.

Total: 47 Hours

Reference(s)

1. Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press.
2. S.C. Saxena and S. P. Arora, A Text Book of Railway Engineering, Dhanpat Rai & Sons.
3. S.C. Rangwala, K.S. Rangwala and P.S. Rangwala, Principles of Railway Engineering, Charotar Publishing House, Anand.
4. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons.
5. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi
6. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai.

List of e-Learning Resources:

1. https://indianrailways.gov.in/railwayboard/
2. https://unacademy.com/course/

MANDSAUR UNIVERSITY, MANDSAUR
By-pass Square, Rewas Dewra Road, SH-31, Mandsaur (M.P.)- 458001

DEPARTMENT OF ALLIED SCIENCES

MAT 300 Engineering Mathematics with Applications
Syllabus to be offered at B.Tech. Sem – III (ME, CE, EEE)

L	T	P	C
2	1	2	4

Course Objective:

The objective of this course is to familiarize prospective engineers with techniques in Fourier transform, Laplace transform, Fourier series, sequence and series and complex variables. It aims to equip the students to deal with advanced levels of mathematics and applications that would be essential for their disciplines.

The students will learn:

- The basic knowledge of Laplace transform and fourier transform with its applications in solving differential equations.
- The tool for convergence of series and expansion of function using Fourier series for learning advanced Engineering Mathematics.
- The tools of differentiation of functions of complex variables that are used in various techniques dealing with engineering problems.
- The tools of integration of functions of complex variables that are used in various techniques dealing with engineering problems.

Course Outcomes:

On completion of course the students are able:		
COs	**COs statements**	**Bloom's Level**
CO1	Understand the basic concept of Fourier series and Fourier transform and concept of convergence to analyze the convergence of series and expansion of the function for Fourier series.	Understand, Analyze,
CO2	Understand and apply the concept of Laplace Transform to evaluate differential equations	Understand, Apply, Evaluate
CO3	Apply the concept of analyticity, Harmonic function and create the image of function applying conformal transformation	Apply, Create
CO4	Understand the basic concept of sequence and series and apply the concept of Ratio test and Root test to analyze the convergence of the series	Understand, Apply Analyze
CO5	Understand and apply the concept of Legendre polynomial to analyze the results of second order differentials equations which are used in many practical applications also Evaluate the convergence of Legendre polynomial	Understand, Apply, Analyze, Evaluate

Articulation Matrix

(Program Articulation Matrix is formed by the strength of correlation of COs with POs and PSOs. The strength of correlation is indicated as 3 for substantial (high), 2 for moderate (medium) correlation, and 1 for slight (low) correlation)

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	1	1	-		1	-	-	2	2	1
CO2	3	2	1	1	2	1	1	-	-	1	1	-	2	2	1
CO3	2	3	2	2	1	1	1	-	-	-	1	1	2	-	-
CO4	1	3	2	2	1	1	-	-	-	1	1	1	2	-	-
CO5	1	3	2	2	2	1	1	-	-	1	1	1	2	2	1

High-3 Medium-2 Low-1

HOD Allied Sciences

HOD
Department of Mathematics
Mandsaur University, Mandsaur (458001)

Unit I: Fourier series and Fourier Transform **12 Hours**

Introduction of Fourier series, Fourier series for Discontinuous functions, Euler's formula, Dirichlet's conditions, Fourier series for even and odd function. Half range series, Paresevel's formula, Complex form of Fourier series. Introduction of Fourier Transform, Properties of Fourier Transform, Sine and Cosine Transform, Convolution and Paresevel's formula for Fourier Transform.

Unit II: Laplace Transform **12 Hours**

Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, Second shifting property, Laplace Transform of the derivative, Inverse Laplace Transform & its properties, Convolution Theorem, Applications of L.T. to solve the ordinary differential equations.

Unit III:Complex Variables **12 Hours**

Limit, continuity, differentiability and analyticity of functions, Cauchy- Riemann equations, line integrals in complex plane, Cauchy's integral theorem, independence of path, existence of indefinite integral, Cauchy's integral formula, derivatives of analytic functions, Taylor s series, Laurent s series, Zeros and singularities, Residue theorem, evaluation of real integrals.

Unit IV:Sequence and Series **12 Hours**

Sequences and Series: Sequences and their limits, convergence of series, comparison test, Ratio test, Root test, Absolute and conditional convergence, alternating series, Power series.

Unit V:Solution in Series **12 Hours**

Solution in series of second order linear differential equations, Bessel's and Legendre's equations and their solutions, Properties of Bessel function and Legendre's Polynomials.

Total: 60 Hours

Reference Books:

1 P.C. Matthew's, *Vector Calculus*, Springer Verlag London Limited, 1998.
2 James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications*, 8th Ed., McGraw – Hill International Edition, 2009.
3 Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000
4 Dass H.K., Advance Engineering Mathematics , S.Chand, NewDelhi, 200

List of e-Learning Resources:

1. https://nptel.ac.in/
2. https://www.coursera.org/
3. https://www.youtube.com/results?search_query=Complex+variable+nptel
4. https://www.youtube.com/watch?v=dr6aewGUHB4&list=PLVFqK_9GOGXm-Ia53f-yONR8XhwGknj9Z&index=9

HOD Allied Sciences

Department of Mathematics
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