Teaching and Examination Syllabus

of

Bachelor of Technology (1st Year)

in

Civil Engineering

Department of Civil Engineering

Sardar Vallabhbhai National Institute of Technology, Surat

First Semester (1st year of UG) (Subjects)

Department of Civil Engineering
B. Tech. Civil Engineering

CE 101 ENGINEERING GRAPHICS

L	T	P	Credit
2	0	4	04

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1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Apply different drafting techniques and draw as per BIS and ISO specifications.
CO2	Construct different engineering curves like parabola, ellipse and hyperbola.
CO3	Understand the concept of orthographic projections i.e., projection of points, lines and planes and acquire visualization skills to execute in drawings
CO4	Learn the methods of drawing of orthographic projection for different solid elements and the sectional views using CAD
CO5	Create drawings of building component including plan, section and elevation

2. Syllabus

- **INTRODUCTION** **(04 Hours)**

  Importance and role of Graphics in Engineering, drawing instruments and materials, Standard drawing paper, drafting techniques, Types of Lines, Lettering and Dimensioning, Drawing Symbols as per IS specifications, Basic concepts of AutoCAD for preparing Drawing

- **GEOMETRICAL CONSTRUCTION OF SCALES AND CONIC SECTIONS** **(06 Hours)**

  Fundamental of plane, diagonal and Vernier scales, functional and conversion scales, nomograms for three variables, Types of Conic sections, different methods of drawing of Ellipse, Parabola and Hyperbola, Tangent and Normal to Ellipse, Parabola and Hyperbola, Drawing of various conic sections with the use of AutoCAD

- **CONCEPT OF ORTHOGRAPHIC PROJECTIONS** **(12 Hours)**

  Projections from pictorial view of the object on the principle planes, Concept of principal planes of projection and different views viz. Top View, Front View, Side View and Sectional View, first and third angle of projection method, Projection of different features viz. Points, Lines and Planes, Projections of the points located in same and different quadrant, projection of lines with its inclination to the reference planes, Concept of true length of the lines and its inclination with reference planes, projection of planes with different geometrical shapes and their inclination with reference planes, use of auxiliary plane method for projection of planes, the use of AutoCAD for preparation of 3D drawing of Orthographic Projections.

- **TECHNICAL SKETCHING AND DETAILING OF BUILDINGS** **(08 Hours)**

  The details of building components, Sketching of building plans, elevations and sections passing through W/C, Bath, staircase and foundations etc., Site plan, Drawing to the scale of 1:100 of Single Storey Load bearing Structure of residential building (2 BHK), Schedule of openings construction notes with specifications area statement, Draw various types of

graphical symbol of materials, door and windows, Preparation of Building Plan, Elevation and sectional drawing in AutoCAD.

(Total Lecture Hours: 30)

3. Practical / Drawing*

1. Students have to prepare drawings of different topics mentioned above as per the given exercise. They have to use drawing sheets as well as computer for AutoCAD drawing.

4. Books Recommended

1. N.D. Bhatt, et. al "Engineering Drawing" Chorotar Publishing House, Anand (2011)
2. K Venugopal, "Engineering Drawing and Graphics (+ AutoCAD)", New Age Publication (2007)
3. K. Venkata Reddy, "Textbook of Engineering Drawing" BS Publications, Hydrabad (2008)
4. P. J. Shah, "Engineering Drawing",S. Chand Publication (2008)
5. Roop Lal, Ramakant Rana, "A Textbook of Engineering Drawing (Along with an Introduction to AutoCAD), I.K. International Publishing House Pvt. Limited (2015)

5. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	1	2	2
CO3	2	3	2
CO4	1	3	3
CO5	1	1	3

1-Low 2-Moderate 3-High

CE 103 BUILDING TECHNOLOGY

L	T	P	Credit
3	0	2	05

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Comprehend the basic characteristics and types of the material used in building construction
CO2	Understand the building components, their types and functions
CO3	Evaluate the role of building construction and general building requirements
CO4	Develop the skills for asset and facility management to plan the building considering the sustainable building construction
CO5	Apply the emerging construction systems in to building construction

2. Syllabus

- **BUILDING MATERIALS** **(12 Hours)**

  Clay, sand, rubble, stones and its geology, building materials: lime, cement and additives. Cement and lime manufacturing, concrete, mortar, water. Aluminum, steel and other light weight metals, wood, timber and bamboo. Glass, floor covering, roofing and other finishes. Gypsum, paints and products, polymer plastic and synthetic/geo textiles, sanitary appliances and water fittings. Chemical, conductors, cables and insulation materials. Water proofing and damp proofing material, welding electrodes and wire

- **BUILDING COMPONENTS** **(12 Hours)**

  Foundation, masonry, load bearing wall, cavity wall, partition wall, floors, column, beam and slabs, lintel and arches, stairs, roof, doors and windows.

- **BUILDING CONSTRUCTION AND GENERAL REQUIREMENTS** **(10 Hours)**

  Study of building drawing, project and unit layout, type of structures (load bearing and frame structures), shoring, underpinning and scaffolding, formwork systems (stay in place formwork systems), damp proofing, termite proofing, water proofing, plaster and pointing, painting & distemper, white washing, approaches to sustainable construction

- **ASSET AND FACILITY MANAGEMENT** **(05 Hours)**

  Plumbing (water, drainage, gas), electric work, fire and life safety, air conditioning, HVAC services, lift and escalators, acoustic and sound insulation, thermal insulation

- **EMERGING CONSTRUCTION SYSTEMS** **(06 Hours)**

  New and innovative construction system, climate responsive and energy efficient development, Precast concrete construction 2D & 3D, hot and cold form steel construction, fast track emerging system

(Total Lecture Hours: 45)

3. Practical / Drawing*

1. To conduct different tests on aggregates and bricks
2. To conduct destructive tests on standard concrete cubes
3. To conduct non-destructive tests on structural member (Column, Beam & Slab).
4. To setting out foundation layout plan for small building on the ground
5. To make different bonds on the ground with Brick or Block only
6. To visit the RMC plant and report the functioning of RMC plant
7. To perform a model study of King post, Queen post & Lean to roof
8. To perform a model study of formwork & scaffolding
9. To measure and prepare a drawing of building components (Door, Window & Staircase)
10. To measure & prepare a plumbing plan for toilet block of an institute building
11. To measure & prepare an electric layout plan of one room of institute building
12. To prepare mini report on Emerging Construction Systems

4. Books Recommended

1. D. N. Ghosh, " Materials of Construction ", Tata McGraw Hill Publication, New Delhi. (1991)
2. Mehta Madan, Scarborough Walter, and Armpriest Diane, “Building Construction – Principles, Materials, and Systems” 2nd Edition, Pearson Education Inc. USA, (2008)
3. Edward Allen and Joseph Iano, “Fundamentals of Building Construction: Materials and Methods”, Wiley Publication, (2008)
4. Barry, “Building Constructions “, Vol. I, II & III, ELBS Publications. (1989)
5. M S Shetty, “Concrete Technology, Theory & Practice” 2nd Edition, S. Chand & Company, New Delhi, 1986.
6. David Bienvenido-Huertas, Juan Moyano-Campos “New Technologies in Building & Construction – Towards Sustainable Development”, Springer Publications, 2022
7. National Building Code of India (NBC) – Bureau of Indian Standards (BIS) (2016)

5. Mapping of COs and POs

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

--Not related 1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	3	1	1
CO2	3	2	2
CO3	3	3	3
CO4	2	2	2
CO5	3	2	2

1-Low 2-Moderate 3-High

CE 105 ENVIRONMENTAL POLLUTION AND MANAGEMENT

L	T	P	Credit
3	0	0	03

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Explain the structure and components of ecosystems and various biogeochemical cycles
CO2	Understand the importance of global environmental issues
CO3	Differentiate between various types of environmental pollution along with their impacts and regulatory standards
CO4	Study of different international environmental treaties and protocols
CO5	Analyse the concepts of various types of environmental management

2. Syllabus

- **INTRODUCTION TO ECOLOGY AND ENVIRONMENTAL SCIENCE (03 Hours)**

  Definition and scope of ecology and environmental science. Basic principles of ecosystem functioning and biodiversity. Overview of environmental challenges facing the world today.

- **WATER POLLUTION (06 Hours)**

  Sources and significance of water. Sources and types of water pollution. Impacts of water pollution on ecosystems and human health. Salient features of Water Act-1974. Strategies for preventing and controlling water pollution.

- **AIR POLLUTION (06 Hours)**

  Sources and types of air pollution. Impacts of air pollution on ecosystems and human health. Stack emission & ambient air quality standards. Salient features of Air Act-1981. Strategies for preventing and controlling air pollution.

- **NOISE POLLUTION (06 Hours)**

  Sources and types of noise pollution. Impacts of noise pollution on ecosystems and human health. CPCB standards with respect to noise in ambient air. Strategies for preventing and controlling noise pollution.

- **SOLID AND HAZARDOUS WASTE (06 Hours)**

  Sources and types of solid and hazardous waste. Impacts of solid and hazardous waste on ecosystems and human health. Strategies for managing and disposing of solid and hazardous waste.

- **ENVIRONMENTAL MANAGEMENT (09 Hours)**

  Principles and practices of environmental management. Sustainability, sustainable development and SDGs. Strategies for promoting sustainability and minimizing environmental impacts. Environmental Audit. Significant impacts of civil and infrastructure projects. EIA at

project; regional and policy levels. Environmental clearance (EIA) procedure in India. Resettlement and rehabilitation issues.

- **GLOBAL ENVIRONMENTAL ISSUES & TREATIES** **(09 Hours)**

Global environmental issues like global warming, ozone depletion, acid rain, hazardous waste. Climate change and its impacts on ecosystems and human societies. International environmental treaties and protocols such as Stockholm Conference, Ramsar Convention, Montreal Protocol, Rio Earth Summit, Kyoto Summit. Inter-governmental Panel on Climate Change (IPCC). United Nations Framework Convention on Climate Change (UNFCCC-1992). COP-26 (The Glasgow Climate Pact). COP-27

(Total Lecture Hours: 45)

3. Books Recommended

1. Daniel B. Botkin & Edward Akeller, "Environmental Science: Earth as a Living Planet", John Wiley & Sons (2005).
2. R. Rajagopalan, "Environmental Studies: From crisis to cure", Oxford University Press (2016).
3. Benny Joseph, "Environmental Studies", McGraw Hill Education (2017).
4. Suresh K Dhameja, "Environmental Studies", S. K. Kataria & Sons (2021).
5. U K Khare, "Basics of Environmental Studies", McGraw Hill Education (2011).

4. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

5. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	1	0	3
CO2	1	0	3
CO3	2	1	2
CO4	2	1	3
CO5	3	2	3

1-Low 2-Moderate 3-High

MA109 MATHEMATICS - I

L	T	P	Credit
3	1	0	04

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Acquire the knowledge of linear algebra to solve problem of engineering
CO2	Use calculus as a tool to solve the engineering problem
CO3	Apply the knowledge of curve tracing to solve engineering problem
CO4	Apply double and triple integrals for evaluation of area and volume
CO5	Analyse the engineering industrial problems using the concept of probability and statistics

2. Syllabus

- **SYSTEM OF LINEAR ALGEBRAIC EQUATIONS** **(04 Hours)**

  Linear systems, Elementary row and column transformation, rank of matrix, consistency of linear system of equations, Linear Independence and Dependence of vectors, Gauss Elimination method, Gauss-Jorden Method, Gauss-Jacobi Iteration Method.

- **DIFFERENTIAL CALCULUS** **(10 Hours)**

  Differentiation of Hyperbolic and Inverse Hyperbolic functions. Successive Differentiation, standard forms, Leibnitz's theorem and applications, Power series, Expansion of functions, Taylor's and Maclaurin's series. Curvature, Radius of curvature for Cartesian curve with application.

- **PARTIAL DIFFERENTIATION** **(08 Hours)**

  Partial differentiation, Euler's theorem for homogeneous function, Modified Euler's theorem, Taylor's and Maclaurin's series for two variables. Tangent plane and Normal line, Error and Approximation, Jacobians with properties, Extreme values of function of two variables, Lagrange's methods of undetermined multipliers

- **CURVE TRACING** **(03 Hours)**

  Cartesian, polar and parametric form of standard curves.

- **DOUBLE AND TRIPLE INTEGRALS** **(08 Hours)**

  Reorientation of concepts of integrals, Double integrals and triple integrals, evaluation techniques, change of order of integration, change of variable, Evaluation of area and volume.

- **STATISTICS AND PROBABILITY** **(12 Hours)**

  Correlation between two variables, application of correlation, evaluation of coefficients of correlation, Rank correlation, Regression, Frequency distribution, Binomial, Poisson and Normal distributions, application to Civil Engineering problems. Introduction to hypothesis testing, Test of significance, Chi-square test, t- test, application of the t-test, F-distribution

(Total Lecture Hours: 45)

3. Books Recommended

1. Kreyszing E., 'Advanced Engineering Mathematics', John Wiley & Sons, Singapore, Int. Student Ed. 2015.
2. Steward J De, 'Calculus', Thomson Asia, Singapore, 2003.
3. O'Neel Peter., 'Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
4. Greenberg M D, 'Advanced Engineering Mathematics', Pearson, Singapore, 2007.
5. Wiley C. R., 'Advanced Engineering Mathematics', McGraw Hill Inc., New York Ed. 1993.

4. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

5. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	3	1	2
CO2	3	1	2
CO3	3	1	2
CO4	3	1	2
CO5	3	1	2

1-Low 2-Moderate 3-High

HS 120 INDIAN VALUE SYSTEM AND SOCIAL CONSCIOUSNESS

L	T	P	Credit
2	0	0	02

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Interpret the important values that need to be cultivated
CO2	Analyse the cultures depicted in Ramayana, Mahabharata, Jainism and Buddhism
CO3	Review the structure of Indian knowledge system
CO4	Discuss the significance of constitution of India
CO5	Demonstrate social responsibility

2. Syllabus

- **HUMAN VALUES AND CONSCIOUSNESS** **(08 Hours)**

  Human Values Definition and Classification of Values; The Problem of Hierarchy of Values and their Choice; Self-Exploration; 'Basic Human Aspirations; Right understanding, Relationship and Physical Facility; fulfilment of aspirations; Understanding Happiness and Prosperity, Harmony at various levels.
  What Is Consciousness?; Can We Build A Conscious Machine?; Levels Of Consciousness; Mind, Matter And Beyond; Holistic Lifestyle; Dealing With Anxiety; Connecting Mind To Brain; Minds, Brains, And Programs.

- **INDIAN CULTURE AND HERITAGE** **(07 Hours)**

  Culture and its salient features: The Vedic – Upanishadic Culture and society, Human aspirations in those societies; Culture in Ramayana and Mahabharata: The Ideal Man and Woman, Concepts Maitri, Karuna, Seela, Vinaya, Kshama, Santi, Anuraga – as exemplified in the stories and anecdotes of the Epics; The Culture of Jainism: Jaina conception of Soul, Karma and liberation, Buddhism as a Humanistic culture; The four Noble truths of Buddhism; Vedanta and Indian Culture;

- **INDIAN KNOWLEDGE SYSTEM** **(08 Hours)**

  Indian knowledge as a unique system, Place of Indian knowledge in mankind's evolution, Relevance of Indian knowledge to present day and future of mankind, Nature of Indian Knowledge; Structure of Indian Knowledge: Types of knowledge (para, apara), The scientific and the unscientific, Instruments for gaining and verifying knowledge, Knowledge traditions: Lineages, Instruments - debate, epistemology and pedagogy, The inverted tree – axiomatic, deductive, empirical knowledge, and evolution of knowledge; Disciplines of Study: A brief outline of the subjects, the major contributions and theories along with timelines where relevant: Mathematics; Astronomy; Physical Sciences; Cosmogony; Language studies; Astrology; Moral studies/righteousness; Statecraft and political philosophy.

- **INDIAN CONSTITUTION** **(04 Hours)**

  History of Making of the Indian Constitution; Philosophy of the Indian Constitution: Preamble; Salient Features; Contours of Constitutional Rights & Duties; Organs of Governance: Parliament; Composition; Qualifications and Disqualifications; Powers and Functions

- **SOCIAL RESPONSIBILITY** **(03 Hours)**

  Social Responsibility: Meaning and Importance, Different Approaches of Social Responsibility. Social Responsibility of Business towards different Stakeholders. Evolution and Legislation of CSR in India.

(Total Lecture Hours: 30)

3. Books Recommended

1. D. K. Chaturvedi, Professional Ethics Values and Consciousness, Ane Books Pvt. Ltd., 2023.
2. R.R. Gaur, R Sangal, G. P. Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010.
3. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.
4. P R Rao, Indian Heritage and Culture, Sterling Publishers Pvt. Ltd, 1988.
5. D. Singh, Indian Heritage and Culture, APH Publishing Corporation, 1998.
6. Sri Prashant Pole, Treasure Trove of Indian knowledge, Prabhat Prakashan, 2021.
7. Sri Suresh Soni, Sources of our cultural heritage, Prabhat Prakashan, 2018.
8. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Second Semester (1st year of UG) (Subjects)

CE 102 MECHANICS OF MATERIALS

L	T	P	Credit
3	0	2	05

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Correlate real-life problems of rigid bodies with engineering mechanics and determine the resultant & moment of various force system acting in 2-Dimension & 3- Dimension.
CO2	Evaluate centroid of line, area and volume; and Moment of inertia of area
CO3	Analyse the internal and external forces in truss, beam and cable.
CO4	Apply the knowledge of flexible bodies to the structural element and compute direct, bending and shear stresses; and simple strains.
CO5	Analyze the response of structural elements subjected to axial force, bending and shear or in combination.

2. Syllabus

- **INTRODUCTION TO FORCES/EQUILIBRIUM OF RIGID BODY (08 Hours)**

  Scalar and vector, system of forces, resultant force. Statics of particle. Free-body diagram. Equilibrium of particle in two dimensions. Resultant of three or more concurrent forces, Resolution of a force into components. Rectangular components of a force. Resultant by rectangular components. Concurrent force system in space: Resolution of a force into rectangular components in space. Coplanar Non-Concurrent Force Systems, Moments about Point and Axis. Equilibrium of Non-coplanar Non-concurrent Forces, Equivalent Force Systems.

- **CENTROID AND MOMENT OF INERTIA (08 Hours)**

  Distributed forces: Centroid and centre of gravity. Determination of centroid of lines and areas using integral technique. Determination of centroid of composite wires and areas. Centroid of volumes. Theorems of Pappus - Guldinus and its applications. Second moment of areas. Definition of moment of inertia. Determination of moment of inertia by integration. Parallel axis theorem for Moment of Inertia. MI of composite area. Concept of Mass moment of inertia of body.

- **PLANE TRUSS (06 Hours)**

  Type of Structures, Determination of reactions at supports for plane trusses, Basic assumption for analysis of trusses. Procedures for analysis of trusses, Analysis of plane trusses by method of joint. Concept of zero force members, Analysis of trusses by method of section.

- **CABLES (07 Hours)**

  Cables: - Cables with Concentrated Loads.

- **SIMPLE STRESSES AND STRAINS (07 Hours)**

  Concept of stresses and strains, Types of stresses, Hook's Law, lateral strain, Poisson's ratio, Elongation due to own weight , Tapering sections, Varying

cross sections, Composite sections, Relation between Modulus of Elasticity, Modulus of Rigidity and Bulk Modulus, Thermal Stresses, Eccentric load, Limit of eccentricity, Core /Kernel of the section

- **SHEAR FORCE DIAGRAM AND BENDING MOMENT DIAGRAMS** **(07 Hours)**

  Introduction, Types of beams, loads and reactions, Shear Forces and Bending Moments, Relationships among loads, shear forces and bending moments, Shear force and bending moment diagrams, Point of contra-flexure

- **STRESSES IN BEAMS** **(06 Hours)**

  Theory of simple bending, Moment of Resistance, Bending stresses in beams, Beam of Uniform strength, Shear stress concept, Derivation of shear stress, Bending and Shear stresses in rectangular, circular, T-section and I – section

(Total Lecture Hours: 49)

3. Practical / Drawing*

1. Plane Force Polygon
2. Forces in space
3. Simple Plane Roof Truss
4. Coplanar Parallel Forces
5. "E“ by Searle’s apparatus
6. Mass M.I. of flywheel
7. Tension test for mild steel and cast-iron specimens
8. Transverse test on wooden beam for Flexural strength and elasticity
9. Shear strength test for mild steel, brass and aluminium
10. Shear force and bending moment test for wooden beam
11. Charpy’s Impact test
12. Brunell Hardness test

4. Books Recommended

1. Beer, F.P. and Johnston, E.R. “Vector mechanics for engineers: Statics and Dynamics”, Tata McGraw-Hill, New Delhi
2. Meriam, J.L. and Kraige, L.G. “Engineering Mechanics: Statics and Dynamics”, John Wiley and sons, New York
3. Hibbeler, R.C. “Engineering Mechanics: Statics and Dynamics”, Prentice Hall of India, New Delhi
4. F. P. Beer and Johnston S J , John DeWolf , David Mazurek, “Mechanics of Materials”, Tata McGraw Hill, New Delhi, 2020.
5. S Timoshenko and D H Young, ”Elements of Strength of Materials”, Tata McGraw Hill, New Delhi, 2006.
6. S S Bhavikatti, “Strength of Materials”, Vikas Publication House, New Delhi, 2007.
7. Barry J. Goodno & James M. Gere , "Mechanics of Materials", Cengage Learning India Pvt. Ltd, 2022

5. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	2	1	3
CO2	3	2	2
CO3	3	1	3
CO4	2	2	2
CO5	2	2	3

1-Low 2-Moderate 3-High

CE 104 SURVEYING - I

L	T	P	Credit
3	1	2	05

1. Course Outcomes (COs)

At the end of the Course the students will be able to:

CO1	Understand the concepts of surveying and its importance in civil engineering
CO2	Use of various surveying instruments (like Chain / Tape, Compass, Theodolite as well as Plane Table) for Linear measurement and Angular Measurement
CO3	Computation of ground profile using different levelling techniques.
CO4	Compute the area and volume in maps and plan using various methods and plannimeter.
CO5	Prepare layout of buildings, roads, rails etc. with different survey instruments

2. Syllabus

Basic Concepts of Surveying **(06 Hours)**

Role of Civil Engineer in Surveying, Definition, Basic measurements, Scale and Mapping, Types of Maps and their uses, Map sheet numbers, Map projections, Principles of Surveying, Classification of Surveying, Division of Surveying, Control networks, Locating position and topographic detail, Concept of plane table surveying

Measurement of Distance **(06 Hours)**

Linear Measurement, Chain and Tapes, Field work, Distance adjustment, Errors in taping, Accuracies, Too Long and Too Short Chain Concept, Measurement of Offsets, Optical distance measurement (ODM-only definition), Electromagnetic distance measurement (EDM-only definition)

Measurement of Angles **(10 Hours)**

Angle Measurement, Equipment viz. Compass and Theodolite, Concept of Meridian, Bearing and Direction, Types of compass, concept of Local attraction, Parts and Operation of Theodolite, Measurement of Horizontal Angles by Method of Repetition, Method of Reiteration, Field procedure for Theodolite Traversing and its Adjustment, Gale's Traverse Table, Omitted Measurements

Concept of Levelling and Contour **(10 Hours)**

Definitions, Principle of leveling, Methods of leveling, About Equipment, Instrument adjustment, Different types of Leveling, Curvature and refraction, Leveling applications viz. Reciprocal leveling, Profile leveling and cross sectioning, Precise leveling, Digital leveling, Contouring and Characteristics of Contours

Computation of Areas and Volumes **(10 Hours)**

Areas from field measurements and plans, Different methods, Trapezoidal and Simpson's rule, Planimeter, Volume by trapezoidal and prismoidal formula,

Calculation of earthwork in cutting and embankment for civil engineering works, Mass haul diagram, Volume by spot levels, Capacity of reservoir.

Layout Surveys **(03 Hours)**

Protection and referencing, Basic setting-out procedures using coordinates, Technique for setting out a direction, Use of grids, Setting out buildings, Roads etc., Controlling verticality, Controlling grading excavation

(Total Lecture Hours: 45)

3. PRACTICALS / DRAWING*:

1. Study of various types of maps and symbols used
2. Study of Various Basic Surveying Instruments
3. Introduction to Dumpy Level
4. Exercise on Leveling (Differential Method)
5. Exercise on Profile leveling/Cross Sectioning
6. Plotting of L/S and C/S
7. Contouring by grid method
8. Measurement of bearings of lines and included angles using various types of Compass
9. Introduction to Vernier Theodolite (Optical)
10. Introduction Digital Theodolite (Electronic Theodolite)
11. Measurement of Horizontal angels by Repetition and Reiteration method using Vernier Theodolite
12. Exercise on Theodolite Traversing
13. Measurement of Area using Plannimeter (Mechanical and Digital)
14. Exercise on Setting out work of a building
15. Final Submission

Student has to prepare a journal with description of practical as well as to prepare drawing of given exercise in prescribed drawing-sheet by the teacher and has to submit the same.

4. BOOKS RECOMMENDED:

1. Arora K. R., "Surveying and Levelling, Vol. I & II", Standard Publications, Delhi (2019).
2. Kanitkar T.P. & Kulkarni S.V., "Surveying and Levelling, Vol. I & II", Vidyarthi Gruh Prakashan, Pune (2014).
3. Duggal K. S., "Surveying and Levelling, Vol. I & II", Tata McGraw-Hill Publishing Co. Ltd.,New Delhi (2019)
4. Punmia B.C., “Surveying and Levelling, Vol. I & II”, Laxmi Publications Pvt. Ltd., New Delhi (2016)
5. Basak, N. N., “Surveying and Levelling “, Tata McGraw-Hill Publishing Co. Ltd., New (2024)

5. CO-PO-PSO_Mapping

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

1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	2	1	2
CO4	2	1	1
CO5	2	1	2

1-Low 2-Moderate 3-High

CY 108 MATERIAL SCIENCE

L	T	P	Credit
3	0	2	05

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Acquire basic knowledge of water chemistry
CO2	Understand corrosion chemistry to protect different metals from corrosion
CO3	Understand the characteristics, synthesis and application of nanomaterials and magnetic materials
CO4	Understand basic properties of crystalline and amorphous solids
CO5	Apply the basic concepts of materials chemistry in civil engineering problems

2. Syllabus

- **WATER** **(08 Hours)**

Structure of water, physical and chemical properties, Hydrogen bonding, Specifications for water in industries, types of water (raw water, cooling water, boiler water, nuclear water), Hardness of water, Estimation and units of Hardness, Boiler feed water, Boiler Problems - Scales & Sludge, Priming, Foaming, Carryover, Caustic Embrittlement, Boiler corrosion, Desalination. Water softening (lime-soda, zeolite and ion-exchange) methods.

- **POLYMER** **(06 Hours)**

Introduction of Polymers: Classification of polymers, nomenclature, functionality in polymers, number and weight average molecular weight, molecular weight distribution (PDI), Chain Architecture (Linear/Branched, Tacticity, Isomerism), homopolymers, copolymers, graft copolymers and their characteristic properties in reference to their applications. Types of polymerization: addition, condensation, chain growth and step growth. Polymerization techniques: bulk, suspension and emulsion polymerization. Moulding constituents of Polymer, Moulding (Injection, Extrusion and Compressing) methods.

- **CHEMISTRY OF MATERIALS** **(13 Hours)**

Alloys: Introduction, Necessity of making alloys, classification, Metal-Metal alloy: Brass (properties and applications), Metal-Non-metal alloy: Steel (properties), Composites: Introduction, classification, particulate composites, structural composites (Laminar and Sandwich), Advantages and applications of Composites. Magnetic materials: Definition of terms, Classification of magnetic materials and properties, Domain theory of ferromagnetism, Hard and soft magnetic materials.

Cement Chemistry: Cement− its constituents and their structures, classification of cement, hydration process and importance of the products of hydration, chemistry of pozzolanic reactions. Analysis of Portland cement with reference to insoluble residue, total silica, sesquioxides, iron, lime and manganese. Role of calcium hydroxide in cement.

Soil Chemistry: Chemical composition of soils, types of clay minerals, soil colloids, diffused double layers, sorption processes, cation and base exchange phenomenon in soils, isomorphous substitution.

- **CORROSION AND ITS CONTROL** **(05 Hours)**

Introduction, types and mechanism of (Chemical and Electrochemical) corrosion, Types of Electrochemical corrosion (Galvanic, Pitting, Crevice), Passivity, Galvanic series, Factors influencing corrosion, Protective measures against corrosion: (i) Modification of the environment (ii) Modification of the properties of the Metal (iii) Prevention of corrosion by Materials selection and Design (iv) Other corrosion prevention methods.

- **CRYSTALLOGRAPHY** **(06 Hours)**

Crystalline and amorphous solids, Lattice and unit cell, Seven crystal system and Bravais lattices, Symmetry operation, Miller indices, Atomic radius, Coordination number, Packing factor calculation for SC, BCC, FCC, Bragg's law of X-ray diffraction, Laue Method, Powder crystal method.

- **NANOMATERIALS** **(07 Hours)**

Introduction and properties, Synthesis: Chemical vapour deposition, Ball milling and relevant applications, Carbon nanotubes: structure and properties and Synthesis: Arc method and Pulsed laser deposition, Applications. Nanomaterials – properties synthesis (sol-gel) and applications.

(Total Lecture Hours: 45)

3. Practical / Drawing*

1. lodometric determination of Cu in Brass sample.
2. Complexometric determination of hardness of water.
3. Estimation of COD in waste water.
4. Determination of DO in waste water.
5. Estimation of CaO in cement solution.
6. Estimation corrosion of metals (Fe and Zn) by agar gel.
7. Estimation of Ca2+ and Mg2+ ions in dolomite.
8. Manganometric determination of Iron(II) ion.
9. Determination of pH of soil sample.
10. Preparation of ZnS colloidal nanoparticles.
11. Determination of the amount of iron in an iron ore solution by KMnO4.
12. Determination of strength of HCl solution by titrating it against NaOH solution via conductometry.

4. Books Recommended

1. Jain P.C. and Jain M. 'Engg. Chemistry' Dhanpat Rai Publishing Co. New Delhi, 15th Edition 2006.
2. Chawla S., 'A Textbook of Engineering Chemistry', Dhanpat Rai & Co., Latest Edition, 2015.

3. Tripathy S.K., Pandhy A.K. and Panda A.K. 'Material Science & Engineering' Scitech Publications (India) Pvt. Ltd., 2nd Edition, 2009.
4. Taylor, H.F.W., Cement Chemistry, 2nd Ed. (reprinted), Thomas Telford Services Ltd., London, 2004.
5. Nad, A. K., Mahapatra, B., Ghoshal, A. 'An Advanced Course in Practical Chemistry', New Central Book Agency Pvt. Ltd., New Delhi, 2022.
6. Beiser A. 'Concepts of the Modern Physics', McGraw-Hill, 2008.

5. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	3	1	2
CO2	3	1	2
CO3	3	1	2
CO4	3	1	2
CO5	3	1	2

1-Low 2-Moderate 3-High

MA 108 MATHEMATICS-II

L	T	P	Credit
3	1	0	04

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Apply ordinary differential equations in engineering problem solving
CO2	Develop the Fourier series of periodic functions
CO3	Derive Fourier integral from Fourier series and comprehend the concept of integral transforms with their applications
CO4	Apply Laplace transforms in engineering problems
CO5	Analyse partial differential equations of second order

2. Syllabus

- **ORDINARY DIFFERENTIAL EQUATIONS and APPLICATIONS (12 Hours)**

  Reorientation of differential equation first order first degree, exact differential equation and Integrating factors, solvable for p, y and x, Solution of homogenous equations higher order, complementary functions, Particular Integrals, Linear differential equation with variable coefficient, Cauchy's Euler and Legendre's equation with variable coefficient, Method of variation of parameters.
  Application of ODE in Civil Engineering problems

- **FOURIER SERIES (06 Hours)**

  Definition, Fourier series with arbitrary period, in particular periodic function with period 2□. Fourier series of even and odd function, Half range Fourier series.

- **FOURIER INTEGRAL AND FOURIER TRANSFORMS (06 Hours)**

  Fourier Integral theorem, Fourier sine and cosine integral complex form of integral, Inversion formula for Fourier transforms, Fourier transforms of the derivative of a function

- **LAPLACE TRANSFORMS (07 Hours)**

  Introduction, Definition, Existence conditions, basic properties, Inverse Laplace transform and properties, Convolution Theorem and properties, Applications of Laplace transforms

- **PARTIAL DIFFERENTIAL EQUATIONS (14 Hours)**

  Formation of partial differential Equation, Partial differential Equation of first order, Linear partial differential equation of first order (Pp + Qq =R) and method of obtaining its general solution, Non-linear partial differential equation of first order f(p, q)=0, f(z, p, q)=0, f(x, p)= g(y, q), z= px + qy + f(p, q).
  Second order PDE, Heat, wave and Laplace equation, one dimensional with standard boundary conditions, solution by separation of variable method using Fourier series, Solution by separation of variables and transformation techniques

(Total Lecture Hours: 45)

3. Books Recommended

1. Kreyszing E., "Advanced Engineering Mathematics", John Wiley & Sons, Singapore, Int. Student Ed. 2015.
2. James Steward De, "Calculus", Thomson Asia, Singapore, 2003.
3. O'Neel Peter., "Advanced Engg. Mathematics", Thompson, Singapore, Ind. Ed. 2002.
4. M D Greenberg, Advanced Engineering Mathematics, Pearson, Singapore, 2007.
5. Wiley C. R., "Advanced Engineering Mathematics", McGraw Hill Inc., New York Ed. 1993.

4. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

5. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	3	1	2
CO2	3	1	2
CO3	3	1	2
CO4	3	1	2
CO5	3	1	2

1-Low 2-Moderate 3-High

MG110 INNOVATION, INCUBATION AND ENTREPRENEURSHIP

L	T	P	Credit
3	1	0	04

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Explain the concepts of Entrepreneurship
CO2	Develop skills related to various functional management areas (Marketing Management, Financial Management, Operations Management, Personnel Management etc.)
CO3	Develop skills related to Project Planning and Business Plan development.
CO4	Demonstrate the concept of Innovation, Intellectual Property Rights (IPR) and Technology Business incubation.
CO5	Build knowledge about Sources of Information and Support for Entrepreneurship.

2. Syllabus

- **CONCEPTS OF ENTREPRENEURSHIP (08 Hours)**

  Scope of Entrepreneurship, Definitions of Entrepreneurship and Entrepreneur, Entrepreneurial Traits, Characteristics and Skills, Entrepreneurial Development models and Theories, Entrepreneurs Vs Managers, Classification of Entrepreneurs; Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship, Intrapreneurship (Corporate Entrepreneurship), Rural Entrepreneurship, Family Business, etc.; Problems for Small Scale Enterprises and Industrial Sickness; Entrepreneurial Environment – Political, Legal, Technological, Natural, Economic, Socio- cultural, etc.

- **FUNCTIONAL MANAGEMENT AREA IN ENTREPRENEURSHIP (14 Hours)**

  Marketing Management: Basic concepts of Marketing, Development of Marketing Strategy, and Marketing plan. Operations Management: Basic concepts of Operations Management, Location problem, Development of Operations strategy and plan. Personnel Management: Main operative functions of a Personnel Manager, Development of H R strategy and plan. Financial Management: Basics of Financial Management, Ratio Analysis, Investment Decisions, Capital Budgeting and Risk Analysis, Cash Flow Statement, Break Even Analysis

- **PROJECT PLANNING (08 Hours)**

  Search for Business Ideas, Product Innovations, and New Product Development – Stages in Product Development; Sequential stages of Project Formulation; Feasibility analysis – Technical, Market, Economic, Financial, etc.; Project report; Project appraisal; Setting up an Industrial unit – procedure and formalities in setting up an Industrial unit; Business Plan Development.

- **PROTECTION OF INNOVATION THROUGH IPR (04 Hours)**

  Introduction to Intellectual Property Rights – IPR, Patents, Trademarks, Copy Rights

- **INNOVATION AND INCUBATION** **(06 Hours)**

  Innovation and Entrepreneurship, Creativity, Green Technology Innovations, Grassroots Innovations, Issues and Challenges in Commercialization of Technology Innovations, Introduction to Technology Business Incubations, Process of Technology Business Incubation

- **SOURCES OF INFORMATION AND SUPPORT FOR ENTREPRENEURSHIP** **(05 Hours)**

  State level Institutions, Central Level institutions, and other agencies

(Total Lecture Hours: 45)

3. Books Recommended

1. Desai Vasant, Dynamics of Entrepreneurial Development and Management, Himalaya
2. Publishing House, India, 6th Revised Edition, 2020
3. Charantimath P. M., Entrepreneurial Development and Small Business Enterprises, Pearson Education, 3rd Edition, 2018
4. Holt David H., Entrepreneurship: New Venture Creation, Pearson Education, 2016
5. Chandra P., Projects: Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill, 9th Edition, 2019
6. Banga T. R. & Shrama S.C., Industrial Organisation & Engineering Economics, Khanna Publishers, 25th Edition, 2015

4. Further Reading

1. Prasad L.M., Principles & Practice Of Management, Sultan Chand & Sons, 8th Edition,2015
2. Everett E. Adam, Ronald J. Ebert, Production and Operations Management, Prentice Hall of India, 5th edition, 2012
3. Kotler P., Keller K. L, Koshi A.& Jha M., Marketing Management – A South Asian Perspective, Pearson, 14th Edition, 2014
4. Tripathi P.C., Personnel Management & Industrial Relations, Sultan Chand & sons, 21st Edition, 2013
5. Chandra P., Financial Management, Tata McGraw Hill, 9th Edition, 2015

5. Mapping of COs and POs

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

1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	1	1	2
CO2	2	3	1
CO3	1	2	3
CO4	3	1	2
CO5	2	1	1

1-Low 2-Moderate 3-High

HS112 ENGLISH AND PROFESSIONAL COMMUNICATION

L	T	P	Credit
3	1	0	04

1. Course Outcomes (COs):

At the end of the course, the students will be able to

CO1	Show enhanced reception towards the use of English language.
CO2	Choose and employ appropriate words for professional communication.
CO3	Develop sentences and text in English coherently and formally.
CO4	Demonstrate overall improvement in oral communication.
CO5	Analyze and infer from written and oral messages.

2. Syllabus

- **COMMUNICATION** **(05 Hours)**

  Introduction to Communication, Different forms of Communication, Barriers to Communication and some remedies, Non-Verbal Communication – Types, Non-Verbal Communication in Intercultural Context.

- **VOCABULARY AND USAGE OF WORDS** **(05 Hours)**

  Common Errors, Synonyms, Antonyms, Homophones, and Homonyms; One Word Substitution; Misappropriations; Indianisms; Redundant Words.

- **LANGUAGE THROUGH LITERATURE** **(09 Hours)**

  Selected short stories, essays, and poems to discuss nuances of English language.

- **LISTENING AND READING SKILLS** **(06 Hours)**

  Types of listening, Modes of Listening-Active and Passive, Listening and note taking practice, Practice and activities. Reading Comprehension (unseen passage- literary /scientific / technical) Skimming and scanning, fact vs opinion, Comprehension practice

- **SPEAKING SKILLS** **(10 Hours)**

  Effective Speaking, JAM, Presentation Skills- types, preparation and practice. Interviews- types, preparation and mock interview; Group Discussion- types, preparation and practice

- **WRITING SKILLS** **(10 Hours)**

  Prerequisites of effective writing, Memo-types, Letter Writing- types, Email etiquette and Netiquette, Résumé-types, Report Writing and its types, Editing.

Tutorials will be based on the coverage of the above topics separately **(15 Hours)**

(Total Lecture Hours: 60 Hours)

3. Tutorials

1. Letter and Resume
2. Group Discussion
3. Presentation Skills (Individual)
4. Role Play on Nonverbal communication
5. Group Presentation
6. Debate
7. Body language and intercultural communication
8. Listening Activities
9. Editing
10. Report Writing
11. Mock interviews
12. JAM

4. Books Recommended

1. Kumar, Sanjay and Pushp, Lata. Communication Skills, 2nd Edition, OUP, New Delhi, 2015.
2. Raman, Meenakshi & Sharma Sangeeta. Technical Communication Principles and Practice, 3rd Edition, OUP, New Delhi, 2015.
3. Raymond V. Lesikar and Marie E Flatley. Basic Business Communication skills for Empowering the Internet generation. Tata McGraw Hill publishing company limited. New Delhi 2005.
4. Courtland L. Bovee, John V. Thill, and Mukesh Chaturvedi. "Business Communication Today." Ninth Edition. Pearson, 2009.
5. Mike Markel. "Practical Strategies for Technical Communication," Bedford/ St. Martin's Second Edition, 2016
6. Laura J. Gurak and John M. Lannon. "Strategies for Technical Communication in the Workplace," Pearson, 2013.

5. Mapping of COs and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	1	0	0	0	0	0	0	0	3	0	0
CO2	0	1	0	0	0	0	0	0	0	3	0	0
CO3	0	1	0	0	0	0	0	0	0	3	0	0
CO4	0	1	0	0	0	0	0	0	3	3	1	0
CO5	0	1	0	0	0	0	0	0	2	2	0	0

0 – Not Related 1-Low 2-Moderate 3-High

6. Mapping of COs and PSOs

	PSO1	PSO2	PSO3
CO1	0	2	2
CO2	0	2	2
CO3	0	2	2
CO4	0	2	2
CO5	0	2	2

0 – Not Related 1-Low 2-Moderate 3-High