

**Scheme of Instructions &
Syllabi
of
Diploma in Civil Engineering**
(With effective from session 2026-27)



(Awdhesh Kumar)

HOD CE

Head

Department of Civil Engineering
Invertis University
Bareilly-243123, UP



(Dr. R. K. Shukla)

Dean Engineering

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Faculty of Engineering & Technology
Invertis University
Bareilly-243123, UP



(Dr. Y.D.S Arya)

Vice Chancellor

VICE CHANCELLOR
INVERTIS UNIVERSITY
BAREILLY

Invertis Institute of Engineering & Technology
INVERTIS UNIVERSITY

Invertis Village, Bareilly-Lucknow NH-24, Bareilly

243123, Uttar Pradesh

Diploma Civil Engineering
(w.e.f. Academic Year 2026-2027)
Year I, Semester-I

Sl. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDITS
						SESSIONAL EXAM.			E-SEM.			
			L	T	P	CT	TA	AT		Total		
THEORY												
1	DAS101	Mathematics-I	3	1	0	20	10	10	40	60	100	4
2	DAS102 OR DAS103	Physics OR Chemistry	3	1	0	20	10	10	40	60	100	4
3	DEE101 OR DMC101	Fundamentals of Electrical & Electronics Engineering OR Fundamentals of Mechanical & Civil Engineering	3	1	0	20	10	10	40	60	100	4
4	DCS101 OR DME101	Fundamentals of Computer OR Fundamentals of Mechanics	3	1	0	20	10	10	40	60	100	4
5	EPC001	AI Based English Proficiency-I	0	0	0	0	0	0	0	50	50	2
PRACTICAL/TRAINING/PROJECT												
6	DAS152 OR DAS153	Physics Lab OR Chemistry Lab	0	0	4	-	-		50	50	100	2
7	DEE151 OR DMC151	Electrical & Electronics Lab OR Mechanical & Civil Lab	0	0	4	-	-		50	50	100	2
8	DCS151 OR DME151	Computer Concept Lab OR Workshop Practice	0	0	4	-	-		50	50	100	2
9	DCE151	Engineering Drawing	0	0	4	-	-		50	50	100	2
10	GP101	General Proficiency	-	-	-	-	-		50	-	50	1
		Total	12	4	16	80	40	40	410	490	900	27

L-Lecture, T-Tutorial, P- Practical, CT-Cumulative Test, TA- Teacher Assessment, AT-Attendance, E-Sem- End Semester Marks

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UNIVERSITY BAREILLY

Diploma Civil Engineering
(w.e.f. Academic Year 2026-2027)
Year I, Semester-II

Sl. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDITS	
						SESSIONAL EXAM.				E-SEM.			
			L	T	P	CT	TA	AT	Total				
THEORY													
1	DAS201	Mathematics-II	3	1	0	20	10	10	40	60	100	4	
2	DAS203 OR DAS202	Chemistry OR Physics	3	1	0	20	10	10	40	60	100	4	
3	DMC201 OR DEE201	Fundamentals of Mechanical & Civil Engineering OR Fundamentals of Electrical & Electronics Engineering	3	1	0	20	10	10	40	60	100	4	
4	DME201 OR DCS201	Fundamentals of Mechanics OR Fundamentals of Computer	3	1	0	20	10	10	40	60	100	4	
5	EPC002	AI Based English Proficiency -II	0	0	0	0	0	0	0	50	50	2	
PRACTICAL/TRAINING/PROJECT													
6	DAS253 OR DAS252	Chemistry Lab OR Physics Lab	0	0	4	-	-	-	50	50	100	2	
7	DMC251 OR DEE251	Mechanical & Civil Lab OR Electrical & Electronics Lab	0	0	4	-	-	-	50	50	100	2	
8	DME251 OR DCS251	Workshop Practice OR Computer Concept Lab	0	0	4	-	-	-	50	50	100	2	
9	DCE251	Engineering Drawing	0	0	4	-	-	-	50	50	100	2	
10	GP201	General Proficiency	-	-	-	-	-	-	50	-	50	1	
		Total	12	4	16	80	40	40	410	490	900	27	

L-Lecture, T-Tutorial, P- Practical, CT-Cumulative Test, TA- Teacher Assessment, AT-Attendance, E-Sem- End Semester Marks



DAS 101: MATHEMATICS-I

Course Code DAS 101	Course Type Core	L: T: P 3: 1: 0	Credits 4
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COURSE OBJECTIVES

This course aims to enable students to:

- This course aims to build a strong mathematical foundation essential for engineering students..
- It focuses on developing analytical thinking and problem-solving skills through core topics such as trigonometry, differential calculus, partial fractions, binomial theorem, and complex numbers, with emphasis on real-world applications.

COURSE CONTENTS

UNIT I: Trigonometry

- Measurement of angles in degrees and radians and their conversions.
- Trigonometric ratios of Allied angles (without proof), Sum and difference formulae and their applications (without proof). Product formulae.
- Trigonometric ratios of multiple angles and sub-multiple angles only
Graphs: $|x|$, $\sin x$, $\cos x$ and e^x .

UNIT II: Differential Calculus

- Functions, concept of limit, standard limits, continuity (basic concept).
- Differentiability, Differentiation rules: sum, product, quotient, chain rule, Differentiation of elementary functions; polynomial, trigonometric, logarithmic,
- Exponential functions. Applications of derivatives.



UNIT III: Partial Fractions

- Definition of polynomial fractions, proper and improper fractions.
- Definition of partial fractions. Decomposition of proper and improper rational expressions into partial fractions.
- Partial fraction decomposition with non – repeated linear factors and repeated linear factors.

UNIT IV: Binomial Theorem

- Basic concept of permutation and combination.
- Binomial Theorem for positive integral index, general form, General term, middle term and independent term of Binomial Theorem.
- Applications of Binomial Theorem

UNIT V: Complex Numbers

- Complex Numbers, real and imaginary parts and geometrical interpretations.
- Algebra of complex numbers, polar and Cartesian form.
- Conjugate, modulus and argument of Complex Number.
- Exponential form De Moivre's Theorem and its simple applications.

COURSE OUTCOMES

After successful completion of the course, students will be able to:

- Apply trigonometric concepts to engineering problems.
- Evaluate limits and derivatives of functions.
- Solve problems involving differentiation and its applications.
- Decompose rational functions using partial fractions.
- Apply the Binomial Theorem in algebraic expansions.
- Perform operations on complex numbers and apply De Moivre's Theorem.

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LIST OF RECOMMENDED TEXTBOOKS /REFERENCE

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2015.
2. H. K. Dass, Engineering Mathematics, Revised Edition, S. Chand Publishing, 2018.
3. Reena Garg, Engineering Mathematics, Latest Revised Edition, Khanna Publishing House, 2018.
4. V. Sundaram, R. Balasubramanian & K.A. Lakshminarayanan, Engineering Mathematics, 6th Edition, Vikas Publishing House, 2010.
5. Schaum's Series, Engineering Mathematics, 4th Edition, McGraw-Hill, 2013.
6. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2021.
7. G. B. Thomas & R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, 1996.

MEANS OF ASSESSMENT

- Assignments, quizzes, and class tests
- Mid-term examination
- End-term examination

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DAS 102/202: PHYSICS

Course Code
DAS 102/202

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

This course aims to enable students to:

- Understand scalar and vector quantities and analyze various types of motion, including projectile and circular motion.
- Apply principles of gravitation, rotational dynamics, and fluid mechanics to solve engineering problems.
- Explain simple harmonic motion, energy conservation, and mechanical properties of materials using elasticity concepts.
- Understand fundamentals of electrostatics and magnetism, including electric and magnetic fields and their effects.
- Acquire knowledge of modern physics concepts such as the photoelectric effect, lasers, and optical fibers, and their practical engineering applications.

COURSE CONTENTS

UNIT I: Vectors and Motion

- Scalars and vectors: addition, subtraction, scalar and vector products; applications in force, velocity, and acceleration.
- Projectile motion: time of flight, horizontal range, and maximum height.
- Circular motion: angular velocity, angular acceleration, centripetal acceleration, and centripetal force.

UNIT II: Gravitation, Rotation, and Fluid Mechanics

- Gravitation: Newton's law of gravitation, Kepler's laws, escape velocity, geostationary satellites.
- Rotational dynamics: moment of inertia, perpendicular and parallel axis theorems (statements), angular momentum, conservation of angular momentum, torque.
- Fluid mechanics: surface tension, equation of continuity, Bernoulli's theorem, viscosity, Stokes' law, coefficient of viscosity.

UNIT III: Oscillations and Elasticity

- Simple harmonic motion (SHM): characteristics, equations, velocity, and acceleration.
- Simple pendulum: derivation of time period, kinetic and potential energy, energy conservation in SHM.
- Elasticity: stress, strain, Hooke's law, Young's modulus, bulk modulus, modulus of rigidity.

UNIT IV: Electrostatics and Magnetism

- Electric charge: properties, Coulomb's law, electric potential and potential difference, electric field and field lines, electric dipole.
- Magnetism: magnetic field and UNITs, magnetic intensity, magnetic lines of force, magnetic flux.

UNIT V: Modern Physics

- Photoelectric effect: work function and engineering applications.
- Lasers: spontaneous and stimulated emission, characteristics, population inversion, types, engineering and medical applications.
- Optics: refraction, refractive index, total internal reflection, optical fibres materials and types.



COURSE OUTCOMES

This course aims to enable students to:

- Apply vector concepts to analyze different types of motion.
- Solve problems using principles of gravitation, rotation, and fluid mechanics.
- Understand and explain simple harmonic motion and elasticity.
- Apply the fundamentals of electrostatics and magnetism.
- Explain modern physics concepts and their engineering applications.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. Halliday, Resnick, Walker, *Fundamentals of Physics*, John Wiley & Sons, 2018.
2. Kumar Tyagi, *Applied Physics*, Navbharti Prakashan, Meerut, 2016.
3. H. C. Verma, *Concepts of Physics (Vol. I & II)*, Bharati Bhawan, 2017.
4. R. K. Gaur, S.L. Gupta, *Engineering Physics*, Dhanpat Rai Publications, 2015.
5. M. N. Avadhanulu, P.G. Kshirsagar, *Textbook of Engineering Physics*, S. Chand Publishing, 2014.
6. Hitendra K. Malik, Ajay Kumar Singh, *Engineering Physics*, McGraw Hill India, 2018.
7. P. Khare, A. Swarup, *Engineering Physics: Fundamentals & Modern Applications*, Infinity Science Press, 2009.

MEANS OF ASSESSMENT

- Assignments, quizzes, and class tests.
- Mid-semester and end-semester written examinations.
- Laboratory experiments, exercises, and viva-voce.
- Presentations and viva-voce.

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DAS 103/203: CHEMISTRY

Course Code
DAS 103/203

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

- To build a strong foundation in chemistry relevant to engineering applications.
- To develop analytical thinking and problem-solving abilities.
- To understand key concepts in industrial, environmental, and material chemistry.
- To prepare students for laboratory practices and industry-oriented applications.

COURSE CONTENT

UNIT I: Basic Concepts & Atomic Structure

- **Solutions:** Concept of solute, solvent, and solution; methods of expressing concentration—molarity, molality, normality, ppm, mass percentage, volume percentage, and mole fraction.
- **Atomic Structure:** Rutherford model, Bohr's theory (excluding derivations), hydrogen spectrum, Heisenberg uncertainty principle, quantum numbers, orbital concept, shapes of s, p, and d orbitals.
- **Principles:** Pauli's exclusion principle, Hund's rule, Aufbau principle, electronic configuration.
- **Periodic Table & Properties:** Atomic size, ionization energy, electron affinity, electro negativity.
- **Chemical Bonding:** Ionic, covalent, and coordinate bonds.

UNIT II: Electrochemistry

- Concepts of oxidation, reduction, and redox reactions.
- Electrolytes and non-electrolytes with examples.
- Faraday's laws of electrolysis and related numerical problems.
- **Industrial Applications:** Electrometallurgy, electroplating, electrolytic refining.
- Electrochemical cells and applications of redox reactions.
- **Cells:** Primary cells (dry cell), secondary cells (lead-acid battery), fuel cells, and solar cells.

UNIT III: Water Technology & Environmental Chemistry

- Sources and impurities of water.
- Hardness of water and its determination using the EDTA method.
- Total dissolved solids (TDS) and alkalinity estimation.
- **Water Treatment Methods:** Lime-soda process, zeolite process, ion-exchange method.
- **Boiler Problems:** Scale, sludge, and corrosion.
- **Environmental Chemistry:** Air and water pollution, green chemistry principles.

UNIT IV: Chemistry of Fuels and Lubricants

- Definition and classification of fuels (solid, liquid, gaseous).
- Combustion of fuels (basic concepts).
- **Calorific Value:** Higher Calorific Value (HCV), Lower Calorific Value (LCV), Dulong's formula.
- **Fuels:** Coal (proximate analysis), petroleum fuels (octane and cetane numbers), LPG, CNG, water gas, biogas.
- **Lubricants:** Mechanism and properties.



UNIT V: Engineering Materials & Industrial Chemistry

- **Metals and Alloys:** Properties, uses, occurrence of metals, ores (iron, aluminum, copper), metallurgy principles.
- Extraction processes of Fe and Al.
- **Polymers:** Monomers, homopolymers, copolymers, degree of polymerization.
- Preparation, properties, and applications of thermoplastics and thermosetting plastics (PVC, PS, PTFE, Nylon-6, Nylon-6,6, Bakelite).
- Rubber and vulcanization.
- **Industrial Materials:** Cement, glass, ceramics (basic chemistry and applications).

COURSE OUTCOMES

After completing this course, students will be able to:

- Apply concepts of atomic structure, bonding, and periodicity to engineering problems.
- Perform chemical calculations and interpret reaction behavior.
- Analyze water quality and recommend suitable treatment methods.
- Understand the properties and applications of fuels, materials, and polymers.
- Demonstrate awareness of environmental issues and laboratory safety practices.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. NCERT, *Chemistry Textbooks for Class XI & XII*, New Delhi. (2025–2026)
2. Rawlley, A & Saraf, D. V. *Applied Chemistry (with Lab Manual)*, Khanna Publishing, 2024.
3. Dara, S. S., & Umare, S. S., *Engineering Chemistry*, S. Chand, 2018.
4. Jain, P. C., & Jain, M., *Engineering Chemistry*, Dhanpat Rai, 2018.
5. Emich, F., *Engineering Chemistry*, Scientific International, 2014.

MEANS OF ASSESSMENT

- Assignments, quizzes, and class tests
- Mid-semester and end-semester examinations
- Practical work and laboratory performance
- Viva-voce and presentations

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**DEE 101/201: FUNDAMENTALS OF ELECTRICAL AND
ELECTRONICS ENGINEERING**

Course Code
DEE 101/201

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

- To develop a conceptual understanding of fundamental electrical and electronic principles.
- To build analytical skills for solving DC and AC circuit problems.
- To understand semiconductor devices and their practical applications.
- To introduce the basic concepts of analog and digital electronics.
- To prepare students for real-world applications in electrical, electronics, and communication systems.

COURSE CONTENTS

UNIT I: Basic Electrical Concepts

- Electric current, electromotive force (EMF), potential difference (voltage), resistance, and resistivity along with their SI UNITS
- Conductors and insulators
- Insulation resistance of cables
- Effect of temperature on resistance and temperature coefficient of resistance
- Electrical power and energy with SI UNITS and numerical applications
- Heating effect of electric current and its applications
- Relationship between electrical, mechanical, and thermal forms of work, power, and energy
- Electrical safety measures and safe handling practices

UNIT II: DC Circuits

- Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL)
- Types of voltage and current sources
- Thevenin's theorem and its application
- Superposition theorem and its application in multi-source circuits
- Maximum power transfer theorem and condition for maximum power delivery
- Applications of network theorems in circuit analysis

UNIT III: AC Circuits

- Instantaneous value, peak value, cycle, frequency, alternating current, and voltage
- Sinusoidal waveforms and their mathematical representation
- Average and RMS values of AC quantities
- Concept of phase and phase difference
- Phasor representation of AC quantities
- Behavior of AC circuits with resistance, inductance, and capacitance

UNIT IV: Semiconductor Devices and Diodes

- Energy band theory and forbidden energy gap
- Intrinsic and extrinsic semiconductors
- Formation and working of P-N junction diode
- V-I characteristics and ratings of a diode
- Diode parameters and breakdown mechanisms
- Applications of diodes: half-wave and full-wave rectifiers
- Transformer Utilization Factor (TUF)

UNIT V: Transistors and Digital Electronics

- Construction and working of Bipolar Junction Transistor (BJT)
- BJT as an amplifier
- Introduction to switching theory
- Number systems, binary arithmetic, and base conversions
- Boolean algebra and logic gates
- Universal gates and basic logic design

COURSE OUTCOMES

After successful completion of the course, students will be able to:

- Understand and apply fundamental electrical and electronic concepts
- Analyze DC and AC circuits using basic laws and theorems
- Explain the working and applications of semiconductor devices
- Apply transistor concepts in electronic circuits
- Use basic digital electronics and logic design principles in practical applications

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. Boylestad, R. L., & Nashelsky, L., *Electronic Devices and Circuit Theory*, Pearson Education.
2. Bell, D. A., *Electronic Devices and Circuits*, Oxford University Press.
3. Mano, M. M., *Digital Computer Design*, PHI Learning.
4. Theraja, B. L., & Theraja, A. K., *A Textbook of Electrical Technology (Vol. I)*, S. Chand.
5. Rajalakshmi, G., & Srivanantham, N., *Basic Electrical and Electronics Engineering*, New Age / McGraw Hill.

MEANS OF ASSESSMENT

- Assignments, quizzes, class tests, mid-semester and end-semester examinations
- Practical work, lab exercises, and viva-voce
- Presentations and continuous assessment



**DMC 101/201: FUNDAMENTALS OF MECHANICAL AND
CIVIL ENGINEERING**

Course Code
DMC101/201

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

This course aims to:

- Introduce the basic concepts of mechanical and civil engineering and their industrial and infrastructural applications.
- Provide knowledge of energy sources, fuels, and fundamental thermodynamic principles in engineering systems.
- Familiarize students with common machine components and power transmission systems.
- Develop an understanding of civil engineering concepts such as soil, foundations, and construction materials.
- Raise awareness about structural behavior, safety practices, and sustainable engineering approaches.

COURSE CONTENTS

UNIT I: Energy Sources and Basic Thermodynamics

- Role of mechanical engineering in energy systems.
- Conventional energy sources: thermal, hydro, nuclear.
- Non-conventional energy sources: solar, wind, tidal, biomass.
- Basic thermodynamics: system, properties, energy, heat, and work.
- Applications of energy systems in power generation and industry.



UNIT II: Fuels and Combustion

- Classification of fuels: solid, liquid, gaseous.
- Composition and properties of fuels.
- Calorific value: higher and lower.
- Combustion process and chemical equations.
- Air requirement for complete combustion; excess air and its effect on efficiency.
- Flue gas analysis and Orsat apparatus.
- Properties of liquid fuels: viscosity, flash point, fire point, octane and cetane numbers.
- Basic numerical problems on combustion.

UNIT III: Machine Components and Power Transmission

- Types of loading on machine components.
- Joints: pin, cotter, knuckle.
- Shaft components: keys, keyways, splines.
- Shafts, cranks, eccentrics, collars.
- Couplings and clutches.
- Bearings: sliding and rolling contact; selection using standard data.
- Gears: types, gear trains, and velocity ratio in simple gear trains.
- Introduction to springs: types and applications.

UNIT IV: Basics of Civil Engineering and Construction Materials

- Role of civil engineering in infrastructure development.
- Classification and properties of soils.
- Bearing capacity of soil (basic concept).
- Foundations: shallow and deep; types.
- Building components: load-bearing and non-load-bearing structures.
- Masonry: brick, stone, and concrete block.



- Mortars and their types.
- Bonds in brick masonry: English and Flemish.

UNIT V: Basic Structural Concepts and Applications

- Types of loads acting on structures.
- Basic concepts of stress and strain in civil structures.
- Introduction to beams, columns, and slabs.
- Overview of common construction practices.
- Introduction to modern construction materials.
- Safety practices in mechanical and civil engineering works.
- Introduction to sustainability and green engineering concepts.

COURSE OUTCOMES

After completing this course, students will be able to:

- Explain the basic concepts of energy sources, fuels, and their applications in engineering systems.
- Identify and describe various machine components and power transmission elements in mechanical systems.
- Understand fundamental properties of soils, construction materials, and basic civil engineering practices.
- Apply basic thermodynamic principles and material behavior in solving simple engineering problems.
- Recognize the role of safety, sustainability, and modern engineering practices in mechanical and civil engineering fields.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. S. Trymbaka Murthy, *A Textbook of Basic Mechanical Engineering*, 2nd Edition, I.K. International Publishing House, 2018.
2. K. Venugopal & V. Prabhu Raja, *Basic Mechanical Engineering*, 2nd Edition, Anuradha Publications, 2014.
3. R. S. Khurmi & J. K. Gupta, *A Textbook of Machine Design*, 14th Edition, S. Chand & Company, 2019.
4. S. S. Bhavikatti, *Basic Civil Engineering*, 3rd Edition, New Age International Publishers, 2015.

MEANS OF ASSESSMENT

- Assignments, quizzes/class tests, mid-semester and end-semester written examinations.
- Practical exercises, actual lab work (where applicable), and viva-voce.
- Presentations and viva-voce evaluations.

DCS 101/201: FUNDAMENTALS OF COMPUTER

Course Code
DCS 101/201

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- Introduce the fundamental concepts of computers and their applications.
- Familiarize students with the components of a computer system.
- Explain data representation and number systems.
- Provide working knowledge of operating systems and MS Office tools.
- Introduce the basics of the Internet and algorithms.

COURSE CONTENTS

UNIT I: Introduction to Computers

- Characteristics and capabilities of computers.
- Limitations of computers.
- Classification of digital computer systems.
- Anatomy of a digital computer.
- Applications of computers in various domains (office, publishing, ticketing, banking, etc.).
- Components of a PC: Mouse, Keyboard, CPU, Monitor, Printers, Scanners, Modem, Memory, Sound cards, Pen drives.



UNIT II: Introduction to Operating System

- Working with Windows desktop: icons, taskbar, and menu options.
- Navigating My Documents, My Computer, Control Panel, Recycle Bin.
- Understanding drives, folders, and files.
- Windows accessories: Notepad, WordPad, Paint, Clock, Calendar, Calculator.

UNIT III: Data Representation & Multimedia

- Representing symbols and minimizing errors.
- ASCII and EBCDIC codes.
- Decimal number system and conversions to binary.
- Multimedia fundamentals: digital images, analog-to-digital conversion, digital audio, and video.

UNIT IV: GUI-Based Software – MS Office

- **MS Word:** Menus, toolbars, opening/closing documents, clipboard operations.
- **MS Excel:** Data manipulation, formulas, functions, charts.
- **MS PowerPoint:** Presentation creation, slide layouts, graphs, auto content wizard, slideshow, animation effects, and views (Normal, Outline, Slide Sorter, and Reading).

UNIT V: Internet, Algorithms & Output Devices

- **Internet:** History, required equipment, and web browsers (Internet Explorer, Mozilla Firefox, Google Chrome).
- **Algorithms:** Introduction, basic operations, procedures, and programs.
- **Output Devices:** Human-computer interface, keyboard, raster scanning, frame buffer, graphics basics, terminals (B/W, color), LEDs/LCDs, inkjet, and laser printers.



COURSE OUTCOMES

By the end of this course, students will be able to:

- Understand basic computer concepts and applications.
- Identify and use various computer components.
- Perform number system conversions and understand data representation.
- Effectively use operating systems and MS Office tools.
- Comprehend the fundamentals of the Internet and algorithms.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. Godbole, A., *Demystifying Computers*, McGraw Hill Education India, Noida, 1st Edition, 2009.
2. Leon, A., *Introduction to Computers*, Vikas Publishing House, New Delhi, 1st Edition 2012.
3. Gupta, V., *Comdex Computer Course Kit*, Dream tech Press, New Delhi, 1st Edition, 2014.
4. Schwartz, S., *Microsoft Office 2010*, Pearson Education, New Delhi, 1st Edition 2010.
5. Marmel, E., *Microsoft Project 2010 Bible*, Wiley India, New Delhi, 1st Edition 2010.
6. Preppernau, J., Cox, J., *Windows 7 Step by Step*, PHI Learning, New Delhi, 1st Edition 2010.

MEANS OF ASSESSMENT

- Assignments, quizzes, and class tests.
- Mid-semester and end-semester written examinations.
- Practical exercises, actual lab work, and viva-voce.
- Presentations and viva-voce evaluations.



DME 101/201: FUNDAMENTALS OF MECHANICS

Course Code
DME 101/201

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

The objectives of this course are to

- Develop a fundamental understanding of forces, equilibrium, and principles of mechanics used in engineering systems.
- Enable students to analyze different force systems and apply equilibrium conditions to solve engineering problems.
- Introduce the concepts of moments, couples, friction, and their applications in real-life mechanical systems.
- Build basic knowledge of stress, strain, and material behavior under various loading conditions.
- Familiarize students with structural elements and simple machines commonly used in engineering practice.

COURSE CONTENTS

UNIT I – Basics of Mechanics

- Definition, scope, and applications of engineering mechanics.
- Idealizations: particle, rigid body, and continuum.
- Scalar and vector quantities.
- Force: characteristics, types, and effects.
- Principles of transmissibility, superposition, and physical independence of forces.
- Free Body Diagram (FBD) and its engineering applications.

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UNIT II – System of Forces and Equilibrium

- Coplanar and non-coplanar force systems.
- Concurrent and non-concurrent forces.
- Resultant of force systems (analytical and graphical methods).
- Laws of forces: parallelogram, triangle, and polygon laws.
- Equilibrium conditions for particle and rigid body.
- Determination of support reactions.
- Applications in engineering structures such as cranes, brackets, and frames.

UNIT III – Moments, Couples, and Friction

- Moment of a force and its applications.
- Varignon's theorem (principle of moments).
- Couples: definition, properties, and equivalent systems.
- Equilibrium using force and moment equations.
- Types of friction: static, limiting, and kinetic.
- Laws of friction and coefficient of friction.
- Angle of friction and angle of repose.
- Applications: inclined planes, ladders, wedges, and ramps.

UNIT IV – Mechanical Properties of Materials

- Concept of stress and strain.
- Types of stresses: tensile, compressive, shear, bending, and torsional.
- Types of strains: linear, lateral, and volumetric.
- Hooke's law and elastic behavior of materials.
- Elastic constants: Young's modulus, shear modulus, bulk modulus, and Poisson's ratio.
- Stress-strain diagrams for ductile and brittle materials.
- Deformation of bars under axial loading.
- Introduction to thermal stress and composite bars.

UNIT V – Structural Systems and Simple Machines

- Types of supports and support reactions.
- Statically determinate and indeterminate structures.
- Analysis of cantilever and simply supported beams.
- Trusses: method of joints and method of sections.
- Graphical methods: Bow's notation and force diagrams.
- Definition and classification of machines.
- Mechanical Advantage (MA), Velocity Ratio (VR), and efficiency.
- Law of machines.
- Lifting machines: levers, pulley systems, wheel and axle, screw jack, and worm gear systems.

COURSE OUTCOMES

Upon successful completion of this course, students will be able to:

- Apply fundamental concepts of mechanics, including force systems, vectors, and free body diagrams, to solve engineering problems.
- Analyze coplanar and non-coplanar force systems and determine resultants and equilibrium conditions using analytical and graphical methods.
- Evaluate moments, couples, and frictional forces in practical engineering applications.
- Interpret stress-strain behavior of materials and calculate deformation under axial and simple loading conditions.
- Analyze basic structural elements and simple machines for practical engineering applications.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. R.S. Khurmi, *Engineering Mechanics*, S. Chand & Company, 21st Edition, New Delhi, 2019.



2. R.K. Rajput, *Engineering Mechanics*, Laxmi Publications, New Delhi, 5th Edition, 2016.
3. S.S. Bhavikatti, *Engineering Mechanics*, New Age International Publishers, New Delhi, 8th Edition, 2022.
4. R.C. Hibbeler, *Engineering Mechanics: Statics*, 15th Edition, Pearson Education Limited, 2022.
5. F.P. Beer, E.R. Johnston, D.F. Mazurek, P.J. Cornwell, *Vector Mechanics for Engineers: Statics and Dynamics*, McGraw Hill Education, New Delhi, 12th Edition, 2019.

MEANS OF ASSESSMENT

- Assignments, quizzes, and class tests.
- Mid-semester and end-semester written examinations.
- Practical exercises, laboratory work, and viva-voce.
- Presentations and oral assessments.

DAS 152/253: PHYSICS LAB

Course Code
DAS 152/253

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- To develop experimental skills and accuracy in measurement.
- To verify fundamental physics concepts through hands-on laboratory work.
- To analyze experimental data, understand errors, and improve problem-solving skills.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Measurement of the diameter of a wire using a screw gauge.
2. Determination of the volume of a solid and a hollow cylinder using a vernier caliper.
3. Determination of the focal length of a convex lens.
4. Measurement of the frequency of AC mains using a sonometer.
5. Determination of acceleration due to gravity (g) using a simple pendulum.
6. Determination of the radius of curvature of a spherical surface using a spherometer.
7. Study of the colour code of resistors.
8. Investigation of the V-I characteristics of a PN junction diode.
9. Determination of the moment of inertia of a flywheel.
10. Determination of the refractive index of glass using a prism.

Handwritten signatures: A, Prathak, Poon, W

ADDITIONAL / ADVANCED EXPERIMENTS

1. Study of the bending of light through a plane mirror and verification of the law of reflection.
2. Determination of Young's modulus of a metallic wire using the stretching method.
3. Determination of the specific heat capacity of a solid using the method of mixtures.
4. Verification of Ohm's law and determination of the resistance of a given wire.
5. Determination of the surface tension of water by capillary rise method.
6. Study of diffraction pattern of a single slit and determination of wavelength of light.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Accurately measure physical quantities using precision instruments like vernier calipers, screw gauges, and spherometers.
- Analyze experimental data to verify fundamental laws of physics, including mechanics, optics, and electricity.
- Determine key physical constants such as acceleration due to gravity, refractive index, focal length, and moment of inertia.
- Understand electrical components and devices through practical experiments, such as diodes and resistors.
- Apply experimental methods to evaluate material properties like Young's modulus, specific heat, and surface tension.
- Develop critical thinking and problem-solving skills by identifying errors, drawing conclusions, and interpreting results.

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DAS 153/253: CHEMISTRY LAB

Course Code
DAS 153/253

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- To develop basic experimental skills and laboratory techniques in chemistry.
- To perform quantitative chemical analyses and prepare standard solutions.
- To understand water quality analysis and the preparation of industrially important chemicals.
- To analyze and interpret experimental data accurately.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Preparation of standard solutions of oxalic acid, sodium carbonate, and hydrochloric acid.
2. Determination of strength of NaOH using standard oxalic acid (acid-base titration).
3. Determination of iron content using KMnO_4 solution (redox titration).
4. Estimation of alkalinity of a water sample by titration.
5. Determination of chloride content in water using Mohr's method.
6. Determination of total hardness of water using EDTA titration.
7. Determination of temporary and permanent hardness of water.
8. Determination of viscosity of lubricating oil using a viscometer.



9. Determination of pH of given solutions using pH meter and pH paper.
10. Preparation of Phenol-Formaldehyde Resin.

ADDITIONAL / ADVANCED EXPERIMENTS

1.
 1. Determination of iron content using spectrophotometry.
 2. Preparation of urea-formaldehyde resin.
 3. Determination of surface tension of a liquid using stalagmometer.
 4. Determination of saponification value of an oil or fat.
 5. Conductometric titration to determine the strength of an acid or base.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Prepare standard solutions and perform accurate titrations for quantitative analysis.
- Analyze water quality parameters, including hardness, alkalinity, and chloride content.
- Determine concentrations of ions and compounds using redox and complex metric titrations.
- Measure physical properties of liquids such as viscosity and surface tension.
- Synthesize industrially important polymers, such as phenol-formaldehyde and urea-formaldehyde resins.
- Develop proper laboratory practices, including safe handling of chemicals, precise measurements, and accurate data recording.



**DEE 151/251: FUNDAMENTALS OF ELECTRICAL AND
ELECTRONICS ENGINEERING LAB**

Course Code
DAS 151/251

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

The objectives of this laboratory course are to:

1. Develop fundamental understanding of electrical and electronic components and circuits.
2. Enable students to verify basic electrical laws and theorems through practical implementation.
3. Familiarize students with measuring instruments such as voltmeters, ammeters, CRO/DSO, and multimeters.
4. Provide hands-on experience in analyzing DC and AC circuits.
5. Introduce semiconductor devices and their practical applications.
6. Build foundational skills in circuit design, testing, and troubleshooting.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. To verify Ohm's Law and determine the resistance of a given resistor using the voltmeter-ammeter method.
2. To verify Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in DC circuits.
3. To verify Thevenin's Theorem for a given DC resistive network.

4. To verify Maximum Power Transfer Theorem and plot the graph of load power versus load resistance.

AC Circuit Experiments

5. To study waveform, average value, and RMS value of AC voltage/current using CRO/DSO.

Semiconductor Devices

6. To plot V-I characteristics of a P-N junction diode in forward and reverse bias and determine static and dynamic resistance.
7. To study the V-I characteristics of a Zener diode and verify its voltage regulation property.

Rectifiers and Applications

8. To construct and test half-wave and full-wave rectifier circuits and measure rectification efficiency and ripple factor.

Transistor Experiments

9. To plot input and output characteristics of a BJT in CE configuration and determine current gain (β).

Digital Electronics

10. To verify truth tables of basic logic gates and universal gates (NAND/NOR) and implement Boolean functions.

ADDITIONAL SKILL-ENHANCING PRACTICALS

1. To measure resistance using Wheatstone Bridge.
2. To study series and parallel combination of resistors and verify experimentally.
3. To determine power and power factor in AC circuits.
4. To study the working of a single-phase transformer (basic demonstration/measurement).
5. To construct a bridge rectifier and compare its performance with other rectifiers.



6. To design and test a Zener diode voltage regulator circuit.
7. To study charging and discharging of a capacitor (RC circuit) and plot the waveform.
8. To perform soldering and desoldering practice for circuit assembly.
9. To implement basic combinational logic circuits (Half Adder/Full Adder).
10. To use a digital multimeter for measurement of voltage, current, and resistance.

COURSE OUTCOMES

After completing this course, students will be able to:

- Apply fundamental electrical laws (Ohm's Law, KCL, KVL) in practical circuits.
- Analyze and verify network theorems for DC circuits.
- Measure electrical parameters using standard laboratory instruments.
- Understand and interpret AC waveforms and calculate RMS and average values.
- Analyze characteristics of semiconductor devices such as diodes and transistors.
- Design and test basic rectifier and electronic circuits.
- Implement basic digital logic circuits using logic gates.
- Develop problem-solving and troubleshooting skills in electrical and electronic systems.

DMC 151/251: MECHANICAL AND CIVIL LAB

Course Code
DMC 151/251

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

By the end of this course, students will be able to:

- Understand and experimentally verify fundamental laws of mechanics and mechanical principles.
- Develop basic skills in analyzing forces, moments, friction, and structural members.
- Gain hands-on knowledge of mechanical and civil engineering components and construction materials.
- Acquire practical exposure to renewable energy systems and mechanical assemblies.
- Improve technical skills in testing, measurement, and evaluation of engineering materials.

LIST OF PRACTICALS

CORE EXPERIMENTS

Fundamentals of Mechanics

1. Verification of the parallelogram law of forces.
2. Verification of the polygon law of forces.
3. Verification of the principle of moments (Varignon's theorem).
4. Determination of coefficient of friction for different surfaces.

5. Determination of support reactions in a simply supported beam.
6. Determination of forces in members of a truss or jib crane.

Fundamentals of Mechanical Engineering

1. Study and demonstration of renewable energy devices (solar cooker, wind turbine, or biogas plant).
2. Study of machine components: keys, couplings, clutches, and bearings (demonstration and identification).
3. Study of gears and gear trains, including simple, compound, and epicyclic systems.

Fundamentals of Civil Engineering

1. Identification of construction materials: soil, aggregates, and timber (visual examination).
2. Tests on cement and bricks, including:
 - Consistency and setting time of cement
 - Water absorption and compressive strength of bricks

SKILL ENHANCEMENT AND INDUSTRY-ORIENTED PRACTICALS

1. Measurement of centre of gravity and moment of inertia of simple objects.
2. Assembly and disassembly of a small mechanical system (e.g., a gear box or pulley system) to enhance hands-on skills.
3. Measurement of torque and power transmission in simple mechanical setups
4. Basic soil property tests, such as particle size distribution and moisture content.
5. Measurement of slump and workability of concrete to understand practical civil engineering concepts.

COURSE OUTCOMES

After successful completion of this course, students will be able to:

- Apply laws of mechanics to verify theoretical concepts through experiments.
- Analyze support reactions, truss forces, and friction phenomena in mechanical systems.
- Identify and understand the function of mechanical components such as gears, clutches, couplings, and bearings.
- Demonstrate knowledge of renewable energy devices and their working principles.
- Identify construction materials and perform basic tests on cement, bricks, and aggregates.
- Develop analytical and practical skills to measure, test, and interpret engineering data.

DCS 151/251: FUNDAMENTALS OF COMPUTER LAB

Course Code
DCS 151/251

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

This lab course aims to:

- Provide hands-on experience with computer peripherals, operating systems, and essential software tools.
- Develop skills in word processing, spreadsheets, and presentation software.
- Teach file management, internet applications, and basic data handling.
- Familiarize students with practical computer applications relevant to industry requirements.
- Enhance problem-solving and digital literacy skills through guided exercises.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Study of Computer Peripherals

- Demonstration and identification of input/output devices.
- Hands-on use of USB devices, scanners, and printers.

2. Windows Desktop Operations

- Navigating Windows environment, arranging icons, creating shortcuts.
- Using taskbar, start menu, and virtual desktops.



3. File and Folder Management

- Creating, copying, renaming, moving, and deleting files/folders.
- Organizing files for project and collaborative work.

4. Notepad and WordPad Operations

- Creating and editing documents.
- Basic formatting and saving text files.

5. Paint Application

- Drawing and editing images.
- Exporting images for reports or presentations.

6. MS Word – Basic Operations, Page Setup & Tables

- Document creation, formatting, headers/footers, and page layout.
- Creating and formatting tables for reports.

7. MS Word – Printing & Mail Merge

- Printer setup, printing options, and mail merge for letters/envelopes.

8. MS Excel – Basic Operations

- Creating worksheets, data entry, formatting, and printing.
- Using formulas, functions, and creating charts for data analysis.

9. MS PowerPoint – Presentation Basics

- Creating slides, layouts, inserting multimedia, animations, and slide transitions.
- Setting slide timings for automated presentations.



10. Internet Applications

- Internet connection setup, email creation, sending/receiving emails.
- Searching information efficiently using search engines.
- Using online collaboration tools (Google Drive, One Drive) and managing bookmarks/favourites.

ADDITIONAL INDUSTRY-RELEVANT PRACTICALS

1. **Introduction to Google Workspace & Collaboration Tools:** Creating and sharing documents, spreadsheets, and presentations online.
2. **Basic Data Entry and Analysis:** Using MS Excel for simple reports, charts, and data visualization.
3. **Document Conversion & PDF Handling:** Converting Word/Excel files to PDF and vice versa.
4. **Basic Cyber Hygiene Practices:** Understanding safe internet use, passwords, and secure file sharing.
5. **Presentation & Report Automation:** Using templates and styles for professional output.

COURSE OUTCOMES

After completing this lab, students will be able to:

- Identify and use computer hardware and peripheral devices effectively.
- Perform file and folder management efficiently using Windows OS.
- Create, edit, format, and print documents using MS Word.
- Manipulate and analyze data using MS Excel, including formulas, functions, and charts.
- Design professional presentations using MS PowerPoint with transitions and animations.
- Use the Internet for communication, research, and productivity tools.
- Apply advanced practical skills like basic database operations, online collaboration tools, and document sharing to enhance employability.



DME 151/251: WORKSHOP PRACTICE

Course Code
DME 151/251

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE DESCRIPTION

This course provides hands-on training in various basic manufacturing and fabrication processes. It enables students to develop practical skills in fitting, carpentry, welding, machining, blacksmithy, and foundry work, which are essential for engineering applications.

COURSE OBJECTIVES

The objectives of this course are to:

- Develop basic workshop skills using different hand tools and machines.
- Familiarize students with various manufacturing processes such as fitting, carpentry, welding, machining, forging, and casting.
- Enhance the ability to read simple drawings and convert them into physical components.
- Promote safety awareness and proper handling of workshop equipment.
- Build precision, accuracy, and workmanship in practical tasks.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Fitting Shop – Basic Fitting

- Marking, cutting, and filing operations
- Preparation of a rectangular fitting job

2. **Fitting Shop – V-Fitting Assembly**
 - Angular filing and precision fitting
 - Preparation of V-fitting or square fitting
3. **Carpentry Shop – Basic Joint**
 - Marking and cutting of wood
 - Preparation of T-lap joint
4. **Carpentry Shop – Advanced Joint**
 - Preparation of mortise and tenon joint
5. **Welding Shop – Arc Welding (Butt Joint)**
 - Arc striking and bead formation
 - Preparation of butt joint
6. **Welding Shop – Arc Welding (Lap Joint)**
 - Preparation of lap joint
 - Study of weld strength and defects
7. **Machine Shop – Basic Lathe Operation**
 - Study of lathe machine
 - Facing and plain turning operations
8. **Machine Shop – Step/Shoulder Turning**
 - Step/shoulder turning operation
 - Measurement and finishing
9. **Blacksmithy Shop – Forging Job**
 - Heating and forging operations
 - Preparation of a hook or simple tool (e.g., screwdriver blade)
10. **Foundry Shop – Sand Mould Preparation**
 - Preparation of mould using split pattern
 - Study of gating and riser systems



Additional Practicals for Skill Enhancement:

1. Measurement and Inspection

- Use of vernier caliper, micrometer, and steel rule
- Checking dimensions and tolerances

2. Sheet Metal Work

- Marking, cutting, and bending operations
- Preparation of tray or funnel

3. Drilling and Tapping

- Drilling holes using drilling machine
- Tapping internal threads

4. Surface Finishing

- Grinding and polishing operations
- Surface roughness understanding

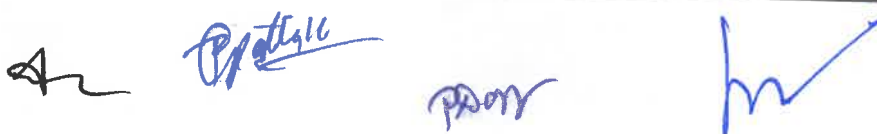
5. Safety Practices in Workshop

- Demonstration of PPE (Personal Protective Equipment)
- Safe handling of tools and machines

COURSE OUTCOMES

After completing this course, students will be able to:

- Perform basic fitting, carpentry, and welding operations with accuracy.
- Operate common workshop machines such as lathe machines safely and efficiently.
- Fabricate simple mechanical components using different workshop practices.
- Identify and use appropriate tools for specific manufacturing operations.
- Demonstrate knowledge of safety procedures in workshop environments.
- Understand basic defects and quality aspects in manufacturing processes.



DME 151/251: ENGINEERING DRAWING

Course Code
DCE 151/251

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

This lab course aims to:

- Introduce students to the fundamentals of engineering drawing, including visualization, orthographic, and isometric projections.
- Develop skills in representing mechanical and civil engineering components through conventional drawing standards.
- Familiarize students with machine drawing and basic CAD tools (AutoCAD) used in industry.
- Enhance understanding of geometric constructions, sections, and surface developments.
- Build competence in interpreting, creating, and communicating engineering designs effectively.

LIST OF PRACTICALS

CORE EXPERIMENTS

Sheet 1: Lettering and Scales

- Single-stroke vertical and inclined capital letters and numerals.
- Use of stencils in engineering drawing.
- Introduction to scales and representative fraction (R.F.).
- Plain and diagonal scales.

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Sheet 2: Conventional Representation

- Types of lines used in engineering drawing.
- Conventional representation of materials.
- Standard symbols for threads and welded joints.
- Representation of common machine parts.

Sheet 3: Principles of Projection

- Concept of orthographic and pictorial projections.
- Horizontal Plane (HP) and Vertical Plane (VP).
- First angle and third angle projection methods.
- Basic dimensioning techniques.

Sheet 4: Projections of Points, Lines, and Planes

- Projection of points in different quadrants.
- Projection of straight lines (parallel and inclined to planes).
- Projection of simple planes.

Sheet 5: Orthographic Projection of Solids

- Projection of simple solids: cube, prism, pyramid, cylinder, cone.
- Solids with axes and faces inclined to reference planes.

Sheet 6: Orthographic Views and Missing Views

- Orthographic views of simple and composite solids from isometric views.
- Exercises on missing views and interpretation of drawings.

Sheet 7: Sections of Solids

- Concept of sectioning and cutting planes.
- Sections with planes parallel and perpendicular to reference planes.
- True shape of sections.

Sheet 8: Isometric Projection

- Isometric scale and construction.



- Isometric projection of simple solids.
- Conversion of orthographic views to isometric views.

Sheet 9: Development of Surfaces

- Methods of development: parallel line and radial line.
- Development of cube, prism, cylinder, cone, and pyramid.
- Development of truncated solids.

Sheet 10: Machine Drawing and CAD Practice

- Drawing of basic machine components: nut-bolt, coupling, bracket.
- Introduction to assembly drawings (simple cases).
- Basic 2D drawing using AutoCAD: line, circle, arc, rectangle, editing, and snap commands.

ADDITIONAL INDUSTRY-RELEVANT PRACTICAL ENHANCEMENTS

To align with industry needs and improve employability, the following additional exercises are recommended:

1. **Parametric Sketching in CAD:** Basic 2D parametric drawings using AutoCAD or similar CAD software.
2. **Assembly and Exploded Views:** Creating simple assemblies and exploded views for mechanical components.
3. **Sheet Metal Development:** Practical exercises on developing sheet metal components for manufacturing.
4. **Introduction to 3D CAD:** Simple 3D modeling of solids in CAD software (e.g., AutoCAD 3D or Fusion 360).
5. **Tolerance and Fits:** Understanding and representing basic engineering tolerances on drawings.

COURSE OUTCOMES

After completing this lab, students will be able to:

- Produce standard engineering drawings using conventional symbols, lines, and projection techniques.
- Draw orthographic and isometric projections of points, lines, planes, and solids.
- Perform sections, developments, and assembly drawings of simple solids and machine components.
- Apply CAD software (AutoCAD) to create 2D drawings and simple assemblies.
- Develop visualization, technical communication, and problem-solving skills required in engineering design.

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**Scheme of Instructions &
Syllabi
of
Diploma in Civil Engineering
2nd Year**

(With effective from session 2026-27)

(Awdhesh Kumar)
HOD CE

(Dr. R. K. Shukla)
Dean Engineering

(Dr. Y.D.S Arya)
Vice Chancellor

Invertis Institute of Engineering & Technology
INVERTIS UNIVERSITY

Invertis Village, Bareilly-Lucknow NH-24, Bareilly

243123, Uttar Pradesh

Study & Evaluation Scheme
Diploma Civil Engineering
(w.e.f. Academic Year 2026-2027)
Year II, Semester-III

Sl. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDITS	
						SESSIONAL EXAM.				E-SEM.			
			L	T	P	CT	TA	AT	TOTAL				
THEORY													
1	DCE301	Surveying – I	3	1	0	20	10	10	40	60	100	4	
2	DCE302	Building Construction – I	3	1	0	20	10	10	40	60	100	4	
3	DCE303	Building Materials	3	1	0	20	10	10	40	60	100	4	
4	DCE304	Strength of Materials	3	1	0	20	10	10	40	60	100	4	
5	DCE305	Hydraulics & Hydraulics Machines	3	1	0	20	10	10	40	60	100	4	
6	EPC001	AI Based English Proficiency-I	0	0	0	0	0	0	0	50	50	2	
PRACTICAL/TRAINING/PROJECT													
7	DCE351	Surveying Lab – I	0	0	6	-	-	-	50	50	100	2	
8	DCE352	Building Materials Lab	0	0	3	-	-	-	50	50	100	2	
9	DCE354	Strength of Materials Lab	0	0	3	-	-	-	50	50	100	2	
10	DCE355	Hydraulics Lab	0	0	3	-	-	-	50	50	100	2	
11	GP301	General Proficiency	-	-	-	-	-	-	50	-	50	1	
		TOTAL	15	5	15	100	50	50	450	550	1000	31	

L-Lecture, T- Tutorial, P- Practical, CT – Cumulative Test, TA –Teacher Assessment, AT – Attendance, E-Sem – End Semester Marks

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Study & Evaluation Scheme
Diploma Civil Engineering
(w.e.f. Academic Year 2026-2027)
Year II, Semester-IV

Sl. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDITS	
						SESSIONAL EXAM.				E-SEM.			
			L	T	P	CT	TA	AT	TOTAL				
THEORY													
1	DCE401	Soil Mechanics & Foundation Engineering	3	1	0	20	10	10	40	60	100	4	
2	DCE402	Public Health Engineering-I	3	1	0	20	10	10	40	60	100	4	
3	DCE403	Concrete Technology	3	1	0	20	10	10	40	60	100	4	
4	DCE404	Irrigation Engineering	3	1	0	20	10	10	40	60	100	4	
5	DCE405	Building Construction – II	3	1	0	20	10	10	40	60	100	4	
6	EPC002	AI Based English Proficiency-I	0	0	0	0	0	0	0	50	50	2	
PRACTICAL/TRAINING/PROJECT													
7	DCE451	Soil Mechanics & Foundation lab	0	0	4	-	-	-	50	50	100	2	
8	DCE452	Public health Engineering Lab	0	0	2	-	-	-	50	50	100	2	
9	DCE453	Concrete Technology Lab	0	0	4	-	-	-	50	50	100	2	
10	DCE454	Civil Engineering Drawing – I	2	0	6	-	-	-	50	50	100	2	
11	GP401	General Proficiency	-	-	-	-	-	-	50	-	50	1	
		TOTAL	17	5	16	100	50	50	450	550	1000	31	

L-Lecture T- Tutorial P- Practical CT-Sessional Exam TA-Theory Exam AT-Assignment TOTAL-Total Marks

L-Lecture, T- Tutorial, P- Practical, CT – Cumulative Test, TA –Teacher Assessment, AT – Attendance, E-Sem – End Semester Marks

DCE 301: SURVEYING-I

Course Code
DCE 301

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn about basic concepts of survey.
- To be able to understand the instruments used for survey work.
- To know about meridians, bearing and leveling procedures.

COURSE CONTENTS

UNIT-I: Introduction of Surveying

- Concept of surveying,
- Linear and Angular Measurements,
- Errors and corrections in chain and tape surveying,
- Numerical problems on chain and tape surveying.

UNIT-II: Compass Surveying-I

- Purpose of compass surveying,
- Prismatic compass and Surveyor compass,
- Meridian – Magnetic, true and arbitrary,
- Bearing – Magnetic, True and Arbitrary,
- Whole circle Bearing and Reduced Bearing,



- Fore and Back bearing,
- Numerical problems on bearings.

UNIT-III: Compass Surveying- II

- Local attraction,
- Concept of a traverse,
- Errors in compass surveying,
- Numerical problems on local attraction

UNIT-IV: Levelling - I

- Purpose of levelling,
- Technical terms used in levelling
- Temporary adjustment: setting up and levelling, adjusting for parallax of Dumpy and I.O.P. level.

UNIT-V: Levelling- II

- Differential levelling
- Concept of back sight, fore sight, intermediate sight,
- Level book and reduction of levels by (a) Height of collimation method and (b) Rise and fall method. Arithmetic checks
- Problem on reduction of levels.
- Fly levelling, Profile levelling and Reciprocal levelling.
- Concept of curvature and refraction, Numerical problems.

COURSE OUTCOMES

After completing this course, student will be able to:

- To perform survey experiments.
- Understand the levelling procedures.
- Understand the traversing procedures.



- Remove local attraction.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. Duggal S.K., *Surveying Vol. I & II*, 5th Edition, McGraw Hill Publishers, Delhi, 2020.
2. Agor R., *A Textbook of Surveying and Levelling*, 12th Edition, Khanna Publishers, New Delhi, 2024.
3. Basak N.N., *Surveying & Levelling*, 2nd Edition, McGraw Hill Publishers, Delhi, 2014.
4. Punmia B.C., *Surveying Vol. I & II*, 18th Edition, Laxmi Publishers, New Delhi, 2022.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-semester and end-semester written tests
- Actual practical work exercises and viva-voce
- Presentation and viva-voce

DCE 302: BUILDING CONSTRUCTION – I

Course Code
DCE 302

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn about the suitable construction materials for different building components and requirements.
- To understand the properties of construction materials for different building components.
- To select appropriate materials for specific structural applications considering durability, cost, and functionality for its application.
- To familiarize with advanced construction materials and technology.

COURSE CONTENTS

UNIT-I: Introduction

- Definition of a building
- Classification of building based on occupancy
- Different parts of a building
- Orientation of buildings and site selection
- Walls and their purposes
- Classification of walls – Load Bearing and Non-Load Bearing wall
- Classification of walls as per materials of construction

UNIT-II: Brick Masonry & Bonds

- Brick masonry
- Mortar and their types
- Brick: header, stretcher, bat, queen closer, king closer, frog and quoin
- Necessity of brick Bonds
- Types of bonds and their selection (English, Flemish, Header and Stretcher)
1, 1-1/2 and 2 Brick thick walls in English Bond
- Sketches for 1, 1-1/2 and 2 brick square pillars in English Bond
- Facing, backing, hearting of bonds
- Column, pillar, jambs, reveals, soffit, plinth, plinth masonry
- Construction of brick walls
- Method of laying bricks in walls
- Precautions observed in the construction of walls

UNIT-III: Stone Masonry

- Natural bed of a surface - Bedding planes, String course
- Corbel, Cornice and their parts
- Block – Incourse, grouting, moldings, templates, throttling, throating stones, parapet and coping
- Types of Stone Masonry: Rubble Masonry; random and coursed, Ashlar Masonry
- Principles to be observed in construction of stone masonry walls
- Partition walls: Constructional details
- Suitability and uses of brick in partition wall
- Wooden partition wall

UNIT-IV: Mortars, Arches and Lintels

- Mortars: Properties of cement, lime and their use
- Preparation of lime surkhi, cement mortar and mud mortar with their uses
- Scaffolding: Constructional details and suitability of mason's Brick Layers and Tubular scaffolding
- Shoring & under pinning: Types and uses
- Arches and Lintels: Meaning and use of Arches and Lintels
- Components of arches



- Brick arches and their construction

UNIT-V: Doors and Windows

- Doors –Name, types, uses and their sketches
- Windows– Name, types and their uses
- Sketches of fully glazed windows, ventilators and Window frames

COURSE OUTCOMES:

After completing this course, student will be able to:

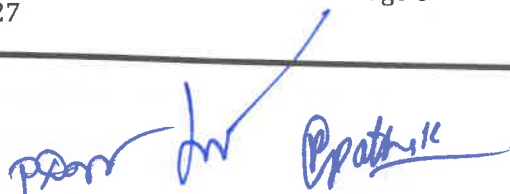
- Identify relevant construction materials.
- Able to know the properties of construction materials to determine their suitability.
- Understand the application of materials in various structural components.
- Find out the suitable alternative materials according to the suitability.

LIST OF RECOMMENDED TEXTBOOKS/REFERENCES

1. Kumar S., *Building Construction*, 20th Edition, Standard Publishers Distributors, Delhi, 2026.
2. Singh G., *Building Construction*, 5th Edition, Standard Publishers, Delhi, 2018.
3. Arora S.P, Bindra S.P., *The Textbook of Building Construction*, 11th Edition, Dhanpat Rai Publications, New Delhi, 2014.
4. Punmia B.C., Jain A. K, Jain A. K, *Building Construction*, 11th Edition, Laxmi Publication (P) Ltd., Delhi, 2017

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce



DCE 303: BUILDING MATERIALS

Course Code
DCE 303

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To impart knowledge about the classification, properties, availability, and uses of various building stones.
- To develop the understanding of the manufacturing process, properties, and testing of bricks and AAC blocks,
- To provide fundamental knowledge of the composition, manufacture, properties, setting and hardening process, and testing of lime and cement as per Indian Standards.
- To understand the modern construction materials such as glass, plastics, fibers, insulating, and waterproofing materials

COURSE CONTENTS

UNIT-I: Building Stone and their Characteristics

- Requirements of good building stone, Classification of Rocks
- Wedging: -Where used, Tools required and operation of wedging.
- Characteristics and uses of Granite, Sand stone, Lime stone, Slate and marble.

UNIT-II: Bricks & clay Products

- Raw material for manufacture, Properties of good brick making earth. Size of standard Bricks, classification of brick as per I.S.
- Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete, blocks (AAC).
- Flooring tiles – Types and uses
- Hand molding and Machine molding,

UNIT-III: Lime and Cement

- Natural sources of lime, Definition of Quick, fat, hydraulic, hydrated lime, calcinations,
- Slaking, manufacture of lime, process of setting and hardening action of lime field test of lime.
- Natural and artificial cement, Raw materials, manufacture of ordinary Portland cement,
- Flow diagram for dry and wet process, setting and hardening of cement.
- Types of cement, Properties of cement,
- Test of cement as per Indian standard.

UNIT-IV: Timber and Plywood

- Classification of Trees, - Cross Section of an Exogenous tree and explanation of terms.
- Seasoning of Timber – Types of seasoning, water, Air, Kiln, Chemical & solar Kiln seasoning.
- Decay in Timber, Preservation of timber, Properties of good timber
- Plywood, particle board, Veneers, laminated board and their uses



UNIT-V: Glass, Plastic and Water Proofing Material

- Types of glass: soda lime glass, lead glass, borosilicate glass, Toughened glass
- Termite & water proofing.
- Thermal and sound insulating materials.
- Fibers and its Types –Jute, Glass, Plastic, Asbestos Fibers
- Properties and uses of plastic, use of plastic in civil engineering.

COURSE OUTCOMES

After completing this course, student will be able to:

- Learn the classification, properties, availability, and uses of different building stones.
- Understand the manufacturing process, properties, classification, and testing of bricks, clay products, and AAC blocks.
- Illustrate the manufacture, properties, setting and hardening process, and testing of lime and cement.
- Describe the manufacturing process of burnt bricks and clay products, and evaluate their quality based on standard tests.
- Selection of suitable building materials (stones, bricks, and clay products) for various Civil Engineering projects.

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. Gurcharan Singh, *Building Materials*, 5th Edition Standard Publishers Distributors, Delhi, 2018.
2. Rangwala S.C., *Engineering Materials*, 43th Edition, Charotar Publishing House Pvt. Ltd., Adan Gujrat, 2019.
3. Duggal S. K., *Building Materials*, 6th Edition 2024, New Age International, New Delhi.
4. Varghese P.C., *Building Materials*, PHI Learning, 2nd Edition, Delhi, 2023.



MEANS OF ASSESSMENT

- Assignments and quiz/class tests.
- Mid-semester and end-semester written tests.
- Actual practical work, exercises, presentation and viva-voce.

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DCE 304: STRENGTH OF MATERIALS

Course Code
DCE 304

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns

COURSE CONTENTS

UNIT-I: Simple Stresses and Strains

- Concept of stress, normal and shear stresses.
- Concept of strain and deformation, longitudinal and transverse strain.
- Definitions of Poisson's ratio, volumetric strain, Hooke's law, modulus of elasticity and rigidity, Bulk modulus of elasticity.
- Stress and strains in bars subjected to tension and compression.
- Extension of uniform bar under its own weight, stress produced in compound and tapering bars due to axial load.
- Stress-strain diagram for mild steel.



UNIT-II: Bending Moment and Shear Force

- Concept of a beam Types of Beams: Simply supported, cantilever, fixed, overhang and continuous beams.
- Types of supports (Hinged, Roller and Fixed)
- Types of loads (distributed and point).
- Concept of Bending Moment & Shear Force, Sign conventions.
- Bending moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to uniformly distributed and concentrated loads, Point of maximum B.M and contra flexure.

UNIT-III: Moment of Inertia and Bending Stresses

- Concept of centroid and second moment of area, Radius of gyration
- Theorems of parallel and perpendicular axes
- Second Moment of area common geometrical sections: rectangle, triangle, circle (without derivations)
- Second moment of area for L, T and I section and section modulus.
- Concept of pure/simple bending, Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only
- Moment of resistance, Calculations of bending stresses

UNIT-IV: Slopes and Deflections of Beams

- Calculate the maximum slope and deflection for the following standard cases.
- Cantilever having point load at the free end, Cantilever with uniformly distributed load over the entire span.
- Simply supported beam with point load at centre of the span.
- Simply supported beam with uniformly distributed load over entire span.

NOTE: All examples will be for constant EI without derivation of formula.



UNIT-V: Columns & Struts

- Definition of long column, short column and strut, slenderness ratio, equivalent length, critical load, collapse Load.
- End conditions of column.
- Application of Euler's and Rankine's formula (no derivation), simple numerical problems based on Euler's and Rankine's formulae.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.
- Analyze structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beams and loading conditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyze the column for various loading and end conditions.

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. Bedi D.S, Strength of Materials, 6th Edition, Khanna Publishing House, Delhi, 2026.
2. Timoshenko, S., Strength of Materials Vol. I, 2nd Edition, CBS, New Delhi, 2002.
3. Khurmi, R.S., Strength of Materials, 26th Edition, S Chand and Co. Ltd. New Delhi, 2018.
4. Ramamurtham, S, Strength of Materials, 18th Edition 2011, Dhanpat Rai and sons, New Delhi, 2011.
5. Punmia B C, Strength of Materials, 10th Edition, Laxmi Publications (p) Ltd. New Delhi, 2018.
6. Rattan S.S., Strength of Materials, 3rd Edition 2016-17, McGraw Hill Education; New Delhi, 2016.
7. Bansal R K, Strength of Materials, 7th Edition, Laxmi Publications, 2023.

8. Subramaniam R, Strength of Materials, 3rd Edition, Oxford University Press, 2016.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce



DCE 305: HYDRAULICS & HYDRAULIC MACHINES

Course Code
DCE 305

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn basic properties of fluids and apply hydrostatic principles to calculate pressure
- Learn fluid pressure and analyze types of fluid flow,
- Understand the flow through pipes including Reynolds experiment.
- Analyse open channel flow including gradually varied flow, hydraulic jump, and economical channel sections
- Measure discharge in pipes and open channels.
- Develop problem-solving ability for engineering applications in fluid mechanics.

COURSE CONTENTS

UNIT-I: Properties of Fluids

- Properties and types of Fluids
- Hydraulics, Hydrostatic Pressure: Pressure, intensity of pressure,
- Pressure head, total pressure, resultant pressure, and center of pressure.
- Total pressure and center of pressure on vertical and inclined plane surfaces
- Drag and lift force



- Working principles, construction details, and elements of Pelton Wheel, Francis Turbine, and Kaplan Turbine.
- Centrifugal Pumps: Component layout, working principle
- Reciprocating Pumps: Working principle

COURSE OUTCOMES

After completing this course, student will be able to:

- Explain the basic properties of fluids and calculate hydrostatic pressure.
- Measure fluid pressure using simple and differential manometers
- Distinguish between laminar and turbulent flow using Reynolds number.
- Analyze open channel flow including gradually varied flow, rapidly varied flow, and hydraulic jump.
- Determine discharge using venturimeter, Notches, and Weirs.

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. Bansal R.K., *Fluid Mechanics & Hydraulic Machines*, 10th Edition Laxmi Publication (P) Ltd., New Delhi (2020).
2. Garde R.J., *Fluid Mechanics*, 3rd Edition, New Age International Publishers, New Delhi 2011.
3. Vijay Gupta & Gupta S.K., *Fluid Mechanics*, 3rd Edition, New Age International Publishers, New Delhi 2012.
4. Jagdish Lal, *Hydraulics & Hydraulic Machines*, 6th Edition, Metropolitan Book Depot, Delhi 2016.
5. Modi P.N., *Fluid Mechanics*, 22nd Edition (, New Age International Publishers, New Delhi 2018.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

DCE351: SURVEYING LAB-I

Course Code
DCE 351

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES:

- To develop practical knowledge of field.
- To understand the principles of surveying.
- To study about linear and angular measurements.
- To develop skills and knowledge about levelling the surface and elevation differences.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Chaining and ranging a line and recording it in the field book.
2. Taking off sets and setting out right angles with cross staff and Indian optical square.
3. Chain survey of a small area.
4. Setting of compasses on ground and measuring angles between the lines meeting at a point by prismatic compass.
5. Traversing with the prismatic compass and chaining of a closed traverse and analyzing it by included angles.
6. Determination of local attraction using fore bearing and back bearing.
7. To find difference of level between two distant points by taking staff reading on different stations from the single setting of Dumpy level/Automatic level.
8. To find difference of level between two points by taking at least four change points.

ADDITIONAL EXPERIMENTS

1. Establishing control points using Differential GPS.
2. Profile levelling and Cross-sectioning of roads.
3. To calculate the vertical height and elevation of top of remote structure where base is inaccessible using Trigonometric levelling.

COURSE OUTCOMES:

By the end of this course, students will be able to:

- Able to perform various types of survey on the field.
- Evaluate level, elevation and difference in level of surfaces.
- Establish the various stations on the field.-
- Analyse the topography and calculate the area.
- Apply experimental knowledge in field.
- Develop practical skills related to survey.
- Understand the use of survey instruments.

DCE352: BUILDING MATERIALS LAB

Course Code
DCE 352

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- To develop practical knowledge of concrete materials and their properties.
- To impart knowledge about the classification, properties, availability, and uses of various building stones.
- To develop the understanding of the manufacturing process, properties, and testing of bricks and other advanced materials.
- To provide fundamental knowledge of the composition, manufacture, properties, setting and hardening process, and testing of lime and cement as per Indian Standards.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. To determine fineness test of cement.
2. To determine normal consistency of cement.
3. To determine setting time (initial and final) of cement.
4. To determine soundness test of cement.
5. To determine compressive strength of bricks.
6. To determine water absorption of bricks
7. To perform layout of a building.
8. To construct brick bonds (English and Flemish bonds) in one, one and half and two brick thick (a) walls (b) Column.



ADDITIONAL EXPERIMENTS

1. Determination of split tensile strength test of concrete.
2. Evaluates bending strength of concrete beams.
3. Study of Rebound Hammer Test as non-destructive test.
4. Study of Ultrasonic Pulse Velocity Test of concrete block.
5. Determination of tensile test on steel bars.
6. Study of efflorescence test on bricks.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Identify and test various ingredients of concrete such as cement, sand, and aggregates.
- Perform standard laboratory tests on fresh and hardened concrete.
- Evaluate workability, strength, durability, and quality of concrete.
- Prepare concrete mixes and understand the importance of water-cement ratio.
- Analyse test results and compare them with standard specifications.
- Apply laboratory knowledge in field construction and quality control practices.
- Develop practical skills related to concrete production, curing, and testing.
- Understand the use of modern testing methods and admixtures in concrete technology.



DCE 354: STRENGTH OF MATERIALS LAB

Course Code
DCE 354

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES:

- To understand the mechanical behaviour of engineering materials under different types of loading.
- To determine important material properties such as strength, stiffness, hardness, toughness, and ductility through experiments.
- To verify the fundamental theories and principles of Strength of Materials using laboratory tests.
- To develop practical skills in handling testing machines and measuring instruments.
- To analyse experimental data and compare theoretical and practical results.
- To improve technical report writing and interpretation of test observations.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. To Study the Universal Testing Machine (U.T.M.)
2. Determine tensile Strength of a given specimen using UTM
3. Determine the deflection and bending stress of simply supported subjected to concentrated load at the centre.
4. To conduct torsion test on mild steel specimen to find modulus of rigidity and angle of twist.
5. To determine the hardness of the given Specimen using Rockwell hardness test.



6. To determine the Impact strength (Specific impact factor) through Izod test.
7. To perform the Charpy impact test on materials.

ADDITIONAL EXPERIMENTS

1. Determination of flexural strength of concrete beam.
2. Determine the hardness of specimen using Brinell hardness test.
3. Determine the deflection in cantilever beam.
4. To demonstrate Euler's Buckling theory.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Perform standard material testing experiments such as tensile, compression, torsion, impact, and hardness tests.
- Determine mechanical properties of materials including Young's modulus, yield strength, ultimate strength, and modulus of rigidity.
- Analyze stress-strain behavior of different engineering materials.
- Verify theories related to bending, torsion, springs, and columns through experimental methods.
- Use laboratory equipment and measuring instruments safely and accurately.
- Interpret experimental results and prepare technical laboratory reports effectively.



DCE 355: HYDRAULICS LAB

Course Code DCE 355	Course Type Core	L: T: P 0: 0: 4	Credits 2
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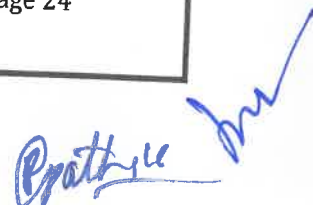
COURSE OBJECTIVE

- To develop practical knowledge of fluids.
- To understand the flow properties in a pipe system.
- To study about the energy and different types of losses in fluid flow.
- To develop skills and knowledge about Reynolds number and fluid flow patterns.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. To verify Bernoulli's Theorem.
2. To find out Venturimeter coefficient.
3. To determine Coefficient of velocity (C_v), Coefficient of discharge (C_d), Coefficient of contraction (C_c) and verify the relation between them.
4. To perform Reynold's Experiment.
5. To determine Darcy's coefficient of friction for flow through pipes.
6. To verify loss of head due to:
 - Sudden enlargement
 - Sudden contraction



ADDITIONAL / ADVANCED EXPERIMENTS

1. Verification of meta-centric height
2. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
3. To verify the momentum equation using the experimental set-up on impact of jet.
4. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness

COURSE OUTCOMES:

By the end of this course, students will be able to:

- Verification of fundamental principles of fluid flow such as Bernoulli's theorem.
- Determine the coefficient of discharge of flow measuring devices
- Determine hydraulic coefficients including coefficient of velocity (C_v), coefficient of contraction (C_c), and coefficient of discharge (C_d).
- Analyze the nature of fluid flow and identify laminar and turbulent flow conditions using Reynolds experiment.
- Determine friction losses in pipe flow and evaluate Darcy's coefficient of friction for different flow conditions.

**DCE 401: SOIL MECHANICS AND FOUNDATION
ENGINEERING**

Course Code
DCE 401

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

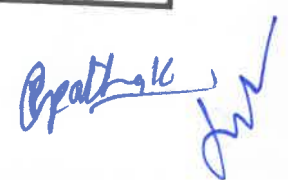
Following are the objectives of this course:

- To learn about the soil origin, classification, structure, and physical properties.
- Determine soil permeability and analyze seepage behavior.
- To understand about soil compaction and consolidation.
- To determine the shear strength of soil and earth pressure.
- To determine the safe bearing capacity for shallow foundations and analyze deep foundations.

COURSE CONTENTS

UNIT-I: Introduction

- Soil formation history
- Different kinds of soils and soil structures
- Graphical representation of soil through phase system
- Weight and volume relationship
- Consistency limits: Liquid limit, Plastic limit, Shrinkage limit
- Plasticity index & Consistency index
- Grain size analysis by sieve



UNIT-II: Classification of Soils and Permeability

- Particle size classification – I.S. Textural classification chart
- Plasticity chart
- I.S. soil classification
- Permeability
- Factors affecting permeability
- Darcy's Law
- Falling head and constant head.

UNIT-III: Compaction and Consolidation of soil

- Introduction of Compaction
- Standard & modified Procter compaction test
- Field compaction methods
- Compacting equipment's
- Consolidation
- Difference between consolidation and compaction.

UNIT-IV: Share Strength and Earth Pressure Theory

- Definition of shear strength
- Cohesive and non-cohesive soil
- Coulomb's Theory
- Shear Box and unconfined compression tests
- Definition of earth pressures: active and passive earth pressures
- Earth pressures on retaining wall
- Rankine's Method
-

UNIT-V: Shallow and Deep Foundation

- Definitions of shallow and deep foundations
- Types of shallow and deep foundations
- Application of Terzaghi's bearing capacity formulae for different types of foundations



- Factors affecting depth of shallow foundation
- Classification of piles
- Plate bearing tests for shallow foundations

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify, classify and determine physical/engineering properties of soil, including permeability, compaction, and consolidation characteristics.
- Analyze shear strength parameters of soil using laboratory tests and evaluate stress in soil media.
- Assess the stability of slopes (using methods like Bishop's) and compute earth pressures on retaining walls.
- Analyze bearing capacity, shallow and different types of deep foundations with their applications.

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. Punmia B.C., *Soil Mechanics & Foundation Engineering*, 16th Edition, Laxmi Publication Pvt. Ltd., New Delhi, 2005.
2. Arora K.R *Soil Mechanics & Foundation engineering*, 6th Edition, Rajshree Publishers, Delhi, 2008.
3. Dr. Alam Singh, *Basic Soil Mechanics & Foundations*, 1st Edition, C.B.S. Publishers & Distributors, New Delhi, 2014.
4. Kaur G., *Soil Mechanics & Foundation engineering*, 2nd Edition, Satya Prakashan, New Delhi, 2024.
5. Gadi S.K., *Soil Mechanics*, 8th Edition, B.Tech Publishers, Lucknow, 2024.
6. Sharma S.K., *Soil Mechanics*, 1st Edition, Asian Publishers, Muzaffarnagar, 2021.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce

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DCE 402: PUBLIC HEALTH ENGINEERING – I

Course Code
DCE 402

Course Type
Core

L: T: P
3: 1:0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To understand the importance of safe water supply and its role in public health.
- To study sources of water, water demand, and methods of water collection.
- To learn the principles and methods of water treatment.
- To understand the design and operation of water distribution systems.
- To develop knowledge of pipe laying and building water supply systems as per relevant IS standards.

COURSE CONTENTS

UNIT – I Sources, Demand and Quality of Water

- **Water supply schemes** - Objectives, components
- **Water Sources:** Study of surface and groundwater sources, along with intake structures covering their definition, classification, factors influencing site selection, and various types of intake arrangements.
- **Water Demand:** Determination of factors influencing water consumption rates, different types of demand variations, population



forecasting methods (including simple numerical problems), design period considerations, and estimation of total water requirement for a city or town.

- **Water Quality:** Importance of water analysis and examination of its physical, chemical, and biological characteristics. Testing procedures include total solids, hardness, chlorides, dissolved oxygen, pH, fluoride, nitrogen and its compounds, along with bacteriological analysis such as E. coli, B. coli index, MPN test, water sampling techniques, and quality standards as per IS 10500.

UNIT – II: Water Treatment

- **Water Purification:** Goals and objectives of water treatment processes; aeration—its purpose and methods; plain sedimentation and sedimentation with coagulation; fundamentals of coagulation including types of coagulants, jar test procedure, and coagulation process; various types of sedimentation tanks and the working of a clariflocculator.

UNIT – III: Filtration and Disinfection

- **Filtration:** Principles and mechanism of filtration; classification of filters such as slow sand, rapid sand, and pressure filters; construction and operation of slow sand and rapid sand filters; common operational issues encountered in filtration systems.
- **Disinfection:** Purpose and techniques of disinfection; chlorination—methods of chlorine application, different chlorination practices, significance of residual chlorine; and flow diagram of a water treatment plant.



- **Other Water Treatment Methods:** Overview of water softening, and techniques for dechlorination and defluoridation.

UNIT – IV: Water Conveyance

- **Conveyance System:** Types of pipes used for water transmission, criteria for selection of pipe materials, types of pipe joints and valves, including their functions, placement, and associated pipeline accessories.

UNIT – V: Water Distribution

- **Water Distribution:** Methods of distribution gravity, pumping, and combined systems; service reservoirs their purpose and types; distribution layouts such as dead-end, grid iron, circular, and radial systems, along with their suitability, advantages, and limitations.
- Pipe laying procedures, testing of pipelines, and practical aspects of building water supply systems.
- Introduction to smart water supply systems.

COURSE OUTCOMES

After completing this course, students will be able to:

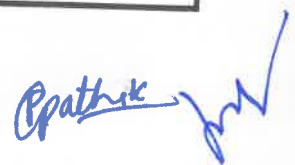
- Explain the importance of safe water supply systems and their role in public health.
- Estimate water demand and identify suitable sources of water supply.
- Analyze the principles and methods of water treatment processes.
- Design basic components of water distribution systems including pipes and storage.



- Apply relevant IS standards in planning building water supply systems.

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. Garg, S. K., Environmental Engineering Vol. I (Water Supply Engineering), 37th Edition, Khanna Publishers, New Delhi, 2017.
2. Rangwala, S. C., Water Supply and Sanitary Engineering, 30th Edition, Charotar Publishing House, Anand, 2022.
3. Birdie, G. S. and Birdie, J. S., Water Supply and Sanitary Engineering, 8th Edition, Dhanpat Rai Publishing Company, New Delhi, 2010.
4. Punmia, B. C., Jain, A. K. and Jain, A. K., Environmental Engineering Vol. I (Water Supply Engineering), 2nd Edition, Laxmi Publications, New Delhi, 2016 (Reprint 2021).
5. Modi, P. N., Water Supply Engineering, Revised Edition, Standard Book House, Delhi, 2016.
6. CPHEEO (Central Public Health & Environmental Engineering Organisation), Manual on Water Supply and Treatment, Revised 4th Edition, Ministry of Housing and Urban Affairs, Government of India, New Delhi, 2019.
7. Peavy, H. S., Row, D. R. and Tchobanoglous, G., Environmental Engineering, International Edition, McGraw Hill Education, 1985 (Latest Reprint).
8. Fair, G. M., Geyer, J. C. and Okun, D. A., Water and Wastewater Engineering, 3rd Edition, John Wiley & Sons, 2018 (Reprint).



MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce



DCE 403: CONCRETE TECHNOLOGY

Course Code
DCE 403

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

COURSE CONTENTS

UNIT-I: Introduction of concrete, cement & aggregate

- Concrete: -Definition of concrete. Properties of concrete. Advantages & uses of concrete.
- Cement and Types of cement: Ordinary Portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, quick setting, white and colour cements, Physical properties of OPC and PPC,
- Aggregates: -Classification of aggregates according to source, size and shape. Characteristics of aggregate particle size and shape, surface texture; specific gravity of aggregate; bulk density, water absorption surface



moisture, bulking of sand and deleterious materials in the aggregate.

- Admixtures

UNIT-II: Water Cement Ratio, Hydration & workability

- Water Cement Ratio: - Duff Abraham water cement (w/c) ratio law, Effect of various W/C ratios on the physical structure of hydrated cement, water cement ratio law and conditions under which the law is valid; internal moisture, temperature, age, and size of specimen.
- Hydration: Hydration of cement & its Bogue's compounds.
- Workability: Definition of workability. Concept of Internal friction, Segregation, Harshness. Factors affecting workability, Measurement of workability slump test, compaction factor test, Vee-Bee Consistometer.

UNIT-III: Concrete Mix Design & Form Work

- Concrete mix design: Objectives, methods of mix design
- Form Work: Concept of form work (shuttering and staging), Materials used for form work. Stripping time for form work as per IS (No problems on the design of form work)
- Removal of formwork.
- Precautions to be taken before, during and after RCC Construction.

UNIT-IV: Concrete Operations

- Storing of Cement: - Storing of cement in the warehouse, Storing of cement at site, Effect of storage on strength of cement.
- Storing of Aggregate: Storing of aggregate on site for maintaining uniformity of moisture and cleanliness.



- **Batching & mixing:** Batching of cement, Batching of aggregate, Hand mixing, Machine mixing.
- **Compaction & finishing** Hand compaction, Machine compaction-types of vibrators (internal screed vibrators and form vibrators) immersion vibrations, Finishing of concrete.
- **Curing:** Object of curing, Method of curing, shading concrete works, covering surfaces with hessian, gunny bags, sprinkling of water, ponding method and membrane curing, steam curing.

UNIT-V: Introduction of Special Concretes and Quality Control

- Cold weather concreting Under water concreting, Hot weather concreting, Ready mix concrete, Fibre reinforced concrete Polymer Concrete, Fly ash concrete, Silica fume concrete, Self-compacting concrete.
- **Quality Control at site:** Control tests on cement, aggregate water and concrete.
- Concreting under special conditions, difficulties and precautions before, during and after concreting
- Concept of quality control

COURSE OUTCOMES

After completing this course, student will be able to:

- Identify materials used for concrete production and their functional roles
- Determine and evaluate key properties of cement, aggregates, and concrete through laboratory
- Prepare mix designs for concrete of given specifications and assess



performance using standard

- Understand and select appropriate special cements and admixtures.

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. B. L. Gupta and Amit Gupta, *Concrete Technology*, 3rd Edition, Standard Publishers Distributors, New Delhi, 2014.
2. Kulkarni P.D., *Textbook of Concrete Technology*, 3rd Edition, New Age International Publishers, Delhi, 2025.
3. Santhakumar A.R, *Concrete Technology*, 2nd Edition, Oxford University Press, Mumbai, 2018.
4. Ramachandran V.S., *Concrete Admixtures Handbook*, 2nd Edition, Standard Publishers Distributors, New Delhi, 2002.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce



DCE 404: IRRIGATION ENGINEERING

Course Code
DCE 404

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- Provide knowledge of irrigation systems and water requirements of crops.
- Develop understanding of methods of irrigation, canal design principles, and well irrigation systems.
- Explain the components and functioning of canal head works and regulatory structures.
- Introduce various cross drainage works, dams, spillways, and storage structures.
- Create awareness about water logging problems and river training works.

COURSE CONTENTS

UNIT-I: Introduction of irrigation system and Water Requirement of Crops

- Definition of irrigation, Types of irrigation, Sources of irrigation water.
- Rain Fall & Runoff: Definition of rainfall & run-off, catchment area, Dickens's & Ryve's formulae,
- Types of rain gauges - Automatic & Non - automatic. Evaporation and evapotranspiration.
- Definition of crop season, Duty, Delta and Base Period, their relationship,
- Gross command area, culturable command area



- Intensity of Irrigation, Irrigable area
- Water requirement of different crops-Kharif and Rabi.

UNIT-II: Methods of Irrigation system

- Lift Irrigation: -Types of Wells - shallow & deep well, aquifer types,
- Yield of an open/tube well.
- Flow Irrigation: -Introduction of canal system, Types of canal system
- Design of irrigation canals- Kennedy's and Lacy's silt theory and equations,
- Comparison of Kennedy's and Lacy's, theory's. critical velocity ratio,
- Various types of canal lining - Advantages & Disadvantages

UNIT-III: Canal Head and Regulatory Works

- Canal Head Works: Definition, object, general layout, Functions of different parts,
- Difference between Weir and Barrage.
- Regulatory Works: -Functions and explanation of terms used,
- Cross and Head regulators, Falls, Energy dissipaters,
- Outlets-Different types.

UNIT-IV: Cross-Drainage and Storage Works.

- Cross Drainage Works: - Aqueduct, Siphon, Super passage
- Level crossing, inlet and outlet
- Dams types: Earthen, causes of failure, masonry & concrete dams,
- Cross-section of gravity dam
- Spillways -Definition and types
- Causes of failure of Earthen dams

UNIT-V: Water Logging and River training

- Water Logging -Definition, causes and effects, detection, prevention and remedies
- Surface and sub-surface drains and their layout
- River training -Mendring of River, Mendring width Mendring length.



- Types of module

COURSE OUTCOMES

After completing this course, student will be able to

- Explain types and sources of irrigation, rainfall and runoff concepts.
- Describe lift and flow irrigation systems, types of wells and aquifers, and compute yield of wells.
- Illustrate the layout and functions of canal head works and differentiate between weir and barrage
- Classify cross drainage works such as aqueduct, siphon, super passage, and level crossing.
- Identify causes and effects of water logging and suggest preventive measures

LIST OF RECOMMENDED TEXT BOOKS/REFERENCES

1. Modi P.N., *Irrigation Engineering*, 9th Edition, Standard Book House, Delhi 2014.
2. Agarwal G.D., *Irrigation Engineering*, 1st Edition, B. Bharti Prakashan, Merrut, 2014.
3. Dr. Bharat Singh, *Irrigation Engineering*, 6th Edition, Nem Chand & Bros., Roorkee, 1979.
4. Subramanya K., *Engineering Hydrology*, 4th Edition, McGraw Hill Education, New Delhi, 2013.
5. Asawa G.L., *Irrigation and Water Resources Engineering*, 1st Edition, New Age International Publishers, New Delhi, 2005.
6. Jain S.K. and Singh V.P., *Water Resources Systems Planning and Management*, 1st Edition, Elsevier Science, 2003.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce.



DCE 405: BUILDING CONSTRUCTION – II

Course Code DCE 405	Course Type Core	L: T: P 3: 1:0	Credits 4
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COURSE OBJECTIVES

Following are the objectives of this course:

- To learn about the origin, effects and the remedies of dampness.
- To learn about the types of floors with their finish.
- To learn about the types of roofs with drainage system.
- To learn about the stairs and staircase with their types.
- To learn about the surface finishing and coatings.

COURSE CONTENTS

UNIT-I: Damp Proofing

- Dampness and its ill effects
- Types of dampness
- Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc.
- Moisture retention in kitchen and bath rooms etc.
- Damp proofing materials and their specifications.
- Methods of damp proofing basement, ground floors, plinth and walls
- Damp Proofing for roofs and window sills
- Plinth Protection methods

UNIT-II: Floors

- Ground floors– floor finish, base course and their purpose
- Types of floor finishes – cast in-situ concrete flooring, Tile flooring
- Terrazzo flooring, Timber flooring
- Ground floors– Flooring on RCC Slab and R.B. Slab

UNIT-III: Roofs

- Pitched roofs – batten, eaves board, facial board, gable hip, lap, purlin, rafter, rag bolt, valley, ridge, Pitched roof
- Steel trusses, North light truss
- Roof coverings for pitched roofs– Asbestos sheeting, Trafford sheets
- Method of arranging and fixing to the battens, rafters, purlins – both steel and wooden
- Drainage arrangement for pitched roofs

UNIT-IV: Stairs and Staircase

- Stair case winders landing,
- Strings
- Newel
- Baluster
- Riser
- Tread
- Width of staircase
- Hand rail, nosing
- Planning and layout of staircase
- Relations between rise and tread
- Determination of width of stair, landing etc.
- Various types of layouts of stairs – straight flight, dog legged, open well, quarter turn, half turn. Bifurcated stair, spiral stair



UNIT-V: Surface Finishes

- Plastering– Proportion of mortars used for different plasters
- Preparation of mortars
- Techniques of plastering and curing
- Pointing– Different types of pointing
- Mortar used and method of pointing
- Painting– On wooden, steel and plastered wall surfaces
- White washing
- Colour washing
- Distempering
- Application of cement and plastic paints
- Commonly used water repellents for exterior surfaces and their application

COURSE OUTCOMES

After completing this course, student will be able to:

- Understand about the origin, effects and the remedies of dampness.
- Realize about the types of floors with their finish.
- Comprehend about the types of roofs with drainage system.
- Perceive about the stairs and staircase with their types.
- Understand about the surface finishing and coatings.

LIST OF RECOMMENDED TEXT BOOKS/REFERENCES

1. Punmia B.C., *Building Construction*, 12th Edition, Laxmi Publication Pvt. Ltd. Delhi, 2024.



3. Singh G., *Building Construction*, 11th Edition, Standard Publishers, Delhi, 2021.
4. Gupta D.V., *Building Construction*, 1st Edition, Asian Publishers, Muzaffarnagar, 2021.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce



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**DCE 451: SOIL MECHANICS AND FOUNDATION
ENGINEERING LAB**

Course Code
DCE 451

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- Determine soil permeability and analyze seepage behavior.
- To understand about soil compaction and consolidation.
- To determine the shear strength of soil and earth pressure.
- To determine the safe bearing capacity for shallow foundations and analyze deep foundations.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Determination of moisture content of soil by oven drying method.
2. Determination of specific gravity of soil particles by specific gravity bottle/Pycnometer.
3. Determination of soil particles size distribution by sieving method.
4. Determination of liquid limit and plastic limit of soil.
5. Determination of permeability by constant head permeameter and falling head permeameter.
6. Determination of shear strength of sand by Shear Box test.



7. Determination of Unconfined compression test of soil.
8. Determination of Standard Proctor compaction test of soil.

ADDITIONAL EXPERIMENTS

1. To determine the effect of earthquake loading.
2. To determine the effect of repeated traffic loading.
3. To study the plate load effect on soil.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Identify, classify and determine physical/engineering properties of soil, including permeability, compaction, and consolidation characteristics.
- Analyze shear strength parameters of soil using laboratory tests and evaluate stress in soil media.
- Assess the stability of slopes (using methods like Bishop's) and compute earth pressures on retaining walls.
- Analyze bearing capacity, shallow and different types of deep foundations with their applications.



DCE 452: PUBLIC HEALTH ENGINEERING LAB

Course Code
DCE 452

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- To develop practical knowledge of water quality analysis and public health engineering practices.
- To perform laboratory tests for physical, chemical, and biological examination of water and wastewater.
- To understand the principles and operation of water treatment and disinfection processes.
- To study the characteristics of potable water and sewage through experimental investigations.
- To develop skills in conducting standard laboratory tests and interpreting results as per IS standards.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. To determine dissolved and suspended solids in water.
2. To determine pH value of water sample.

3. To determine turbidity of water.
4. To calculate:
 - i. Oxygen Demand (OD)
 - ii. Biological Oxygen Demand (BOD)
 - iii. Chemical Oxygen Demand (COD)
5. To determine residual chlorine in water sample.
6. To perform Jar Test for Coagulants.
7. To perform chlorine demand test.
8. To determine hardness of water.
9. To determine available chlorine in bleaching powder.
10. To visit and write specific report for the following: (Any one)
 - a. Water treatment plant
 - b. Sewage treatment plant.
 - c. Construction site for layout of water supply & sewerage system.

ADDITIONAL EXPERIMENTS

1. Determination of acidity of water.
2. Determination of optimum detention period in sedimentation.
3. Study of filtration process and filter media.
4. Study of University plumbing and sanitary fittings.



COURSE OUTCOMES

By the end of this course, students will be able to:

- Identify and test important physical and chemical characteristics of water and wastewater.
- Perform standard laboratory tests related to water quality and sewage analysis.
- Evaluate suitability of water for domestic use based on standard specifications.
- Understand the principles of water treatment, disinfection, and wastewater treatment processes.
- Analyze laboratory results and interpret their significance in public health engineering.
- Apply laboratory knowledge in water supply, sanitation, and environmental engineering practices.
- Develop practical skills in sampling, testing, and quality control of water and sewage.
- Understand field applications of treatment plants and distribution systems.
- Prepare technical reports based on laboratory observations and field visits.
- Develop awareness regarding safe water supply and sanitation practices.



DCE 453: CONCRETE TECHNOLOGY LAB

Course Code
DCE 453

Course Type
Core

L: T: P
0: 0: 4

Credits
2

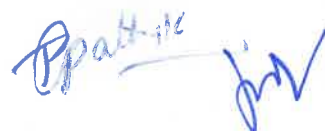
COURSE OBJECTIVES

- To develop practical knowledge of concrete materials and their properties.
- To perform laboratory tests on cement, aggregates, fresh concrete, and hardened concrete.
- To understand the principles of concrete mix design and quality control.
- To study the behavior and strength characteristics of concrete through experimental work.
- To develop skills in conducting standard tests as per IS codes and interpreting results.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Determination of normal consistency of cement using Vicat apparatus.
2. Determination of initial and final setting time of cement.
3. Determination of soundness of cement.
4. Determination of specific gravity of cement.
5. Slump test on fresh concrete.
6. Compaction factor test on concrete.
7. Determination of compressive strength of cement mortar cubes.
8. Determination of specific gravity and water absorption of aggregates.
9. Determination of compressive strength of concrete cubes.



ADDITIONAL EXPERIMENTS

1. Determination of fineness of cement by sieve analysis.
2. Determination of flexural strength of concrete beam.
3. Study of light weight concrete and its properties.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Identify and test various ingredients of concrete such as cement, sand, and aggregates.
- Perform standard laboratory tests on fresh and hardened concrete.
- Evaluate workability, strength, durability, and quality of concrete.
- Prepare concrete mixes and understand the importance of water-cement ratio.
- Analyze test results and compare them with standard specifications.
- Apply laboratory knowledge in field construction and quality control practices.
- Develop practical skills related to concrete production, curing, and testing.
- Understand the use of modern testing methods and admixtures in concrete technology.



DCE 454: CIVIL ENGINEERING DRAWING-I

Course Code
DCE 454

Course Type
Core

L: T: P
0: 0:4

Credits
2

COURSE OBJECTIVES

- To develop skills in engineering drawing related to building construction and civil engineering works.
- To understand the preparation of detailed building drawings and structural components.
- To study standard practices used in planning and drafting of residential buildings.
- To develop knowledge of sanitary and septic tank drawings as per IS standards.
- To introduce the use of AutoCAD for preparation of civil engineering drawings.

LIST OF PRACTICALS

CORE DRAWINGS

1. Foundations.
2. Doors & windows.
3. Roofs: Wooden roof truss details. Section of RCC & RB flat roofs.
4. Floors.
 - (a) Concrete floor finish over ground floor.
 - (b) Terrazzo floor finish over ground floor.
 - (c) Terrazzo tile floor finish over ground.
5. Working drawing of a two roomed building with kitchen, bath and W.C.
6. Working drawing of a three roomed building from a given line plan and given data.
7. Details of dog legged stairs. Plans of remaining type of stairs.
8. Detailed plan and cross section of a domestic septic and soak pit for 10 users as per IS:2470 Part I.
9. Detailed plan and cross section of bathroom, kitchen and W.C. connections.
10. Two Room building working drawing with AutoCAD.

ADDITIONAL EXPERIMENTS

1. Detailed drawing of lintels and sunshades.
2. Reinforcement detailing of RCC slabs and beams.
3. Drawing of residential water supply and drainage layout.



4. Preparation of site plan and layout plan.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Prepare detailed drawings of building components such as foundations, roofs, floors, doors, and windows.
- Draft working drawings of residential buildings with proper dimensions and specifications.
- Draw sanitary installations, septic tanks, soak pits, and plumbing connections as per IS standards.
- Understand the planning and detailing of staircases and building layouts.
- Apply standard conventions and symbols used in civil engineering drawing.
- Develop skills in preparing neat and accurate engineering drawings manually and using AutoCAD.
- Interpret line plans and convert them into detailed working drawings.
- Understand practical aspects of residential building construction through drawing exercises.
- Use AutoCAD tools and commands for preparation of civil engineering drawings.
- Develop drafting skills required for professional civil engineering practice.



**Scheme of Instructions &
Syllabi
of
Diploma in Civil Engineering
3rd Year**

(With effective from session 2026-27)

(Awdhesh Kumar)
HOD CE

(Dr. R. K. Shukla)
Dean Engineering

(Dr. Y.D.S Arya)
Vice Chancellor

Invertis Institute of Engineering & Technology
INVERTIS UNIVERSITY
Invertis Village, Bareilly-Lucknow NH-24, Bareilly
243123, Uttar Pradesh





Study & Evaluation Scheme
Diploma Civil Engineering
(w.e.f Academic Year 2026-2027)
Year III, Semester-V

Sl. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDITS
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DCE501	Transportation Engineering – I	3	1	0	20	10	10	40	60	100	4
2	DCE502	Surveying – II	3	1	0	20	10	10	40	60	100	4
3	DCE503	Design of RCC Structures	3	1	0	20	10	10	40	60	100	4
4	DCE504	Design of Steel Structures	3	1	0	20	10	10	40	60	100	4
5	DCE505	Public Health Engineering – II	3	1	0	20	10	10	40	60	100	4
6	EPC001	AI Based English Proficiency-I	0	0	0	0	0	0	0	50	50	2
PRACTICAL/TRAINING/PROJECT												
7	DCE551	Transportation Engineering Lab	0	0	4	-	-	-	50	50	100	2
8	DCE552	Surveying Lab – II	0	0	4	-	-	-	50	50	100	2
9	DCE553	Mini Project work	0	0	2	-	-	-	50	100	150	3
10	DCE554	Industrial Training	0	0	2	-	-	-	50	-	50	1
11	GP501	General Proficiency	-	-	-	-	-	-	50	-	50	1
		TOTAL	15	5	12	100	50	50	450	550	1000	31

L-Lecture, T- Tutorial, P- Practical, CT – Cumulative Test, TA –Teacher Assessment, AT – Attendance, E-Sem – End Semester Marks

Invertis University, Bareilly

w.e.f. Academic Year 2026-27

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Study & Evaluation Scheme
Diploma Civil Engineering
(w.e.f Academic Year 2026-2027)
Year III, Semester-VI

Sl. No.	Course Code	SUBJECT	PERIODS			EVALUATION SCHEME					TOTAL	CREDITS
						SESSIONAL EXAM.				E-SEM.		
			L	T	P	CT	TA	AT	TOTAL			
THEORY												
1	DCE601	Construction Management	3	1	0	20	10	10	40	60	100	4
2	DCE602	Earthquake Engineering	3	1	0	20	10	10	40	60	100	4
3	DCE603	Transportation Engineering – II	3	1	0	20	10	10	40	60	100	4
4	DAS604	Environmental and Ecology	2	0	0	10	05	05	20	30	50	2
5	DCE605	Estimation, Costing and valuation	3	1	0	20	10	10	40	60	100	4
6	EPC002	AI Based English Proficiency-II	0	0	0	0	0	0	0	50	50	2
PRACTICAL/TRAINING/PROJECT												
7	DCE651	B.B.S Lab	0	0	3	-	-	-	50	50	100	2
8	DCE652	Major Project	0	0	8	-	-	-	150	200	350	8
9	GP601	General Proficiency	-	-	-	-	-	-	50	-	50	1
		TOTAL	14	4	11	90	45	45	430	570	1000	31

L-Lecture, T- Tutorial, P- Practical, CT – Cumulative Test, TA –Teacher Assessment, AT – Attendance, E-Sem – End Semester Marks

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DCE 501: TRANSPORTATION ENGINEERING-I

Course Code
DCE 501

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To provide knowledge of highway transportation system.
- To develop understanding of highway geometrics, alignment, and surveys
- To impart knowledge of traffic engineering principles.
- To familiarize students with road materials and pavement construction techniques

COURSE CONTENTS

UNIT-I: Introduction:

- Importance of Highway transportation
- Functions of IRC & classification of roads.
- Glossary of terms used in road geometrics and their importance; Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient.

UNIT-II: Traffic Control device and Materials

- Traffic control devices - Signs, markings and signals
- Types of intersections



- Accidents: Types, causes and remedies.
- Different types of road materials in use, soil, aggregates binders.
- Function of soil as Highway sub grade.
- CBR value and its significance.
- Aggregates: Availability of road aggregates in India, requirements of road aggregates as per IS specifications.
- Binders: Common binders; cement, bitumen, Tar, cut back and emulsion, properties as per IS specifications

UNIT-III: Road Pavements

- Types and Their Construction of road pavement
- Construction of concrete roads as per IRC specifications
- Form laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used.
- Functions of various components, Sub-grade preparation - Setting out alignment of road, setting out bench marks,
- Stabilization, types of Stabilization
- Types of surfacing: (a) Surface dressing. (b) carpet (c) Asphalt concrete. (d) Grouting.

UNIT-IV Road maintenance:

- Common types of road failures-their causes and remedies.
- Maintenance of bituminous roads such as patch work and resurfacing.
- Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms).



4. Khanna S.K. & Justo C.E.G., *Highway Engineering*, 10th Edition, Nem Chand & Bros, Roorkee, 2017.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce



4. Khanna S.K. & Justo C.E.G., *Highway Engineering*, 10th Edition, Nem Chand & Bros, Roorkee, 2017.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce



DCE 502: SURVEYING-II

Course Code
DCE 502

Course Type
Core

L: T: P
3: 1:0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn about Plane table survey and contouring.
- To learn about theodolite surveying.
- To know about different types of curves.

COURSE CONTENTS

UNIT-I: Introduction of Plane Table Surveying

- Purpose of plane table surveying. Equipment used in plane table survey
- Setting of Plane table. Methods used in Plane table Survey
- Errors and precautions in Plane table surveying.

UNIT-II: Contouring

- Concept of contour,
- Contour interval and horizontal equivalent,
- Factors affecting contour interval,
- Characteristics of contour,
- Methods of contouring.

UNIT-III: Theodolite Surveying

- Transit vernier theodolite,
- Temporary adjustments of a transit theodolite,
- Traversing by included angles method,

- Errors in theodolite survey and precautions taken to minimize them;
- Introduction of Auto/Dumpy Level, Electronic Theodolite, Total Station

UNIT-IV: Curve

- Need and definition of a simple circular curve,
- Elements of simple curve,
- Technical terms used in simple curves,
- Setting out of simple circular curve,
- Numerical Problems on simple curves.

UNIT-V: Vertical and Transition Curve

- Concept of vertical curves,
- Need of centrifugal force and super elevation,
- Concept of transition curve,
- Numerical Problems on curves.

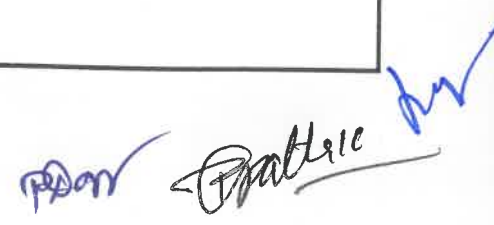
COURSE OUTCOMES

After completing this course, student will be able to:

- Perform plane table survey.
- Set the contour
- Perform the theodolite surveying.
- Understand the curves and able to set the curves.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCES

1. Duggal S.K., *Surveying Vol. I & II*, 5th Edition, McGraw Hill Publishers, Delhi, 2020.
2. Agor R., *A Textbook of Surveying and Levelling*, 12th Edition, Khanna Publishers, New Delhi, 2024.
3. Basak N.N., *Surveying & Levelling*, 2nd Edition, McGraw Hill Publishers, Delhi, 2024.
4. Punmia B.C., *Surveying Vol. I & II*, 18th Edition, Laxmi Publishers, New Delhi, 2022.



MEANS OF ASSESSMENT

- Assignments and quiz/class tests.
- Mid-semester and end-semester written tests.
- Actual practical work, exercises and viva-voce.
- Presentation and viva-voce.



MEANS OF ASSESSMENT

- Assignments and quiz/class tests.
- Mid-semester and end-semester written tests.
- Actual practical work, exercises and viva-voce.
- Presentation and viva-voce.



DCE 503: DESIGN OF RCC STRUCTURE

Course Code
DCE 503

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To understand the concept of reinforced concrete structures, different materials used in RCC and their properties.
- To study the principles of analysis and design of RCC members using Working Stress Method and Limit State Method as per IS: 456–2000.
- To develop the ability to design RCC beams, slabs, and columns under various loading and support conditions using standard design procedures
- To understand shear, bond, and development length requirements for safe and economical design of RCC structural members.

COURSE CONTENTS

UNIT-I: Introduction

- Concept of reinforced concrete structures, Different materials used in RCC with their properties. Load and loading standard as per IS:875
- Concept of design of reinforced concrete based on working stresses method and limit state method and their difference



UNIT-II: Design based on Working Stress Method

- Fundamental of working stress method: (i) Assumptions in the theory of simple bending for RCC beams. (ii) Flexural strength of a singly reinforced RCC beam. Position of the Neutral Axis. Resisting moment of the section, critical neutral axis, actual neutral axis, concept of balanced, under reinforced and over-reinforced sections. (iii) Shear Strength: Permissible shear stresses as per IS:456 – 2000
- Development of stresses in reinforcement, development length and anchoring of bars, Bond Strength

UNIT-III: Design of beam section

- Design of singly reinforced concrete beams as per IS:456 – 2000 from the given data such as span, load and properties of materials used.
- Design of Doubly Reinforced Concrete Beams: (i) Doubly reinforced concrete beam and its necessity (ii) Strength of a double reinforced concrete beam section., (iii) Method of design: Simple problems only. (iv) Reinforcement details of doubly reinforced concrete beam.

UNIT-IV: Design of RCC Slabs

- Structural behavior of slabs under uniformly distributed load (UDL), Types of ends supports,
- Design of one-way slab with the help of tables of IS:456 –2000
- Design of Two-way slab with the help of tables of IS:456 –2000. (Corners not held down)-IS-code method
- Detailing of reinforcement.

UNIT-V: Design of Columns

- Concept of long and short columns, Specifications for main and lateral reinforcement. Behavior of RCC column under axial load.
- Design of Axially loaded short and long columns with hinged ends (circular,



square and rectangular as per IS specifications)

COURSE OUTCOMES

After completing this course, student will be able to:

- Understand and explain the concept of RCC structures, properties of materials, types of loads, and relevant IS codes.
- Apply Working Stress Method and Limit State Method for analysis and design of RCC structural elements.
- Design RCC slabs and columns for different support conditions and loading cases using standard design methods.

List of Recommended Text books /References

1. Mallick S.K., *Reinforced Concrete*, 3rd Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2012.
1. Jain A.K., *Reinforced Concrete: Limit State Design*, 7th Edition, Nem Chand & Bros., Roorkee, 2012
2. Punmia B.C., *Limit State Design of Reinforced Concrete*, 3rd Edition, Laxmi Publications (P) Ltd., New Delhi, 2010.
3. Raju N.K., *Reinforced Concrete Design (IS 456:2000) – Principles and Practice*, 3rd Edition, New Age International Publishers, New Delhi, 2016.
4. BIS, *IS 456 – 2000 Code of Practice for Plain & Reinforced Concrete*.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-semester and end-semester written tests



DCE 504:DESIGN OF STEEL STRUCTURES

Course Code
DCE 504

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn the principles of working State Design (LSD) and Load
- Connections: Teach the design of bolted and welded connections, including eccentric connections.
- Structural Elements Design: Enable students to design structural components like tension members, compression members, columns (built-up, laced, battened), and beams.
- Application & Codes: Apply relevant design codes (e.g., IS 800-1984) to practical engineering problems and industrial structures.

COURSE CONTENTS

UNIT-I: Connections

- Structural Steel and Sections: Properties of structural steel, Designation of structural steel sections as per IS Handbook and IS: 800-1984
- Structural Steel Connections: Riveted connections - types of rivets, permissible stresses in rivets, Types of riveted joints, Failure of riveted joints, Assumptions made in the design of riveted joints, Specification for riveted joints.
- Design of riveted joints for axially loaded members.
- Welded Connections-: comparison between riveted and welded joints, types



of welds, permissible stresses in the welds, types of welded connections, strength of welded joint, Design of welded joints for axially loaded members

- Introduction to Bolted Connections

UNIT-II: Tension Members

- Tension Members: Forms of common sections.
- Permissible Stresses in tension for steel
- Strength of a tension member.
- Design tension members
- Tension splice and their design.

UNIT-III: Compression Members

- Design of struts and columns as per IS: 800-1984.
- Angle struts, type of section used, effective length, radius of gyration, slenderness ratio and its limits, permissible compressive stress
- Analysis and design of single and double angle sections compression members subjected to axial load.
- Introduction to analysis and design of axially loaded column.
- Introduction to lacing and battening (No numerical problem on lacing and battening)

UNIT-IV: Beams

- Beams: design criteria, allowable stresses,
- Design of laterally restrained beams including simple built-up sections, checks for web bulking, web crippling and deflection.

Unit-V: Column Bases

- Column bases
- Design of simple column base for axially loaded columns



COURSE OUTCOMES:

After completing this course, student will be able to:

- Understand the material properties of steel, advantages, and limitations of structural steel.
- Analyze and design bolted and welded connections.
- Design tension and compression members, including column bases.
- Design flexural members (beams) and gantry girders, including checking for serviceability.

LIST OF RECOMMENDED TEXT /REFERENCES BOOKS

1. Ram Chandra, *Design of steel Structures*, 19th Edition 2022, Standard Book House, Delhi.
2. Negi L.S., *Design of steel Structures*, 2nd Edition 2017, Tata Mc. Graw Hill Education Pvt. Ltd., Delhi.
3. Punmia B.C., *Design of steel Structures*, 2nd Edition 2015, Laxmi Publication (P) Ltd., Delhi.
4. Ramamarutham S., *Design of steel Structures*, 6th Edition 2014, Dhanpat Rai Publishing Co., Delhi.
5. BIS, *IS 800 – 2005 Code of Practice for General Construction in steel*.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce



DCE 505: PUBLIC HEALTH ENGINEERING – II

Course Code
DCE 505

Course Type
Core

L: T: P
3: 1:0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To understand the principles and importance of sanitation and sewerage systems.
- To study the design and operation of sewerage and sewage conveyance systems.
- To learn the methods of sewage treatment and disposal.
- To understand building drainage systems as per relevant IS standards.
- To develop knowledge of rural sanitation and maintenance of sewerage systems.

COURSE CONTENTS

UNIT – I: Domestic Sewage and Sewerage Systems

- **Introduction to Sanitation:** Objectives of sanitation and the need for organized collection and safe disposal of waste. Definitions of key terms used in sanitary engineering. Methods for collection and conveyance of sewage, including conservancy and water carriage systems with their merits and limitations. Surface drains (sketches only)—types and suitability.



Classification of sewage: domestic, industrial, and storm water, including seasonal variations.

UNIT – II: Sewerage Systems and Appurtenances

- **Sewerage Systems:** Different types of sewerage systems; materials used for sewers, their sizes, and types of joints.
- **Appurtenances:** Location, purpose, and construction details of manholes, drop manholes, lamp holes, catch basins, inverted siphons, flushing tanks, grease and oil traps, storm regulators, and ventilating shafts.

UNIT – III: Laying and Construction of Sewers

- Procedures for alignment and setting out of sewer lines; excavation methods; checking gradients using boning rods; preparation of bedding; handling, jointing, testing, and backfilling of sewer pipes. Construction details and required cross-sections of surface drains.

UNIT – IV: Sewage Characteristics and Disposal

- **Characteristics of Sewage:** Physical, chemical, and bacteriological properties of sewage, along with relevant IS standards for analysis.
- **Natural Disposal Methods:** Composition of sewage and methods of disposal such as dilution in water bodies, self-purification of streams, land treatment, and issues related to nuisance from improper disposal.

UNIT – V: Sewage Treatment and Building Drainage

- **Sewage Treatment:** Concepts and principles of primary and secondary

treatment, including the activated sludge process with flow diagrams. Introduction and functions of treatment units such as screens, grit chambers, detritus tanks, skimming tanks, sedimentation tanks, primary and secondary clarifiers, filters, contact beds, intermittent sand filters, trickling filters, sludge treatment and disposal units, oxidation ponds, oxidation ditch, duckweed pond, and vermiculture.

- **Building Drainage:** Objectives and requirements of building drainage systems; sanitary fittings and installations; various types of traps.
- Introduction to smart wastewater management, supported by a field visit for practical exposure.

COURSE OUTCOMES:

After completing this course, students will be able to:

- Explain the principles of sanitation and sewerage systems.
- Analyze the design and functioning of sewerage networks and sewage conveyance.
- Evaluate different methods of sewage treatment and disposal.
- Apply IS standards for building drainage systems.
- Assess rural sanitation systems and maintenance practices for sewerage networks.

LIST OF RECOMMENDED TEXT /REFERENCES BOOKS

1. Garg, S. K., Environmental Engineering Vol. II (Sewage Disposal and Air Pollution Engineering), 35th Edition, Khanna Publishers, New Delhi, 2018.
2. Rangwala, S. C., Water Supply and Sanitary Engineering, 30th Edition, Charotar Publishing House, Anand, 2022.
3. Birdie, G. S. and Birdie, J. S., Water Supply and Sanitary Engineering, 8th Edition, Dhanpat Rai Publishing Company, New Delhi, 2010 (Reprint).



4. Punmia, B. C., Jain, A. K. and Jain, A. K., Environmental Engineering Vol. II (Wastewater Engineering), 2nd Edition, Laxmi Publications, New Delhi, 2016 (Reprint 2021).
5. Modi, P. N., Sewage Disposal and Air Pollution Engineering, Revised Edition, Standard Book House, Delhi, 2016.
6. CPHEEO (Central Public Health & Environmental Engineering Organisation), Manual on Sewerage and Sewage Treatment Systems, Revised Edition (Part A & B), Ministry of Housing and Urban Affairs, Government of India, New Delhi, 2013.
7. Metcalf & Eddy, Inc., Wastewater Engineering: Treatment and Resource Recovery, 5th Edition, McGraw Hill Education, 2014.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests.
- Mid-semester and end-semester written tests.
- Actual practical work, presentations and exercises and viva-voce.

DCE 551: TRANSPORTATION ENGINEERING LAB

Course Code
DCE 551

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- To develop practical knowledge of highway materials and transportation engineering tests.
- To perform laboratory tests on aggregates, bitumen, and pavement materials.
- To understand the properties and behavior of materials used in highway construction.
- To study standard testing procedures as per IS specifications.
- To develop skills in quality control and evaluation of transportation engineering materials.

LIST OF PRACTICALS

CORE EXPERIMENTS:

1. Determination of impact value of aggregates.
2. Determination of crushing value of aggregates.
3. Determination of abrasion value of aggregates using Los Angeles abrasion testing machine.
4. Determination of penetration value of bitumen.
5. Determination of ductility value of bitumen.
6. Determination of softening point of bitumen.
7. Determination of flash point and fire point of bitumen.

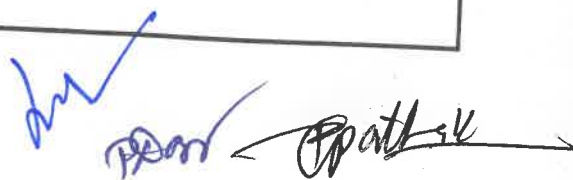
ADDITIONAL EXPERIMENTS:

1. Study of traffic signs, road markings, and traffic control devices.
2. Demonstration of road safety equipment and highway maintenance tools.
3. Study of geometric design elements of highways.
4. Visit to a highway construction site or bitumen plant

COURSE OUTCOMES

By the end of this course, students will be able to:

- Perform standard laboratory tests on highway construction materials.
- Evaluate the quality and suitability of aggregates, bitumen, and soil for pavement construction.
- Understand the properties and behavior of transportation engineering materials.
- Conduct tests related to pavement design and quality control.
- Analyze laboratory test results according to standard specifications.
- Apply practical knowledge in highway construction, maintenance, and transportation projects.
- Identify traffic control devices and understand basic road safety measures.
- Develop technical and practical skills required in transportation engineering laboratories.



DCE 552: SURVEYING LAB-II

Course Code
DCE 552

Course Type
Core

L: T: P
0: 0:4

Credits
2

COURSE OBJECTIVES

- To develop practical knowledge of field.
- To understand the principles of Plane table surveying.
- To study about angular measurements with the help of theodolite.
- To develop skills and knowledge about setting of curves of roads.

LIST OF PRACTICALS

1. Setting of plane table on the ground.
2. Plotting at least five point using Radiation method.
3. Traverse an area using Plane table survey.
4. Plotting a few points by Intersection method.
5. Preparing a contour plan by method of squares.
6. Reading the vernier and measurement of horizontal angles by repetition and reiteration method.
7. Traversing an area with a Theodolite (at least five lines) and plotting the traverse by calculating Latitude and Departure.
8. Measurement of vertical angles by the use theodolite.
9. Setting out of simple curve by: (a) Offsets from main chord (b) Offsets from the chords produced





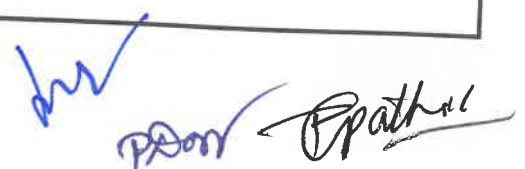
ADDITIONAL EXPERIMENTS

1. Setting Out a horizontal curve on road using Rankine Method.
2. To study the detailed topographic survey using Total station.
3. Survey camp of one week duration shall be arranged in the University campus or nearby locality to enhance the actual Practical knowledge of site surveying. The students are supposed to do topographical survey of the area showing contours and other features on site map.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Able to perform various types of survey on the field using plane table.
- Evaluate angles using theodolite.
- Analyse the topography and calculate the area.
- Apply experimental knowledge in field.
- Develop practical skills related to survey.
- Understand the use of advance survey instruments.



DCE 601: CONSTRUCTION MANAGEMENT

Course Code
DCE 601

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To impart knowledge on planning techniques.
- To cover all phases from initiation, planning, and execution to monitoring and closing.
- To understand quality assurance methods and implement safety protocols in construction projects.
- To provide skills for estimating project costs, budgeting, and optimizing resource allocation.

COURSE CONTENTS

UNIT-I: Introduction

- Significance of construction management, Main objectives of construction management and overview of the subject,
- Functions of construction management; planning, organizing, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job.
- Classification of construction into light, heavy and industrial construction,

- Stages in construction from conception to completion,
- The construction team: owner, engineer, architect and contractors, their functions and inter-relationship,
- Resources for construction industry

UNIT-II: Construction Planning & Scheduling

- **Construction Planning:** Importance of construction planning Stages of construction planning, pre-tender stage, Contract stage Contracts and e-tendering
- Different types of contracts
- Penalties and Arbitration, Stages at which planning is done.
- Pre tender and contract planning by the contractor.
- **Scheduling construction works by bar charts** - Definition of activity, identification of activities through Preparation of bar charts for simple construction work
- Preparation of schedules for labour, materials, machinery and finances for small works
- Limitations of bar charts, Scheduling by network techniques,
- Introduction to network techniques; PERT and CPM

Unit-III: Organization

- **Organization:** Types of organization: Line, staff, functional and their characteristics.
- **Site Organization:** Factors influencing, job layout from site plan
- Principle of storing and stacking materials at site, Location of equipment
- Preparation of actual job layout for a building



- Organizing labour at site.

UNIT-IV: Labour Act and Control Progress

- Conditions of construction workers in India
- wages paid to workers
- Labour welfare, Payment of wages Act.
- Minimum wages Act, Workmen compensation Act, Contract Labour Act.
- Control of Progress: Methods of recording progress,
- Analysis of progress, taking corrective actions keeping head of office informed.

UNIT-V: Inspection and Quality control

- Inspection and Quality Control: Principles of inspection, Major items in construction job requiring quality control.
- Accidents and Safety in Construction: accidents – causes, safety measures for: excavation work,
- Drilling and blasting, hot bituminous works, scaffolding, ladders, form work, demolitions, safety campaign, professional practice.

COURSE OUTCOMES

After completing this course, student will be able to:

- Create, analyze, and manage project schedules using Bar Charts
- Efficiently allocate materials, machinery, and personnel.
- Create comprehensive safety plans and understand legal, ethical, and contractual obligations.
- Identify and implement improvements for project efficiency, sustainability, and risk management.



LIST OF RECOMMENDED TEXTBOOKS /REFERENCE

1. Sadimala C.M., *Materials and Financial Management*, 1st Edition 2007, New Age International Publishers, Delhi.
2. Gahlot P.S., *Construction Planning and Management*, 3rd Edition 2024, New Age International Publishers, Delhi.
3. Chitkara K.K, *Construction Project Management: planning, Scheduling and control*, 4th Edition 2019, Tata McGraw Hill Publishing Company, New Delhi.
4. Joy P.K, *Total Project Management - The Indian context*, 1st Edition 2017, Macmillan India Ltd, New Delhi.
5. Vohra N.D., *Quantitative Techniques in Management*, 6th Edition 2021, Tata McGraw Hill Publishing Company, New Delhi.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

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DCE 602: EARTHQUAKE ENGINEERING

Course Code
DCE 602

Course Type
Core

L: T: P
3: 1:0

Credits
4

COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand the basic concepts of earthquakes and seismic waves.
- To study seismic hazards and zoning with reference to India.
- To learn earthquake-resistant design principles and relevant IS codes.
- To understand the effects of soil conditions and liquefaction.
- To develop knowledge of retrofitting and disaster risk reduction.

COURSE CONTENTS

UNIT – I: Fundamentals of Earthquakes and Seismic Hazards

- **Earthquake Basics:** Causes of earthquakes; plate tectonics theory; origin of seismic waves (P-waves, S-waves, surface waves); focus and epicenter; magnitude, intensity and energy release; commonly used scales and basic terminology in seismology.
- **Seismic Risk Concepts:** Characteristics of earthquakes; seismic hazard, vulnerability and risk; concept of seismic zoning and seismic zones in India; performance of structures during past earthquakes and lessons learned.

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UNIT – II: Earthquake Resistant Design Principles

- **Design Philosophy:** Philosophy of earthquake resistant design; objectives of seismic design; concept of ductility and energy dissipation; behaviour of short-period and long-period structures; importance of structural configuration.
- **Structural Analysis Concepts:** Concept of response spectrum; static force calculation method (equivalent lateral force method); distribution of seismic forces along height.
- **Architectural Considerations:** Building simplicity and symmetry; plan and vertical irregularities; importance of continuity and uniformity in structural systems; separation of structural blocks.

UNIT – III: Soil Effects and Seismic Construction Practices

- **Soil Behavior During Earthquakes:** Effect of local soil conditions; amplification of ground motion; liquefaction phenomenon, causes and effects; remedial measures for liquefaction; construction of earth structures under seismic conditions.
- **Seismic Construction of Masonry Buildings:** Guidelines for earthquake resistant masonry construction; strengthening measures; seismic bands and reinforcement detailing; precautions and provisions as per IS: 4326.

UNIT – IV: Seismic Design of RC Structures and Retrofitting

- **Seismic Detailing of RC Buildings:** Ductile detailing of reinforced concrete

structures; beam-column joints; confinement reinforcement; shear walls; detailing provisions as per IS: 13920.

- **Retrofitting and Rehabilitation:** Need for retrofitting; assessment of existing buildings; retrofitting techniques for masonry and reinforced concrete buildings; jacketing, bracing, base isolation and other strengthening measures.

UNIT – V: Disaster Management and Policy Framework

- **Disaster Fundamentals, Policy and Institutional Framework:** Definition of disaster—natural and manmade; National Policy on Disaster Management Act (Revised), Case study of Bhuj Earthquake 2001 and Indian Ocean Tsunami 2004,
- **Disaster Risk Reduction:** Definition, Disaster Management Cycle, factors promoting vulnerability reduction and mitigation; disaster mitigation and prevention strategies; early warning system; human resource development; information dissemination and communication; case studies of major disasters in India.

COURSE OUTCOMES

After completing this course, students will be able to:

- Explain the basic concepts of earthquakes, seismic waves, and seismic hazards.
- Interpret seismic zoning and earthquake risk with reference to India.
- Analyze structural behavior under earthquake loading conditions.

- Apply provisions of relevant IS codes for earthquake-resistant design.
- Evaluate techniques for retrofitting and strengthening of existing structures.

LIST OF RECOMMENDED TEXTBOOKS /REFERENCE

1. Duggal, S. K., Earthquake Resistant Design of Structures, 3rd Edition, Oxford University Press, New Delhi, 2013.
2. Srivastava, H. N., Earthquakes: Geography and Management, 2nd Edition, New Age International Publishers, Delhi, 2010.
3. Jai Krishna, Elements of Earthquake Engineering, 2nd Edition, South Asian Publishers, New Delhi, 2014 (Reprint).
4. Chopra, A. K., Dynamics of Structures, 5th Edition, Pearson Education, 2017.
5. Agarwal, P. N., Engineering Seismology, 1st Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1992 (Reprint 2012).
6. Richter, C. F., Elementary Seismology, 2nd Edition (Indian Reprint), Eurasia Publishing House Pvt. Ltd., New Delhi, 2009.
7. IS 4326, Earthquake Resistant Design and Construction of Buildings – Code of Practice, 3rd Revision, Bureau of Indian Standards, New Delhi, 2013.
8. IS 13920, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces, Latest Revision, Bureau of Indian Standards, New Delhi, 2016 (with 2019 Amendment).

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests.
- Numerical problem solving, design exercises, presentation and viva-voce.

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DCE 603: TRANSPORTATION ENGINEERING-II

Course Code
DCE 603

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn about basic principles and methods used in Railway Engineering.
- To know about basics of Bridge Engineering.
- To know about basics of Tunnel Engineering.
- To know about basics and methods for Airport design.

COURSE CONTENTS

UNIT-I: Introduction to Permanent Way and its Components

- Concept of Railway engineering
- Concept of a permanent way
- Concept of gauge and Suitability of these gauges under different conditions
- Introduction to rails
- Creep: Its definition, causes, effects and prevention
- Wear of rails, its causes and effects
- Sleepers, Ballast and Fixtures and fastening.

UNIT-II: Railway Track Geometry, Signaling and Interlocking

- Geometrics for Gauge
- Points and Crossings
- Track Laying
- Numerical problems on geometric designs
- Signaling and Interlocking

UNIT-III: Introduction to Bridge Engineering

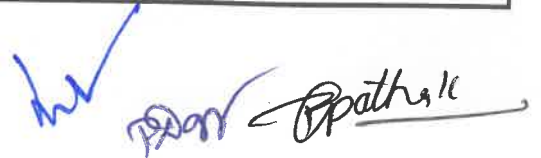
- Concept of Bridge.
- Detailing of Piers.
- Technical terms used in Bridge engineering.
- Abutments and wing walls
- Bridge Bearings
- Temporary Bridges

UNIT-IV: Introduction to Tunnel Engineering

- Tunnel & Its function and component parts, different parts. Classification of Tunnel.
- Cross sections adopted for tunnel, Survey of tunnels.
- Tunnel lining and its categories.
- Shafts and dirt control in tunnel.

UNIT-V: Introduction to Airport Engineering

- Technical terms used in Airport engineering
- Basic Element, Runway and Taxi Way.
- Classification and Construction Method



- Numerical problems on airport design.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify track components.
- Understand the geometric design.
- Understand about bridge and tunnel.
- Design the runway.

LIST OF RECOMMENDED TEXTBOOKS / REFERENCE

1. Gupta B.L., *Road, Railway, Bridges, Tunnels & Harbour Dock Engineering*, 5th Edition, Standard Publishers Distributors, Delhi, 2024.
2. Rangwala S.C., *Highway Engineering*, 12th Edition, Charotar Publishing House (P) Ltd., Anand, Gujarat, 2022.
3. Ahuja & Birdi, *Road, Railway, Bridges & tunnels Engineering*, 18th Edition, Standard Books House, Delhi, 2024.
4. Gupta D.V., *Transportation Engineering*, 9th Edition, Asian Publishers Muzaffarnagar, 2024.

MEANS OF ASSESSMENT

- Assignments and quiz/class-tests,
- Mid-semester and end-semester written tests.
- Actual practical work, exercises and viva-voce.
- Presentation and viva-voce.



DAS 604: ENVIRONMENT AND ECOLOGY

Course Code
DAS 604

Course Type
Core

L: T: P
2: 0: 0

Credits
2

COURSE OBJECTIVES

Following are the objectives of this course:

- To impart knowledge of Environmental Science, ecosystems, and bio-diversity.
- Create awareness about global environmental issues such as global warming,
- Provide knowledge of natural resources and energy sources, including renewable and non-renewable energy.
- Develop understanding of environmental pollution, control measures, and environmental protection laws in India.
- Understand the environmental responsibility and public awareness for sustainable living

COURSE CONTENTS

UNIT-I: Introduction

- Introduction to Environmental Science - Definition and scope and need for public awareness,
- Ecosystems,
- Biodiversity.
- Global Warming, Climate change and its impact,
- Green House Effect, Acid Rain,
- Concept of Green Building.



UNIT-II: Energy Resources

- Natural Resources - Renewable and non-renewable and their equitable use for sustainability,
- Conventional and Non-conventional Energy Sources
- Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel,
- Hydrogen as an alternative fuel.

UNIT-III: Sustainable Development

- Transportation and industrial growth
- Social Issues Related to Environment–Sustainable development,
- Reset element and rehabilitation Environmental ethics.

UNIT-IV: Environmental Pollution and Pollution Control Laws

- Pollution–Definition, causes and effects
- control measures for water, air, soil, noise, thermal pollution
- Prevention and Control Act 1981 & Environmental Protection Act 1986
- Function of State pollution control board
- National Green Tribunal (NGT)

COURSE OUTCOMES:

After completing this course, student will be able to:

- Explain the scope and importance of Environmental Science, ecosystems, biodiversity.
- Classify natural resources and energy sources into renewable and non-renewable categories and describe conventional and non-conventional energy resources.
- Discuss sustainable development, environmental ethics, and environmental issues related to transportation, industrial growth, and rehabilitation.



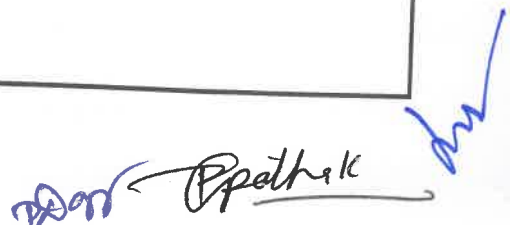
- Explain important environmental protection laws including the Prevention and Control of Pollution Act
- Explain the role and functions of State Pollution Control Boards and the National Green Tribunal (NGT)

LIST OF RECOMMENDED TEXT BOOKS /REFERENCES

1. Roy Dr. Subrat, *Environmental Science*, 1st Edition, Khanna Book Publication 2024.
2. Basak N.N., *Environmental Engineering*, Edition McGraw Hill Education 2017.
3. Kaushik A. and Kaushik C.P., *Perspectives in Environmental Studies*, 6th Edition, New Age International Publishers, New Delhi, 2018.
4. Odum E.P. and Barrett G.W., *Fundamentals of Ecology*, 5th Edition, Cengage Learning, 2004.
5. Rao M.N. and Datta A.K., *Waste Water Treatment*, 3rd Edition, Oxford & IBH Publishing, New Delhi, 2009.
6. Sharma P.D., *Ecology and Environment*, 13th Edition, Rastogi Publications, Meerut, 2018.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-semester and end-semester written tests
- Presentation



DCE605: ESTIMATION, COSTING AND VALUATION

Course Code
DCE 605

Course Type
Core

L: T: P
3: 1: 0

Credits
4

COURSE OBJECTIVES:

Following are the objectives of this course:

- Understand Estimation Types: Introduce types of estimates (preliminary, detailed) and their importance in projects.
- Quantity Calculation: Teach methods to estimate material quantities for buildings, roads, and earthwork.
- Rate Analysis: Train in analyzing rates for items of work and drafting technical specifications.
- Valuation Techniques: Teach methods for calculating the value of buildings and property, including rent fixation.

COURSE CONTENTS

UNIT-I: Buildings and Measurements

- Introduction to Estimating, Types of estimates, drawings, (to be attached with these estimates, Preparation of rough cost estimates).
- Units of measurement for various items of work as per BIS:1200-1 (1991)
Rules for measurements,
- Different methods of taking out quantities – centre line method and long wall and short wall method.

UNIT-II: Specifications and Rate analysis

- Preparation of a detailed estimate with specification, abstract of cost and material statement for RCC roofs only.
- Specifications: Need, general and detailed specifications, method of writing specifications,
- Analysis of rates: Steps in the analysis of rates for any item of work, requirement of material, lab our, sundries T.& P.
- Contractors profit, Calculation of quantities of materials for Plain cement concrete of different proportions, Brick masonry in cement and lime mortar
- Plastering and pointing with cement mortar in different proportions and White washing.

UNIT-III: Public Health

- Preparation of detailed estimate for laying a water supply line (C.I. Pipe)
- Preparation of detailed estimates for sanitary and water supply fittings in a domestic building containing one set of toilets and septic tank.

UNIT-IV: Roads

- Methods for calculating earth work using: -Average depth, Average cross-sectional area and Graphical method.
- Calculations of quantities of materials for roads in plains from given drawings
- Preparation of detailed estimate using the above quantities
- Detailed estimate of a single span slab culvert with return wing walls
- Calculation of quantities of different items of work for a masonry retaining wall from given drawings.



UNIT-V: Valuation

- Purpose of valuation, principles of valuation, Definition of terms such as depreciation, sinking fund salvage and scrap value.
- Valuation of a building property by replacement cost method and rental return method,
- Method of calculation of standard rent-Concept of capitalized value and years purchase.

COURSE OUTCOMES

After completing this course, student will be able to:

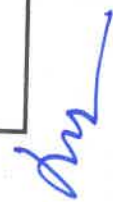
- Calculate accurate quantities for building components and civil works (e.g., long wall, center line methods).
- Determine the cost of materials, labor, and equipment to analyze rates for specific construction items.
- Formulate detailed specifications and prepare tender documents. Apply, analyze, and evaluate cost estimations to assist in project management and sanctioning.

LIST OF RECOMMENDED TEXTBOOKS /REFERENCE

1. Dutta B.N., *Estimating & Costing in Civil Engineering*, UBS Publishers Pvt. Ltd., New Delhi.
2. Gupta D.V., *Estimating, Costing and Valuation*, Asian Publishers Muzaffar nagar.
3. Birdi G.S., *Estimating, Costing & Valuation*.
4. Rangwalala S.C., *Estimating, Costing & Valuation*, Charotar Publishing House Pvt. Ltd., Anand.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce



DCE 651: BAR BENDING SCHEDULE LAB

Course Code
DCE-651

Course Type
Core

L: T: P
0: 0: 4

Credits
2

COURSE OBJECTIVES

- To develop practical knowledge of reinforcement detailing in RCC structures.
- To understand the preparation and interpretation of Bar Bending Schedules (BBS).
- To study reinforcement requirements for beams, slabs, columns, and footings.
- To develop skills in calculation of cutting length, bending length, and steel quantity.
- To familiarize students with standard codes and practices related to reinforcement detailing.

LIST OF PRACTICALS

CORE EXPERIMENTS

1. Study of different types and grades of reinforcing steel bars.
2. Preparation of Bar Bending Schedule for simply supported beam.
3. Preparation of Bar Bending Schedule for one-way slab.
4. Preparation of Bar Bending Schedule for two-way slab.
5. Preparation of Bar Bending Schedule for RCC column.
6. Estimation of steel quantity for RCC members.



ADDITIONAL EXPERIMENTS

1. Reinforcement detailing of staircase slab.
2. Preparation of BBS for combined footing.
3. Study of reinforcement detailing as per IS 456 provisions.
4. Calculation of weight of steel bars using standard formulas.
5. Site visit to observe reinforcement placement and bar bending work.

COURSE OUTCOMES

By the end of this course, students will be able to:

- Identify different reinforcement bars and their applications in RCC construction.
- Prepare Bar Bending Schedules for various RCC structural components.
- Calculate cutting length, bending allowance, and quantity of reinforcement steel.
- Interpret and prepare reinforcement detailing drawings.
- Apply IS code provisions related to reinforcement detailing and RCC construction.
- Develop practical skills in bar cutting, bending, and reinforcement placement.
- Estimate steel requirements for small RCC structures.
- Understand quality control and safety practices in reinforcement work.

