ANNEXURE-VI

DETAILED SYLLABUS

B.TECH (CIVIL) FOR WORKING PROFESSIONALS

(Batch 2023 & Onwards)

PROGRAMME OBJECTIVES AND OUTCOMES

B.Tech (Civil) for Working Professionals

Programme Objectives (POBs)

1. To provide diploma-holding professionals with advanced theoretical knowledge and practical competencies in specialized domains of civil engineering.
2. To implement pedagogically sound blended learning methodologies incorporating digital platforms (MOOCs/NPTEL) complemented by intensive practical sessions within campus facilities.
3. To enhance professional expertise in critical domains including advanced structural analysis, precision surveying methodologies, geotechnical engineering, and contemporary project management frameworks.
4. To cultivate industry-aligned proficiencies through specialized elective courses and structured on-site professional development modules.
5. To reinforce the principles of ethical professional conduct and sustainable engineering practices within the context of contemporary civil engineering applications.

Programme Outcomes (POs)

1. Working professionals will demonstrate the ability to synthesize fundamental and specialized engineering knowledge in addressing practical civil engineering challenges encountered in professional contexts.
2. The candidates/students will be able to exhibit proficiency in operating sophisticated digital instrumentation and field equipment, including Total Station apparatus, Theodolite systems, and soil testing instrumentation.
3. They will be able to demonstrate analytical capabilities in the interpretation of construction data for the purpose of designing and evaluating infrastructure solutions.
4. Working professionals will integrate principles of sustainability and professional ethics into construction methodologies and infrastructure management practices.
5. Working professionals will exhibit leadership capabilities and team management skills essential for the successful execution of complex engineering initiatives.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	3rd
COURSE TITLE	**Structural Analysis - I**
COURSE CODE	CIV-221-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	This course aims to introduce the concepts of engineering mechanics of materials and the behaviour of the materials and structures under applied loads with respect to civil engineering design and analysis

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Basic concepts of structural analysis**:- Structure, structural engineering, Types of loads (point, uniformly distributed and varying), Types of supports and support reactions, free body diagrams, Equations of equilibrium, Principle of Superposition, Axial force, Bending moment, and Shear force in determinate beams (Simply supported beams, cantilever, and overhanging beams) and diagram of shear force and bending moment.	10
2.	**Symmetric Beam Bending**: Simple theory of bending, Bending and shear stress for regular sections, shear center.	9
3.	**Deflection of statically determinate beams**: Slope and deflection of beams by integration, area-moment method and conjugate beam method.	10
4.	**Compound stresses**: - Normal and tangential stresses, Principal stresses and strains, Principal planes, Mohr's circle of stress, Evaluation by analytical and graphical method.	8
5.	**Columns**: Fundamentals, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory, Problems with eccentric load.	8

COURSE OUTCOMES	
CO 1.	Explain climate change mechanisms and identify civil engineering sectors affected.
CO 2.	Evaluate climate-related risks to different infrastructure systems and materials.
CO 3.	Propose suitable adaptation techniques for climate-resilient infrastructure projects.

CO 4.	Assess and recommend eco-friendly materials and green infrastructure for civil engineering use.
CO 5.	Interpret climate change-related policies, design standards, and future trends in the field.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Mechanics of Materials	Beer, P. F., Johnston (Jr.), E. R., Dewolf, J. T., and Mazurek, D. F
2.	Mechanics of Materials	Hibbeler, R. C
3.	Mechanics of Structures Vol. I (Strength of Materials	Shah, H. J., and Junnarkar, S. B
4.	Fundamentals of Solid Mechanics: A Treatise on Strength of Materials	Gambhir, M. L.
5.	Engineering Mechanics of Solids	Popov, E. P
6.	Mechanics of Materials	Gere, J. M., and Goodno, B. J.
7.	Mechanics of Materials	Craig (Jr.), R. R.,

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	3rd
COURSE TITLE	**Surveying - I**
COURSE CODE	CIV-222-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	Introduce students to the basic concepts, principles, and terminology of surveying, including different types of surveys (land, construction, topographic, geodetic) and their applications.
2.	Teach students various measurement methods, such as distance measurement (electronic and traditional methods), levelling, angle measurement, and traverse measurements
3.	Enable students to identify and quantify different sources of errors in survey measurements, including instrumental, environmental, and observational errors

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction: Definition- Classifications - Basic Principles-	03
2.	Equipment and accessories for ranging and chaining – Methods of ranging – well conditioned triangles – Errors in linear measurement and their corrections – Obstacles.	10
3.	Compass – Basic principles - Types - Bearing - Systems and conversions- Sources of errors - Local attraction - Magnetic declination-Dip - Adjustment of closing error – applications -	10
4.	Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection	10
5.	Level line - Horizontal line - Datum - Benchmarks -Levels and staves - Methods of levelling - Fly levelling - Check levelling - Procedure in levelling Curvature and refraction – Sources of Errors in levelling- Types of instruments	12

COURSE OUTCOMES	
CO 1.	Students will be able to apply geometric principles and mathematical concepts to solve real-world surveying problems, such as land area calculation and boundary determination.

CO 2.	Graduates will demonstrate proficiency in employing various surveying techniques to accurately measure distances, angles, and elevations in a surveying context.
CO 3.	Graduates will be capable of interpreting survey data and presenting findings through maps, charts, and reports that effectively communicate information to various stakeholders, such as land developers, engineers, and government agencies.
CO 4.	Students will be able to apply geometric principles and mathematical concepts to solve real-world surveying problems, such as land area calculation and boundary determination.
CO 5.	Graduates will demonstrate proficiency in employing various surveying techniques to accurately measure distances, angles, and elevations in a surveying context.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Surveying (volume I)	Dr. K. R. Arora
2.	Surveying (volume I)	S. K. Duggal
3.	A Text Book of Surveying	C L Kochher
4.	Surveying and levelling	P. B. Shahani

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	3rd
COURSE TITLE	**Building Material & Construction**
COURSE CODE	CIV-223-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To aid practicing engineers in materials selection and design by understanding the interplay among structure, processing, properties, and performance.
2.	Introduction about basic building units and their suitability.
3.	To assess and evaluate the differences in material composition.
4.	To provides a broad overview of the field and serves.
5.	To know the pattern of lying of building units.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Introduction to building materials.** Role of material in construction. Types of materials used in building construction. **Lime**: Classification & Types **Cement**: Classification/types and testing of cement. **Fly Ash**: Classification and Uses of Fly Ash **Mortar:** Classifications/types and their use. **Timber**: Classifications/types, and seasoning of timber. **Steel**: Classifications and their tests	**10**
2.	**Stones, Bricks and Concrete Blocks** Stone as building material: Criteria for selecting stones, Tests of stones, Deterioration and Preservation of stonework. Bricks as building material: Classification of bricks, Special and advanced bricks, Defects in bricks, Tests on bricks as Per Indian standard. Concrete Blocks: Types of concrete blocks advantages and disadvantages of concrete blocks.	**10**
3.	**Properties of Building materials.** Factors affecting properties of building materials, the importance of studying properties of building materials, introducing various	**10**

	properties of building materials e.g., structural properties, thermal, fire-related properties, and acoustic properties.	
4.	**Introduction of Building Practices and Building Elements.** Building codes and their objectives. Load-bearing structures and framed structures its suitability and importance. Types of loads. Introduction to building elements and Their Types. Foundation, Plinth, Floors, DPC, Walls, Slab, Stairs, Columns, Beams, Lintel, Roofs, Plaster, Doors, Windows, and Ventilators.	**10**
5.	**Masonry Construction:** Definition and terms used in masonry. Brick masonry, characteristics, and requirements of good brick masonry, Bonds in brickwork.	**5**

COURSE OUTCOMES	
CO 1.	Learner should differentiate the basic materials used in building construction.
CO 2.	Learner should analyze the requirements of modern material, our traditional one.
CO 3.	Learner should know building elements and their construction.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Building materials	Parbin Singh.
2.	Building materials and construction	Gurcharan Singh
3.	Building materials and construction	Ragawala.
4.	Building construction	Sushil Kumar.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	3rd
COURSE TITLE	**Structure Lab-I**
COURSE CODE	CIV-241-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	To experimentally investigate the deformation and load-carrying behavior of structural elements such as beams, trusses, arches, and frames.
2.	To verify classical theorems of structural analysis like Maxwell's theorem and assess influence lines in statically determinate structures.
3.	To understand the concept of structural redundancy and elastic coupling in structural systems.

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	Deflection of curved beams.	**4**
2.	Behavior of Portal Frame under different load combinations.	**3**
3.	Deflection of Truss.	**3**
4.	Behavior of a cantilever beam under symmetrical and unsymmetrical loading.	**4**
5.	Analysis of an elastically coupled beam.	**3**
6.	Analysis of a redundant joint.	**3**
7.	Analysis of two hinged arches.	**3**
8.	Verification of Maxwell's Theorem.	**3**
9.	Verification of Horizontal Thrust in a 3-Hinged Arch.	**4**

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	3rd
COURSE TITLE	**Surveying Lab-I**
COURSE CODE	CIV-242-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	20	30

COURSE OBJECTIVES	
1.	To use the basic surveying equipment viz Chain, tape, Compass
2.	To layout different types of traverses using chain/tape and compass.
3.	To handle & use Plane table with other accessories.
4.	To handle & use various types of levelling instruments viz, Dumpy level, Tilting Level
5.	To prepare L –sections and X-sections showing relative levels of various points

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	Study of chains and their accessories.	**2**
2.	Aligning, Ranging, and Chaining.	**2**
3.	Chain Traversing.	**2**
4.	Compass Traversing.	**2**
5.	Plane table surveying: Radiation.	**2**
6.	Plane table surveying: Intersection.	**2**
7.	Plane table surveying: Traversing.	**2**
8.	Plane table surveying: Resection – Three point problem.	**2**
9.	Plane table surveying: Resection – Two point problem.	**2**
10.	Study of levels and levelling staff.	**2**
11.	Fly levelling using Dumpy level.	**2**
12.	Fly levelling using tilting level.	**2**
13.	Check levelling.	**2**
14.	LS and CS.	**2**
15.	Contouring.	**2**

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	4th
COURSE TITLE	**Structural Analysis – II**
COURSE CODE	CIV-271-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To introduce the students to basic theory and concepts of classical methods of structural analysis

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Indeterminate Structures**: Introduction to indeterminate structures; stability, static and kinematic indeterminacy of structures viz. beams, frames, trusses.	6
2.	**Energy Methods of Analysis of Structures**: Strain energy and strain energy density – strain energy due to axial load (gradual, sudden, and impact loadings), shear, flexure. Castigliano's theorems – Maxwell's reciprocal theorem - Principle of virtual work - unit load method - application of energy theorems for computing deflections in determinate beams, plane frames, and plane trusses.	12
3.	**Force Methods of Analysis of Structures**: Method of least work, method of consistent deformation for analysis of indeterminate beams; continuous beams; deflection of truss joints; analysis of two hinged arches and Cleypryon's Three-Moment equation.	10
4.	**Displacement Methods of Analysis by slope and deflection method**: Analysis of indeterminate beams & frames (with & without sway) by classical displacement methods viz.; slope deflection method,	10
5.	**Displacement Methods of Analysis by moment Distrubution method**:- Distribution factors, analysis of indeterminate Beams and Frames (with and without Sway) by moment distribution method.	7

COURSE OUTCOMES	
CO 1.	Identify the degree of indeterminacy of different types of structures.
CO 2.	Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.

CO 3.	Analyse statically indeterminate structures by force & displacement methods and building frames by approximate methods for horizontal and vertical loads.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Structural Analysis	Hibbeler, R. C. Pearson Prentice Hall.
2.	Fundamentals of Structural Analysis	Leet, K. M., and Uang, C. M. Tata McGraw-Hill.
3.	Advanced Structural Analysis	Menon, D., CBS Publishers & Distributors Pvt. Ltd.
4.	Structural Analysis	Menon, D, Narosa Publishing House.
5.	Elementary Structural Analysis	Ashok, K. Jain, Nem Chand & Bros
6.	Advanced Structural Analysis with Finite Element Method	Ashok, K. Jain , Nem Chand & Bros
7.	Mechanics of Structures Vol. II (Theory and Analysis of Structures	Junnarkar, S. B., and Shah, H. J. Charotar Publishing House Pvt. Ltd.
8.	Basic Structural Analysis	Reddy, C. S, Tata McGraw Hill
9.	Intermediate Structural Analysis	Wang, C. K, Tata McGraw Hill
10.	Structural Analysis	Hibbeler, R. C. Pearson Prentice Hall.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	4th
COURSE TITLE	**Surveying - II**
COURSE CODE	CIV-272-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To impart a basic understanding of various aspects related to geodetic surveying and other measurements in Civil Engineering.
2.	To provide knowledge of Total Station & advanced surveying instruments.
3.	To develop skills to set out Curves in the field using both Total Station and Theodolite.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Contouring - Methods - Characteristics, and uses of contours – Plotting – Methods of interpolating contours – Computations of cross-sectional areas and volumes	9
2.	Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tachometry –Sub tense method - Stadia constants	9
3.	Horizontal and vertical control, baseline, corrections, satellite stations, reduction to center, trigonometrical levelling, single and reciprocal observations.	9
4.	Errors, Sources, precautions, and corrections, classification of errors, true and most probable values, weighed observations, the principle of least squares, normal-equation.	9
5.	Classifications of total station: Electro-optical system, Working principle, Infrared and Laser Total Station instruments. Microwave system working principle, Microwave Total Station instruments. Comparison between Electro-optical and Microwave Systems. Care and maintenance of Total Station instruments.	9

COURSE OUTCOMES	
CO 1.	Graduates will have a comprehensive understanding of geodetic surveying, including geodetic datum
CO 2.	Students will be adept at integrating cutting-edge technologies, such as advanced GPS, and other digital mapping tools, for precise and detailed survey data collection and analysis.

CO 3.	Graduates will demonstrate the ability to process and analyze complex survey data, utilizing statistical methods
CO 4.	Students will be equipped with the skills to manage and lead advanced surveying projects, including planning, executing, and overseeing complex surveying tasks in diverse fields such as construction, environmental management, and urban planning.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Surveying (volume 2)	Dr. K. R. Arora
2.	Surveying (volume II)	S.K Duggal
3.	Surveying (volume II)	B. C Punima

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	4th
COURSE TITLE	**Fluid Mechanics-I**
COURSE CODE	CIV-273-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To develop the understanding of basic principles of mechanics of fluids at rest and in motion and their applications in solving the real engineering problems
2.	To imbibe basic laws and equations used for analysis of static and dynamic fluids.
3.	To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
4.	To inculcate the importance of fluid flow measurement and its applications in Industries.
5.	To be able to carry out dimensional analysis for various physical phenomenon occurring in nature.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Unit I: Introduction** Physical properties of Fluids: Mass density, Viscosity, Compressibility, Vapour pressure, Surface tension, Capillarity, Ideal Fluids and Real Fluids; Newtonian and non-Newtonian fluids.	7
2.	**Unit II: Fluid Statics** Pressure Intensity, Pascal's law; Hydrostatic Law; manometers and its types; Hydrostatic forces on surface, Total pressure, Centre of pressure; Buoyancy, Centre of buoyancy, Stability of immersed and floating bodies, Metacentric height and its determination.	13
3.	**Unit III: Fluid Kinematics** Steady and unsteady; Uniform and non-uniform; laminar and turbulent flows; one-, two- and three-dimensional flows; Conservation of mass; Continuity equation; velocity field and acceleration; Streamlines, Streak lines and path lines and flow net; Elementary explanation of stream function and velocity potential; rotation, circulation and vorticity.	7
4.	**Unit IV: Fluid Dynamics** Equations of motion, Euler's equation of motion along a streamline and Bernoulli's equation; Bernoulli's equation for real flow; Applications of Bernoulli's equation; flow measurement through	11

	Venturimeter, orifice-meter, Pitot tube; Orifices & mouth- pieces; Notches and weirs, Classification of notches and weirs, Nappe, Crest/Sill.	
5.	**Unit V: Dimensional Analysis** Dimensional homogeneity, Primary and Secondary dimensions, Rayleigh method & Buckingham's Π-theorem; Important Dimensionless numbers (Reynold's number, Froude's number, Euler's number); Kinematic and Dynamic similarity; Model Analysis and similitude.	7

COURSE OUTCOMES	
CO 1.	To analyze various Physical properties of fluids
CO 2.	Analyze and perform calculations on Pressure Intensity, force on plane and curved surfaces, center of pressure and metacentric height
CO 3.	Perform calculations for determination of Steady and unsteady, uniform and non uniform, laminar and turbulent flows; one, two and three dimensional flows; Stream lines, Streak lines and path lines.
CO 4.	Determine Euler's equation of motion along a streamline and its integration to yield Bernoulli's equation.
CO 5.	To carry out dimensional analysis for a physical phenomenon occurring in nature by using Buckingham's theorem

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Fluid Mechanics and Fluid Power Engineering	Kumar, D.S.
2.	Engineering Fluid Mechanics	Garde R.J.
3.	Fluid Flow in Pipes & Channels	Asawa, GL,
4.	Engineering Fluid Mechanics	Kumar, K.L.
5.	Introduction to Fluid Mechanics and Fluid Machines	Som, S.K. and Biswas, G.,

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	4th
COURSE TITLE	**Surveying Lab-II**
COURSE CODE	CIV-291-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	Measure Horizontal and vertical angles using Theodolite
2.	Measure height of buildings using theodolite and Tachometer
3.	Measure horizontal and vertical distances using Tachometry,
4.	Setting out of works
5.	Measure horizontal/vertical distances, horizontal/vertical angles, and area of sites

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	Contouring by Different Methods	**5**
2.	Study of Theodolite	**3**
3.	Measurement of horizontal angles by reiteration and repetition and vertical angles.	**3**
4.	Theodolite survey traverse.	**4**
5.	Heights and distances - Triangulation - Single plane method.	**3**
6.	Tachometry - Tangential system - Stadia system - Sub tense system.	**3**
7.	Setting out works - Foundation marking - Simple curve (right/left handed) Transition curve.	**5**
8.	Measurement of Horizontal and Vertical distance using Total Station.	**4**

COURSE OUTCOMES	
CO 1.	To handle and use Theodolite for measurement of horizontal angles & vertical angles.
CO 2.	To layout different types of traverses using Theodolite.
CO 3.	To handle and use Tacheometer
CO 4.	To set out works- Foundation markings, simple curves, and Transition curves.
CO 5.	To handle and use Total station for measurement of horizontal/vertical distances, traversing, and area calculation.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	4th
COURSE TITLE	**Fluid Mechanics Lab-I**
COURSE CODE	CIV-292-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	To develop understanding of hydrostatic law, the principle of buoyancy and stability of a floating body, and application of mass, momentum, and energy equation in fluid flow.
2.	To imbibe basic laws and equations used for the analysis of static and dynamic fluids.
3.	To teach the importance of fluid flow measurement and its applications in Industries
4.	To give fundamental knowledge of fluid, its properties, and behaviour under various Conditions of internal and external flows.

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	To determine the metacentric height of a ship model experimentally.	**4**
2.	To verify Bernoulli's equation experimentally.	**4**
3.	To determine the coefficient of discharge, coefficient of velocity, and coefficient of Contraction of an orifice or a mouthpiece of a given shape.	**4**
4.	To calibrate an orifice meter and to study the variation of coefficient of discharge with Reynold's number.	**4**
5.	To calibrate a Venturimeter and to study the variation of coefficient of discharge with Reynold's Number.	**5**
6.	To calibrate sharp-crested rectangular and triangular weir.	**5**
7.	To verify the momentum equation experimentally	**4**

COURSE OUTCOMES	
CO 1.	The ability to analyze experimental data and develop empirical equations.
CO 2.	Verification of basic principles and equations of fluid mechanics.
CO 3.	The ability to use computers for data analysis, empirical equations, and presentation

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	5th
COURSE TITLE	**Geotechnical Engineering-I**
COURSE CODE	CIV-321-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To develop basic understanding of soils.
2.	To understand flow of water through soils.
3.	To understand soil compressibility characteristics.
4.	To understand different kind of stresses in soils.
5.	To understand soil investigation.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction: Soil and its formation, various processes and agencies for formation, Types of Soils. Basic definitions. Relations and interrelations, Three phase soil Model, Index properties, classification of soils (USCS & ISCS)	**10**
2.	Soil Hydraulics: Flow-through soils, Darcy's Law. Permeability and factors affecting permeability and determination in the lab/Field. Steadystate Flow, seepage force, Laplace equation for steady- state flow, flow nets for homogenous embankments with & without toe filters.	**07**
3.	Soil Compressibility: One Dimensional Consolidation, Terzaghi's equation. Consolidation test, e log p curves. Consolidation settlement, time required for settlement. Compaction, laboratory compaction tests, proctor compaction, compaction curve, and control on field compaction.	**10**
4.	Effective Stress & Stress Distribution: Total & effective stresses, Pore Water pressure, Stress distribution under concentrated load. Boussineq's method	**08**
5.	Soil Investigation & Clay Mineralogy: Laboratory & Field Investigation. Basic definitions, Sub-soil exploration, Standard Penetration methods, (SPT&SCPT) Geo-Physical methods, Minerals Present in clay.	**10**

	Dependence of behavior of clay on type of mineral.	

COURSE OUTCOMES	
CO 1.	To classify soils and understand their index properties.
CO 2.	To analyze flow through soils.
CO 3.	To perform/demonstrate soil compaction tests
CO 4.	To determine stress distribution in soils.
CO 5.	To utilize various methods of soil investigation in field and laboratory

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Soil Mechanics and Foundation Engineering	K.R.Arora
2.	Soil Mechanics and Foundation Engineering	S.K.Garg
3.	Theoretical Soil Mechanics	Terzaghi & Peck
4.	Soil Mechanics	S.B. Saighal
5.	Geotechnical Engineering	C.Venkataramiah

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	5th
COURSE TITLE	**Concrete Technology**
COURSE CODE	CIV-322-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	**To impart knowledge of concrete materials and their properties** – Understand the role of cement, aggregates, water, and admixtures in concrete production and performance.
2.	**To develop skills in concrete mix design and testing** – Learn proportioning methods, workability assessment, strength evaluation, and non-destructive testing techniques.
3.	**To introduce advanced and sustainable concrete technologies** – Explore durability aspects, fiber-reinforced concrete, and eco-friendly innovations in concrete production.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Concrete as a construction material, constituents of concrete. Properties of concrete materials: cement, aggregates, water, admixtures. Hydration of cement: setting, hardening, and strength development.	**08**
2.	Principles of concrete mix design: factors influencing mix proportions. Proportioning of concrete mixes for desired strength and workability. Special concrete mixes: lightweight, high-strength, self-compacting concrete.	**12**
3.	Properties of Fresh and Hardened Concrete - Workability, segregation, bleeding, setting time, strength development. Factors affecting properties and performance. Curing of concrete and its importance.	**08**
4.	Testing of Fresh and Hardened Concrete - Tests for workability: slump, compaction factor, flow. Tests for compressive strength, tensile strength, and durability. Non-destructive testing methods for concrete evaluation.	**09**
5.	Durability aspects, fiber-reinforced concrete, sustainability in concrete production, advanced concrete technologies and their applications	**08**

COURSE OUTCOMES

CO 1.	Explain the properties and role of cement, aggregates, water, and admixtures in concrete.
CO 2.	Apply mix design principles for strength, workability, and special concretes.
CO 3.	Evaluate workability, setting, strength, and curing effects.
CO 4.	Perform and interpret fresh and hardened concrete tests.
CO 5.	Understand durability, fiber-reinforced, and sustainable concrete technologies.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Properties of Concrete	Neville, A.M. Pearson Publishers, New Delhi, 2004
2.	Concrete Technology	Shetty, M.S. S.Chand& Company New Delhi, 2002,
3.	Concrete Technology	Gambhir,M.L. TaTa McGraw Hill New Delhi, 1995
4.	Concrete Technology	Neville, A.M. and Brookes, J.J, Pearson. 1994
5.	Properties of Concrete	Neville, A.M. Pearson Publishers, New Delhi, 2004

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	5th
COURSE TITLE	**Fluid Mechanics-II**
COURSE CODE	CIV-323-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To develop the understanding of basic principles of fluid flow through pressure and gravity type conduit systems.
2.	To gain proficiency in applying the conservation equations to open channel flow problems.
3.	To develop and apply relationships for hydraulic jumps, surges, and critical, uniform and gradually-varying flows.
4.	To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Boundary Layer Theory** Concept of boundary layer; Laminar and turbulent boundary layers; boundary layer thickness; von Karman integral equation; Laminar sub layer; hydro-dynamically smooth and rough boundaries, Separation of flow and its control, Cavitation.	**10**
2.	**Flow In Open Channels** Classification of flow in channels, Steady and unsteady flow, Uniform and non-uniform flow, Laminar and turbulent flow, Sub-critical, critical and super-critical flow; Discharge through open channel by Chezy's formula; Most economic section of channels; Specific energy and specific energy curve; Hydraulic jump; Gradually varied flow.	**10**
3.	**Flow Through Pipes, Water Hammer and Surge Tanks** Loss of energy in pipes, Major and minor losses, Loss due to sudden enlargement & contraction; Hydraulic gradient & total energy line; Flow through compound pipes, Equivalent pipes, Flow through parallel pipes, Flow through branched pipes; Power transmission through pipes; Water hammer in pipes, Gradual closure of valve, Sudden closure of valve in rigid pipe, Sudden closure of valve in elastic pipe, Surge tanks, Location of Surge tank and types of surge tanks.	**09**
4.	**Fluid Flow Past Submerged Bodies**	**08**

	Forces exerted by a flowing fluid on a stationary body, Drag and lift; Drag on sphere, Terminal velocity, Drag on a cylinder; Lift development on a circular cylinder, Flow of ideal fluid over stationary cylinder, Expression for lift forces acting on Rotating cylinder, Magnus effect	
5.	**Hydraulic Machines** Types of Turbines, Description and principles of impulse and reaction Turbines, Turbine characteristics, Selection of Turbines; Unit quantities and specific speed, Runaway speed, Cavitation; Draft tube, Draft tube dimensions, Types of Draft tubes; Centrifugal pumps, specific speed power requirements, Reciprocating pumps.	**08**

COURSE OUTCOMES	
CO 1.	Analyze and perform calculations on open channel flows, compute water surface profiles and hydraulic jump characteristics
CO 2.	Analyze and perform calculations on pipe flow problems involving turbulent flow, understand the concept of friction factor, head loss, and design of pipes and analysis of Pipe-networks.
CO 3.	Perform calculations for determination of the drag and lift forces on submerged bodies.
CO 4.	Analyze water hammer phenomenon in closed conduits and concept of surge tanks.
CO 5.	Determine various hydraulic characteristics of turbines and pumps.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Fluid Mechanics and Fluid Power Engineering	Kumar, D.S.
2.	Engineering Fluid Mechanics	Garde R.J.
3.	Fluid Flow in Pipes & Channels	Asawa, GL,
4.	Engineering Fluid Mechanics	Kumar, K.L.
5.	Introduction to Fluid Mechanics and Fluid Machines	Som, S.K. and Biswas, G.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	5th
COURSE TITLE	**Geotechnical Engineering Lab-I**
COURSE CODE	CIV-341-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	To understand the laboratory tests used for the determination of physical, index, and Engineering properties of soil

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	Soil Identification Tests	**3**
2.	Water Content Determination Test	**3**
3.	Field Density Measurement	**3**
4.	Specific Gravity Test	**4**
5.	Sieve Analysis Test	**3**
6.	Sedimentation Analysis Test	**3**
7.	Atterberg and Shrinkage Limits	**3**
8.	IS Light Heavy Compaction Tests	**4**
9.	Permeability Tests	**4**

COURSE OUTCOMES	
CO 1.	To determine basic soil properties and consistency limits.
CO 2.	Draw the complete particle size distribution curve of a given soil.
CO 3.	Determine the Compaction characteristic of a given soil.
CO 4.	Determine the Permeability of any given soil specimen

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	IS codes relevant to each Test.	IS Codes
2.	Geotechnical Engineering, New Age International publishers, 2012.	C. Venkatramaiah,

3.	Basic and Applied Soil Mechanics, New Age International Publishers, 2012	Gopal Ranjan and A. S. R. Rao,
4.	Soil Mechanics and Foundation Engineering, Standard Publishers, 2011.	K. R. Arora,

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	5th
COURSE TITLE	**Concrete Technology Lab**
COURSE CODE	CIV-342-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	To know the concept and procedure of different types of tests conducted on cement, aggregate, and finished concrete.
2.	To understand the procedure of designing the concrete mix of given specification of its ingredients and appropriate water-cement ratio and admixtures.

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	**FINE AGGREGATES:** Grading and zoning of fine aggregates, Specific gravity of fine aggregates.	**4**
2.	**COARSE AGGREGATES:** Grading and zoning of Coarse aggregates. Determination of water absorption of coarse aggregates	**5**
3.	**CEMENT:** Determination of standard consistency of cement. , Determination of initial setting time and final setting time of cement, Determination of fineness of cement, Soundness test of concrete.	**5**
4.	**CONCRETE:** Determination of consistency of fresh concrete by slump test. Determination of workability of freshly mixed concrete by Compaction factor test. Determination of cube strength of concrete for different mixes and different W/C ratio Determination of tensile strength of concrete. Determination of flexural strength of concrete beam.	**16**

COURSE OUTCOMES	
CO 1.	Perform different tests conducted on cement, aggregate, and concrete at the site.
CO 2.	Perform a non-destructive test on concrete.
CO 3.	Design the concrete mix as per the site conditions and specification of materials available there.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	6th
COURSE TITLE	**Design of Concrete Structures**
COURSE CODE	CIV-371-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To equip students with a basic understanding of the behavior of reinforced concrete (RC) structures and to develop the skill to analyze and design reinforced concrete members.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Working Stress Method vs. Limit State Design. Principles of ultimate load design and load factors.	**4**
2.	Flexural design: balanced and under-reinforced sections. Shear design and detailing. Design examples for singly and doubly reinforced beams. L and T beams.	**5**
3.	One-way and two-way slabs: flexural and shear design. Detailing of slab reinforcements.	**12**
4.	Axially loaded columns: short and slender columns. Design examples for different shapes of column designs.	**12**
5.	Detailing and durability considerations in design of columns, beams and slabs. Design of connections and anchorage and development lengths	**12**

COURSE OUTCOMES	
CO 1.	Understanding of reinforced concrete as a construction material and various design philosophies & their differences.
CO 2.	Analyze and design RC members under flexure, shear, and axial force in line with Indian standards.
CO 3.	Design the two-way RC slabs using moment coefficients.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Structural Analysis	Hibbeler, R. C. Pearson Prentice Hall.

2.	Fundamentals of Structural Analysis	Leet, K. M., and Uang, C. M. Tata McGraw-Hill.
3.	Advanced Structural Analysis	Menon, D., CBS Publishers & Distributors Pvt. Ltd.
4.	Structural Analysis	Menon, D, Narosa Publishing House.
5.	Elementary Structural Analysis	Ashok, K. Jain, Nem Chand & Bros
6.	Advanced Structural Analysis with Finite Element Method	Ashok, K. Jain , Nem Chand & Bros
7.	Mechanics of Structures Vol. II (Theory and Analysis of Structures	Junnarkar, S. B., and Shah, H. J. Charotar Publishing House Pvt. Ltd.
8.	Basic Structural Analysis	Reddy, C. S, Tata McGraw Hill
9.	Intermediate Structural Analysis	Wang, C. K, Tata McGraw Hill

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	6th
COURSE TITLE	**Quantity Survey and Cost Estimation**
COURSE CODE	CIV-372-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To produce a forecast of the probable cost of a future project
2.	Identify and prioritize cost-saving opportunities.
3.	To determine the true (full) costs of each item of the project
4.	To evaluate the target of road construction project
5.	To assess and evaluate the differences in the value of the assets.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Introduction to Estimation.** Definition and importance of Quantity Surveying and Cost estimation Definition of items of a work and their units. Data required for the preparation of an estimate. Types of preliminary Estimate and Detailed estimate. Forms used in estimating.	**7**
2.	**Analysis of Rates.** Definition and importance of analyses of rates. Introduction to Preparing of rates, Labor schedule, material schedule, and rate schedule. Analysis of rates for item of work of buildings e.g., Earthwork in the foundation, lime concrete in Foundation, concrete in foundation and superstructure, Brickwork in foundation and superstructure, stone masonry, RCC masonry, RCC work, Plastering, color washing, woodwork, DPC, and steelwork, etc.	**7**
3.	**Detailed Estimation of masonry structures.** Introduction to estimates of different types of buildings. Estimates of walls. Methods of building estimate; Long wall and short wall method, centerline methods. Estimate of masonry platform. Estimate of a masonry tank. Estimate of a single room building. Estimate of two room building with CGI roof over wooden	**11**
4.	**Detailed Estimates of R.C.C Structures.** Estimation of R.C.C slabs: One-way slab, Two-way slab. Estimate of a RCC Beams: Simply supported Beam, cantilever beam, lintel Beam. RCC Column. Bar bending schedule.	**10**
5.	**Estimation of Roads.**	**10**

	Methods of estimating earthwork: (a) Mid Sectional Area Method.(b) Mean Sectional Area Method(c) Prismoidal Formula Method. (d) Graphical Method. Estimate of a metallic road: Estimation of 3-layer metallic road .introduction about influence of Material variation and cost in layered metallic road.	

COURSE OUTCOMES	
CO 1.	Give the Students a reasonable idea of the project's cost to help them decide whether the work can be undertaken as proposed or not.
CO 2.	Learner should be capable enough to analyze the project resources.
CO 3.	Learner should be able to make DPR of buildings.
CO 4.	Learner should know the cost variation due to material change in road construction.
CO 5.	Learner should assess and calculates the property value.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Estimating & Costing	Datta.
2.	Estimating & Costing	Mahajan.
3.	Cost Estimation: Methods and Tools.	Gregory K. Mislick, Daniel A. Nussbaum.
4.	Civil Estimating and Costing	A.K.Upadhyay.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	6th
COURSE TITLE	**Geotechnical Engineering-II**
COURSE CODE	CIV-373-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To understand shear strength of soil along with the different tests to evaluate it.
2.	To understand the basic equations for bearing capacity analysis of soils.
3.	To understand basic theories for earth pressure calculations.
4.	To understand the different soil stabilization methods.
5.	To understand the different theories for slope stability analysis of soils.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Shear Strength:** Shear strength concept. Mohr Coulomb equation. Direct shear test, Triaxial compression test under different drainage conditions, CD, CU and UU. Unconfined compression test. Vane shear test. Modified shear strength envelope.	**10**
2.	**Bearing Capacity And Foundations:** Basic definitions, Terzaghi's solution for ultimate bearing capacity. Size effects and water table effect effects on bearing capacity. Skemptons bearing capacity equation. Plate load test. Design principles for footing and rafts, Pile foundation types, classification and determination of load-carrying capacity, dynamic and static methods. Pile load test, pile groups efficiency of pile groups.	**10**
3.	**Earth Pressure:** Lateral earth pressure, Rankine's theory for active and passive States. Lateral earth pressure under various conditions, like surcharge, sloping backfill, and high water table behind the wall. Earth pressure diagrams. Total thrust. Tension Cracks.	**10**
4.	**Stabilisation:** Methods of stabilization, Brief introduction to each of the methods of stabilization such as mechanical stabilization, Compaction Chemical stabilization, Precompression, Stone columns, stabilization by geotextiles.	**08**
5.	**Stability Of Slopes:** Infinite slopes, types of slope failures, stability number Swedish and Friction circle methods. Submergence case, complete drawdown case, Steady seepage case.	**07**

COURSE OUTCOMES	
CO 1.	To equip the knowledge of strength and mechanical behavior of soils.
CO 2.	To understand the concepts of bearing capacity and foundations.
CO 3.	To understand the practical aspects of earth pressure and retaining structures.
CO 4.	To understand the concepts of slope stability along with its practical application

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Soil Mechanics and Foundation Engineering	K.R.Arora
2.	Soil Mechanics and Foundation Engineering	S.K.Garg
3.	Theoretical Soil Mechanics	Terzaghi & Peck
4.	Soil Mechanics	S.B. Saighal
5.	Geotechnical Engineering	C.Venkataramiah

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	6th
COURSE TITLE	**Geotechnical Engineering Lab-II**
COURSE CODE	CIV-391-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	To understand different characteristics of the soil.

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	Consolidation Test	**4**
2.	Direct Shear Test	**4**
3.	Unconfined Compression Test	**3**
4.	Unconsolidated Undrained Triaxial Test	**4**
5.	Vane Shear Test	**4**
6.	Consolidated Undrained Triaxial Test	**4**
7.	Standard Penetration Test	**4**
8.	Plate Load Test	**3**

COURSE OUTCOMES	
CO 5.	Determine consolidation characteristics of a given soil sample.
CO 6.	Obtain shear strength parameters of different types and consistencies of soils and under different drainage conditions.
CO 7.	Perform a Standard Penetration test of soil to obtain SPT (N) – value.
CO 8.	Determine allowable soil pressure of soil foundation system by vertical plate load test.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	6th
COURSE TITLE	**Computer Based Drafting Lab**
COURSE CODE	CIV-392-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	To learn how to deal with the different AutoCAD Windows and their contents.
2.	To gain knowledge in drawing of various building components and structural drawings of a building.
3.	To obtain knowledge of modelling of various building components and special sections of a building.
4.	To become aware of different modelling, drafting, analysis, and design software.

COURSE CONTENT		
Units	**Topic**	**Cont. Hours**
1.	**Introduction to Computer Aided Drawing:** Introduction, Auto- Cadd Window, Starting, Opening and Saving a Drawing, Prototype Drawing and closing of drawing. Different forms of Projections and plotting in Cadd, Geometrical construction in Cadd.	**6**
2.	**Software For Cad And Practice Exercises On Cad:** Drawing cross sections (I, C, T, angles, solid and hollow sections), To draw horizontal and vertical lines keep ortho on; To draw inclined lines keep the ortho off; Draw the alphabets as per the given dimensions. Practice exercises on simple drawing areas and sections, surfaces, etc.	**6**
3.	**Drawing of Plans of Buildings:** Development of Working of Building. Drawing of different plans for single and Multi-storey Buildings; Drawing in different layouts. Reinforcement detailing's and structural drawings.	**6**
4.	**Drawing Of Sections And Elevations Of Buildings:** Drawing of different sections and elevations of buildings. Drawing of single and multi- storey buildings, their sections, and their elevations. Reinforcement detailing's and structural drawings. 3D drafting of Building.	**6**
5.	**Drawing Of Building Components:**	**6**

	Detailing of Building components like Doors, Windows, Ventilator, Lift, Stairs, Elevators. Drawing of Plumbing and electrical drawings of buildings.	

COURSE OUTCOMES	
CO 1.	Recognizing the need for computer aided drafting of buildings.
CO 2.	Understanding the method of Drafting in CAD and drafting 2D and 3D visualizations
CO 3.	Gaining skill based knowledge of drafting tools.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	"Engineering Drawing + AutoCAD," New Age International Publishers, 2011	K.Venugopal V. Prabhu Raja
2.	"Introduction to AutoCAD 2015 for Civil Engineering Applications", SDC Publishers, 2014.	Nighat Yasmin
3.	"Exploring AutoCAD Civil 3D 2018", CADCIM, 2018.	Sham Tickoo

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	7th
COURSE TITLE	**Design of Steel Structures**
COURSE CODE	CIV-421-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	**Understand advanced steel design concepts** – Learn the principles of Working Stress and Limit State Design for steel structures.
2.	**Develop competency in designing structural members** – Analyze and design tension members, compression members, beams, and beam-columns considering stability and strength.
3.	**Master steel connection design** – Design bolted, welded, and moment connections for structural integrity and performance.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to advanced design concepts for steel structures. Working Stress Method vs. Limit State Design for steel structures.	**09**
2.	Design of tension members: Types of tension members and loading conditions. Design for axial tension and net area. Block shear rupture and yielding.	**09**
3.	Types of compression members and loading conditions. Euler's buckling formula and effective length. Interaction formula for combined axial and flexural loading. Design of laterally supported beams.	**09**
4.	Types of steel connections: bolted, welded, and composite. Design of bolted and welded connections. Eccentrically loaded and moment connections.	**09**
5.	Design of laterally unsupported beams and design of beam-columns.	**09**

COURSE OUTCOMES	
CO 1.	**Understand steel design principles** – Explain the concepts of Working Stress and Limit State Design for steel structures.
CO 2.	**Analyze and design tension members** – Determine net area, block shear rupture, and yielding criteria for axial tension members.

CO 3.	**Design compression members and beams** – Apply Euler's buckling formula and interaction formulas to design stable compression members and beams.
CO 4.	**Evaluate and design steel connections** – Design bolted, welded, and eccentric connections for structural stability.
CO 5.	**Design complex steel structural elements** – Develop solutions for laterally unsupported beams and beam-columns under combined loading.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Design of Steel Structures – Limit States Method	Subramanian, N. Oxford University Press.
2.	Design of Steel Structure	Duggal, S. K. Tata McGraw Hill.
3.	Steel Structures – Design & Behaviour	Salmon, C. G., Johnson, J. E., and Malhas, F. A., Pearson
4.	Design and Analysis of Steel Structures	Vizrani, V. N., Ratwani, M. M., and Kumar, V. Khanna Publishers.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	7th
COURSE TITLE	**Transportation Engineering**
COURSE CODE	CIV-322-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To provide basic knowledge in transportation so that students can understand and solve transportation-related problems and design for highway mode of transportation, focusing on highway users' characteristics, geometric and pavement design, traffic engineering, and transportation planning.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Introduction:** Scope, history, classification of roads. Comparison with other modes of transportation.	**10**
2.	**Alignment Design:** Route survey and highway location. Geometric design: cross-section elements; sight distances, horizontal and vertical alignment	**10**
3.	**Pavement Design:** Factors affecting pavement design, types of pavements, Methods of flexible pavement design.	**10**
4.	**Rigid Pavement Design:** Stress due to load and temperature in rigid pavements, Introduction to design methods of rigid pavements	**08**
5.	**Highway Materials and Construction:** Properties and tests for road aggregates and bituminous materials, design of bituminous concrete mix, methods of preparing the subgrade, base course, and construction of various types of surface covers.	**07**

COURSE OUTCOMES	
CO 1.	Give necessary information, prepare a horizontal and vertical alignment, including super elevation, which complies with AASHTO standards.
CO 2.	Understand the relationship between the environment and transportation infrastructure and its importance in project development of transportation projects.
CO 3.	Utilize CAD software to prepare a plan, profile, and x-sections depicting a typical roadway design.

CO 4.	Prepare well-written design narratives documenting the various parameters and standards used in the design process so another individual could review the work and understand what decisions and assumptions were used and why.
CO 5.	Understand the mathematics behind the development of tables and charts for determining highway design criteria.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Highway Engineering.	Khanna, S.K. and Justo.
2.	Highway Engineering	Bhanot, K.L.
3.	Principles of Transportation and Highway Engineering.	Rao, G.V.
4.	Pavement Design and Management Guide by Transportation Association of Canada.	Ottawa, Ontario, Edn. Dr. Ralph Haas,

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	7th
COURSE TITLE	**Waste Water Engineering**
COURSE CODE	CIV-423-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To acquire knowledge on physical and chemical properties of water
2.	To get knowledge on the working principles of various physical, chemical, and biological treatment systems for water and wastewater, including sludge.
3.	To understand the principles of Design of physical, chemical and biological treatment systems.
4.	To get knowledge about the various modes of conveyance of wastewater from the source of its generation to the treatment plant.
5.	To study the causes and preventive measures of various types of environmental pollution.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**Environmental Pollution:** Importance of clean environment, Sources of pollution to land, water & air, General effects of pollution, pollution by sewage, calculation of storm water & sewage, Time of concentration and Intensity of storm.	**08**
2.	**Sewage Disposal:** Methods of sewage disposal, effects of disposal on land & in water bodies, self-purification of streams, BOD calculations, Types & design of sewers.	**12**
3.	**Sewage Treatment:** Unit operations in sewage treatment, Screening, sedimentation, grit removal etc. septic and imhoff tanks, soakage's for isolated systems, Filtration, activated sludge process, Oxidation ponds, Methods of aeration.	**10**
4.	**Air Pollution And Its Preventive Measures:** Air Pollution & its effects on human health, factors responsible for air pollution, measurement of air pollution, air quality standards, and Engineering interventions to check air pollution, case studies relating to the topic.	**08**
5.	**Solid Waste Management:** Solid waste problems, constituents of solid waste; Collection, transport and disposal of Solid waste .land filling, composting, incineration.	**07**

COURSE OUTCOMES	
CO 1.	An ability to estimate sewage generation and design sewer system.
CO 2.	The required understanding on the characteristics and composition of sewage, self-purification of streams.
CO 3.	An ability to perform basic design of the unit operations and processes that are used in sewage treatment.
CO 4.	Understand the standard methods for disposal of sewage.
CO 5.	Gain knowledge on sludge treatment and disposal.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Sewage Treatment & Disposal & Waste Water Engineering.	Modi, P.N.
2.	Water supply & sanitary Engineering	Punmia, B.C.
3.	Environmental engineering & management	Suresh K. Dhameja
4.	Wastewater Engineering: Treatment and Reuse	Metcalf and Eddy
5.	Environmental Engineering Sewage Waste Disposal and Air Pollution	S.K.Garg
E-REFERENCES		
1.	https://archive.nptel.ac.in/courses/105/106/105106119	
2.	https://archive.nptel.ac.in/courses/105/104/105104102	
3.	https://www.edx.org/learn/environmental-science/tsinghua-university-water-andwastewater-treatment-engineering-biochemical-technology-shui-chu-li-gong-chengsheng-wu-hua-xue-fang-fa	

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	7th
COURSE TITLE	**Transportation Lab**
COURSE CODE	CIV-441-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	2	0	30

COURSE OBJECTIVES	
1.	Learn the Fundamentals of Bitumen and & its engineering behaviour.
2.	Learn the Fundamentals of Aggregate & its engineering behaviour.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**TESTS ON AGGREGATE**: Aggregate grading , Specific Gravity, Crushing Abrasion, Impact, Soundness, Flakiness, Shape, Fineness Modulus.	**15**
2.	**TESTS ON BITUMEN:** Viscosity, Penetration, Softening point, Flash & Fire Point, Ductility.	**15**

COURSE OUTCOMES	
CO 3.	Identify engineering properties of aggregate.
CO 4.	Identify the grade & properties of bitumen.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	"Highway Engineering". Nem Chand Brothers, Roorkee	Khanna, S.K. and Justo,
2.	Highway Materials and Pavement Testing., Nem Chand Brothers, Roorkee.	Khanna, Justo & Veeraragavan
3.	Material Testing Laboratory Manual Standard Publishers, Nai Sarak, Delhi	Kukreja, Kishore &Chawla,

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	7th
COURSE TITLE	**Pre Project**
COURSE CODE	CIV-442-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
2	0	0	4	0	60

COURSE OBJECTIVES	
1.	To identify a research/industry related problem for the undergraduate project work with the respective faculty's guidance, and prepare a design and work plan.

MODUS OPERANDI

Each group comprising of around 5 students shall identify a project related to the curriculum of study. At the end of the semester, a preliminary synopsis report on the project shall be submitted to the Department for assessment. The students will be required to appear for viva voce, which shall be conducted in the department, in the faculty members' presence under the supervision of the HOD.

EVALUATION MECHANISM

S. No.	**Criteria**	**Max. Marks**
1.	Attendance and Regularity	10
2.	Theoretical Knowledge and Individual Involvement	40
3.	Quality and Contents of Project Synopsis	30
4.	Presentation (in Presence of External Expert)	20
Total Marks		100

COURSE OUTCOMES	
CO 1.	Conduct a literature survey in a relevant area of one's course of study and finally identify and concentrate on a particular problem in the field of civil engineering
CO 2.	Formulate a project proposal through extensive literature and/or discussion with learned resource persons in the industry and around.
CO 3.	Generate a proper execution plan of the project work to be carried out in phase second in the 8th semester through deliberations and improve presentation skills.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	7th
COURSE TITLE	**Seminar**
COURSE CODE	CIV-443-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
1	0	0	1	1	30

COURSE OBJECTIVES	
1.	To encourage and motivate the students to read and collect recent and relevant information from their area of interest confined to the relevant discipline from technical publications including peer reviewed journals, conferences, books, project reports, etc., prepare a report based on a central theme and present it before a peer audience.

MODUS OPERANDI		
Units	**STEPS**	**Cont. Hours**
1.	A seminar shall be organized at the 7th semester of the Civil Engineering curriculum leading to the Degree of B.Tech in Civil Engineering. The students shall conduct thorough research on a topic of their choice, either library research or laboratory research. The students shall be guided in their research work by the staff members of the department. The students shall then make a hard-copy of their seminar report & submit it in the Seminar coordinator's office following which they will be asked to present their research work before their fellow students.	30
2.	The students shall make a PowerPoint presentation of 15-20 minutes duration on the research work in front of their fellow students under the supervision of the faculty member/s assigned. A discussion on the same topic will follow the seminar presentation.	

COURSE OUTCOMES	
CO 1.	Identify and familiarize with some of the good publications and journals in their field of study.
CO 2.	Acquaint oneself with the preparation of independent reports, name them based on a central theme, and write abstracts, main body, conclusions, and references to identify their intended meaning and style.
CO 3.	Understand effective use of presentation tools, generate confidence in presenting a report before an audience and improve their skills in the same.
CO 4.	Develop skills like time management, leadership quality, and bond with an audience.

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	8th
COURSE TITLE	**Irrigation & Hydraulic Structures**
COURSE CODE	CIV-471-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To develop the understanding of necessity of irrigation and requirements
2.	To introduce the basic concepts relevant to Irrigation and its techniques.
3.	To understand the principles of Design of Irrigation & Hydraulic Structures.
4.	To study the causes and the preventive measures for water logging and flooding.
5.	To study the importance of cross drainage works and types

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**General Introduction:** The necessity of Irrigation in India, Advantages, and Disadvantages of Irrigation, Techniques of water distribution in farms, Soil moisture & Crop water requirements; Duty, Delta, Base period, Crop period, Consumptive use, Irrigation requirements	**09**
2.	**Canal Irrigation:** Types of canals, parts of a canal irrigation system with diagram, channel alignment, assessment of water requirements, distribution system of canal irrigation, estimation of channel losses; design of channels by regime & semi-theoretical approaches. Canal lining	**09**
3.	**Cross Drainage Works:** The necessity of Cross Drainage works, their types & selection; Design of various types of Cross Types of Drainage works- Aqueduct, Syphon Aqueduct, Super passage, siphon, siphon super passage, Level Crossing, Detailed design of Aqueduct and Cross sections	**09**
4.	**Diversion Head works:** Parts of diversion head works, types of weirs and barrages, introduction to design of weirs on permeable foundations, control of silt entry into a canal, silt excluders, Silt ejectors and their drawing. A basic introduction to Bligh's theory. A detailed study of khosla's theory.	**09**
5.	**Water Logging & Flood Control:** auses & Preventive measures of waterlogging, Drainage of irrigated lands, saline & alkaline lands. Flood problems, types of floods, Flood control measures	**09**

COURSE OUTCOMES	
CO 1.	To optimize the effective usage of water resources for irrigation purposes.
CO 2.	To comprehend the basic design principles for the development of an efficient irrigation system.
CO 3.	To design channels and other irrigation structures required for irrigation, drainage, flood control, and other water-management projects.
CO 4.	To identify a suitable method of irrigation and drainage of the waterlogged area.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Irrigation Water power & Water Resources Engineering	Arora, K.R.
2.	Irrigation Engineering	G. Singh
3.	Theory and Design of Irrigation Structures	Varshney & Gupta
4.	Irrigation Engineering	I. E. Houk
5.	Irrigation	J. D. Zimmerman
E-REFERENCES		
1.	https://nptel.ac.in/courses/126105010	
2.	https://nptel.ac.in/courses/105104103	
3.	https://archive.nptel.ac.in/courses/105/105/105105203/	

PROGRAMME	B.Tech (Civil) for Working Professionals
SEMESTER	8th
COURSE TITLE	**Social and Environmental Impact Assessment**
COURSE CODE	CIV-472-C
COURSE CATEGORY	Professional Core Course (PCC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	**A: Introduction:** Definition, significance and scope of impact assessment, Need & objective, types of environmental impacts, methods of environmental impacts, major steps in impact assessment procedure, generalized approach to impact analysis, social impact assessment.	**09**
2.	**B: Environment Impact Assessment:** Basic concept of EIA: Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. EIA Methodologies: introduction, Criteria for the selection of EIA Methodology, EIA methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.	**09**
3.	**C: Global Environmental Issues:** Green House Effect, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust.	**09**
4.	**D: Environmental audit:** Recent trends in industrial waste management, Cradle to grave concept, Life cycle analysis, Clean technologies; Environmental audit and Legislation: Definition and concepts, Environmental audit versus accounts audit, Compliance audit, Relevant methodologies, Various pollution regulations, Introduction to ISO and ISO 14000.	**09**
5.	**E: Environmental Protection Acts:** The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries	**09**

COURSE OUTCOMES	
CO 1.	Aware and sensitize about the present days environmental issues at global and local scale.
CO 2.	Get acquainted with environmental and social impacts of any developmental activity.
CO 3.	Knowledge about environmental impact assessment with its objectives and procedure.

TEXT BOOKS/REFERENCES	
S. No	**Book/Text Title**
1.	Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2.	Glynn, J. and Gary, W. H. K. – Environmental Science and Engineering, Prentice Hall Publishers
3.	Suresh K. Dhaneja – Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4.	Bhatia, H. S. Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5.	Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers Rutledge, London, 1992.
6.	Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
7.	Environmental Impact Assessment, Barthwal, R. R. New Age International Publication