Civil and Infrastructure Engineering

Semester III						
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CE205T	Building Materials and Construction	3	0	0	6
2	CE206T	Sustainable Infrastructure Planning	2	1	0	6
3	ME208T	Fluid Mechanics	2	1	0	6
4	ME205T	Mechanics of Materials	2	1	0	6
5	HS201T	Economics	2	1	0	6
6	CE204L	Construction Materials Laboratory	0	0	3	3
7	CE203L	Building Drawing Practice	0	0	3	3
		Total Credits				**36**

Civil and Infrastructure Engineering

1	**Title of the course** (L-T-P-C)	**Building Materials and Construction** **3-0-0-6**
2	**Pre-requisite courses(s)**	--
3	**Course content**	• Introduction to Building materials and Construction (4 Hrs.) Functions of Buildings and Structures in General, Loads on Buildings as per IS875, IS1893 and NBC. Functional Requirement of buildings and necessity by laws. Role of Materials in Construction. • Stone, Bricks, Lime and Aggregates (6 Hrs.) Stone as building material – Criteria for selection – Tests on stones. Bricks – Classification – Manufacturing of clay bricks – Tests on bricks. Concrete blocks – Lightweight concrete blocks. Lime – Preparation of lime mortar. Fine aggregates and its properties, coarse aggregates and its properties. • Cement, Mortar and Concrete (12 Hrs.) Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement, Hydration of cement, Chemical reaction, Structure of cement paste, Consistency and setting. Lime and supplementary cementations materials. Properties of cement mortar. • Concrete as a material, its ingredients and Concrete Production Process including prefabrication, modular coordination. Mix design of concrete, fresh concrete, strength concrete, durability of concrete. Cement, water and aggregates selection for concrete • Other Building Materials (8 Hrs) Metals with reference to Structural Steel: Structure and its role in properties of steel. Strengthening mechanism in metals. Behaviour in service and corrosion. Uses of metals in civil engineering. Timbers, industrial timbers, glasses. Plastics and Polymers in Construction, admixture paints, sealants, adhesives and water proofing materials. • Traditional and Contemporary Construction Practices (8 Hrs) Brick and other masonry construction, Selection of bricks/masonry units and mortar for masonry. Requirements of walls and types of walls. Masonry design requirements as per IS 1905. Thermal insulation, Room acoustics. BIM, 3 D printing, Green Building. Supplements: • Industry Visits • Expert Talks
4	**Texts/References**	1. Varghese.P.C. (2015). Building Materials, 2nd Ed., PHI Learning Pvt. Ltd, New Delhi, India. 2. Rajput. R.K. (2008). Engineering Materials,3rd Ed., S. Chand and Company Ltd. New Delhi, India. 3. Gambhir.M.L.(2004). Concrete Technology, 3rd Ed., Tata McGraw Hill Education Pvt. Ltd., New Delhi, India. 4. Duggal.S.K. (2008). Building Materials, 4th Ed.,, New Age International, New Delhi, India. 5. Jagadish K.S., Venkatarama Reddy B.V., and Nanjunda Rao K.S. (2007). Alternative Building Materials Technology, New Age International, New Delhi, India. 6. Gambhir M.L., & Neha Jamwal (2012). Building Materials, products, properties and systems, Tata McGraw Hill Education Pvt. Ltd, New Delhi, India. 7. IS456 – 2000 (2021): Plain and reinforced concrete-code of practice. Bureau of Indian Standards, New Delhi 8. IS4926 - 2003: Indian Standard specification for ready–mixed concrete,Bureau of Indian Standards, New Delhi. 9. IS383 – 1970 (2011): Indian Standard specification for coarse and fine 10. aggregate from natural Sources for concrete, Bureau of Indian Standards, New Delhi.

		11. IS1542-1992(2009): Indian standard specification for sand for plaster, Bureau of Indian Standards, New Delhi 12. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, Bureau of Indian Standards, New Delhi.

1	**Title of the course** (L-T-P-C)	**Sustainable Infrastructure Planning** **3-0-0-6**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Traditional Building Planning: • Functional Planning of Buildings: General aspects to consider for planning, byelaws and regulations, selection of the site for building construction, principles of planning, orientation of the building and its relation to the outside environment • Materials, Components and Functional Requirements of Building: Masonry: definitions of terms used in masonry, materials used, stone masonry, brick masonry, different bonds used for brick masonry, permissible stress of brick masonry work; floors and roofs: components of a floor, materials used for floor construction, different types of flooring, types of roofs, basic roofing elements, and roof coverings; Staircases: Functional requirements of a good stair, type of steps, type of stairs, planning a staircase, guidelines for accessible buildings; damp proofing, fire protection, and thermal insulation Sustainable Planning in Civil Engineering: • The concept of sustainability and green building, sustainable construction materials, and life cycle assessment • Sustainable construction techniques, green building rating system, sustainable design in practice. • Sustainable infrastructure planning in structural engineering, geotechnical • engineering, transportation engineering, and water resources engineering
4	**Texts/References**	References: • Varghese P. C (2016), Building Construction, 2nd Ed., PHI Learning Pvt. Ltd. New Delhi, India. • Bhavikatti S.S. and Chitawadagi M.V. (2019), Building Planning and Drawing, Dreamtec Press, New Delhi, India. • McLennan J. F. (2004), The Philosophy of Sustainable Design: The future of architecture., Ecotone Publishing. • Montoya M. (2011), Green Building Fundamentals, Pearson Higher Education. • Kibert C. J. (2016), Sustainable Construction - Green Building Design and Delivery, John Wiley & Sons. • Leffers, M.R. (2010), Sustainable Construction and Design, Pearson HigherEducation.

1	**Title of the course** (L-T-P-C)	**Fluid Mechanics** **(3-0-0-6)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	Introduction :Scope, definition of fluid as continuum, fluid properties.(2hr) Fluid Statics: Pressure at a point, basic equation for pressure field, pressure variation(fluid at rest):standard atmosphere, Measurement of pressure manometer,Hydrostatics force on a plane and curve surface, Buoyancy, flotation and stability, pressure variation in a fluid with rigid body motion linear motion, rigid body rotation(4hr) Elementary Fluid Dynamics: Statics, stagnation pressure, Bernoulli Equation assumptions(4hr) Fluid Kinematics The velocity filed : Eulerian and Largrangian flow descriptions, steady and deformation, Acceleration field: material derivative, unsteady and convective effects. Control volume and system representation : Reynolds' Transport Theorem, physical interpretation, steady, unsteady effects, moving control volume, potential function(6Hr) Integral approach Conservation of mass derivation of continuity, fixed, non-deforming control volume, moving non-deforming control volume, deforming control volume. Conservation of momentum: linear momentum and moment of momentum equation and their application., comparison of energy equation with Bernoulli's equation(6hr) Differential approach : linear motion and angular motion with deformation, Conservation of mass: differential form of continuity equation, stream function, Conservation of linear momentum, Inviscid flows, Irrotational flow(6hr) Viscous flow : Stress relationships,NS Equations, Simple solutions for viscous flows(4hr) Dimensional analysis Buckingham's II-theorem,Dimensionless groups & their importance (3hr) Viscous Flow in Pipes : General characteristics of pipe flow, fully developed laminar and turbulent flow, turbulent shear stress, turbulent velocity profile, Pipe Flow rate measurement.(4hr) Boundary layer: Boundary layer characteristics boundary layer structure and thickness on a plate, Blasius boundary layer, momentum integral boundary layer equation for a flat plate(4hr)
4	**Texts/References**	1. Yunus A. Cengel, John M. Cimbala, Fluid Mechanics, Tata McGraw Hill Education,2011 2. F.M.White Fluid Mechanics, Seventh Edition, Tata McGraw Hill Education,2011, 3. Kundu,Pijush K., and Ira M.Cohen.Fluid Mechanic, Elsevier,2001

1	**Title of the course** (L-T-P-C)	**Mechanics of Materials** **(2-1-0-6)**
2	**Pre-requisite courses(s)**	Nil
3	**Course content**	**Module 1:** Basics: Fundamentals of mechanics of deformable solids. Concepts of stress and strain and their relationships. Axially loaded members - Normal stress and strain, Simple (direct) shear stress and strain, Hooke's law, Stresses on inclined planes under axial loading, thermal stresses and strains, statically indeterminate problems. Elastic strain energy under axial loads. **Module 2:** Torsion: torsion of circular cross-section shafts (Solid and hollow sections): Deformation field, Torsion formulae for stresses and angular deflection, Elastic strain energy under torsion, Closely-wound helical springs – stresses and deflections. **Module 3**: Bending: Euler – Bernoulli model: normal and shear stresses, deflections for symmetric bending. Statically indeterminate problems, Elastic strain energy under flexure. **Module 4:** Combined stresses: State of stress and strain at a point , transformation laws , Mohr's circle diagram for stress and principal stresses, thin walled structures : thin cylinders and spheres. Theories of failure: Maximum Normal-Stress theory, Maximum shear-stress theory and Maximum Distortional-energy theory. **Module 5:** Energy methods – Castigliano's theorem and its applications, fictitious-load method. Stability of structures – Buckling of idealized and elastic columns
4	**Texts/References**	**TEXTBOOKS:** 1. S.H Crandall, N.C Dahl and S.J Lardner, An Introduction to Mechanics of Solids, Tata McGraw Hill, Third Edition, 2012. 2. E.P. Popov, Engineering Mechanics of Solids, Prentice Hall of India, 2nd edition, 2012. **REFERENCES:** 1. J. M. Gere and Goodno, Mechanics of Materials, 7th ed, Cengage Learning India, 2012. 2. J.P Den Hartog, Strength of Materials, Dover, 1949. 3. J.M Gere and S.P Timoshenko, Mechanics of Materials, CBS Publishers, 1986 4. R. C. Hibbeler, Mechanics of Materials, Pearson, 10th edition, 2016 . 5. S.P Timoshenko and D.H Young, Elements of strength of Materials, 5th ed, Affiliated East West Press, 1976. 6. F. P. Beer, E. R. Johnston Jr., John T. DeWolf , D. F. Mazurek, Mechanics of Materials, McGraw- Hill Education; 7th edition, 2014 7. M. Salvadori and R. Heller, Structure in Architecture, Prentice Hall Inc, 1963. 8. S.P Timoshenko, History of Strength of Materials, Dover, 1983. 9. M. H. Sadd, Elasticity: Theory, Applications, and Numerics, 1st ed, Elsevier India, 2006.

1	**Title of the course** (L-T-P-C)	**Economics** **(2-1-0-6)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	Basic economic problems. resource constraints and Welfare maximizations. Nature of Economics: Positive and normative economics; Micro and macroeconomics, Basic concepts in economics. The role of the State in economic activity; market and government failures; New Economic Policy in India. Theory of utility and consumer's choice. Theories of demand, supply and market equilibrium. Theories of firm, production and costs. Market structures. Perfect and imperfect competition, oligopoly, monopoly. An overview of macroeconomics, measurement and determination of national income. Consumption, savings, and investments. Commercial and central banking. Relationship between money, output and prices. Inflation - causes, consequences and remedies. International trade, foreign exchange and balance payments, stabilization policies : Monetary, Fiscal and Exchange rate policies.
4	**Texts/References**	1. P. A. Samuelson & W. D. Nordhaus, Economics, McGraw Hill, NY, 1995. 2. A. Koutsoyiannis, Modern Microeconomics, Macmillan, 1975. R. Pindyck and D. L. Rubinfeld, Microeconomics, Macmillan publishing company, NY, 1989. 3. R. J. Gordon, Macroeconomics 4th edition, Little Brown and Co., Boston, 1987. 4. William F. Shughart II, The Organization of Industry, Richard D. Irwin, Illinois, 1990. 5. R.S. Pindyck and D.L. Rubinfeld. Microeconomics The (7 Edition), Pearson Prentice Hall, New Jersey,2009. 6. R. Dornbusch, S. Fischer, and R. Startz. Macroeconomics (9th Edition), McGraw-Hill Inc. New York, 2004.

1	**Title of the course** (L-T-P-C)	**Construction Materials Laboratory** **0-0-3-3**
2	**Pre-requisite courses(s)**	--
3	**Course content**	This course provides hands-on experience in testing construction materials to assess their properties, quality, and suitability for civil engineering applications. 1. Tests on Bricks and Blocks – Evaluate compressive strength, water absorption, and efflorescence. 2. Tests on Fine and Coarse Aggregates – Assess particle size distribution, specific gravity, bulk density, and impact resistance. 3. Tests on Lime and Cement – Determine consistency, setting time, soundness, and strength. 4. Tests on Cement Mortar – Analyze workability, flow, and compressive strength. 5. Tests on Fresh Properties of Concrete - Conduct slump, flow, compaction factor, and Vee-Bee consistency tests. 6. Tests on Strength Properties of Concrete - Measure compressive, flexural, and split tensile strength. 7. Tests on Steel – Examine tensile strength, elongation, and yield properties. 8. Tests on Timber and Wood – Assess moisture content, bending `strength, and hardness. 9. Tests on Tiles – Evaluate water absorption, flexural strength, and surface quality. 10. Demonstration on 3D Concrete Printing – Explore digital fabrication in construction. 11. Demonstration on Pavement Materials and Geosynthetics – Understand advanced road and ground reinforcement materials. Supplements: • Industry Visits
4	**Texts/References**	1. Varghese.P.C. (2015). Building Materials, 2nd Ed., PHI Learning Pvt. Ltd, New Delhi, India. 2. Gambhir M.L., & Neha Jamwal (2012). Building Materials, products, properties and systems, Tata McGraw Hill Education Pvt. Ltd, New Delhi, India. 3. IS456 – 2000 (2021): Plain and reinforced concrete-code of practice. Bureau of Indian Standards, New Delhi. 4. IS4926 - 2003: Indian Standard specification for ready–mixed concrete, Bureau of Indian Standards, New Delhi. 5. IS383 – 1970 (2011): Indian Standard specification for coarse and fine aggregate from natural Sources for concrete, Bureau of Indian Standards, New Delhi. 6. IS1542-1992(2009): Indian standard specification for sand for plaster, Bureau of Indian Standards, New Delhi. 7. IS 10262-2009: Indian Standard Concrete Mix Proportioning –Guidelines, Bureau of Indian Standards, New Delhi.

1	**Title of the course** (L-T-P-C)	**Building Drawing Practice** **0-0-3-3**
2	**Pre-requisite courses(s)**	--
3	**Course content**	1. Drawing various plans and elevations, isometric views & perspective views of civil engineering structures like buildings, bridges, retaining walls, dams, pipelines, and water tanks with design notations, drawing staircases in 3D 2. Detailing of reinforcement in concrete structures 3. The typical exercises include the following: * Introduction *2-D line drawing using a. Absolute Co-ordinate Method. b. Relative Co-ordinate Method c. Polar Co-ordinate Method * Isometric view of 2-D truss, brick bonds, and brickbats *Cross-section of a masonry foundation *Symbols a. Water supply and sanitary fixtures b. Electrical installations c. Building materials 6. Plan, elevation, and section of a single room 7. Plan, elevation, and section of a single-story residential building 8. Plan, elevation, and section of a two-story building 9. Plan and elevation of an RCC overhead tank 10. Plan and section elevation of a doglegged and open newel staircase 11. Cross section and plan of the one-way roof slab, beam, and column showing the details of reinforcement
4	**Texts/References**	References: 1. S.S. Bhavikatti and M.V. Chitawadagi (2019), Building Planning and Drawing, Dreamtec Press, New Delhi, India. 2. N. Kumara Swamy and A. Kameswara Rao (2019), Building Planning and Drawing, 9th Ed., Charotar Publishing House Pvt. Ltd. New Delhi, India.