A.1 B.Tech. Civil Engineering Higher Semester Scheme

	Third Semester				
Code	Subject Name	L	T	P	Credit
MA21XX	Statistics & Probability	3	0	0	3
XX21XX	Management of Technology	3	0	0	3
CIV2101	Fluid Mechanics **(DC-1)**	4	0	0	4
CIV2102	Surveying and Practices **(DC-2)**	3	0	2	4
CIV2103	Strength of Materials **(DC-3)**	3	1	0	4
CIV2120 XX21XX	Concrete & Construction Technology/ Data Structures and Algorithm **(FC-1)**	4	0	0	4
CIV2130	Material Testing Lab	0	0	2	1
CIV2131	Fluid Mechanics Lab	0	0	1	1
CIV2170	Project-based Learning-1	0	0	1	1
	Total Credits				**25**

SYLLABUS:

CIV 2101: FLUID MECHANICS [4 0 0 4]

Introduction: Definition of fluids, fluid Properties of fluids: density, viscosity, and surface tension, Units and dimensions in fluid mechanics, Fundamental principles and applications in civil engineering, Hydrostatics: Pressure distribution in fluids, Buoyancy and Archimedes' principle, Manometry and pressure measurement in civil engineering applications, Fluid Kinematics: Description of fluid flow, Eulerian and Lagrangian approaches, Streamlines, flownet in civil engineering systems. Fluid Dynamics: Euler's and Bernoulli's Equations, Euler's equation of motion, Bernoulli's theorem and its applications to pressure distribution. Impact on civil engineering structures Pipe Flow: Laminar and turbulent flows in pipes and channels, Pipe flow and pressure drop calculations, Friction losses in pipes, Minor losses and fittings, Dimensional Analysis Buckingham Pi theorem, Dimensionless numbers in fluid mechanics, Open Channel Flow: types of flow in open channels, Specific energy, and critical flow, gradually varied and rapidly varied flows in civil engineering systems. Flow Measurements: Pitot tubes and orifices, Venturi meters and flow nozzles, Weirs and flumes. Pumping and Pump Selection: Pump types and characteristics, Pump selection for civil engineering projects Energy efficiency and considerations in pump design, turbines. Introduction to Hydraulics: Water distribution systems in civil engineering, Hydraulic analysis of networks and pipes, hydraulic structures

Textbooks:

1. R.K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, 9th ed., Laxmi Publications, New Delhi, India, 2018.
2. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, 22nd ed., Rajsons Publications Pvt Ltd, New Delhi 2019.
3. R.K. Rajput, A Textbook of Fluid Mechanics, S. Chand Publication, Jaipur, India, 2018.

Reference Books:

1. V. L. Streeter, E. B Wiley, Fluid Mechanics, McGraw Hill book Co., New York. 1998.
2. Çengel Yunus, John M Cimbala, Fluid Mechanics Fundamentals and Applications, Tata McGraw Hill Education Pvt. Limited New Delhi, 2011.
3. R.J. Garde, Fluid Mechanics through problems, New age international Pvt. Ltd., Publishing, New Delhi. 2003.

CIV2102: SURVEYING AND PRACTICES [3 0 3 4]

Surveying: Principles of surveying. Errors and their adjustment. Maps: scale, coordinate system. Distance and angle measurement. Levelling and trigonometric levelling. Traversing and triangulation survey. EDM and Total station. Curves setting. Photogrammetry: Types of photographs, Flying height and scale. Remote Sensing: Basic concept, Electromagnetic spectrum, Spectral signature. GIS: Data Sources, Data Models and Data Structures. Chain surveying: direct and indirect ranging; uses of cross staff. Compass surveying; surveyor's compass and prismatic compass. Levelling: profile levelling, fly levelling, reciprocal levelling, and inverted staff reading problem. Theodolite, Tachometric survey. Total station and Curve setting.

Textbooks:

1. K.R. Arora, Surveying Vol. I, 17th ed., Rajsons Publications, New Delhi, India, 2019.
2. S. K. Duggal, Surveying Vol. 1, 5th ed., McGraw-Hill, New Delhi, India, 2019.
3. N. N. Basak, Surveying & Levelling, 2nd ed., McGraw Hill Education, New Delhi, India, 2017.

Reference Books:

1. B.C. Punmia, Surveying Vol. I, 17th ed., Laxmi Publications, New Delhi, India, 2016.
2. R. Agor, Advanced Surveying, 5th ed., Khanna Publishers, New Delhi, India, 2016.
3. G. Satheesh, R. Sathikumar, N. Madhu, Advanced Surveying, 2nd ed., Pearson, Pallavaram, Chennai, India, 2017.

CIV2103: STRENGTH OF MATERIALS [3 1 0 4]

Stresses on composite and compound bars. Complex Stress and Strains- Two dimensional and three-dimensional stress system. Normal and tangential stresses, Principal Planes, Principal Stresses and Strains, Mohr's circle of stresses. Bending and Shearing Stresses: Theory of simple bending, Concept of pure bending and bending stress, Equation of bending, Neutral axis, Section-Modulus, Determination of Slope and Deflection of beams by Double Integration Method, Macaulay's Method, Area Moment Method, Conjugate Beam Method, and Strain Energy Method, Castiglione's Method, and Unit Load Method. Columns and Struts: Theory of columns, Slenderness ratio, Direct and bending stresses in short columns, Kern of a section. Buckling and stability, Euler's buckling/crippling load for columns with different end conditions, Rankin's formula, Eccentric loads and the Secant formula Imperfections in columns. Thin Pressure Vessels: cylinders and spheres. Stress due to internal pressure, Change in diameter and volume. Theories of failure.

Textbooks:

1. R. K. Rajput, Strength of Materials, 7th ed., S Chand & Co., Jaipur, India, 2018.
2. B.C. Punmia, Strength of Materials and Mechanics of Structures: Vol. I, 10th ed., Laxmi Publications (P) Ltd., New Delhi, India, 2018.
3. R. Subramanian, Strength of Materials, 3rd ed., Oxford University Press, New Delhi, India, 2016.

Reference Books:

1. P.S. Gahlot, D. Gehlot, Fundamentals of Structural Mechanics, 1st ed., CBS Publishers & Distributors Pvt. Ltd., Bengaluru, India, 2012.
2. S. B. Junarkar, H. J. Shah, Mechanics of Structures Vol.-I, 3rd ed., Charotar Publishing House, Gujarat, India, 2013.
3. R.K. Kaushik, Strength of Materials, Dreamtech Press, New Delhi, India, 2019.

CIV 2120: CONCRETE & CONSTRUCTION TECHNOLOGY [4 0 0 4]

Cement – Types, composition, properties, hydration of cement. Concrete: Ingredients, grade, water cement ratio, chemical and mineral admixtures, Mix design as per IS 10262:2009, and production. Fresh Concrete: Properties, Factors affecting workability, and methods of workability assessment. Hardened Concrete: properties, parameters effecting durability. Special Concretes: Ready Mix Concrete, High Strength Concrete, Self-Compacting Concrete, Recycled Aggregate Concrete, Geopolymer, Fiber Reinforced Concrete.

Construction Technology: Classification of buildings, load bearing and framed structure; Sequence of construction activity; excavation, foundations, Damp Proofing; Construction joints, brick and stone masonry, stairs, arches & lintels, Temporary structural support viz. shoring, shuttering, underpinning and scaffolding; Fabrication and Erection work; Construction practices for plastering, pointing, painting, flooring.

Textbooks:

1. M.S. Shetty and A.K. Jain, Concrete Technology: Theory and Practice, 8th ed., S. Chand and Co, Jaipur, India, 2018.
2. M.L. Gambhir, Concrete Technology: Theory and Practice, 5th ed., Tata McGraw Hill, New Delhi, India, 2017.
3. S.C. Rangwala, Building Construction, 34th ed., Charotar Publishing House, New Delhi, India, 2022.

Reference books:

1. A. M. Neville, Properties of Concrete, McGraw-Hill, Singapore, 2012.
2. SP 20, Handbook on Masonry Design and Construction, B.I.S. Publication, 1991.
3. SP 62 (S&T), Handbook on Building Construction Practices, B.I.S. Publication, 1997.
4. IS 10262:2009 Guidelines for concrete mix design proportioning.
5. IS 516:1959 Method of Tests for Strength of Concrete, Reprint 2006.

CIV2130: MATERIAL TESTING LABORATORY [0 0 2 1]

Tension, shear and torsion test on mild steel, Compression test on cast iron, timber. Hardness test by Rockwell and Brinell's method. Impact test by Izod and Charpy method. Test on Bricks - Compressive Strength, Absorption, Efflorescence. Tests on Flooring. Wear resistance (Dorry's abrasion test), Absorption. Determination of specific gravity, Fineness, standard consistency, setting time and soundness of cement. Determination of workability of concrete by slump test, compaction factor test and Vee - Bee consistometer method. Concrete Mix design as per IS 10262:2009; Determination of compressive, tensile and flexural strength of concrete. Determination of permeability and modulus of elasticity of concrete. Introduction to Non-Destructive test of concrete.

Textbooks:

1. M.S. Shetty and A.K. Jain, Concrete Technology: Theory and Practice, 8th ed., S. Chand and Co, Jaipur, India, 2018.
2. A.V.K Suryanarayana, Testing of Metallic Materials, Prentice Hall of India, New Delhi, India, 2007.
3. G. Singh, Materials of Construction,17th ed., Std. Publishers, New Delhi, India, 2019.

References Books:

1. Neville, Brooks, Concrete Technology, Pearson Education, 2010.
2. Technical Teachers, Training Institute, Laboratory Manual of Strength of Materials, Oxford University Press, 2010.
3. IS 10262:2009 Guidelines for concrete mix design proportioning.
4. IS 516:1959 Method of Tests for Strength of Concrete.

CIV2131: FLUID MECHANICS LAB [0 0 2 1]
Calibration of V - Notch, Rectangular notch, Cippoletti Notch, Broad crested weir, curved weir, orifices, mouth pieces, Venturimeter, orifice meter, Venturi flume, standing wave flume, Determination of Friction factor of pipes, Tests on Impact of jet on Vanes, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan Turbine.

Textbooks:

1. R.K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, 9th ed., Laxmi Publications, New Delhi, India, 2018.
2. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics Including Hydraulic Machines, 22nd ed., Rajsons Publications Pvt Ltd, New Delhi 2019.
3. R.K. Rajput, A Textbook of Fluid Mechanics, S. Chand Publication, Jaipur, India, 2018.

Reference Books:

1. V. L. Streeter, E. B Wiley, Fluid Mechanics, McGraw Hill book Co., New York. 1998.
2. Çengel Yunus, John M Cimbala, Fluid Mechanics Fundamentals and Applications, Tata McGraw Hill Education Pvt. Limited New Delhi, 2011.
3. R.J. Garde, Fluid Mechanics through problems, New age international Pvt. Ltd., Publishing, New Delhi. 2003.

CIV2170: PROJECT BASED LEARNING-1 [0 0 2 1]
Students are required to work on project based on on identification of a research problem/latest innovation and literature review. Project work will be done in III semester. The educational value of project-based learning is aimed to build students creative capacity to work through different scenario, commonly in small teams. Typically, project-based learning takes through the following phases or steps: identifying a problem and potential solution based on feedback from experts, instructors, and/or peers. Depending on the goals of the instructor, the size and scope of the project can vary accordingly. Evaluation will be based on report and presentation.

	Fourth Semester				
Code	Subject Name	L	T	P	Credit
XX22XX	Engineering Economics	3	0	0	3
CIV2201	Structural Analysis (DC-4)	3	1	0	4
CIV2202	Environmental Engineering (DC-5)	3	1	0	4
CIV2220 XX22XX	Construction Project Management/ Relational Database Management Systems (FC-2)	4	0	0	4
CIV22XX	Program Elective 1	3	0	0	3
CIV22XX	Open Elective 1	3	0	0	3
CIV2230	Environmental Engineering Lab	0	0	2	1
CIV2231	Building Drawing Lab	0	0	2	1
CIV2270	Project-based Learning-2	0	0	2	1
	Total Credits				25

CIV2201: STRUCTURAL ANALYSIS [3 1 0 4]
Introduction to indeterminate structures, degrees of freedom per node with static and kinematic indeterminacy. Slope and Deflection of fixed beams, continuous beams and frames by three moments theorem and conjugate beam method. Castigliano's theorem and its applications. Influence line diagram of moving loads on beam and frame. Analysis of

indeterminate beams and frames by moment distribution method and slope-deflection method. Approximate analysis of frames by portal method and cantilever method. Introduction to matrix method of structural analysis.

Textbook:

1. S. Ramamrutham, R. Narayanan, (11e), Theory of Structures, Dhanpat Rai Publications, New Delhi, 2020.
2. B. C. Punmia, Strength of Materials and Mechanics of Structures: Vol. I, (10e), Laxmi Publications (P) Ltd., 2018.
3. S. P. Gupta, G. S. Pandit, R. Gupta, (5e), Structural Analysis – A Matrix Approach-Volume 2, McGraw Hill, New Delhi, 2018.

Reference book:

1. C. K. Wang, Indeterminate Structural Analysis, Indian Ed., McGraw Hill Education, 2017
2. S. Timoshenko, D. H. Young, Mechanics of Structures, (3e), Mc Graw Hill Book Co., 2015
3. R. C. Hibbler, Structural Analysis, (8e), Pearsons, 2014

CIV2202: ENVIRONMENTAL ENGINEERING [3 1 0 4]

Water and Wastewater Quality and Treatment: Sources of water and its conveyance, Basics of water quality standards – Physical, chemical and biological parameters; Water quality index; Unit processes and operations; Water requirement; Water demand and distribution system; Drinking water treatment. Sewerage system design, quantity of domestic wastewater, primary and secondary treatment. Effluent discharge standards; Sludge disposal; Reuse of treated sewage for different applications. Air Pollution: Types of pollutants, their sources and impacts, air pollution control, air quality standards, Air quality Index and limits. Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal)

Textbooks:

1. S. K. Garg, Water Supply Engineering, Khanna Publishers, 33rd edition, New Delhi, 2010.
2. S. K. Garg, Sewage Disposal and Air Pollution Engineering, Khanna Publishers, 41st edition New Delhi, 2015.
3. G. S. Birdie, Water Supply and Sanitary Engineering, Dhanpath Rai and Sons, 9th edition New Delhi, 2023.
4. B. C. Punmia, Water Supply Engg., Laxmi Publications, New Delhi, 2022.

Reference Books:

1. C. Sawyer, P, McCarty and G. Parkin, Chemistry for Environmental Engineering and Science, 5/e, McGraw Hill, New Delhi, 2003.
2. IS Standard 10500 (2012): Drinking Water-Specification, second revision , Bureau of Indian Standards, Manak Bhavan, New Delhi.
3. Metcalf, Eddy, Wastewater Engg, Treatment and Reuse, Tata McGraw Hill, New Delhi, 2014.

CIV2220: CONSTRUCTION PROJECT MANAGEMENT [4 0 0 4]

Construction Projects: Classification, construction team, conceptual planning stage, design stage, procurement stage, execution, and close-out stage. Project management: Objectives and function, Work Breakdown Structure, planning, scheduling, types of schedules. Network Schedules: rules, preparation, and numbering. CPM analysis: activity times, floats, critical path. PERT Analysis: time estimates, slack, critical path, uncertainty in project duration. Project Costs: direct and Indirect costs, time-cost trade-offs. Construction equipment management: Classification, earthmoving, hoisting, hauling, piling, compaction, and concreting equipment, selection of construction equipment, depreciation, owning and

operating cost. Construction safety management: Need, case studies on construction accidents, safety acts and regulations, contract safety specifications, safety and health policies, responsibilities of stakeholders, accident costs. Introduction to lean construction and Building Information Modeling.

Textbooks:

1. B. Sengupta, M Guha, Construction Management and Planning, McGraw Hill, 2016 Reprint
2. B. C. Punamia, K K Khandelwal, Project Planning and Control with PERT and CPM, Laxmi Publications Pvt Ltd, 2014 Reprint
3. S. C. Sharma, Construction Equipment and Management, Khanna Book Publishing Company, 2016.
4. N.K. Jha, D.A. Patel, A. Singh, Construction Safety Management, Pearson Education, 1st Edition, 2022.

References Books:

1. D. Lock, Project Management, 10th Edition, 2013, Routledge, Taylor & Francis.
2. Peurifoy, Schexnayder, Shapira, Construction Planning, Equipment and Methods, Tata McGraw Hill, 2015 Reprint.
3. SP 70 : 2001, Handbook on Construction Safety Practices, Bureau Of Indian Standards, New Delhi.

CIV2240: REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM [3 0 0 3]

Basics of remote sensing, spectral reflectance curve. Aerial photography and concept of scale. Satellite remote sensing, orbit types, data acquisition, digital image processing, ground-truthing, spectro-radiometer and image resolution. Remote sensing satellites: INSAT series, IRS series, LANDSAT series, SPOT series, IKONOS Series, QUICKBIRD series and OCEANSAT. Active and passive remote sensing: Optical remote sensing, infrared, thermal and microwave remote sensing and sensors, image interpretation characters. Geographical Information Systems (GIS): Evolution, raster and vector data, database, analysis and management, digital elevation model, applications of GIS.

Textbooks:

1. Sabins, Jr. F. F. and Ellis, J. M. Remote Sensing: Principles, Interpretation, and Applications. Waveland Press, 4th Edition 524 p, 2020.
2. Campbell, J. B. and Wynne, R. H. Introduction to Remote Sensing. The Guilford Press, 5th Edition, 662 p, 2013.
3. Demers M. N., Fundamentals of Geographic Information Systems. John Wiley and Sons, 3rd Edition, 464 p, 2008.

Reference Books:

1. Weng, F., Passive Microwave Remote Sensing of the Earth: for Meteorological Applications, John Wiley and Sons, 384 p, 217.
2. Janssen, L. L. F. and Huurneman, G. C. (Eds.), Principles of Remote Sensing. ITC Educational Textbook Series, 2nd Edition, 41 p, 21.
3. Burrough P. A. and McDonnell, R. A., Principles of Geographical Information Systems. Oxford University Press, 2nd Edition 1998.

CIV2241: COMPUTATIONAL HYDRAULICS [3 0 0 3]

Ordinary and partial differential equations, Governing equations for ground water flow, Introduction to method of finite differences. Introduction to method of characteristics; Introduction to method of finite volumes; Stability, convergence and accuracy and

consistency of numerical schemes; Explicit and implicit schemes; Alternate direction implicit-explicit scheme, Solution of trigonal/ pentagonal matrix using Thomas algorithm, Crank Nicholson Scheme, Boundary conditions; Pneumann and Dirichlet boundary conditions Conservative and non-conservative formulations of conservation laws, Numerical schemes for solution of transport and diffusion equations in 1D; applications to steady and unsteady flows; St. Venant Equation, pollutant dispersion; flood wave propagation.

Textbooks:

1. Ioana Popescu., Computational Hydraulics, UNESCO-IHE Institute for Water Education, Delft The Netherlands, 2020.
2. Michael B. Abbott, David R. Basco, Computational Fluid Dynamics: An Introduction for Engineers, Longman Scientific & Technical, 2012.

Reference Books:

1. Cornelis B. Vreugdenhil., Computational Hydraulics: An Introduction, Springer Verlag, Germany; 1st ed. 1989 edition.
2. Brebbia C.A., Ferrante A.J., Computational Hydraulics, Butterworth & Co (Publishers) Lt1983, ISBN 9780408011532.

CIV2242: ENGINEERING GEOLOGY [3 0 0 3]

Geology in Civil Engineering, Internal structure of earth and composition. Plate tectonics, earthquake, seismic waves, characteristics of strong ground motions and attenuation. Identification of rock-forming minerals and Ores, their physical and engineering properties. Sources of rocks, classification of rocks, rock-cycle, Rock as building material. Structural geology: folds, joints, faults, and unconformity. Weathering types, agencies, causes and products of weathering. Geomorphic features of river and wind. Geophysical techniques, Geological considerations in selection of sites for Dams, Reservoirs, Tunnels, Bridges and Highways. Demonstration of rocks and minerals.

Textbooks:

1. P. Singh, Engineering and General Geology, (8e), New Delhi, India: S. K. Kataria and Sons, 2013.
2. D. V. Reddy, Engineering Geology for Civil Engineering, New Delhi, India: Oxford and IBH Publishing Co. Pvt. Ltd., 2012.

Reference Book:

1. P. K. Mukherjee, A Textbook of Geology, Kolkata, India: World Press, 2005.

CIV2230: ENVIRONMENTAL ENGINEERING LABORATORY [0 0 2 1]

Determination of solids - total solids, suspended solids, dissolved solids, volatile solids, fixed solids, settleable solids. Determination of turbidity, pH, alkalinity, acidity, chloride, fluorides, dissolved oxygen and total hardness in water sample, Jar test. Residual chlorine and chlorine demand in a given water sample. Determination of percentage available chlorine in Bleaching powder. Determination of biochemical oxygen demand and chemical oxygen demand in a given water sample. Determination of. Total count test and determination of most probable number in water sample. Determination of PM10 and PM2.5, sulphur dioxide and oxides of nitrogen in ambient air. Demonstration of pipes, joints and fixtures, sanitary fittings.

Textbooks:

1. Standard Methods for the Examination of water and wastewater: AWWA, APHA, WPCF, 2012.
2. IS - 3025 - 1964 - Methods of Sampling and Test (Physical and Chemical) for Water Used in Industry, IIT New Delhi.

Reference Books:

1. Lab Manual, ISO 14001 Environmental Management, Regulatory Standards for Drinking Water and Sewage disposal
2. Clair Sawyer and Perry McCarty and Gene Parkin, "Chemistry for Environmental Engineering and Science", McGraw-Hill Series in Civil and Environmental Engineering, McGraw Hill, New York. 2002.

CIV2231: BUILDING DRAWING LAB [0 0 2 1]

Building layout plan, Foundations: Masonry foundations, RCC Footings – Isolated and Combined footings; Brick and stone masonry, Doors, Windows, and frame section; Introduction to building bylaws, Designing and working Drawing of Residential Buildings: Plan, Elevation and Sectional views using AutoCAD. Introduction to Revit.

Textbooks:

1. S. C Rangwala, Elementary and Advanced Building Construction, 2009.
2. V. B Sikka, A course in civil engineering drawing, S.K. Kataria & Sons, Reprint 2013.

Reference Books:

1. T. S. Balagopal Pabhu, K.V Paul and C Vijayan, Building Design of Civil Engg. Drawing, Spades Publishers, Calicut, 1999.
2. M. G Shah, C. M Kale, & S Patki, Building Drawing: with an integrated approach to built environment. Tata McGraw-Hill Education, 2002.

CIV2270: PROJECT BASED LEARNING-2 [0 0 2 1]

Students are required to work on projects based on planning and designing of the solution. Project work will be done in IV semester. The educational value of project-based learning is aimed to build students creative capacity to work through different scenario, commonly in small teams. Typically, project-based learning takes through the following phases or steps: identifying a problem and potential solution based on feedback from experts, instructors, and/or peers. Depending on the goals of the instructor, the size and scope of the project can vary accordingly. Project evaluation will be based on report and presentation.