

# Civil and Infrastructure Engineering

Semester II						
S.No	Course Code	Course Name	L	T	P	C
1	CE101T	<a href="#"><u>Introduction to Civil Engineering</u></a>	2	1	0	6
2	CE301T	<a href="#"><u>Environmental studies</u></a>	3	0	0	6
3	MA109T	<a href="#"><u>Linear Algebra and Differential Equations</u></a>	3	1.5	0	9
4	ME101C	<a href="#"><u>Engineering Graphics Lab</u></a>	1	0	3	5
5	CS101T	<a href="#"><u>Data Structures and Algorithms</u></a>	3	0	0	6
6	CS101L	<a href="#"><u>Data Structures and Algorithms Laboratory</u></a>	0	0	3	3
7	ME101L	<a href="#"><u>Hands on Engineering Lab</u></a>	0	0	3	3
8	CC	<a href="#"><u>NSO/NSS/NCC/NCA</u></a>	0	0	2	2
		Total Number of Credits				40

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1	<b>Title of the course (L-T-P-C)</b>	<b>Introduction to Civil Engineering 2-1-0-6</b>
2	<b>Pre-requisite courses(s)</b>	NIL
3	<b>Course content</b>	<p><b>Introduction and Scope of Civil Engineering:</b> Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, History of Civil Engineering: Early constructions and developments over time, ancient monuments of the world, Civil Engineering aspects of Indian heritage structures. Civil Engineering Specializations: Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Environmental Engineering, Transportation Engineering, Construction Management, Ocean Engineering, Remote Sensing and GIS, Energy and Sustainable Infrastructure.</p> <p><b>Megastructures of Civil Engineering:</b> Design, Construction and Structural Details of Some of the Megastructures of the World. Mega Civil Engineering Projects of India. Failure Case Studies in Civil Engineering: Structures, Foundations, Dams, Pavement Systems, and the Geo-environment. Some Major Civil Engineering Challenges</p> <p><b>Materials in Civil Engineering:</b> Stones, bricks, mortars, Plain, Reinforced &amp; Prestressed Concrete, Construction Chemicals, Structural Steel, High Tensile Steel, Carbon Composites, Plastics in Construction, 3D printing, Recycling of Construction &amp; Demolition wastes, Sustainable Building Materials.</p> <p><b>Introduction to Plan Reading, and Construction Techniques:</b> Scale drawings of floor plans, sections, and elevations; Plan types, Interpretation of plans. Components of a building. Typical loads and forces in Civil Engineering structures. Introduction to estimation and costing.</p> <p><b>Smart Cities and Current Trends in Construction Industry:</b> Application of Machine Learning (ML) and Artificial Intelligence (AI) in Civil Engineering. Position of construction industry vis-à-vis other industries, plan outlays for construction; current budgets for infrastructure works; Possible scopes for a career, Importance of ethics in engineering.</p>
4	<b>Texts/References</b>	<p><b>Reading:</b></p> <ol style="list-style-type: none"> <li>1. J. E. Gordon, "STRUCTURES: Or Why Things Don't Fall Down", Da Capo Press; Reprint edition, 2003.</li> <li>2. Paul A. Bosela, Pamalee A. Brady, Norbert J. Delatte, M. Kevin Parfitt "Failure Case Studies in Civil Engineering: Structures, Foundations, and the Geoenvironment", American Society of Civil Engineers; 2nd edition 2013.</li> <li>3. P.C. Varghese "Building Materials", Prentice Hall India Learning Private Limited; 2nd edition, 2015.</li> <li>4. Gary Anglin, "Introduction to Estimating, Plan Reading and Construction Techniques", Routledge; 1st edition, 2019.</li> <li>5. You-Lin Xu, Jia He "Smart Civil Structures", CRC Press; 1st edition, 2019.</li> </ol> <p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Pijush Samui, Dookie Kim, Nagesh Iyer, Sandeep Chaudhary, "New Materials in Civil Engineering", 1<sup>st</sup> edition, Elsevier, 2020.</li> <li>2. Saeed Moaveni, "Engineering Fundamentals: An Introduction to Engineering" Cengage Learning India Pvt. Ltd.; Fourth edition, 2011.</li> <li>3. J. E. Gordon, "The New Science of Strong Materials – Or Why You Don't Fall through the Floor", Princeton University Press, 2020.</li> <li>4. BIS, "National Building Code of India", Bureau of Indian Standards, 2017.</li> <li>5. M.W.Martin and R.Schinzinger, "Ethics in Engineering" McGraw Hill Education; Fourth edition, 2017.</li> <li>6. S.S. Bhavikatti and M.V. Chitawadagi "Building Planning and Drawing", Dreamtech Press, 2019.</li> </ol>

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1	<b>Title of the course (L-T-P-C)</b>	<b>Environmental studies (3-0-0-6)</b>
2	<b>Pre-requisite courses(s)</b>	<b>Nil</b>
3	<b>Course content</b>	<p><b>Module A:</b> Natural Resources, Ecosystems, Biodiversity and its conservation: Natural resources and ecosystems, Forest, grassland, desert and aquatic ecosystems, biodiversity at global, national and local levels, conservation of biodiversity</p> <p><b>Module B:</b> Air Pollution Introduction to understanding air quality management, fundamental processes of meteorology, Air Pollutants – Gaseous and particulate, Criteria for pollutants, ambient and source standards, Aerosols: Characterisation of aerosols, size distributions, measurement methods; Transport behaviour: diffusion, sedimentation, inertia; Visibility; principles of particulate control systems.</p> <p><b>Module C:</b> Water Treatment Discussion of water quality constituents and introduction to the design and operation of water and wastewater treatment processes.</p> <p><b>Module D:</b> Solid Waste Management and Climate Change Different aspects of solid and hazardous waste management. Climate change and greenhouse gas emissions, technologies would reduce the greenhouse gas emissions. Climate change and its possible causes.</p> <p><b>Module E:</b> Sociology/Environmentalism Description: Environmentalism in sociological tradition, Sustainability, North-South divide, Political economy approaches in environmental studies, Debates over environmental issues.</p> <p><b>Module F:</b> Economics Energy economics and financial markets, Market dynamics, Energy derivatives, Energy Efficiency; Sustainable Development: Concept, Measurement &amp; Strategies, Interaction between Economic Development and the Environment</p> <p><b>Module G:</b> Philosophy Environmental ethics, Deep ecology, Practical ecology, Religion and attitude towards environmental ethics, Ecofeminism and its evolution.</p> <p><b>Module H:</b> Field work and project: visit to a local area to document environmental assets, case studies of a simple ecosystem and group discussions on current environmental issues.</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. Cunningham W.P. and Cunningham M.A. (2002), Principles of Environmental Science, Tata McGraw-Hill Publishing Company, New Delhi.</li> <li>2. Dasgupta, P. and Maler, G. (eds.), (1997), The Environment and Emerging Development Issues, Vol. I, Oxford University Press, New Delhi.</li> <li>3. Jackson, A.R.W. and Jackson, J.M. (1996), Environmental Sciences: The Environment and Human Impact, Longman Publishers.</li> <li>4. Nathanson, J.A., (2002), Basic Environmental Technology, Prentice Hall of India, New Delhi</li> <li>5. Redclift, M. and Woodgate, G. (eds.), (1997), International Handbook of Environmental Sociology.</li> <li>6. Srivastava, K.P. (2002), An Introduction to Environmental Study, Kalyani Publishers, Ludhiana.</li> <li>7. Review articles from literature.</li> </ol>

# Civil and Infrastructure Engineering

1	<b>Title of the course (L-T-P-C)</b>	<b>Linear Algebra and Differential Equations (3-1.5-0-9)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	<p><b>Linear Algebra:</b> Vectors in <math>\mathbb{R}^n</math>, notion of linear independence and dependence, linear span of a set of vectors, vector subspaces of <math>\mathbb{R}^n</math>, basis of a vector subspace. Systems of linear equations, matrices and Gauss elimination, row space, null space, and column space, rank of a matrix. Determinants and rank of a matrix in terms of determinants. Abstract vector spaces, linear transformations, matrix of a linear transformation, change of basis and similarity, rank-nullity theorem. Inner product spaces, Gram-Schmidt process, orthonormal bases, projections and least squares approximation. Eigenvalues and eigenvectors, characteristic polynomials, eigenvalues of special matrices (orthogonal, unitary, Hermitian, symmetric, skew-symmetric, normal). Algebraic and geometric multiplicity, diagonalization by similarity transformations, spectral theorem for real symmetric matrices, application to quadratic-forms.</p> <p><b>Differential Equations:</b> Exact equations, integrating factors and Bernoulli equations. Orthogonal trajectories. Lipschitz condition, Picard's theorem, examples on non-uniqueness. Linear differential equations generalities. Linear dependence and Wronskians.</p> <p>Dimensionality of space of solutions, Abel-Liouville formula. Linear ODE's with constant coefficients, the characteristic equations. Cauchy-Euler equations. Method of undetermined coefficients. Method of variation of parameters. Laplace transform generalities. Shifting theorems. Convolution theorem.</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley (1995).</li> <li>2. G. Strang, Linear algebra and its applications (4th Edition), Thomson (2006)</li> <li>3. S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India (2000)</li> <li>4. E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999)</li> <li>5. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8<sup>th</sup> Edition), John Wiley (2005)</li> </ol>

# Civil and Infrastructure Engineering

1	<b>Title of the course (L-T-P-C)</b>	<b>Data Structures and Algorithms (3-0-0-6)</b>
2	<b>Pre-requisite courses(s)</b>	Exposure to Computer Programming
3	<b>Course content</b>	Introduction: data structures, abstract data types, analysis of algorithms. Creation and manipulation of data structures: arrays, lists, stacks, queues, trees, heaps, hash tables, balanced trees, tries, graphs. Algorithms for sorting and searching, order statistics, depth-first and breadth-first search, shortest paths and minimum spanning tree.
4	<b>Texts/References</b>	<ol style="list-style-type: none"><li>1. Introduction to Algorithms, 3rd edition, by T. Cormen, C. Leiserson, R. Rivest, C. Stein, MIT Press and McGraw-Hill, 2009.</li><li>2. Data structures and algorithms in C++, by Michael T. Goodrich, Roberto Tamassia, and David M. Mount, Wiley, 2004.</li></ol>

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1	<b>Title of the course</b> (L-T-P-C)	<b>Data Structures and Algorithms Laboratory</b> <b>(0-0-3-3)</b>
2	<b>Pre-requisite courses(s)</b>	Exposure to Computer Programming (CS 102)
3	<b>Course content</b>	Laboratory course for CS 211 is based on creating and manipulating various data structures and implementation of algorithms.
4	<b>Texts/References</b>	<ol style="list-style-type: none"><li>1. Introduction to Algorithms, 3rd edition, by T. Cormen, C. Leiserson, R. Rivest, C. Stein, MIT Press and McGraw-Hill, 2009.</li><li>2. Data structures and algorithms in C++, by Michael T. Goodrich, Roberto Tamassia, and David M. Mount, Wiley, 2004.</li></ol>

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1	<b>Title of the course (L-T-P-C)</b>	<b>Engineering Graphics Lab (1-0-3-5)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	<p>Engineering Graphics with mini drafter: Around half a semester and bit more with following topics to be covered.</p> <ul style="list-style-type: none"><li>• Introduction to Engineering Graphics</li><li>• Curves</li><li>• Projections of Points</li><li>• Projection of Lines</li><li>• Projection of Planes</li><li>• Projections on Auxiliary Planes</li><li>• Projections of Solids</li><li>• Sections of Solids</li><li>• Intersections of Solids</li></ul> <p>Engineering Graphics with 2D Drafting Software: 5 weekly computer laboratory sessions covering above using AutoCAD® as a drafting software, 5th session on Isometric Projections.</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"><li>1. N. D. Bhatt, revised and enlarged by V. M. Panchal and P. R. Ingle, Engineering Drawing, 53rd Edition, 2014, Charotar Publishers, Anand.</li><li>2. Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, Prentice-Hall of India.</li><li>3. Gopalakrishna K. R., Engineering Drawing Vol. I &amp; II Combined., Subhas Stores, 25th Edition, 2017.</li><li>4. Narayana. K. L., and Kannaiah, P. E., Text Book on Engineering Drawing, 2nd Edition, 2013, Scitech Publications, Chennai.</li><li>5. Venugopal K. and Prabhu Raja V., Engineering Drawing + AutoCAD, New Age International Publishers, 5th Edition, 2011.</li></ol>

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1	<b>Title of the course</b> (L-T-P-C)	<b>Hands on Engineering Lab</b> <b>(0-0-3-3)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	<p><b>List of Experiments (Mechanical Workshop)</b></p> <ul style="list-style-type: none"> <li>● To make a Square-fit from the given mid steel pieces (Fitting)</li> <li>● To make a V-fit from the given mid steel pieces (Fitting)</li> <li>● To make a rectangular tray as per required dimensions (Sheet Metal)</li> <li>● To build a transition piece (Sheet Metal)</li> <li>● To make a Butt joint using the given two M.S pieces (Arc welding)</li> <li>● To make a lap joint using the given two M.S pieces (Arc welding)</li> <li>● To build a pipeline using fittings for given flow circuit (Plumbing)</li> </ul> <p><b>List of Experiments (Electrical Workshop)</b></p> <ul style="list-style-type: none"> <li>● To control one lamp by a one switch with provision for plug socket with switch control (Electrical wiring)</li> <li>● To do stair case wiring (i.e. control of one lamp by two switches fixed at two different places) (Electrical wiring)</li> <li>● Measurement of hot and cold resistance of filament</li> <li>● Improvement of Power Factor</li> <li>● Calibration of Energy meter</li> <li>● Measurement of Power using three ammeter/voltmeter method</li> </ul> <p><b>List of Experiments (Electronics)</b></p> <ul style="list-style-type: none"> <li>● Understanding breadboard, One-way traffic</li> <li>● Introduction to Arduino and Buzzer</li> <li>● Using Arduino speed measurement of motor/ glowing of LED</li> <li>● Control of water level using Arduino Line follower using Arduino</li> </ul>
4	<b>Texts/References</b>	<p>Elements of Workshop Technology Vol. 1 (2015), S. K. Hajra Choudhary, A. K. Hajra Choudhary and Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd.</p> <p>W. A. J. Chapman, Workshop Technology, Vol. 1 (2006), Vol 2 (2007), and (1995), CBS Publishers.</p>