Civil Engineering Department

Semester : 4

Teaching Scheme for Civil Engineering – Semester IV

Course Code	Course Name	Lecture hours	Tutorial hours	Practical hours	Credit
CE 2003	Engineering Geoscience	2	1	2	4
CE 2005	Surveying	2	0	3	5
CE 2004	Structural Analysis	3	2	0	4
CE 2501	Construction Material Lab	0	0	3	2
ME 2001	Material Science & Engineering	3	1	2	5
MA 2002	Mathematics IV: Introduction to Numerical Methods	3	1	0	4
	Total	**13**	**5**	**10**	**24**

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I	Course Code	**CE 2003**			
II	Course Title	**Engineering Geoscience**			
III	Credit Structure	L	P	T	C
		2	2	1	4
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	**Earth Materials:** Structure of Solid Earth, Rock cycle, Common rock forming minerals, Types of rocks and its engineering properties, Soils: processes of formation, soil profile and soil types. Geophysical methods of earth characterization. **Earth Processes:** Concept of plate tectonics; sea-floor spreading and continental drift. Origin of oceans, continents, mountains and rift valleys. Earthquake and earthquake belts. Volcanoes: types products and distribution. Deformation in Earths interior, Faults, Folding and Joints. Dynamic behavior of Earth Surface and role of hydrosphere: River processes, Hillslope processes, catchment erosion processes, Coastal Processes, Groundwater and karst processes. Applications in Civil Engineering and Environmental Management **Practicals:** Study of physical properties of minerals and rocks in hand specimen, Study of topographic sheet and analysis of hillslope and watershed features, Drawing profile sections and interpretation of geological maps of different complexities.			
VI	Text/References	1. Earth Environments: Past, present and future by D. Huddartand T. Stott, John Wiley & Sons. 2. Earth: Portrait of a Planet (3rd Ed) by S. Marshak, W. Norton & Company. 3. Geology for Engineers and Environmental Scientists by A.E. Kehew, Prentice Hall. 4. Foundations of Engineering Geology by T. Waltham, Taylor and Francis			

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">CE 2005</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Surveying</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>2</td><td>3</td><td>0</td><td>5</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Basic Concepts: Surveying, navigation, and mapping; Spheroidal and ellipsoidal model of Earth; Fundamental principles of surveying; Coordinate reference systems; Plane and geodetic surveying.
Basic Survey Measurements: Distance measurement, taping, electronic distance measurements; Angle and direction measurements; Combined distance and angular measurements; Height measurements, levelling; Control and topographic surveying, horizontal control, vertical control, 3D surveys.
Mapping: Coordinate reference systems, map projections, coordinate and datum transformations.
Errors and Adjustments: Observations and errors; Error propagation, accuracy and precision, measures of quality, compatibility of measurements; Adjustments of survey measurements; Pre-analysis, field surveying operations, and post-analysis.
Introduction to Modern Surveying Methods and Tools: Total Station (TS), Global Positioning System (GPS), Photogrammetry, Geographic Information System (GIS), Light Detecting and Ranging (LiDAR), Radar Interferometry; Digital Elevation Model (DEM).
Application of Surveying for Infrastructure: Route surveying; Earthwork operations; Construction surveys; Cadastral surveys.
Laboratory Experiments:
1. Introduction to conventional instruments : toposheets, chain, compass
2. Mapping with total station, GPS, DGPS and Compass.
3. Levelling with auto level
4. Mapping with stereo photographs</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1. Engineering Surveying by W. Schofield and M. Breach, Elsevier Butterworth-Heinemann.
2. Elementary Surveying: An Introduction to Geomatics by Charles D Ghilani and P. R. Wolf, Prentice Hall.
3. Adjustment Computations: Spatial Data Analysis by Charles D Ghilani, Wiley.
4. Surveying for Engineers by J. Uren and W. F. Price, Palgrave Macmilla.
5. Surveying by Jack C. Mccormac, John Wiley & Sons.
6. Surveying, Theory and Practice by James M. Anderson and Edward M. Mikhail, McGraw-Hill.
7. Basic Surveying by Whyte & Paul, Routledge, Oxford</td></tr>
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Civil Engineering Department

Semester : 4

I	Course Code	**CE 2004**			
II	Course Title	**Structural Analysis**			
III	Credit Structure	L	P	T	C
		3	0	1	4
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Deflection of plane trusses - Castigliano's theorem Bettis & Maxwells reciprocal theorems - unit load-deflection method method of virtual work - Muller-Breslau principle. Three hinged arches, Cables and suspension bridges. Indeterminate structures degree of static indeterminacy, Kinematic indeterminacy - two hinged arches- Clapeyrons theorem of three moments - Moment distribution method - Slope deflection method - Method of consistent deformation - Beams curved in plan - Multi storey frame analysis vertical and lateral load analysis - Kanis method. Moving loads and influence lines for beams and bridge truss members. Introduction to plastic analysis.			
VI	Text/References	1. Structural Analysis by T. S. Thandavamoorthy, Oxford University Press. 2. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill.			

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I	Course Code	**CE 2501**			
II	Course Title	**Construction Material Lab**			
III	Credit Structure	L	P	T	C
		0	3	0	2
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Tests: 1. Tension test on M.S. and HYSD bars 2. Compression, shear and bending strength of metals, bricks, wood 3. Aggregate impact test, flakiness index & elongation index 4. Aggregate crushing strength, Los Angeles abrasion test; Aggregate Sieve Analysis (Fineness modulus), water absorption, bulk density and specific gravity 5. Cement Standard Consistency, Initial and Final setting time 6. Cement Fineness, soundness, Compressive strength 7. Concrete Slump test, Compacting factor test 8. Concrete Compressive strength cubes and cylinders with varying w/c ratio 9. Concrete Non Destructive Testing of Concrete, Compressive strength, Rebar locator, Ultrasonic pulse velocity test 10. Concrete Non Destructive Testing of Concrete, Compressive strength, Rebar locator, Ultrasonic pulse velocity test 11. Bricks Dimension, Water absorption, compressive strength, efflorescence of bricks 12. Bitumen - penetration test, flash point test, ductility test, viscosity test			
VI	Text/References	1. Building and Construction Materials: Testing and Quality Control (Lab Manual Series) by M L Gambhir and NehaJamwal, Tata McGraw Hill 2. Concrete Technology by M S Shetty, S Chand & Co. 3. Laboratory Manual in Highway Engineering by A K Duggal and A K Puri, New Age International Publishers.			

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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">ME 2001</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Material Science & Engineering</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>2</td><td>1</td><td>5</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Introduction, Materials in Engineering design, the evolution of engineering materials, the families of engineering materials, modern materials, properties of engineering materials; Fundamentals, Atomic bonding, Crystalline structure-perfection/imperfection, phase diagrams, diffusion in solids, phase transformations; Structural materials and their behavior: Metals and alloys, ceramics and glasses, polymers, composites, conductors, semiconductors, optical and magnetic materials, mechanical and thermal behavior, electrical behavior, optical behavior, magnetic behavior; Corrosion and degradation of engineering materials; Material selection and design consideration: materials and industrial design, material property charts, material selection strategy and procedure, economic, environmental and societal issues related to engineering materials; case studies related to few engineering products/equipments.
Laboratory experiments: 1. Tension Test
2. 3 Point Bending Test
3. Compression Test
4. Impact Test
5. Rockwell Hardness Test
6. Demonstration of Powder XRD
7. Study of microstructure of various materials</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1. Materials Science and Engineering : A First Course V. Raghavan
2. Elements of Materials Science and Engineering (6th Edition), Lawrence H. Van Vlack
3. Introduction to Materials Science for Engineers (6th Edition), James F. Shackelford and Madnapalli K. Muralidhara
4. Materials Science and Metallurgy, U. C. Jindal
5. Materials Science and Metallurgy, Parashivamurthy K. I.</td></tr>
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I	Course Code	**MA 2002**			
II	Course Title	**Mathematics IV: Introduction to Numerical Methods**			
III	Credit Structure	L	P	T	C
		3	0	1	4
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Introduction, Floating Point Arithmetic, Interpolation by polynomials, divided differences, error of interpolating polynomial, piecewise linear and cubic spline interpolation. Numerical differentiation, Numerical quadrature (Trapezoidal, Simpson's and Gauss methods).Numerical Linear AlgebraSolution of a system of linear equations, Gauss elimination,Gauss Seidel methods, partial pivoting, LU factorization, Cholesky's method, matrixnorms. Eigen value problem, Gershgorin's theorem, Power and inverse power methods, QR method. Numerical solution of ordinary differential equations, Euler, Multistep, Runge-Kuttamethods. BVP finite difference methods. Introduction to finite element method and 1 D problem. Numerical solution to elliptic PDE. Introduction to statistics and probability. Random variable and probability function. Expectation of random variable.			
VI	Text/References	1. S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An algorithmic Approach (3rd edition), McGraw Hill, 1980. 2. C. E. Froberg, Introduction to Numerical Analysis (2nd edition), Addison-Wesley, 1981. 3. E. Kreyszig, Advanced Engineering Mathematics (Latest Edition) Wiley India. 4. K. Atkinson and W. Han, Elementary Numerical Analysis (3 rd Edition), Wiley India, 2004			