Semester VI						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	CE306T	Design of Steel Structures	2	1	0	6
2	CE 301C	Sensors Technologies and Instrumentation in civil Engineering	2	0	2	6
3	CE 307T	Foundation Engineering	2	1	0	6
4	CE 308T	Estimation and Costing in Civil Engineering	2	1	0	6
5	-	Institute Elective-II	2	1	0	6
6	-	HSS Elective-I	2	1	0	6
		Total Credits				36

1	**Title of the course** (L-T-P-C)	**Design of Steel Structures** **2-1-0-6**
2	**Pre-requisite courses(s)**	NIL
3	**Course content**	1. Introduction: General- Types of Steel – Mechanical behavior of steel – Measures of Yielding – Measures of Ductility – Types of Structures – Structural Steel Sections. 2. Methods of Structural design: Introduction-Design Philosophies-Working Stress method- Ultimate Strength method-Load and Resistant factor- Limit State Method-Partial safety factor-Load-Load combinations-Classification of Cross sections- General aspects in the design. 3. Design of Steel fasteners: Types of fasteners – Riveted connections- Bolted connections- Assumptions- Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld- fillet weld – Design examples. 4. Design of Tension Members: General – Modes of Failure of Tension member- Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design. 5. Design of Compression Members: General – Strength of Compression members- Design Compressive strength- Example on analysis of Compression members – Design of Angle struts – Design Examples- Built up Columns- Design of Lacing – Design of Battens- Design Examples- Design of Roof members. 6. Design of Beams: General- Lateral Stability of Beams- Bending Strength of Beams –Plastic Section Modulus - Design Examples. 7. Design of Beam Columns: Behaviour of members under combined loading – Modes of Failures – Design Examples. 8. Design of Column Splices and Column Base: Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design Examples.
4	**Texts/References**	**References:** 1. Limit State Design of Steel Structures – S.K.Duggal, TMH Education Pvt Ltd, 2nd Edition, 2014 2. IS-800-2007, BIS Publication 3. Steel Structures : Design and Practice- N.Subramanian, Oxford Pub, 2011 4. Design of Steel structures – S.S. Bhavikatti, IK International Pub Pvt Ltd, 4th Edition 5. Design of Steel structures – L.S. Negi, McGraw Hill Education, 2nd Edition, 2017

1	**Title of the course** (L-T-P-C)	**Sensors Technologies and Instrumentation in civil Engineering** **2-0-2-6**
2	**Pre-requisite courses(s)**	
3	**Course content**	**Module 1:** Fundamentals of Measurement, Sensing and Instrumentation covering definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations. **Module 2:** Sensor Installation and Operation covering to: i) Predict the response of sensors to various inputs; ii) Construct a conceptual instrumentation and monitoring program; iii) Describe the order and methodology for sensor installation; and iv) Differentiate between types of sensors and their modes of operation and measurement and v) Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty **Module 3:** Data Analysis and Interpretation covering a) Fundamental statistical concepts, b) Data reduction and interpretation, c) Piezometer, Inclinometer, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range) **Module 4**: Frequency Domain Signal Processing and Analysis covering Explain the need for frequency domain analysis and its principles; Draw conclusions about physical processes based on analysis of sensor data; Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution **Module 5:** Visit a built/site under construction that has internet tools such as BMS, BIM, SCADA, etc. and prepare a report detailing the technical features, productivity advantages, functioning, etc.; identify at least five interesting software systems used in Civil Engg. and their key features **Tutorials** from the above modules demonstrating clearly the understanding and use for the sensors and instruments used for the problems posed and inferences drawn from the measurement and observations made along with evaluation report
4	**Texts/References**	1. Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Heinemann 2. David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press 3. S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis 4. Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

1	**Title of the course** (L-T-P-C)	**Foundation Engineering** **2-1-0-6**
2	**Pre-requisite courses(s)**	
3	**Course content**	**Soil Exploration**: Introduction and different methods – Direct methods, Semi-direct and Indirect methods; Sampling in soils and rocks; Subsurface exploration program - Preparation of bore logs and preparation of exploration report. **Lateral Earth Pressures**: Lateral earth pressure theory, Different types of earth pressures, Rankine's active and passive earth pressures, pressure distribution diagram for lateral earth pressures against retaining walls for different conditions in cohesionless and cohesive soils, Coulomb's active and passive earth pressure theory, Culmann's graphical construction, Problems **Shallow Foundations and Bearing Capacity**: Types of shallow foundations and choice, basic requirements, Significance of these foundations. Bearing capacity of foundation: Bearing capacity – Basic Definitions, Factors affecting bearing capacity, Estimation of Bearing capacity by different methods, Analytical measures – Terzaghi's and Meyerhof methods and calculations, Field measures – SPT, CPT and Plate load tests. **Settlement of foundation**: Settlement analysis – Types of foundation settlement, Components of settlements - their estimation, Allowable settlement values, Effects, Causes and remedial measures of total and differential settlements. **Deep Foundations** – types of deep foundations, pile foundations: Classification and uses, Load carrying capacity calculations by different methods – static methods, dynamic methods, in-situ penetration tests, piles load test; Negative skin friction; under reamed pile foundations; Pile groups – Necessity, Efficiency, Group capacity and settlements.
4	**Texts/References**	**Reading:** 1. Braja M. Das and Khaled Sobhan, "Principles of Geotechnical Engineering", Cengage India Private Limited, Ninth edition, 2017. 2. Muni Budhu, "Foundations and Earth Retaining Structures", John Wiley & Sons, 2018. 3. Swami Saran, "Analysis and Design of Substructures: Limit State Design", Oxford & IBH Publishing Co Pvt. Ltd, 2nd edition, 2018. 4. Rodrigo Salgado, "The Engineering of Foundations, Slopes and Retaining Structures", CRC Press; 2nd edition, 2022. **References:** 1. P.C. Varghese, "Design of Reinforced Concrete Foundations", Prentice Hall India Learning Private Limited, 2009. 2. N.N. Som and S.C. Das, "Theory and Practice of Foundation Design", Prentice Hall India Learning Private Limited, 2003 3. R. Katzenbach, S. Leppla, and D. Choudhury, "Foundation Systems for High-Rise Structures", CRC Press, 1st edition, 2019. 4. Wei Dong Guo, "Theory and Practice of Pile Foundations", CRC Press, 1st edition, 2012.

1	**Title of the course** (L-T-P-C)	**Estimation and Costing in Civil Engineering** **2-1-0-6**
2	**Pre-requisite courses(s)**	
3	**Course content**	1. Introduction to estimates: Purpose of estimating; Different types of estimates - their function and preparation; Building estimates: Schedule of rates, Units of measurements, units of works; Road Estimates Volume of earthwork, Different methods, Earthwork for hill roads; Railway and canal works Estimates for a new track railway line; earthwork in canals. 2. Analysis of rates: Preparation for analysis of rates. Quantity of materials per unit rate of work, labour estimate. 3. Specifications: Necessity, types of specifications, specifications for different civil engineering materials. 4. Contracts: Essentials of contracts, types of engineering contracts advantages and disadvantages. 5. Tenders: tender forms, tender documents & notices time limits, necessity. 6. Valuation: Purpose, difference between value and cost, qualifications and functions of a valuer, scrap & salvage value, sinking fund, capitalised value.
4	**Texts/References**	1. Chakraborti, M, Estimation, costing, specifications and valuation in civil engineering National Halftone Co. Calcutta, 2005. 2. Dutta B.N., Estimation and costing in civil engineering: theory and practice UBS Publishers Distributors Ltd, 2006. 3. Birdie, G.S. - Estimation and costing in civil engineering Dhanpat Rai Publishing co. ltd.