

Shree Mahavir Education Society's  
Sanghavi College of Engineering, Nashik

**Department of Civil Engineering**

**Course Outcomes**

**Third Year (2019 Pattern) : Semester-I**

<b>Course code</b>	<b>Course Name</b>	<b>Course Outcomes(Cos)</b>
301001	Hydrology and Water Resource Engineering	CO1. Understand government organizations, apply & analyze precipitation & its abstractions. CO2. Understand, apply & analyze runoff, runoff hydrographs and gauging of streams. CO3. Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology. CO4. Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics. CO5. Understand water logging & water management, apply & analyze ground water hydrology CO6. Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement.
301002	Water Supply Engineering	CO1. Define identify, describe reliability of water sources, estimate water requirement for various sectors CO2. Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics CO3. Design various components of water treatment plant and distribution system. CO4. Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants. CO5. Design elevated service reservoir capacity and understand the rainwater harvesting. CO6. Understand the requirement of water treatment plant for infrastructure and Government scheme.
301003	Design of Steel Structures	CO1. Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force. CO2. Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening. CO3. Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending. CO4. Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section. CO5. Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.

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301003	Design of Steel Structures	CO6. Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.
301004	Engineering Economics and Financial Management	CO1. Understand basics of construction economics. CO2. Develop an understanding of financial management in civil engineering projects. CO3. Prepare and analyze the contract account. CO4. Decide on right source of fund for construction projects. CO5. Understand working capital and its estimation for civil engineering projects. CO6. Illustrate the importance of tax planning & understand role of financial regulatory bodies
301005 a	Elective I- Advanced Fluid Mechanics and Hydraulic Machines	CO1: Determine discharge using notches and weirs, and energy loss in hydraulic jump in open channel flow. CO2: Describe simple superpositions of basic ideal fluid flows; and determine velocity and shear stress distribution for laminar flow between parallel plates. CO3: Understand flow through openings under varying head, and determine rise in pressure due to water hammer effect in pipe flow. CO4: Calculate force exerted by free jet on stationary and moving, flat and curved vanes using impulse momentum principle. CO5: Design Pelton wheel and Francis turbines and predict their performance characteristics. CO6: Estimate performance characteristics of Centrifugal pump
301005 b	Elective-I Research Methodology and IPR	CO1: Understand a research problem for civil engineering domain. CO2: Analyze the available literature for given research problem and illustrate different techniques of literature survey thereby gap identification. CO3: Recognize the importance of data collection and investigate the statistical and reliability methods of preliminary data analysis. CO4: Explain the important concept of interpretation and develop technical writing and presentation skills. CO5: Comprehend the various forms of the intellectual property, its relevance and business impact in the changing global business environment. CO6: Realize the importance of patents, trademark and copyright and follow research ethics.
301005 c	Elective I: Construction Management	CO1. Understand the overview of construction sector. CO2. Illustrate construction scheduling, work study and work measurement. CO3. Acquaint various labor laws and financial aspects of

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301005 c	Elective I: Construction Management	<p>construction projects.</p> <p>CO4. Explain elements of risk management and value engineering.</p> <p>CO5. State material and human resource management techniques in construction.</p> <p>CO6. Understand basics of artificial intelligence techniques in civil engineering.</p>
301005 d	Elective I: Advanced Concrete Technology	<p>CO1: Understand the chemistry of cement and its effect on properties of concrete</p> <p>CO2: Apply the knowledge of supplementary cementitious materials to produce sustainable concretes</p> <p>CO3: Understand the mechanism of working of admixtures and their effect on properties of concrete</p> <p>CO4: Evaluate the characteristic properties of fiber reinforced concrete</p> <p>CO5: Understand the durability properties of concrete</p> <p>CO6: Interpret the properties of concrete through advance testing methods</p>
301005 e	Elective I: Matrix Methods of Structural Analysis	<p>CO1: To understand the structural behavior of bars and trusses and analyze it by using flexibility method of analysis.</p> <p>CO2: To understand the structural behavior of beams and plane frames and analyze it by using flexibility method of analysis.</p> <p>CO3: To analyze bars, springs and truss by member approach of stiffness matrix method.</p> <p>CO4: To analyze beams by member approach of stiffness matrix method and to develop transformation matrix and global/structure stiffness matrix for plane frame and thereby analyze it by member approach of stiffness matrix method.</p> <p>CO5: To develop transformation matrix and global/structure stiffness matrix for grid and analyze the grid by structure and member approach of stiffness matrix method.</p> <p>CO6: To develop the member stiffness matrix of space truss and space frame and develop the flow chart /algorithm to write the program for analysis of skeletal structures with reference to computer application.</p>
301005 f	Elective I: Advanced Mechanics of Structures	<p>CO1: Apply moment area and conjugate method to find slope and deflection.</p> <p>CO2: Evaluate stresses and strain in thin and thick cylinder.</p> <p>CO3: Analyze the beam and trusses by influence line diagram.</p> <p>CO4: Analyze the beam for moving load by influence line diagram.</p> <p>CO5: Understand and analyze beam curved in plan and elevation.</p> <p>CO6: Analyze three and two hinged arches for axial thrust, shear and moment</p>

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301006	Seminar	CO1. Appraise the current civil engineering research / techniques / developments / interdisciplinary areas. CO2. Review and organize literature survey utilizing technical resources, journals etc. CO3. Evaluate and draw conclusions related to technical content studied. CO4. Demonstrate the ability to perform critical writing by preparing a technical report. CO5. Develop technical writing and presentation skills.
301011 a	Audit Course I: Professional Ethics and Etiquettes	CO1: Understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories CO2: Understand various social issues, industrial standards, code o ethics and role of professional ethics in engineering field. CO3: Follow ethics as an engineering professional and adopt good standards and norms of engineering practice. CO4: Apply ethical principles to resolve situations that arise in their professional lives
301011 b	Audit Course I: Sustainable Energy Systems	CO1: To demonstrate an overview of the main sources of renewable energy. CO2: To understand benefits of renewable and sustainable energy systems
<b>Third Year (2019 Pattern) : Semester-II</b>		
301012	Waste Water Engineering	CO1. Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams CO2. Design preliminary and primary unit operations in waste water treatment plant CO3. Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process CO4. Understand and design suspended and attached growth wastewater treatment systems CO5. Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems CO6. Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
301013	Design of Reinforced Concrete Structures	CO1. Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete. CO2. Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections. CO3. Design & detailing of rectangular one way and two-way slab with different boundary conditions

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301013	Design of Reinforced Concrete Structures	CO4. Design & detailing of dog legged and open well staircase CO5. Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion. CO6. Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.
301014	Remote Sensing and Geographic Information System	CO1. Articulate fundamentals and principles of RS techniques. CO2. Demonstrate the knowledge of remote sensing and sensor characteristics. CO3. Distinguish working of various spaces-based positioning systems. CO4. Analyze the RS data and image processing to utilize in civil engineering CO5. Explain fundamentals and applications of RS and GIS CO6. Acquire skills of data processing and its applications using GIS
301015 a	Elective II: Advanced Engineering Geology with Rock Mechanics	CO1: Illustrate seismic zones, plate tectonics and civil engineering significance of major rock formations of India with their characteristics. CO2: Explain soil profile, geo-hydrological characters of various rock formations and necessity of geological studies in water conservation. CO3: Apply knowledge of geology in Infrastructural, Urban development and demonstrate importance of national wealth. CO4: Validate the suitability of rocks based on mechanical properties, R.Q.D. and geophysical exploration. CO5: Explore subsurface Geology for civil engineering projects to suggest foundation treatments for various geological defects and channel erosion. CO6: Illustrate the suitability of proposed alignments for tunnels and bridges on the basis of Geological investigations
301015 b	Elective II: Soft Computing Techniques	CO1: Understand AI techniques, soft computing techniques and basic concepts Artificial Neural Network CO2: Understand components of ANN, training algorithms and implement the back propagation algorithm CO3: Design the feed forward back propagation neural network. CO4: Understand types of neural networks and their applications CO5: Understand working of genetic algorithm, support vector regressions, model tree and random forest along with their applications CO6: Develop models for time series applications using support vector regressions, model tree and random forest.

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301015 c	Elective II: Advanced Surveying	<p>CO1: Recognize the concept of triangulation for fixing the ground control points.</p> <p>CO2: Differentiate most probable values for different measurement and adjust those in a given figure.</p> <p>CO3: Summarize the concepts of astronomical and hydrographic surveying.</p> <p>CO4: Demonstrate the use of aerial photographs for mapping.</p> <p>CO5: Analyze use of modern surveying instruments in the field.</p> <p>CO6: Execute GPS and the associated software for different applications in civil engineering.</p>
301015 d	Elective II: Advanced Geotechnical Engineering	<p>CO1; Classify the soil and understand the soil structure and role of water in clay.</p> <p>CO2: Calculate lateral pressure on retaining structures and carry out design the retaining structures.</p> <p>CO3: Interpret the results of triaxial tests under different drainage conditions.</p> <p>CO4: Draw the stress paths for different conditions.</p> <p>CO5: Select and implement soil stabilization techniques based on field conditions.</p> <p>CO6: Explain different ground improvement techniques</p>
301015 e	Elective II: Architecture and Town Planning	<p>CO1: Apply the principles of architectural planning and landscaping for improving quality of life</p> <p>CO2: Understand the confronting issues of the area and apply the acts.</p> <p>CO3: Evaluate and defend the proposals.</p> <p>CO4: Appraise the existing condition and to develop the area for betterment.</p>
301015 f	Elective II: Solid Waste Management	<p>CO1. Outline solid waste management systems with respect to its generation rate (quantity), sampling, characteristics and regulatory/legal requirements.</p> <p>CO2. Explain and suggest relevant method of storage, collection and transportation of solid waste for the given site condition with justification.</p> <p>CO3. Develop understanding of technological applications for processing and material recovery from solid waste with its economics and design composting system for organic waste.</p> <p>CO4. Describe the fundamental and technological aspects of waste to energy systems from solid waste and to design anaerobic digester and incineration system.</p> <p>CO5. Outline the design, operation, and maintenance of sanitary landfill and management of legacy waste.</p> <p>CO6. Explain the functional element for management of special</p>

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301015 f	Elective II: Solid Waste Management	waste and suggest the relevant method of reuse and recycling for the given type of waste in the given situation.
301016	Internship	CO1. To develop professional competence through industry internship CO2. To apply academic knowledge in a personal and professional environment CO3. To build the professional network and expose students to future employees CO4. Apply professional a societal ethics in their day to day life CO5. To become a responsible professional having social, economic and administrative considerations CO6. To make own career goals and personal aspirations
301021 a	Audit Course II: Leadership and Personality Development	CO1. Enhanced holistic development of students and improve their employability skills
301021 b	Audit Course II: Industrial Safety	CO1. Analyze the safety problem with its solution