Bhujbal Knowledge City, Adgaon, Nashik
MET's Institute of Engineering
Department of Civil Engineering

List Course Outcomes (2019 Pattern)

Academic Year:-2025-26

- **Note: Patterns referred to create this document are:**

A. For FE Civil Engineering (Semester-I,II): 2019 Pattern

B. For SE Civil Engineering (Semester-III,IV): 2019 Pattern

C. For TE Civil Engineering (Semester-V,VI): 2019 Pattern

D. For BE Civil Engineering (Semester-VII,VIII): 2019 Pattern

Course Outcomes

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Department of Civil Engineering		
FE, Sem-I,II		
FE Civil Course-2019	**COs**	**Course Outcomes**
101011 Engineering Mechanics	**101011-CO 1**	Determine resultant of various force systems
	101011-CO 2	Determine centroid, moment of inertia and solve problems related to friction
	101011-CO 3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
	101011-CO 4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
	101011-CO 5	Calculate position, velocity and acceleration of particle using principles of kinematics
	101011-CO 6	Calculate position, velocity and acceleration of particle using principles of kinetics and
FE,Sem-II		
FE Civil Course-2019	**COs**	**Course Outcomes**
110013 Project Based Learning§	**110013-CO 1**	Project based learning will increase their capacity and learning through shared cognition.
	110013-CO 2	Students able to draw on lessons from several disciplines and apply them in practical way
	110013-CO 3	Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

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SE, Sem- III		
SE Civil, Course-2019	**COs**	**Course Outcomes**
201001 Building Technology and Architectural Planning	**201001-CO 1**	Identify types of building and basic requirements of building components.
	201001-CO 2	Make use of Architectural Principles and Building byelaws for building construction.
	201001-CO 3	Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.
	201001-CO 4	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
	201001-CO 5	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
	201001-CO 6	Understand different services and safety aspects
201002 Mechanics of Structures	**201002-CO 1**	Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures.
	201002-CO 2	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
	201002-CO 3	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
	201002-CO 4	Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains.
	201002-CO 5	Analyze axially loaded and eccentrically loaded column.
	201002-CO 6	Determine the slopes and deflection of determinate beams and trusses.
201003 : Fluid Mechanics	201003-**CO1**	Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
	201003-**CO2**	Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow

	201003-**CO3**	Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
	201003-**CO4**	Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
	201003-**CO5**	Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section.
	201003-**CO6**	Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body.

207001 **Engineering Mathematics III**	**207001-CO 1**	Solve Higher order linear differential equations and its applications to modelling and analysing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
	207001-CO 2	Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems.
	207001-CO 3	Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
	207001-CO 4	Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems.
	207001-CO 5	Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.
207003 **Engineering Geology**	**207003-CO 01**	Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions.
	207003-CO 02	Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
	207003-CO 03	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
	207003-CO 04	Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects.
	207003-CO 05	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
	207003-CO 06	Explain geological hazards and importance of ground water and uses of common building stones.

201007 Awareness to Civil Engineering Practices	**201007-CO 01**	Describe functioning/working of different types of industries/sectors in Civil Engineering.
	201007-CO 02	Describe drawings and documents required and used in different Civil Engineering works
	201007-CO 03	Understand the importance of Code of Ethics to be practiced by a Civil Engineer and also understand the duties and responsibilities as a Civil Engineer.
	201007-CO 04	Understand different health and safety practices on the site.
SE Sem- IV		
SE Civil, Course-2019	**COs**	**Course Outcomes**
201008 Geotechnical Engineering	**201008-CO 1**	Identify and classify the soil based on the index properties and its formation process
	201008-CO 2	Explain permeability and seepage analysis of soil by construction of flow net.
	201008-CO 3	Illustrate the effect of compaction on soil and understand the basics of stress distribution.
	201008-CO 4	Express shear strength of soil and its measurement under various drainage conditions.
	201008-CO 5	Evaluate the earth pressure due to backfill on retaining structures by using different theories.
	201008-CO 6	Analysis of stability of slopes for different types of soils.

201009 Surveying	**201009-CO 1**	Define and Explain basics of plane surveying and differentiate the instruments used for it.
	201009-CO 2	Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
	201009-CO 3	Describe different methods of surveying and find relative positions of points on the surface of earth.
	201009-CO 4	Execute curve setting for civil engineering projects such as roads, railways etc.
	201009-CO 5	Articulate advancements in surveying such as space based positioning systems
	201009-CO 6	Differentiate map and aerial photographs, also interpret aerial photographs.
	201010-CO 1	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.

201010 Concrete Technology	**201010-CO 2**	Able to check the properties of concrete in fresh and hardened state.
	201010-CO 3	Get acquainted to concreting equipments, techniques and different types of special concrete.
	201010-CO 4	Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.
201011: Structural Analysis	**201011-CO 1**	Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
	201011-CO 2	Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
	201011-CO 3	Implement application of the slope deflection method to beams and portal frames.
	201011-CO 4	Analyze beams and portal frames using moment distribution method.
	201011-CO 5	Determine response of beams and portal frames using structure approach of stiffness matrix method.
	201011-CO 6	Apply the concepts of plastic analysis in the analysis of steel structures.
201012 Project Management	**201012-CO 1**	Describe project life cycle and the domains of Project Management.
	201012-CO 2	Explain networking methods and their applications in planning and management
	201012-CO 3	Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
	201012-CO 4	Demonstrates resource allocation techniques and apply it for manpower planning.
	201012-CO 5	Understand economical terms and different laws associated with project management
	201012-CO 6	Apply the methods of project selection and recommend the best economical project.

201017 Project Based Learning	**201017-CO 1**	Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service.
	201017-CO 2	Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/project.
	201017-CO 3	Create, work in team and applying the solution in practical way to specific problem.

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Department of Civil Engineering

Course Outcomes

TE, Sem-V

Hydrology and Water Resource Engineering 301001	**301001 CO1**	Understand government organizations, apply & analyze precipitation & its abstractions
	301001 CO2	Understand, apply & analyze runoff, runoff hydrographs and gauging of streams.
	301001 CO3	Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
	301001 CO4	Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics
	301001 CO5	Understand water logging & water management, apply & analyze ground water hydrology
	301001 CO6	Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement.
Water Supply Engineering 301002	**301002 CO1**	Define identify, describe reliability of water sources, estimate water requirement for various sectors
	301002 CO2	Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
	301002 CO3	Design various components of water treatment plant and distribution system.
	301002 CO4	Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants
	301002 CO5	Design elevated service reservoir capacity and understand the rainwater harvesting.
	301002 CO6	Understand the requirement of water treatment plant for infrastructure and Government scheme.
Design of Steel Structures	**301003 CO1**	Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.

301003	**301003 CO2**	Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening
	301003 CO3	Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
	301003 CO4	Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section.
	301003 CO5	Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.
	301003 CO6	Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.
Engineering Economics and Financial Management 301004	**301004 CO1**	Understand basics of construction economics
	301004 CO2	Develop an understanding of financial management in civil engineering projects.
	301004 CO3	Prepare and analyze the contract account.
	301004 CO4	Decide on right source of fund for construction projects
	301004 CO5	Understand working capital and its estimation for civil engineering projects.
	301004 CO6	Illustrate the importance of tax planning & understand role of financial regulatory bodies
Construction Management 301005 c	**301005 c CO1**	Understand the overview of construction sector.
	301005 c CO2	Illustrate construction scheduling, work study and work measurement.
	301005 c CO3	Acquaint various labor laws and financial aspects of construction projects.
	301005 c CO4	Explain elements of risk management and value engineering.
	301005 c CO5	State material and human resource management techniques in construction.
	301005 c CO6	Understand basics of artificial intelligence techniques in civil engineering.

TE, Sem-VI

TE Civil, Course-2019	COs	Course Outcomes

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Waste Water Engineering 301012	**301012 CO1**	Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
	301012 CO2	Design preliminary and primary unit operations in waste water treatment plant
	301012 CO3	Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
	301012 CO4	Understand and design suspended and attached growth wastewater treatment systems Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
	301012 CO5	Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
Design of Reinforced Concrete Structures 301013	**301013 CO1**	Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete.
	301013 CO2	Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections
	301013 CO3	Design & detailing of rectangular one way and two-way slab with different boundary conditions
	301013 CO4	Design & detailing of dog legged and open well staircase
	301013 CO5	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
	301013 CO6	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings
Remote Sensing and Geographic Information System 301014	**301014 CO1**	Articulate fundamentals and principles of RS techniques.
	301014 CO2	Demonstrate the knowledge of remote sensing and sensor characteristics.
	301014 CO3	Distinguish working of various spaces-based positioning systems.
	301014 CO4	Analyze the RS data and image processing to utilize in civil engineering
	301014 CO5	Explain fundamentals and applications of RS and GIS
	301014 CO6	Acquire skills of data processing and its applications using GIS
Advanced Engineering Geology with Rock Mechanics 301015 a	**301015 a CO1**	Illustrate seismic zones, plate tectonics and civil engineering significance of major rock formations of India with their characteristics.
	301015 a CO2	Explain soil profile, geo-hydrological characters of various rock formations and necessity of geological studies in water conservation
	301015 a CO3	Apply knowledge of geology in Infrastructural, Urban development and demonstrate importance of national wealth.
	301015 a CO4	Validate the suitability of rocks based on mechanical properties, R.Q.D. and geophysical exploration.
	301015 a CO5	Explore subsurface Geology for civil engineering projects to suggest foundation treatments for various geological defects and channel erosion.

	301015 a CO6	Illustrate the suitability of proposed alignments for tunnels and bridges on the basis of Geological investigations.
Architecture and Town Planning 301015 e	**301015 e CO1**	Apply the principles of architectural planning and landscaping for improving quality of life
	301015 e CO2	Understand the confronting issues of the area and apply the acts.
	301015 e CO3	Evaluate and defend the proposals
	301015 e CO4	Appraise the existing condition and to develop the area for betterment.

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BE, Sem-VII		
BE Civil, Course-2019	**COs**	**Course Outcomes**
Foundation Engineering 401001	**401001 CO1**	Perform subsurface investigations for foundations using different methods
	401001 CO2	Estimate the bearing capacity of shallow foundations.
	401001 CO3	Calculate immediate and primary consolidation settlement of shallow foundations
	401001 CO4	Decide the capacity of a pile and pile group.
	401001 CO5	Understand the steps in geotechnical design of shallow foundations and well foundations.
	401001 CO6	Analyze problems related to expansive soil and overcome them using design principles, construction techniques in black cotton soil.
Transportation Engineering 401002	**401002 CO1**	Understand principles and practices of transportation planning.
	401002 CO2	Demonstrate knowledge of traffic studies, analysis and their interpretation.
	401002 CO3	Design Geometric Elements of road pavement.
	401002 CO4	Evaluate properties of highway materials as a part of road pavement.
	401002 CO5	Appraise different types of pavements and their design.
	401002 CO6	Understand the fundamentals of Bridge Engineering and Railway Engineering
Coastal Engineering 401003 a	**401003 a CO1**	Understand basic of ocean waves including wave generation, classification, propagation, wave theories, wave diffraction, wave refection and wave breaking.
	401002 a CO2	Understand and apply short term and long-term wave analysis.

	401002 a CO3	Understand basic characteristics of tides, tide producing forces, dynamic theory of tides.
	401002 a CO4	Understand coastal process of erosion/accretion due to waves, bed forms, long shore transport (Littoral drift) and estimation of wave induced sediment quantity.
	401002 a CO5	Understand the coastal structures and shore protection methods.
	401002 a CO6	Understand coastal zone management activities, issues related to integrated coastal zone management and regulation of coastal zone.

Airport and Bridge Engineering **401004 d**	**401004 d CO1**	Understand the fundamental of airport.
	401004 d CO2	Understand and design the runway and taxiway and drainage systems.
	401004 d Co 3	Understand the BIM, AR and VR in airport planning and pavement design.
	401004 d CO4	Plan the lighting and marking of airport and heliport.
	401004 d Co 5	Estimate various components of bridge and loads on bridges.
	401004 d CO6	Study and design of bridge structures

BE,Sem-VIII		
BE Civil, Course-2019	**COs**	**Course Outcomes**
Dams and Hydraulics Structures 401011	**401011 CO1**	Understand types of dams and instrumentation working
	401011 CO2	Execute stability analysis of Gravity Dam
	401011 CO3	Understand types of spillways & Design of Ogee spillway

	401011 CO4	Illustrate the failures and analyze stability of earthen dam
	401011 CO5	Design Canals and understand the canal structures
	401011 CO6	Analysis of the Diversion headwork and Cross Drainage work
Quantity Surveying, Contracts and Tenders 401012	**401012 CO1**	Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
	401012 CO2	Describe tendering process, construction contracts, and aspects of Arbitration and prepare tender documents**.**
	401012 CO3	Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule
	401012 CO4	Apply engineering knowledge to prepare estimate for roads, culverts, and water tank (Elevated storage tank)
	401012 CO5	Apply concepts of specification to draft brief specification, detailed specification and prepare detailed rate analysis report.
	401012 CO6	Evaluate depreciation and valuation of property on the basis of present condition, specifications and market trend
Irrigation and Drainage 401013 c	**401013 c CO1**	Summarize types of irrigation methods.
	401013 c CO2	Estimate evapotranspiration and crop-water requirement.
	401013 c CO3	Understand component parts and their design considerations of lift irrigation system.
	401013 c CO4	Design drip and sprinkler irrigation systems
	401013 c CO5	Understand basics of salt affected soils and estimate leaching requirement.
	401013 c CO6	Design surface and subsurface drainage systems.
Green Structures and Smart Cities 401014 e	**401014 e CO1**	Students should be able to describe the importance of energy and minimization by altering the building materials.
	401014 e CO2	Students should be able to understand the importance green construction and green rating system
	401014 e CO3	Students should be able to introduce the applications of energy conservation and efficiency practices in buildings.
	401014 e CO4	Students should be able to understand phases and approval involved in smart city project.
	401014 e CO5	Students should be able to assess the national and global experience of smart cities.
	401014 e CO6	Students should be able to understand the importance of sustainable development and current protocol of sustainable development goals.