

# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal, MP)

## CIVIL ENGINEERING DEPARTMENT

### Flexible Scheme: Course Outcomes (COs)

The course outcomes of the courses of 2019 admitted batch from 1<sup>st</sup> year to 4<sup>th</sup> year of the undergraduate course of Civil Engineering Program are given below:

Courses	Course Outcome's	
<b>After the completion of this course, students will be able to:</b>		
100205: Basic Civil Engineering & Mechanics	CO1	<b>Explain</b> concepts and terminologies of building materials, surveying and mechanics
	CO2	<b>Apply</b> various methods for surveying and mechanics
	CO3	<b>Determine</b> the location, area and volume of objects on ground surface
	CO4	<b>Solve</b> the problems of surveying and mechanics by using various methods
	CO5	<b>Analyse</b> the effects of system of forces on rigid bodies in static conditions
<b>100205: Basic Civil Engineering &amp; Mechanics</b>		
100205: Basic Civil Engineering & Mechanics (P)	CO1	<b>Follow</b> the guidelines for field surveying.
	CO2	<b>Follow</b> the working principles of survey instruments for measurements.
	CO3	<b>Measure</b> the horizontal distances, difference in elevation and angles of various points
	CO4	<b>Detect</b> measurement errors and accordingly suggest corrections
	CO5	<b>Interpret</b> survey data and compute areas
<b>100205 (P) - Basic Civil Engineering And Mechanics Lab</b>		
110302: Building Planning & Design	CO1	<b>Explain</b> basics of building planning & design.
	CO2	<b>Illustrate</b> sustainability principle, by laws & characteristics of thermal and sound insulation in building planning & design.
	CO3	<b>Apply</b> sustainability concepts & principles in planning & design of buildings.
	CO4	<b>Evaluate</b> environmental, sustainable & safety aspects of a building.
	CO5	<b>Plan</b> different types of buildings as per by laws & codal provisions.
<b>110302: Building Planning &amp; Design</b>		

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<b>110303: Building Materials &amp; Construction</b>	<b>CO1</b>	<b>Explain</b> the basic elements of buildings, engg. materials & construction.
	<b>CO2</b>	<b>Evaluate</b> the properties of various materials like cement, aggregate, concrete, admixture, brick , stone etc.
	<b>CO3</b>	<b>Distinguish</b> the suitability of building materials in the construction of elements of buildings.
	<b>CO4</b>	<b>Evaluate</b> various types of concrete in building construction accordingly.
	<b>CO5</b>	<b>Apply</b> various techniques for finishing & protection works of various elements of building.
		<b>110303: Building Materials &amp; Construction</b>
<b>110303 (P): Building Materials &amp; Construction</b>	<b>CO1</b>	<b>Determine</b> the properties of cement, sand & aggregate as per IScode
	<b>CO2</b>	<b>Determine</b> the workability of concrete for suitability of concrete mix in different construction works
	<b>CO3</b>	<b>Evaluate</b> compressive strength of various concrete mixes
	<b>CO4</b>	<b>Determine</b> physical properties of brick by experiment and practice accordingly
	<b>CO5</b>	<b>Examine</b> the properties of the cement mortar for various elements of the buildings
		<b>110303 (P): Building Materials &amp; Construction</b>
<b>110304: Surveying</b>	<b>CO1</b>	<b>Explain</b> the techniques used for linear & angular measurements in surveying.
	<b>CO2</b>	<b>Analyse</b> different geodetic methods of survey such as triangulation, trigonometric levelling, tachometry, photographic & GIS.
	<b>CO3</b>	<b>Apply</b> methods in control surveys.
	<b>CO4</b>	<b>Apply</b> tachometry in traverse computations.
	<b>CO5</b>	<b>Apply</b> various methods for setting curves, area & volume computations.
		<b>110304: Surveying</b>
<b>110304 (P): Surveying</b>	<b>CO1</b>	<b>Follow</b> the guidelines for field surveying
	<b>CO2</b>	<b>Follow</b> the working principles of survey instruments for measurements
	<b>CO3</b>	<b>Measure</b> horizontal & vertical angle by theodolite for traversing and levelling

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	CO4	<b>Determine</b> tachometric constants for linear measurements by tacheometry
	CO5	<b>Create</b> a simple circular curve by using Rankine's method for alignment
		<b>110304 (P): Surveying</b>
<b>110305: Strength of Materials</b>	CO1	<b>Explain</b> the concepts of stress, strains, bending, deflection, buckling & torsion.
	CO2	<b>Explain</b> various theories for determining stress, buckling of columns & deflections of structures.
	CO3	<b>Apply</b> various theories for determining stress, buckling of columns & deflections of structures.
	CO4	<b>Evaluate</b> the stresses in bending, shear and torsion.
	CO5	<b>Analyze</b> various sections for stresses, strain, bending, torsion, buckling & deflections.
		<b>110305: Strength of Materials</b>
<b>110305(P): Strength of Materials</b>	CO1	<b>Evaluate</b> properties of material by impact test
	CO2	<b>Evaluate</b> properties of material by hardness test
	CO3	<b>Evaluate</b> properties of material by tensile test
	CO4	<b>Determine</b> compressive & flexural strength of materials
		<b>110305(P): Strength of Materials</b>
<b>110306: Software Lab</b>	CO1	<b>Attempt</b> to draw different components of a building
	CO2	<b>Produce</b> plan, elevation & section of various components of a residential and institutional building
	CO3	<b>Use</b> AutoCAD software in civil engineering drawing
	CO4	<b>Prepare</b> drawing sheets of various types of buildings like residential, institutional, commercial etc
		<b>110306: Software Lab</b>
<b>110307: Self Learning / Presentation</b>	CO1	<b>Analyze</b> contemporary issues in civil engineering & its allied areas through literature survey
	CO2	<b>Distinguish</b> state of art & relevance of the topic in national & international arena
	CO3	<b>Demonstrate</b> good oral & written communication skills
	CO4	<b>Develop</b> poster and power point presentations for effective communication
	CO5	<b>Display</b> lifelong learning
		<b>110307: Self Learning / Presentation</b>
<b>110308: Summer</b>	CO1	<b>Observe</b> various activities in field

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Internship Project - I	CO2	Examine the utility of general and specific equipments for construction
	CO3	Differentiate the construction projects individually and in team
	CO4	Develop the writing and communication skills for various engineering problems
	CO5	Adapt lifelong learning for benefit of society
<b>110308: Summer Internship Project - I</b>		
110402: Geotechnical Engineering	CO1	Evaluate different properties of soil, types of foundations and its classifications
	CO2	Examine flow and shear parameters & their effects on various types of soil
	CO3	Determine the stress distribution & shear strength parameter of soil by various methods
	CO4	Analyse the stability of slopes, earth pressures & retaining walls using analytical methods
	CO5	Evaluate suitable foundation system for various site conditions.
<b>110402: Geotechnical Engineering – I</b>		
110402 (P): Geotechnical Engineering	CO1	Check physical properties of soil
	CO2	Check strength properties of soil
	CO3	Differentiate the flow properties and stresses of soil
	CO4	Check shear strength of soil
<b>110402 (P): Geotechnical Engineering – I</b>		
110403: Fluid Mechanics – I	CO1	Define various fluid properties & states of fluid
	CO2	Apply principles of fluid flow & dimensional analysis
	CO3	Solve fluid flow problems
	CO4	Analyse characteristics of fluid at rest, fluid at motion & dimensionless numbers
	CO5	Discriminate different types of fluid flow, measurement techniques & principles
	CO6	Apply the concepts of laminar flow in solving various fluid flow problems
<b>110403: Fluid Mechanics – I</b>		
110403 (P): Fluid Mechanics – I	CO1	Differentiate between different flow measurement devices
	CO2	Notice flow through pipes & fall velocity of particle
	CO3	Correct the instrumental errors

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	CO4	Apply Stoke's law to calculate terminal velocity
		<b>110403 (P): Fluid Mechanics – I</b>
<b>110404: Structural Analysis</b>	CO1	Classify different type of structures based on support conditions
	CO2	Explain various methods & principles for analysis of structures
	CO3	Apply various methods & principles for structural analysis
	CO4	Analyse various structures using various methods, principles & theorems
	CO5	Evaluate different methods of structural analysis
		<b>110404: Structural Analysis</b>
<b>110406: Water Resources Engineering</b>	CO1	Analyse various requirements for an efficient irrigation project
	CO2	Design different components of irrigation system using different theories
	CO3	Plan an efficient, economical & safe irrigation system
	CO4	Explain the concept of hydrology and hydrograph
	CO5	Apply basic principles for measurement & forecasting of rainfall & runoff
	CO6	Analyse runoff hydrograph by various methods
		<b>110406: Water Resources Engineering</b>
<b>110407: Survey Practice Lab</b>	CO1	Observe topographical characteristics
	CO2	Differentiate methods to perform ground survey
	CO3	Prepare longitudinal & cross section profiles
	CO4	Develop contour map by using tachometer & total station
	CO5	Prepare the details of features using Plane table surveying
	CO6	Produce a simple circular curve by using Rankine's method for alignment
		<b>110407: Survey Practice Lab</b>
<b>110501: Estimating Costing &amp; Contracting</b>	CO1	Explain the fundamentals of quantity estimation, costing & contracting.
	CO2	Apply methods to estimate area, volume & cost.
	CO3	Evaluate mathematical & numerical models for rate & quantity estimation
	CO4	Determine rates & value
	CO5	Classify different rates of items, contracts & measurement techniques
		<b>110501: Estimating Costing &amp; Contracting</b>

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110502: Structural Design & Drawing (R.C.C.)	CO1	Apply the concepts of different design philosophies for deriving basic expressions used in RC design
	CO2	Determine the capacity of RC elements using IS456 guidelines.
	CO3	Analyze the RC elements for determining design variables as per IS456 & IS 875
	CO4	Design the RC elements as per IS 456 provisions.
	CO5	Develop the design sketches for RC elements as per IS456; IS13920 and SP34 provisions.
<b>110502: Structural Design &amp; Drawing (R.C.C.)</b>		
110503: Fluid Mechanics – II	CO1	Differentiate different types of fluid flow & fluid machinery.
	CO2	Describe principles of analysis of fluid flow problem.
	CO3	Explain basic principles for measurement of different forces acting on fluid body.
	CO4	Analyse pipe flow, open channel flow problems & various characteristics of hydraulic machines.
	CO5	Design open & closed conduit systems.
<b>110503: Fluid Mechanics – II</b>		
110503: Fluid Mechanics – II (P)	CO1	Differentiate between turbines & pumps
	CO2	Select the efficient turbines by studying the performance characteristics of various turbines
	CO3	Distinguish the performance characteristics of various pumps
<b>110503: Fluid Mechanics – II (P)</b>		
110505: Transportation Engineering	CO1	Explain the principles of highway planning & their geometrical design.
	CO2	Evaluate physical properties of suitable highway engineering materials with drainage provisions
	CO3	Apply the concepts of traffic engineering in transportation planning.
	CO4	Design pavements as per regulations.
	CO5	Formulate the layers of pavement along with provisions of its drainage & maintenance.
<b>110505: Transportation Engineering</b>		
110505: Transportation Engineering (P)	CO1	Select suitable aggregate material by testing the physical properties
	CO2	Determine properties of bitumen and its grade
	CO3	Determine CBR value of material for subgrade and subsequent layers of pavement.

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	CO4	<b>Design</b> job mix formula for bituminous surface using Marshal Stability test.
		<b>110505: Transportation Engineering (P)</b>
<b>110506: Minor Project – I</b>	CO1	<b>Recognize</b> various engineering problems and techniques to solvethem.
	CO2	<b>Reproduce</b> the solution of the problems upon the need of society.
	CO3	<b>Cooperate</b> to work within group.
	CO4	<b>Develop</b> the writing and communication skills for various engineering problems.
	CO5	<b>Display</b> lifelong learning.
		<b>110506: Minor Project – I</b>
<b>110507: Summer Internship Project - II</b>	CO1	<b>Develop</b> the writing and communication skills for various engineering problems.
	CO2	<b>Adapt</b> lifelong learning for benefit of society.
		<b>110507: Summer Internship Project - II</b>
<b>110508: Self Learning Presentation</b>	CO1	<b>Analyze</b> contemporary issues in civil engineering & its allied areas through literature survey
	CO2	<b>Distinguish</b> state of art & relevance of the topic in national & international arena
	CO3	<b>Demonstrate</b> good oral & written communication skills
	CO4	<b>Develop</b> poster and power point presentations for effective communication
	CO5	<b>Display</b> lifelong learning
		<b>110508: Self Learning Presentation</b>
<b>110509: Environmental Engineering</b>	CO1	<b>Explain</b> the concepts of water supply and waste water engineering.
	CO2	<b>Determine</b> the requirements for safe supply of water and safe disposal of sewage.
	CO3	<b>Apply</b> suitable techniques for water & waste water treatment.
	CO4	<b>Analyse</b> a given water supply scheme and a given sewerage system.
	CO5	<b>Design</b> a water supply system based upon the needs of societyand sewage system for safe disposal of sewage.
		<b>110509: Environmental Engineering</b>
<b>110509: Environmental</b>	CO1	<b>Follow</b> sampling procedure & other guidelines for sampling & analysis of water and wastewater samples.

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Engineering (P)	CO2	Check various water and waste water quality parameters.
	CO3	Improve the water and waste water quality by suggesting suitable corrective measures.
	CO4	Train others on various ways of improving the quality of water and waste water.
<b>110509: Environmental Engineering (P)</b>		
110602: Structural Design & Drawing (Steel)	CO1	Explain the principles of steel structural design using relevant IS Codes
	CO2	Evaluate structural behaviour of different steel structural elements
	CO3	Analyse a given section of steel structural element using IS codes
	CO4	Design different elements of steel structure under various loading conditions using relevant IS codes
	CO5	Design a structure/ component to meet desired needs within realistic constraints such as economy, safety, viable construction & its sustainability as per codal provisions
<b>110602: Structural Design &amp; Drawing (Steel)</b>		
110607: Minor Project – II	CO1	Recognize various engineering problems and techniques to solve them
	CO2	Reproduce the solution of the problems upon the need of society
	CO3	Cooperate to work within group
	CO4	Develop the writing and communication skills for various engineering problems
	CO5	Display lifelong learning
<b>110607: Minor Project – II</b>		
100007: Disaster Management	CO1	Identify disaster prevention and mitigation approaches.
	CO2	Classify global and national disasters, their trends and profiles.
	CO3	Determine the impacts of various disasters.
	CO4	Apply Disaster Risk Reduction in management.
	CO5	Infer the linkage between disasters, environment and development.
<b>100007: Disaster Management</b>		
110612: Solid Waste Management	CO1	Explain the principles & concepts of waste management.
	CO2	Apply various techniques in collecting the waste.
	CO3	Apply various techniques of reducing the waste.
	CO4	Apply various techniques in disposal of waste.
	CO5	Plan an effective & efficient waste management system
<b>110612: Solid Waste Management</b>		



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<b>110613: Construction Planning &amp; Management</b>	CO1	<b>Explain</b> the concepts of construction planning & management process.
	CO2	<b>Describe</b> various techniques used in construction planning & management.
	CO3	<b>Apply</b> techniques of project planning & management.
	CO4	<b>Analyze</b> various problems of time & cost optimization using network techniques like CPM & PERT.
	CO5	<b>Plan</b> effectively for manpower & material management in a project along with suitable safety measures.
		<b>110613: Construction Planning &amp; Management</b>
<b>110614: Railways, Airport &amp; Tunnel Engineering</b>	CO1	<b>Explain</b> the elements of airport planning, bridges & tunnels.
	CO2	<b>Design</b> runway & taxiway system as per regulations.
	CO3	<b>Explain</b> various elements of railway tracks, signalling, yards, bridges & tunnels.
	CO4	<b>Illustrate</b> various gauge, signals, fasteners, turnouts, crossing etc.
	CO5	<b>Apply</b> construction methods of railway tunnels.
		<b>110614: Railways, Airport &amp; Tunnel Engineering</b>
<b>900120: Building Services &amp; Maintenance</b>	CO1	<b>Identify</b> various services required in a building.
	CO2	<b>Carry</b> out planning of fire fighting system for a building
	CO3	<b>Develop</b> a management strategy for maintenance of building services in a building
	CO4	<b>Design</b> a sustainable building services plan for a building.
		<b>900120: Building Services &amp; Maintenance</b>
<b>900121: Sustainable Materials &amp; Green Buildings</b>	CO1	<b>Apply</b> the concepts of sustainability in the context of building and conventional
	CO2	<b>Explain</b> the Concepts of VOC and indoor air quality
	CO3	<b>Apply</b> the concepts of embodied, Operational and Life Cycle Energy, Minimizing Energy consumption by optimal design, use of BIPV.
	CO4	<b>Apply</b> the guidelines of ECBC, LEED, GRIHA while planning a building.
	CO5	<b>Use</b> renewable energy sources in buildings.
		<b>900121: Sustainable Materials &amp; Green Buildings</b>
<b>110701- Software Application for Solving Civil Engineering Problems</b>	CO1	<b>Design</b> various beams, slabs & multi storey building's using various software's.
	CO2	<b>Design</b> water supply & sewer networks using various software's.
	CO3	<b>Practice</b> MS Excel in estimation works.
	CO4	<b>Produce</b> land use land cover maps and geo contour maps using various software's.
	CO5	<b>Practice</b> Primavera and MS-Project software's.
		<b>110701: Software Application for Solving Civil Engineering Problems</b>

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110702 - Summer Internship Project – III	CO1	Observe various activities of civil construction works.
	CO2	Examine the utility of general and specific equipments for construction.
	CO3	Differentiate the construction projects individually and in team.
	CO4	Develop the writing and communication skills for various engineering problems.
	CO5	Adapt lifelong learning for benefit of society.
<b>110702 - Summer Internship Project – III</b>		
110703 - Creative Problem Solving	CO1	Identify various on field problems.
	CO2	Practice various methods to solve problems.
	CO3	Produce solutions to various problems.
	CO4	Demonstrate various problems solving skills.
<b>110703 - Creative Problem Solving</b>		
110713: Advanced Structural Design (RCC)	CO1	Explain the structural behaviour of water retaining structures; earth retaining structures; bridges and Prestressed concrete structures.
	CO2	Determine design forces in water retaining structures; earth retaining structures; highway bridges; and Prestressed sections.
	CO3	Analyse the water retaining structures; earth retaining structures; highway bridges and Prestressed sections for realistic loadings.
	CO4	Design economic and safe water retaining structures; earth retaining structures; highway bridges and Prestressed sections as per Codal provisions.
<b>110713: Advanced Structural Design (RCC)</b>		
110714: Hydraulic Structure	CO1	Identify different components of hydro project.
	CO2	Explain basic principles of designing hydropower plant & cross drainage works.
	CO3	Solve problems of dam analysis, energy dissipators & cross drainage works.
	CO4	Evaluate suitability of types of hydraulic structures.
	CO5	Design various elements of hydraulic structures.
<b>110714: Hydraulic Structure</b>		
110715-Advanced Structural Analysis	CO1	Determine response of structures by classical methods
	CO2	Use approximate methods for analysis of statically indeterminate structures
	CO3	Determine response of structures by matrix force method
	CO4	Evaluate and draw the influence lines for reactions, shears, and bending moments in beams and girders due to moving loads
	CO5	Model and analyze structural systems (building) with the aid of software's
<b>110715-Advanced Structural Analysis</b>		
100008: Intellectual Property rights (IPR)	CO1	Imbibe the knowledge of Intellectual Property and its protection through various laws
	CO2	Apply the knowledge of IPR for professional development
	CO3	Develop a platform for protection and compliance of Intellectual Property Rights & knowledge

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	CO4	Create awareness amidst academia and industry of IPR and Copyright compliance
	CO5	Deliver the purpose and function of IPR and patenting.
		<b>100008: Intellectual Property rights (IPR)</b>
900201- Integrated Waste Management for Smart City (OC - 2)	CO1	Explain the principles & concepts of waste management.
	CO2	Apply various techniques of handling the waste.
	CO3	Apply various techniques of energy recovery from waste.
	CO4	Plan an effective & efficient waste management system.
		<b>900201- Integrated Waste Management for Smart City (OC - 2)</b>
900202 - Project Planning & Control (OC - 2)	CO1	Know the project planning and project network.
	CO2	Analyze the network by CPM & PERT.
	CO3	Analyze the project using precedence network.
	CO4	Analyze the effect of resource planning on project.
	CO5	Evaluate the cost of project during planning.
		<b>900202 - Project Planning &amp; Control (OC - 2)</b>
900213 - Urban Planning & Transportation Systems (OC - 3)	CO1	Explain the concepts for planning a city and land-use patterns.
	CO2	Differentiate various theories used in urban planning.
	CO3	Analyse various requirements for transportation systems.
	CO4	Design approaches in addressing the issues and concerns of urban environment through planning.
	CO5	Plan strategies for any project with an urban planning perspective as a member and/or leader in a team of planning projects.
		<b>900213 - Urban Planning &amp; Transportation Systems (OC - 3)</b>
900226 - Safety & Quality Management (OC - 3)	CO1	Explain the quality management systems and utilize the ISO 9000 family of standards
	CO2	Improve the quality of the project through tools and techniques
	CO3	Perform the environmental impact assessment (EIA) for construction projects towards quality.
	CO4	Analyse the quality assurance and quality control, quality improvement tools and techniques;
	CO5	Evaluate the contract and inspection procedures.
	CO6	Identify the safety management practices in construction industry.
		<b>900226 - Safety &amp; Quality Management (OC - 3)</b>
110801: Internship/ Project	CO1	Observe various activities of civil engineering works.
	CO2	Recognize various engineering problems and techniques to solve them.
	CO3	Reproduce to solution of the problems upon the need of society.
	CO4	Develop the writing and communication skills for various engineering problems.
	CO5	Adapt lifelong learning for benefit of society.
		<b>110801: Internship/ Project</b>