



ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

SEMESTER V

Sr. No	Course Category	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
				L	T	P		Continual Assessment	End Sem Examination	Total
1	PCC	23CV501T	Geotechnical Engineering	3	-	-	3	30	70	100
2	PCC	23CV501P	Geotechnical Engineering Lab	-	-	2	1	25	25	50
3	PCC	23CV502T	Transportation Engineering	3	-	-	3	30	70	100
4	PCC	23CV502P	Transportation Engineering Lab	-	-	2	1	25	25	50
5	PCC	23CV503T	Reinforced Cement Concrete Structures	3	-	-	3	30	70	100
6	PCC	23CV503P	Reinforced Cement Concrete Structures Lab	-	-	4	2	50	50	100
7	PCC	23CV504T	Hydrology & Water Resources	3	-	-	3	30	70	100
8	OE	23CV561O	Open Elective - II	3	-	-	3	30	70	100
9	VSC	23CV505T	Technical Skill Development - II	2	-	-	2	50	-	50
10	SEC	23CV541P	Career Development - V	-	-	2	1	50	-	50
Total				17	-	10	22	350	450	800
11	MDM	23CV531M	Multidisciplinary Minor - III	3	-	-	3	30	70	100
Total				20	-	10	25	380	520	900

Open Elective - II

23CV561O	OE - II Green Buildings
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Multidisciplinary Minor - III

23CV531M	MDM - III Smart Construction Techniques
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		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean - Academics	Date of Release	Version	



ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV501T	Geotechnical Engineering	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To acquire knowledge for classifying the soil based on index and engineering properties. 2. To recognize the concepts of compaction, flow through soil, stress distribution, consolidation and shear strength of soils.	At the end of the course, the student will be able to 1. Identify various types of soils and their properties. 2. Explain the flow through soil and its effect for engineering solution. 3. Analyze the stress distribution of soil under various loading conditions and Apply the principles of soil mechanics in order to find Compaction Characteristics. 4. Estimate magnitude and rate of settlement of soil. 5. Evaluate the shear strength of soil.

Unit I	[10 Hrs]
Introduction: Formation of soil, Three Phase diagram and functional relationship, Soil structure, Index properties.	
Unit II	[8 Hrs]
Permeability & Seepage: Permeability: Darcy's law, Factors affecting permeability, Laboratory determination of coefficient of permeability, Permeability of layered systems. Seepage: Total, neutral and effective stresses, Capillarity, Characteristics of Flow nets.	
Unit III	[9 Hrs]
Stress Distribution & Compaction: Stress Distribution: Boussinesq's and Westergaard's theories (Vertical & Tangential Stresses): point loads & uniformly distributed loads, Newmark's influence chart. Compaction: Mechanism of compaction, factors affecting compaction, Laboratory Compaction Tests, field compaction equipment.	
Unit IV	[9 Hrs]
Consolidation: Compression of laterally confined soil, Terzaghi's 1-D consolidation theory, Determination of coefficient of consolidation, Degree of consolidation. Determination of pre-consolidation pressure, Settlement, Rate of settlement	
Unit V	[9 Hrs]
Shear Strength of Soils: Importance of shear strength, Shear Parameters, Mohr's circle, Mohr Coulomb's Failure theories, Laboratory tests for determination of shear strength – Direct shear test, Tri-axial compression test (UU, CU and CD), Unconfined compression tests, Vane shear test. Sensitivity & thixotropy of clay.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Soil Mechanics & Foundations	B. C. Punmia	18 th	Laxmi Publications
2	Geotechnical Engineering	Debashis Moitra	-	Universities Press
3	Soil Mechanics & Foundation Engineering	K. R. Arora	-	Standard publication

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Principles of Geotechnical Engineering	Braja M Das	2 nd	Cengage Publications
2	Soil Mechanics and Foundation Engineering	V.N.S. Murty	Reprint 2022	CBS Publishers & Distributors

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV501P	Geotechnical Engineering Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
	At the end of the course, the student will be able to 1. Demonstrate tests related to index properties of soils. 2. Demonstrate tests related to engineering properties of soils.

Minimum EIGHT experiments to be performed from the list as below

Expt. No.	Title of the experiment
1	Determination of water content of given soil sample by oven drying method as per IS 2720 (Part- 13).
2	Determination of specific gravity of soil by pycnometer method as per IS 2720 (Part- 3).
3	Determination of grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- 4).
4	Determination of Plastic Limit & Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- 5).
5	Determination of Shrinkage Limit of given soil sample as per IS 2720 (Part- 6).
6	Determination of co-efficient of permeability of soil by constant head test / falling head test as per IS 2720 (Part- 17)
7	Determination of Maximum Dry Density (MDD) and Optimum Moisture Content (OMC) by standard proctor test of given soil sample as per IS 2720 (Part- 7).
8	Determination of field density and dry unit weight of soil in field by core cutter method as per IS 2720 (Part- 29).
9	Determination of field density and dry unit weight of soil in field by sand replacement method as per IS 2720 (Part- 28)
10	Determination of shear strength of soil by direct shear test as per IS 2720 (Part-13)
11	Determination of Unconfined compression test of given soil sample as per IS 2720 (Part-10)
12	Demonstration of Triaxial Compression Test as per IS 2720 (Part-11)

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV502T	Transportation Engineering	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none">To know about Highway, its classification and modern methods of transportation engineering.To understand the design of Highways based on traffic and geometrics.To learn about materials required for construction of Highways.To learn the basics of Bridge Engineering.	<ol style="list-style-type: none">Classify and plan of the highways and introduce to Intelligent Transportation System.Design the highway based on volume and speed data and Traffic Safety Audit.Design the highway based on geometric features.Understand the highway materials with their properties.Understand the various IRC loadings on bridge.

Unit I	[9 Hrs]
Highway Development & Planning: Principles of Highway planning, Road development in India Classification of roads. Highway Alignment: Requirements, Engineering Surveys. Current road projects in India; project preparation. Use of intelligent transportation system. Introduction to BRTS, Metro and other modern methods of transportation.	
Unit II	[9 Hrs]
Traffic Studies: Volume studies, speed studies, parking studies and accident studies. Traffic Safety : Causes and types of accidents, Urban traffic management, highway lighting, Traffic safety audit	
Unit III	[9 Hrs]
Highway Geometric Design: Cross Section elements, carriageways, camber, stopping & overtaking sight distances, Horizontal alignment- Curves, design of super elevation, widening, transition curves, vertical curves.	
Unit IV	[9 Hrs]
Highway Materials: Properties of sub grade and pavement component materials, Tests on sub grade soils, aggregates and bituminous materials. Highway Maintenance – Material recycling. Application of Geosynthetics.	
Unit V	[9 Hrs]
Bridge Engineering: Classification, identification and site selection. Flood discharge, waterways, scour depth, economic span. IRC classification of Loads, Forces, Stresses: IRC Specification & code of practices, Critical combinations.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Highway Engineering	S.K.Khanna, .E.G.Justo		Nem Chand & Bros
2	Principles and Practice of Highway Engineering	L.R.Kadiyali		Khanna Publishers
3	Bridge Engineering	Rangwala S. C.		Charotar Publications

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Principles of Transportation and Highway Engineering	RaoG.V.		Tata McGraw Hill
2	Bridge Engineering	S. Ponnuswami		Tata McGraw Hill

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV502P	Transportation Engineering Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
-	After completion of this course, students will be able to: <ol style="list-style-type: none">1. Perform the laboratory tests on natural and treated subgrade.2. Perform the laboratory tests on materials used for grade course.3. Perform the laboratory tests on materials used for surface and wearing course.4. Study the traffic volume, spot speed and prepare report.

Minimum TEN experiments to be performed from the list as below

Expt. No.	Title of the experiment
1	Determination of strength of subgrade by CBR test.
2	Determination of strength of treated subgrade by CBR test.
3	Classification of subgrade soil using AASHTO classification.
4	Determination of Aggregate Crushing Value.
5	Determination of Aggregate Impact Value.
6	Determination of Aggregate Abrasion value by Los Angeles Abrasion Testing method.
7	Determination of flakiness index and elongation index of aggregates.
8	Determination of water absorption value of the aggregates.
9	Determination of Bitumen Penetration Value by penetrometer.
10	Determination of Bitumen Ductility Value.
11	Determination of Softening Point of Bitumen.
12	Determination of Flash and Fire point of Bitumen.
13	Traffic Volume Study and prepare a report of analysis by representing the data in various formats.
14	Spot Speed Study and determination of various speed limits for a given section of road.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Highway Engineering	S.K.Khanna, .E.G.Justo		Nem Chand & Bros
2	Principles and Practice of Highway Engineering	L.R.Kadiyali		Khanna Publishers
3	Relevant IS Codes	Rangwala S. C.		Charotar Publications

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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B. Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV503T	Reinforced Cement Concrete Structures	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> To understand and apply working stress and limit state design philosophies. To design reinforced concrete beams, columns, slabs and footings. 	At the end of the course, students will be able to <ol style="list-style-type: none"> Understand the concept of working stress method for beams. Analyse and design of reinforced concrete beam with limit state approach. Design one way and two way slab. Design short and slender columns. Design isolated footings and staircase.

Unit I: Design of Beam (Working Stress Method)	[9Hrs]
Introduction, Assumptions, Basic concepts, design constants. Analysis and design of rectangular section. Balanced, under-reinforced and over-reinforced sections; Limitations of Working stress methods.	
Unit II: Design of Beam (Limit State Method)	[9Hrs]
Introduction to Limit state method, basic assumptions, design of reinforced rectangular, T and L shaped beams in flexure, shear and torsion.	
Unit III : Design of Slab (Limit State Method)	[9Hrs]
Design of one-way, two-way, cantilever and continuous slab.	
Unit IV: Design of Column (Limit State Method)	[9Hrs]
Design of short and slender columns for axial load and with uni-axial bending.	
Unit V : Design of Footing and Staircase	[9Hrs]
Types of footings; Design of isolated footing. Design of Staircase.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Design of Reinforced Concrete Structures	P. Dayaratnam		Oxford & IBH Pub., New.Delhi.
2	Reinforced Concrete-Limit State Design	A.K.Jain		Nem Chand & Bros., Roorkee
3	Reinforced Concrete Design	S.N.Sinha		TMH Pub.,N.Delhi
4	RCC Design	B.C Punamia and Ashok Kumar Jain		Laxmi Publications
5	Reinforced concrete	H J Shah	Vol. I & II	Charotar Publishing House Pvt. Ltd
6	Design of Reinforced Concrete Structure	N Subramanian		Oxford

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Reinforced Concrete	I.C.Syal & A,K,Goel		A.H,Wheeler &Co.Delhi
2	IS 456:2000, Plain and Reinforced concrete - code of practice.	BIS		BIS
3	SP 16 (1980): Design Aids for Reinforced Concrete to IS 456:1978	BIS		BIS

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV503P	Reinforced Cement Concrete Structures Lab	-	-	4	2	50	50	100

Course Objectives	Course Outcomes
To provide students with practical experience in understanding and applying the principles of reinforced concrete (RCC) design and construction, including analyzing stress and strain in structural elements, designing and detailing RC structures, and understanding code requirements.	At the end of course, students will be able to 1. Design and reinforcement detailing of structural components. 2. Apply integrated approach for structural design of building 3. Program in Excel for design of structural elements

Expt. No.	Title of the experiment
1	Analysis of rectangular Beam section by working stress method.
2	Analysis of rectangular Beam section by Limit State method.
3	Design and draw reinforcement detailing of Rectangular / T Beam / L Beam Section.
4	Design and draw reinforcement detailing of Short / slender Column.
5	Design and draw reinforcement detailing of One way / Two Way slab.
6	Design and draw reinforcement detailing of Cantilever slab.
7	Design and draw reinforcement detailing of isolated / combined footing.
8	Design and draw reinforcement detailing of staircase.
9	One Field Visit and Report writing.
10	Excel Programming for any of the design mentioned above.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Design of Reinforced Concrete Structures	P. Dayaratnam	-	Oxford & IBH Pub., New.Delhi.
2	Reinforced Concrete-Limit State Design	A.K.Jain	-	Nem Chand & Bros., Roorkee
3	Reinforced Concrete Design	S.N.Sinha	-	TMH Pub.,N.Delhi
4	RCC Design	B.C Punamia and Ashok Kumar Jain	-	Laxmi Publications
5	Reinforced concrete	H J Shah	Vol. I & II	Charotar Publishing House Pvt. Ltd
6	Design of Reinforced Concrete Structure	N Subramanian	-	Oxford

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Reinforced Concrete	I.C.Syal & A,K,Goel	-	A.H,Wheeler &Co.Delhi
2	IS 456:2000, Plain and Reinforced concrete - code of practice.	BIS	-	BIS
3	SP 16 (1980): Design Aids for Reinforced Concrete to IS 456:1978	BIS	-	BIS

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV504T	Hydrology & Water Resources	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
To describe the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth.	At the end of the course, the students will be able to- 1. Illustrate the concept of hydrological cycle and the function of precipitation 2. Explain basic terms like infiltration, evaporation and transpiration, and perform data analysis. 3. Summarize the concept of runoff from hydrograph analysis and predict the yield from a catchment. 4. Understand the importance of floods for their forecasting by rational and statistical methods. 5. Explain the presence of ground water for the availability of use for different purposes and predict the ground water recharge.

Unit I	[10 Hrs]
Introduction to Hydrology: definition importance and its applications in Engineering. Hydrological cycle, water budget, Data required for hydrological study & its sources. Precipitation: Definition, types of precipitation, various forms of precipitation, factors affecting precipitation, measurement of precipitation by non- recording and recording type of rain gauges, mass curve, selection of site for rain gauges, density and adequacy of rain gauge stations, optimum number of rain gauges, determination of missing rainfall data, methods of estimation of mean rainfall, test for consistency of rainfall record, mass curve of rainfall, Hyetograph; Depth-Area-Duration Relationship, Frequency of point rainfall.	
Unit II	[9 Hrs]
Infiltration: Definition, mechanism, factors affecting infiltration, measurement of infiltration, infiltration capacity, infiltration indices and its application. Evaporation: Definition, mechanism, factors affecting evaporation, estimation of evaporation Evapotranspiration: Definition, factors affecting Evapotranspiration, measurement, use of Blaney-Criddle and Thornthwaite formula.	
Unit III	[9 Hrs]
Runoff: Source and its components, factors affecting the runoff, basin parameters, estimation methods, classification of streams, measurement of discharge of streams by area-slope and area-velocity method; stage discharge relationship, yield of the river. Flow mass curve, determination of reservoir storage volume. Hydro-graphics: flood hydrology, definition, typical flood hydrograph and its components, baseflow and base flow separation, unit hydrograph, theory, S-curve and its use.	
Unit IV	[8 Hrs]
Floods: causes and effects, factors affecting peak flows and estimation of peak flows, low flow, basin flood, flood routing and flood forecasting Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, co-relation. Analysis of time series, frequency analysis.	
Unit V	[9 Hrs]
Geo-hydrology: Introduction, occurrence and distribution of ground water, water table and water table maps, aquifer, aquiclude, aquitard and aquifuge. Groundwater exploration, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Hydrology and Water Resource Engineering	S. K. Garg	-	Khanna Publishers
2	Hydrology and Water Resource Engineering	Subramaniam	-	Tata McGraw Hill publication
3	Water Power Engineering	B.C. Punmia	-	Laxmi Publication

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Water Resources systems	P R Bhave & Narosa	-	Publishing house, New Delhi.
2	Principles and Practice of Highway Engineering	S. Ponnuswami	-	Tata McGraw Hill

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean - Academics	Date of Release	Version	



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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV561O	OE-II (Green Building)	3	-	-	3	30	70	100
Course Objectives		Course Outcomes						
1. To describe the importance and necessity of green building. 2. To assess a building on the norms available for green building. 3. To suggest technologies to improve efficiency of green building. 4. To suggest different material for design of green building.		At the end of the course, students will be able to: 1. Describe the importance and necessity of green building. 2. Analyze the principles and elements of design of green building. 3. Describe the thermal performance of building sections. 4. Comprehend the qualitative input to site selection and green design of a building. 5. Comprehend properties of green building construction materials.						
Unit I		[9 Hrs]						
Green building: Introduction, History, Concept, Need in current scenario, Importance, Classification, Assessment methods (Global and Local), LEED, GRIHA								
Unit II		[9 Hrs]						
Principles and elements of design of green building, Climatic zones, design sequence, form, vegetation, Energy Conservation in Building and methods								
Unit III		[8 Hrs]						
Thermal comfort inside the building: Factors, Indices, Cooling and Heating requirements, Heat transmission through building sections, Thermal performance of building sections, U-value and Insulation thickness								
Unit IV		[10 Hrs]						
Sustainable Site: Site selection, General requirement, mandatory requirements, orientation Green Design: Sustainable and conservation practices – water conservation, harvesting and recharge – Traditional and Modern Methods sewerage treatment, solid waste treatment- Solid and Liquid Waste Management								
Unit V		[9 Hrs]						
Sustainable Building Materials- Traditional and Recycled Materials in context of Sustainability, importance, selection criteria Building Design: Placement of rooms, Calculation of building and property dimensions, Construction sequencing								

Text Books

S.N	Title	Authors	Edition	Publisher
1	Green Building: Principles and Practices in Residential Construction	Abe Kruger, Carl Seville	1 st edition	Delmar Cengage Learning
2	Sustainable Construction	Charles J. Kibert	5 th edition	Wiley Publications
3	Alternative Building Materials and Technologies	S Jagadeesh, B V Venkata	1 st edition	New Age International
4	Sustainable Building Design Manual – Volume I & II	TERI	1 st edition	Tata Energy Research Institute

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Green Building Fundamentals	G. Harihara Iyer	1 st edition	Notion Press
2	Understanding Green Building Guidelines	Traci Rose Rider	1 st edition	W. W. Norton & Co.
3	Green Buildings	Gevorkian	1 st edition	McGraw hill publication
4	Non-conventional Energy Resources	D S Chauhan and S K Sreevasthava	1 st edition	New Age International

		July 2025	1.0	Applicable for 2025-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV505T	Technical Skill Development - II	2	-	-	2	50	-	50

Course Objectives	Course Outcomes
	At the end of course students will be able to 1. Summarize the use of software available in civil engineering. 2. Modelling and analyze the multistoried building model(s) with the use of software.

Minimum EIGHT experiments to be performed from the list as below

Sr. No.	Topic
1	Introduction to software(s) such as STAAD, SAP, E-Tabs, etc.
2	Modelling and analysis of multistoried residential building with the use of any one of the software mentioned above.
3	One Micro Project.

		July 2025	1.0	Applicable for 2025-26
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B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

FIFTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
23CV531M	MDM - III Smart Construction Techniques	3	-	-	3	30	70	100
Course Objectives		Course Outcomes						
To equip students with the knowledge and skills to leverage technology for enhanced efficiency, safety, and sustainability in construction projects.		At the end of the course, students will be able to- 1. Understand the use of various conventional and smart construction materials 2. Understand and apply various equipment and machinery used in construction. 3. Understand and apply various subsurface construction techniques, from traditional methods to advanced trenchless technologies. 4. Examine new techniques used in construction, evaluation and safety methods adopted in construction industry. 5. Analyze current philosophy, technology, terminology, and practices used in building automation						
Unit I								[9 Hrs]
Conventional and Smart Construction Materials: Types of cement, mortar, Ready mix concrete (RMC), Types of concrete, Smart Construction Materials.								
Unit II								[9 Hrs]
Introduction to construction Equipments: Various construction Equipments with its Advantages, Disadvantages and its Uses.								
Unit III								[10 Hrs]
Sub Structure Construction : Box Jacking, pipe jacking, diaphragm walls types and methods, piling techniques, driving well and caisson, sheet piles, construction procedures and applications, cofferdam, Tunneling techniques, laying operations for built up offshore system, shoring for deep cutting, well points, dewatering and stand by plant equipment for underground open excavation, Trenchless Technology.								
Unit IV								[8 Hrs]
New Construction Techniques: Pre - Engineered Building and its Application & Advantages. Safety in Construction Operations: Introduction to various types of Hazards and its Safety measurement on construction site.								
Unit V								[9 Hrs]
Building Management System (BMS): Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system, architecture and components of BMS.								

Text Books

S.N	Title	Authors	Edition	Publisher
1	Concrete Technology	M.S.Shetty	6th	S. Chand & Company, Limited
2	Building Construction	S.C.Rangwala	32nd	Charotar Publishing House Pvt. Ltd.
3	Smart Buildings	Jim Sinopoli	2 nd (2010)	Heinemann imprint of Elsevier
4	Understanding Building Automation Systems (Direct Digital Control, Energy Management, Life Safety, Security, Access Control, Lighting, Building Management Programs)	Reinhold A. Carlson, Robert A. Di Giandomenico	1991	R.S. Means Company

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Construction Planning, Equipment and methods	Peurifoy	-	Tata McGraw Hill Publication

		July 2025	1.0	Applicable for 25-26
Chairman - BoS	Dean – Academics	Date of Release	Version	



ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.Tech. Scheme of Examination & Syllabus 2023-24

CIVIL ENGINEERING

2	Construction Technology	Sankar S.K. and Saraswati S.	-	Oxford University Press, New Delhi
3	Building Construction	Sushil Kumar	19th	Standard Publisher Distributors, New Delhi
4	Elements of Civil Engineering	S. S. Bhavikatti	-	Vikas Publishing House Pvt Limited
6	SP 70 (2001): Handbook on Construction Safety Practices	BIS	-	BIS

		July 2025	1.0	Applicable for 25-26
Chairman - BoS	Dean – Academics	Date of Release	Version	