NAAC Criterion-I

Curricular Aspects

Key Indicator -1.1 Curriculum Design and Development

Sub-Criteria -1.1.2

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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

Gola ka Mandir, Gwalior - 474005, Madhya Pradesh, India

MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE, GWALIOR – 474005

(A Govt. Aided UGC Autonomous& NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal)

CIVIL ENGINEERING DEPARTMENT

SEMESTER	2019-2023 BATCH		2020-2024 BATCH		Percentage Change
	COURSE CODE	COURSE NAME	COURSE CODE	COURSE NAME	
I	100101	Engineering Chemistry	100011	Engineering Mathematics-I	27.69
	100102	Engineering Mathematics-I	100012	Engineering Chemistry	
	100103	Technical English	100014	Engineering Graphics	
	100104	Basic Electrical & Electronics Engineering	100015	Energy, Environment, Ecology & Society	
	100105	Engineering Graphics	100016	Technical Language	
	100106	Manufacturing Practices	100017	Language Lab	
			100018	Engineering Graphics Lab	
II	100201	Engineering Physics	100020	Basic Civil Engineering & Mechanics	
	100202	Energy, Environment, Ecology & Society	110211	Building Planning & Design	
	100203	Basic Computer Engineering	100021	Basic Mechanical Engineering	
	100204	Basic Mechanical Engineering	100022	Basic Electrical & Electronics Engineering	
	100205	Basic Civil Engineering & Mechanics	100023	Basic Computer Engineering	
	100206	Language Lab. & Seminars	100024	Manufacturing Practices	
			100026	Basic Civil Engineering Lab	
III	100001	Engineering Mathematics-II	100025	Engineering Mathematics-II	
	110302	Building Planning & Design	110311	Building Materials & Construction	
	110303	Building Materials & Construction	110312	Fluid Mechanics - I	
	110304	Surveying	110313	Surveying	
	110305	Strength of Materials	110314	Strength of Materials	
	110306	Software Lab	110315	Survey Practice Lab	
	110307	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	110316	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	
	110308	Summer Internship Project–I	200XXX	Novel Engaging Course (Informal Learning)	
			110317	Summer Internship Project–I (Institute Level)	
			1000001	Indian Constitution & Traditional Knowledge	

IV	100003	Engineering Mathematics- III	100028	Engineering Mathematics- III
	110402	Geotechnical Engineering	110411	Geotechnical Engineering - I
	110403	Fluid Mechanics - I	110412	Theory of Structure - I
	110404	Structural Analysis	110413	Transportation Engineering
	110406	Water Resources Engineering	110414	Water Resources Engineering
	100004	Cyber Security	100009	Cyber Security
	110407	Survey Practice Lab	110415	Civil Drawing lab
	100002	Biology for Engineers	200XXX	Novel Engaging Course (Informal Learning)
			1000002	Biology for Engineers
V	110501	Estimating Costing & Contracting	110520	Data Science
	110502	Structural Design & Drawing (RCC)	110511	Water Supply Engineering
	110503	Fluid Mechanics - II	110512	Theory of Structure - II
	110509	Environmental Engineering	110513	Structural Design & Drawing (RCC)
	110505	Transportation Engineering	110514	Fluid Mechanics - II
	110506	Minor Project-I	110515	Minor Project-I
	110507	Summer Internship Project-II	110516	Self-learning/Presentation (SWAYAM/NPTEL/ MOOC)
	110508	Self-learning/Presentation (SWAYAM/NPTEL/MOOC)	200XXX	Novel Engaging Course (Informal Learning)
			110517	Summer Internship Project-II
			1000005	Project Management & Financing
			1000006	Disaster Management
VI	100005	Ethics, Economics, Entrepreneurship & Management	110620	Artificial Intelligence & Machine Learning
	110602	Structural Design & Drawing (Steel)	110621	Waste Water Engineering
	DE	110612 Solid Waste Management 110613 Construction Planning & Management 110614 Railway Airport & Tunnel Engineering	110622	Structural Design & Drawing (Steel)
	DE	110652 Geotechnical Engg - II (Foundation Engg) 110654 Concrete Technology 110655 Air Pollution & Control 110656 Disaster Recovery & Build Back Better	110623	Estimating Costing & Contracting

	OC	900120 Building Services & Maintenance 900121 Sustainable Materials & Green Buildings	DE	110661 Geotechnical Engg - II (Foundation Engg) 110662 Concrete Technology 110663 Air Pollution & Control
	100007	Disaster Management	OC	910111 Building Services & Maintenance 910110 Sustainable Materials & Green Buildings
	110607	Minor Project-II	110624	Minor Project-II
	100006	Indian Constitution & Traditional Knowledge	200XXX	Novel Engaging Course (Informal Learning)
			1000007	Intellectual Property Rights (IPR)
VII	DE	110713 Advanced Structural Design (RCC) 110714 Hydraulic Structure 110715 Advanced Structural Analysis	DE	110731 Advanced Structural Design (RCC) 110732 Hydraulic Structure 110733 Railway Airport & Tunnel Engineering
	DE	110754 Wastewater Treatment & Recycling 110757 Principles of Construction Management 110758 Advanced Geomatics Engineering	DE	110761 Wastewater Treatment & Recycling 110762 Principles of Construction Management 110763 Advanced Geomatics Engineering
	OC	900201 Integrated Waste Management for Smart City 900202 Project Planning & Control	OC	910201 Integrated Waste Management for Smart City 910202 Project Planning & Control
	OC	900213 Urban Planning & Transportation Systems 900226 Safety & Quality Management	OC	910213 Urban Planning & Transportation Systems 910226 Safety & Quality Management
	100008	Intellectual Property Rights (IPR)	110721	Problems
	110701	Problems	110722	Creative Problem Solving
	110702	Summer Internship Project-III	110723	Summer Internship Project-III
	110703	Creative Problem Solving	1000008	Universal Human Values & Professional Ethics
VIII	DE	110851 Safety in Construction 110856 Rock Engineering 110857 Strategies for Sustainable Design	DE	110861 Safety in Construction 110862 Rock Engineering 110863 Strategies for Sustainable Design
	OC	900614 Natural Hazards 900634 Safety in Construction 900635 Geographic Information Systems	OC	910614 Natural Hazards 910634 Safety in Construction 910635 Geographic Information Systems
	110801	Internship/Project	110811	Internship/Project
	110802	Professional Development	110812	Professional Development

Course Code: 110411
Course Name: Geotechnical Engineering - I

L	T	P	Credit
2	1	2	4

Course Objectives:

1) The students will get the basic knowledge about natural material like rocks and get acquainted with natural dynamic processes and their actions.
2) The students will know the significance of geological investigations for civil engineering projects and site selection.
3) To inculcate the basic knowledge of soil such as its identification and classification, determination of various engineering properties and its suitability as a foundation/subgrade material.
4) To develop an understanding of the relationships between physical characteristics and mechanical properties of soils by experimentally measuring them.
5) To explain role of water in soil behavior and how soil stresses, permeability and quantity of seepage including flow net are estimated.
6) To determine shear parameters and stress changes in soil due to foundation loads & estimate the magnitude and time-rate of settlement due to consolidation.
7) To apply the principles of soil mechanics in stability analysis of slopes and settlement calculations.

Syllabus:

Unit-I Engineering geology & soil properties

Introduction to geology, mineralogy, petrology – Three-fold classification of rocks and their characteristic features. Structural geology - Types and classification of structures (Joints, Unconformities, Folds and faults) and their effect on civil engineering projects.

Introduction – Types of soils, their formation & deposition, basic definitions and relationships - Three phase system. Index properties of soil and their determination. Relationship between volume weight, void ratio-moisture content, moisture content-specific gravity, and unit weight- air voids etc.

Plasticity Characteristics of soil & indices and their determination, use of consistency limits, Classification of soil based on particle size and consistency limits, unified soil classification systems, Indian standard soil classification system, general characteristics of soil in different groups.

Unit-II Soil Water and Consolidation:

Permeability of soil: Darcy law and its validity, Determination of permeability in laboratory and in field using various methods like constant head method, pumping tests etc. factors affecting permeability of soil, Seepage analysis – introduction, stream & potential functions, flow nets, uses of a flow net, Introduction to effective, neutral and total stresses, effect of water table, fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

Consolidation – Introduction, Compressibility and consolidation, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's Theory of consolidation, final settlement of soil deposits, Determination of consolidation settlement and secondary consolidation.

Unit-III Stress Distribution in Soils:

Stresses in soil – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area, influence factors, isobars, Boussinesq's equation, westergaard's analysis. Newmark's influence chart. Contract pressure under rigid & flexible area, computation of displacements from elastic theory.

Unit – IV Shear Strength of Soils:

Mohr Circle and its characteristics, principal planes, relation between major and minor principal stresses. Mohr–

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Coulomb's theory, types of shear tests, direct shear test, merits of direct shear test, Triaxial compression test, test behaviour of UU, CU and CD tests, pore-pressure measurements, computation of effective shear strength parameters, unconfined compression test, vane shear test, critical void ratio, Liquefaction.

Unit – V Stability of Slopes:

Introduction, Types of slopes and their failure mechanisms, factor of safety, analysis of Infinite and finite slopes, wedge failure, Swedish circle method, friction circle method, stability numbers and charts. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Stability of Earth dams.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Evaluate different properties of rocks & soil and its classification.
CO2: Examine the flow and shear parameters & their effects on various types of soil.
CO3: Determine the stress distribution & shear failure by various methods.
CO4: Evaluate the shear strength parameter of soil by various methods.
CO5: Analyse the stability of slopes using various methods.

Text Books:

1. Soil Mech. & Found. Engg., Dr. K.R. Arora, Std. Publishers Delhi, 7th Edition, 2014
2. Soil Mech. & Foundation, Dr. B.C. Punmia, Laxmi Publications, Delhi, 16th Edition, 2017
3. Soil Mech. & Found Engg., S.K. Garg, Khanna Publishers, Delhi, 1st Edition, 2003
4. Basic & Applied Soil Mechanics, Gopal Ranjan, New Age International Publishers, 2016
5. Parbin Singh., "Engineering and General Geology", S. K. Kataria and Sons, 2009

Reference Books:

1. Modern Geotech Engg. Dr. Aram Singh, IBT Publishers, Delhi, 8th Edition, 2016
2. Geotech Engg., C. Venkatramaiah, New Age International Publishers, 16th Edition, 2018
3. Soil Testing for Engg., T.W. Lambe, John Wiley & Sons. Inc. 1969
4. Bangar, K.M, Principles of Engineering Geology, Standard Publishers Distributors. 1995, New Delhi

List of Experiment's:

1. Moisture Content Determination. Oven Drying Method.
2. Grain Size Analysis – Mechanical Method.
3. Grain Size Analysis – Hydrometer Method.
4. Liquid Limit, Plastic Limit, Shrinkage Limit Tests.
5. In-Place Density tests – Core Cutter Method, Sand Replacement Method.
6. Specific Gravity Tests.
7. Permeability Tests, Variable Head Method.
8. Compaction Test.
9. Unconfined Compression Test.
10. Direct Shear Test.
11. Triaxial Shear Test (UU)
12. Vane Shear Test.
13. Plate Load Test (Demonstration)
14. Consolidation Test.

Upon completion of practical course, the students will be able to:

CO 1: Check physical properties of soil.
CO 2: Check strength properties of soil.
CO 3: Differentiate the flow properties and stresses of soil.
CO 4: Check shear strength of soil.