

**Government College of Engineering, Aurangabad**  
**Department of Civil Engineering**  
**T.E. Civil**

**Proposed Scheme of Instruction and Evaluation (CBCS 2018-19 Onwards)**

Course Code	Course Title	Scheme of Teaching (hrs/week)				Scheme of Evaluation (Marks)						
		Th	T	Pr	Cr	Theory				TW	Pr/VV	Total
						CT-I	CT-II	TA	ESE			
<b>Semester-V</b>												
HS 3002	Engineering Economics	3	0	0	3	15	15	10	60	-	-	100
AM 3001	Design of Steel Structures	4	0	0	4	15	15	10	60	-	-	100
CE 3002	Transportation Engineering	4	0	0	4	15	15	10	60	-	-	100
CE 3003	Environmental Engineering	4	0	0	4	15	15	10	60	-	-	100
CE 3004	Geotechnical and Foundation Engineering	4	0	0	4	15	15	10	60	-	-	100
CE 3005	Lab-Transportation Engineering	0	0	2	1	-	-	-	-	25	25	50
CE 3006	Lab-Environmental Engineering	0	0	2	1	-	-	-	-	25	25	50
CE 3007	Lab-Geotechnical and Foundation Engineering	0	0	2	1	-	-	-	-	25	25	50
CE 3008	Open Elective-II (Disaster Management)	3	0	0	3	15	15	10	60	-	-	100
	<b>Total of Semester-V</b>	<b>22</b>	<b>0</b>	<b>6</b>	<b>25</b>	<b>90</b>	<b>90</b>	<b>60</b>	<b>360</b>	<b>75</b>	<b>75</b>	<b>750</b>
<b>Semester-VI</b>												
HS 3001	Constitution of India & Professional Ethics	3	0	0	3	15	15	10	60	-	-	100
AM 3009	Design of RCC structures	4	0	0	4	15	15	10	60	-	-	100
CE 3010	Water Resources Engineering	4	0	0	4	15	15	10	60	-	-	100
CE 3011	Engineering Geology	4	0	0	4	15	15	10	60	-	-	100
CE 3012	Lab-Water Resources Engineering	0	0	2	1	-	-	-	-	25	25	50
CE 3013	Lab-Engineering Geology	0	0	2	1	-	-	-	-	25	25	50
AM 3014	Lab-Structural Design and Drawing (Steel)	0	0	4	2	-	-	-	-	50	50	100
CE 3015	Seminar	0	0	2	1	-	-	-	-	25	25	50
CE 3016	Open Elective-III (Watershed Management)	3	0	0	3	15	15	10	60	-	-	100
	<b>Total of Semester-VI</b>	<b>17</b>	<b>0</b>	<b>10</b>	<b>23</b>	<b>75</b>	<b>75</b>	<b>50</b>	<b>300</b>	<b>125</b>	<b>125</b>	<b>750</b>
	<b>Grand Total T.E.</b>	<b>39</b>	<b>0</b>	<b>16</b>	<b>48</b>	<b>165</b>	<b>165</b>	<b>110</b>	<b>660</b>	<b>200</b>	<b>200</b>	<b>1500</b>

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## HS-3002: Engineering Economics

Teaching Scheme		Evaluation Scheme	
Theory	3 Hrs/Week	Class Test-I	15 Marks
Tutorial	-----	Class Test-II	15 Marks
Total Credits	3	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Pre-requisites** : Basic concepts of economics and mathematics

**Course Description** : This course is to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making. The content of the course is spread broadly into five units to cover all the aspects of economics related to civil engineer.

### Course Outcomes:

After successful completion of this course, the students will be able to:

1. Understand fundamental concepts of Economics, namely Micro and Macro Economics.
2. Apply the basic concepts of principle Cash flow using various Interest calculation Formulae
3. Understand the project planning with a specific view on project Financing.
4. Know decision making techniques based on financial guidelines.
5. Understand depreciation methods and replacement analysis

### Detailed Syllabus:

<b>Unit -1:</b>	<b>Introduction to Engineering Economy</b> Definition of Economics, Concept of Costs, Break Even Analysis, Law of Supply and Demand, Budget and budgetary provisions in Micro and Macro Economies, Economic Laws, their nature and trends, Relation between Science, Engineering, Technology and Economics.	<b>08 Hrs</b>
<b>Unit -2:</b>	<b>Methods of Economic Evaluation</b> Benefit - Cost ratio, Cash flow, Financial ratios, Discounted Cash flows, Sinking Fund, Single payment compound amount factor, Single payment present worth factor, Equal payment series, Equal payment series payment Present worth factor, Net Present Value,	<b>06 Hrs</b>
<b>Unit -3:</b>	<b>Cost engineering</b> Capital Cost, Operational costs, Estimation and Estimation Techniques, Approximate estimates, Unit estimate, Time Value of Money Concept.	<b>05 Hrs</b>
<b>Unit -4:</b>	<b>Financing of Projects</b> Introduction to Micro and Macro Economics, Financial statements – Profit and loss, Balance sheets, Working capital management, Sinking Fund Factor, Return on Investment	<b>06 Hrs</b>
<b>Unit -5:</b>	<b>Depreciation and Replacement Analysis</b> Depreciation - methods and calculation, Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis	<b>05Hrs</b>

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**REFERENCES:**

1. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, Latest Edn
2. Chopra P.N., "Principles of Economics", Kalyani Publishers, Latest Edn
3. Donald. G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, Latest Edn .
4. Degarmo, E.P., Sullivan, W.G and Canada, J.R, "Engineering Economy", Macmillan, New York, Latest Edn
5. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, Latest Edn.
6. Thuesen H. G. , Fabrycky W. J. , and G. J. Thuesen G. J., Engineering Economy, Prentice Hall International, Latest Edn
7. Paul E. De Garmo, and Canada, J. R. (1997), Engineering Economy, Prentice Hall. Latest Edn.

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	----	----	----	----	H	----	----	----	H	----
CO2	H	----	----	----	----	----	H	----	----	----	H	----
CO3	----	----	H	----	M	H	H	L	M	M	H	----
CO4	----	----	----	----	----	L	H	----	----	----	H	----
CO5	H	L	----	----	----	----	H	----	----	----	H	----

**H– High M – Medium L – Low**

**Teacher's Assessment:** Teachers Assessment of 10 marks is based on one of the / or combination of few of following

1. Technical quizzes
2. Application development
3. Question & answer / Numerical solution
4. Group discussion

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### AM 3001: Design of Steel Structures

Teaching Scheme		Evaluation Scheme	
Theory	4 Hrs/Week	Class Test-I	15 Marks
Tutorial	--	Class Test-II	15 Marks
Total Credits	4	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** AM-1001 Engineering Mechanics, AM-2001 Solid Mechanics, AM-2008 Structural Analysis

**Course Description:** To introduce the concept of structural design using steel sections. To expose the students to the basic principles of design philosophies used in steel design and make the students aware of the code provisions for design using steel members and the design procedures of various structural members

**Course Outcomes:** After successful completion of the course, students will be able to:

1. Interpret the provisions of IS 800-2007 for the design of steel structural elements.
2. Design steel structural members and joints using relevant codes and standards.
3. Complete detailing after the design of steel structural elements.
4. Associate the design concept with overall design of steel structures.

**Detailed Syllabus:**

<b>Unit -1:</b>	<p><b>A Introduction:</b> Types of structural steel used in general construction work, permissible stresses. Various Indian standard sections and their properties. Relevant IS specifications such as IS:800-2007, IS:808-1989, IS:875 part I to III, SP: 6(1), SP: 6(6), IS:4000-1992, codes for welded connections. Philosophy of limit state design for strength and serviceability, partial safety factor, load combinations, classification of cross section such as plastic, compact, semi-compact and slender.</p> <p><b>B Design of bolted and welded joint:</b> Design of bolted and welded joint, eccentric connections, framed connection.</p>	<b>8 Hrs</b>
<b>Unit -2:</b>	<p><b>Design of tension and compression members:</b> Assessment of dead load, live load and wind load, design of purlin, design of Tension and compression members of a truss, detailing of typical joints and supports. Types of tension member. Factors affecting strength of member, Limit strength due to yielding, rupture and block shear. Design of tension and compression member using single and double angle sections, connections of member with gusset plate by bolts and welds. Design of lug angle.</p>	<b>10 Hrs</b>

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<b>Unit -3:</b>	<b>A Design of column :</b> Buckling classification as per geometry of cross section, buckling curves, Design of column using rolled steel section. Design of built-up column, lacing and battening, connection of lacing/battening with main components by bolts and welds. <b>B Design of Column bases :</b> design of slab base and gusseted base under axial load.	<b>8 Hrs</b>
<b>Unit -4:</b>	<b>Design of Flexural member-</b> Laterally supported and unsupported beams using single rolled steel section with and without flange plate, strength in flexure, low and high shear, check for deflection. Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld.	<b>8 Hrs</b>
<b>Unit -5:</b>	<b>Design of Plate Girder:</b> Introduction to plate girder and design concept design of cross section, curtailment of flange plates, stiffeners and connections. Introduction of gantry girder	<b>6 Hrs</b>

#### References:

1. Subramanian N , “ Design of Steel Structure” Oxford University Press, New Delhi.
2. Duggal S.K , “. Limit state Design of steel structures by Limit State Method” as per IS: 800- 2007 Tata McGraw Hill Education Private limited New Delhi
3. Bhavikatti S S, “ Design of steel structure by Limit State Method” as per IS: 800- 2007, I K International Publishing House, New Delhi.
4. Shah V.L. & Gore, “Limit state design of Steel Structure” Structures Publication, Pune.
5. Teaching Resource Material by INSDAG.

#### Indian Standards:

1. IS 456-2000: Code of practice for plain and R. C. BIS, New Delhi.
2. I.S.800:2007, “Code for general construction in steel structures,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.
3. I.S.875 (part I to part V), “ Code Of Practice For. Design Loads,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.
4. I.S.226, “ Steel for general structural purposes,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.
5. I.S.808:1989, “Code for Classification of Hot Rolled Steel ,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.
6. I.S.226, “ Steel for general structural purposes,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.
7. I.S.808:1989, “Code for Classification of Hot Rolled Steel ,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.
8. I.S.816:1969, “ Code of practice for use of metal arc welding for general construction in mild steel,” Bureau of Indian Standards, Manak Bhavan, 9, Bhadur Shah Zafar Marg, New Delhi.

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**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	H	H	H									
CO2	H	H	H		M							
CO3	M	H	H		M							
CO4	H	H	H	M	L							

**H – High M – Medium L – Low**

**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Question & answer / Numerical solution

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## CE 3002 Transportation Engineering

Teaching Scheme		Evaluation Scheme	
Theory	4 Hrs/Week	Class Test – I	15 Marks
Tutorial	----	Class Test -II	15 Marks
Total Credits	4	Teachers Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisites: Not required**

**Course description:** This course introduces the elements of roads railways bridges, Airport, Docks and harbours and tunneling as modes of Transportation, Properties, Mixes of materials. Suitable ingredients for mix design of Material

**Course Outcomes:**

After successful completion, students will be able to:

1. Describe different terminologies related with road materials
2. Analyze pavement material parameters required for material mix design.
3. Describe appropriate pavements its suitability and its construction techniques- Flexible white topping and rigid pavement
4. Compute the trial sections of different types of roads

**Detailed Syllabus:**

Unit 1	<b>Classification of Bridges</b> Classifications of bridges, site selection, Bridge hydrology, economic span, Bridge foundations, loads on bridges, River training works, Role and importance of transportation, objectives of transportation system, transport policy, process and types of surveys, OD matrix, modal split analysis, transport networks, network flow analysis, urbanization and transport demand, motorization trends, grade separated interchanges such as flyovers, underpasses, overpasses,	6 Hours
Unit 2	<b>Geometric Design and Pavement</b> Road classifications, standards and hierarchies, Route location, design speed and the principles of geometric alignment, horizontal, vertical and coordinated alignment, structural design of flexible, rigid and composite pavements, road surfaces, skidding resistances and road safety, Road construction and maintenance methods and operations, road condition monitoring and rehabilitation options/methods, Highway Engineering surface features: Road markings, signing, furniture, lighting, International Highway Engineering: Highway Capacity Manual (HCM), geometric design (ASSHTO) and road maintenance (HDM), Case study.	6 Hours
Unit 3	<b>Traffic Engineering</b> Basic traffic theory, traffic studies, traffic volume count, traffic impacts, traffic analysis process, origin destination survey, speed and delay study, parking surveys, road network inventory, accident study - need,	6 Hours

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	design of survey proforma, methods of conducting surveys, analysis and interpretation, instrumentation of traffic monitoring.	
<b>Unit 4</b>	<b>Material Properties, Mix and Pavement Design</b> Properties of materials, quality control issues and tests, Material mix design by Marshall method, Design of Flexible and Rigid pavements , construction joints in rigid pavement and related issues, Pavement Failure: flexible pavement failure, rigid pavement failure, maintenance of different types of pavements, Strengthening of existing pavement: Objective of strengthening, types of overlay, different types of overlay, overlay design methodologies, effective thickness approach, design of overlays using effective thickness approach and deflection approach resorting to Benkelman Beam Method (IRC: 81-1981; IRC: 81-1997).Principles of economic evaluation and financing of a highway project	<b>6 Hours</b>
<b>Unit 5</b>	<b>Rail, Airport, Docks and Harbours</b> Railway Track and its components, fixtures and fasteners, Points and crossings, geometric design, station and yards. Airport authorities, Airport planning, Design and constructions of runways, orientation of runways, Types of docks and harbors, planning and construction aspects .Types of Tunnels, construction techniques.	<b>6 Hours</b>

#### REFERENCE BOOKS

1. Bindra and Arora ,Bridge Engineering
2. Srinivasan, Docks and harbor Charotar publishing house pvt ltd, Ananad Gujrat
3. S. K. Khanna and Just Highway Engineering Eighth Edition, Nem chand & Bros. Roorkee (U.P.)
4. Partha Chakroborty and Animesh Das Principles of Transportation Engineering
5. Ministry of Road Transportation &Highways Specification of road and bridges -2001 Govt. of India, New Delhi
6. G. Venkatappa Rao Principles of Transportation and Highway Engineering
7. Second Revision- IRC-37-2001 Guidance of Design of Flexible pavement,
8. IRC-58-2002 Guidance of Design of Rigid pavement, -

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2		H							L			
CO3			M		M	M						
CO4			M									M

**H- High      M – Medium      L – Low**

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**Teacher's Assessment:** Teachers Assessment of 10 marks is based on one or more of the following

1. Technical Quizzes on Material and pavements
2. Application Development
3. Question & answer / Numerical solution
4. Study of any one of different types of disasters and its management
5. Other if any -Power point presentation



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### CE 3003 : Environmental Engineering

Teaching Scheme		Evaluation Scheme	
Theory	4 Hrs/Week	Class Test-I	15 Marks
Tutorial	0 Hrs/Week	Class Test-II	15 Marks
Total Credits		Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** No prerequisite

**Course Description:**

This course introduces about water and wastewater quality, quantity and Supply system, identification of suitable method of treatment to be used for removal of impurities, design of conventional water and wastewater treatment plant and analyse water and wastewater distribution system

**Course Outcome:**

After successful completion, students will be able to:

1. Learn about water quality, quantity and Supply system
2. Identify suitable method of treatment to be used for removal of impurities
3. Design conventional water treatment plant
4. Analyse water distribution system

**Detailed Syllabus:**

<b>Unit -1</b>	Characteristics of water, physical, chemical and biological standards. Water quality standards as per IS10500: 2012, U.S.EPA and WHO. Quantity of water, rate of water consumption for various purposes, factors affecting, fire demand, Sources of water and their yield, population forecast, Principles of water treatment processes, Theory operation and design of aeration system, Solids separation: coagulation and flocculation theory, zeta potential and its significance, mean velocity gradient, "G" and power consumption, common coagulants, coagulant aids, principle of sedimentation, Design of settling tanks and clariflocculator, tube settlers.	<b>6Hrs</b>
<b>Unit -2</b>	Filtration: theory, Mechanism of filtration, slow and rapid gravity filter, under Drainage system, operation troubles, Back washing of filters, Design of filters, filter materials, multimedia filters. Disinfection, factors affecting disinfection, type of disinfectants, Theory and application of chlorine, break point chlorination, bleaching powder estimation, Ozone and ultra violet rays, Disinfection by products. Disposal of sludge and back wash waters of water treatment plant.  Softening, Chemical precipitation, ion exchange process, Regeneration process, Design aspects, Reverse Osmosis process, Electro dialysis, Ultra filtration Taste and odor Removal. Demineralization, Desalination of Water,	<b>6 Hrs</b>

	Removal of fluorides, color, taste and odors, dissolved metals, Dissolved gases CO <sub>2</sub> , O <sub>2</sub> , Cl <sub>2</sub> , etc. Removal of iron and manganese.	
<b>Unit -3</b>	<p>Sewage quantity: Collection and conveyance of sewage, sources of sewage, variations in sewage flow, Design of circular sanitary sewers. Sewer materials, choice of materials, testing of sewer pipes, sewer appurtenances.</p> <p>Characteristics of sewage: Physical, chemical and biological characteristics, Sampling, analysis of sewage for pH, Suspended Solid, Total Solids, COD, BOD, Chlorides and sulphates. Process flow diagram for sewage treatment.</p> <p>Stream sanitation: Self purification of natural streams, river classification as per MoEF, Govt. of India &amp; effluent discharge standards as per BIS2490, Oxygen Sag Curve, Streeter-Phelps equation and terminology (without derivation and numerical).</p> <p>Sewage treatment: Process flow diagram for sewage treatment, Theory and design of screen chamber, Grit Chamber and Primary sedimentation tank as per the Manual of CPHEEO.</p>	<b>6Hrs</b>
<b>Unit -4</b>	<p>Theory &amp; design of secondary treatment units: Introduction to unit process and unit operations for secondary treatment. Biological principle, important microorganisms in wastewater &amp; their importance in waste water treatment systems, bacterial growth, general growth pattern, growth in terms of bacterial numbers and bacterial mass. Kinetics</p> <p>Activated sludge process: Design of ASP, sludge volume index, sludge bulking &amp; control. Types of ASP. Trickling filter: Biological principle, different T.F media &amp; their characteristics, design of standard rate and high rate filters using NRC formula, single stage &amp; two stage filters, recirculation, ventilation, operational problems, control measures, theory of rotating biological contractors.</p> <p>Low cost treatment methods: Oxidation pond: Bacteria–algae symbiosis, design of oxidation pond as per the manual of CPHEEO, advantages &amp; disadvantages of oxidation ponds. Aerated lagoons: Principle, aeration method, advantages &amp; disadvantages of aerated lagoons. Introduction and theory of Phyto remediation technology for waste water treatment. Introduction and theory of root zone cleaning system</p>	<b>6Hrs</b>
<b>Unit -5</b>	<p>Pipe materials, corrosion, laying of pipes, distribution system planning of water supply projects. Water distribution systems and analysis; Appurtenances of water transport and distribution systems. O &amp; M of water treatment, plants, industrial water treatment, Survey of water treatment works, water Supply system, Data collection and feasibility of project. Design of water supply scheme project for a medium sized township (above 1 lakh population)</p>	<b>6Hrs</b>

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	<p>Theory &amp; design of an aerobic treatment units: Septic tanks, suitable conditions &amp; situations, biological principle, method of treatment &amp; disposal of septic tank effluent. Design of septic tank along with up flow filters and soak pit.</p> <p>Anaerobic digester: Principal of anaerobic digestion, stages of digestion, bio-gas production its characteristics &amp; application, factors governing anaerobic digestion, design of an aerobic digesters. Such as gravity thickener, sludge drying bed, decanters.</p> <p>Methods of sludge treatment and disposal, advantages &amp; disadvantages. Up-flow Anaerobic Sludge Blanket(UASB)Reactor-Principle, advantages &amp; disadvantages.</p>	
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**Reference Books:**

1. G.M. Fair, J.C. Geyer, D.A. Okan, Elements of Water Supply and Wastewater Disposal, John Wiley and Sons Inc., 1971.
2. M.J. Hammer, Water and Waste Water Technology, John Wiley and Sons, New York, 1986.
3. CPHEEO: Manual on water supply and treatment, Ministry of Urban Development, 1991.
4. B. C. Punmia, Ashok Jain, Arun Jain, "Water Supply Engg.", LP
5. Dr.A.G.Bhole, Design of Water Treatment Plants, Indian Water Works Association 6. S.K.Garg, Water Supply Engineering, Khanna Publishers
6. Environmental studies by Rajgopalan-Oxford University Press.
7. Waste Water Treatment & Disposal-Metcalf & Eddy-TMH publication.
8. Environmental Engg.- Peavy, Rowe-McGrawHill Publication.
9. Waste Water Treatment-Rao&Dutta.
10. Waste Water Engg.-B.C.Punmia & Ashok Jain- Arihant Publications.
11. Water Supply & Waste Water Engg.-B.S.N.Raju-TMH publication.
12. Sewage Disposal & Air Pollution Engg S.K.GargKhanna Publication.
13. Environmental Engg.-Davis-McGraw Hill Publication
14. Manual on sewerage and sewage treatment-Public Health Dept., Govt.of India.
15. I.S.3025 (all parts)
16. I.S.10500 :2012

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H	L		M				M		L	
CO2		M	M		M		L	M				
CO3		H	H		M		H	L	L			
CO4		M			M	M	M	L	L	M	L	
CO5					M			M	L	M	L	L

1 – High 2 – Medium 3 – Low

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**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Application development
3. Question & answer / Numerical solution
4. Group discussion
5. Other if any

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## CE 3004 : Geotechnical and Foundation Engineering

Teaching Scheme		Evaluation Scheme	
Theory	04 --Hrs/Week	Class Test-I	15 Marks
Tutorial	--	Class Test-II	15 Marks
Total Credits	<b>04</b>	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** Knowledge of CE-2002- Fluid mechanics and CE-3011- Engineering Geology.

**Course Description:** This course introduces the different terminologies in geotechnical engineering, soil classification methods, significance of permeability, seepage and shear strength parameters of soil, laboratory and field compaction methods, stability of slopes, general types of foundations.

### Course Outcomes:

After successful completion of the course, students will be able to:

1. Understand and apply basic soil mechanics principles to identify various properties of soil.
2. Characterize and classify soils.
3. Suggest suitable compaction methods.
4. Choose Type of foundation as per site conditions.

### Detailed Syllabus:

<b>Unit -1:</b>	Introduction to soil Mechanics, Soil problems in civil engineering, Major soil deposits of India, soil phase system, Particle size and shape, Soil minerals, Soil structures, Weight volume relationships, I.S. classification of soil.	<b>08 -- Hrs</b>
<b>Unit -2:</b>	Permeability and Seepage, Darcy's law, Factors affecting permeability, Laboratory methods for determination of coefficient of permeability, Pumping in and pumping out tests, Determination of average permeability of stratified soil deposits, Critical hydraulic gradient, Types of soil water, Seepage pressure and quick sand condition.	<b>08 -- Hrs</b>
<b>Unit -3:</b>	Shear Strength Parameters of soil, Mohr's envelopes for different types of soils, Pore pressure, total and effective stress, Sensitivity and thixotrophy, Stress in soils, Geostatic stresses, Boussinesq theory.	<b>08 -- Hrs</b>
<b>Unit -4:</b>	Soil compaction , Dry density and moisture content relationship, Zero air voids line, Standard proctor test and modified proctor test, Field compaction methods, Consolidation, Earth pressure theories, Stability of slopes, Classification and failure of slopes, Finite slope stability by Swedish circle method.	<b>08 -- Hrs</b>

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<b>Unit -5:</b>	Methods of exploration, Methods of boring, Introductory concepts of foundation, Location and depth of foundation, Choice of foundation type and preliminary selection, Bearing capacity, Proportioning of footings. Settlement of shallow foundations, Types of settlements, Causes and control of settlement.	<b>08 -- Hrs</b>
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**References:**

1. V.N.S.Murthy, "Soil Mechanics and Foundation Engineering", Vol. I, Saikrupa Technical Consultants, Bangalore.
2. Shashi K. Gulhati and Manoj Datta, "Geotechnical Engineering", Tata McGraw Hill Publication.
3. C. Venkatramaiah, "Geotechnical Engineering", New Age International Publication.
4. Dr. K. R. Arora , "Soil mechanics and foundation Engineering" , Standard publishers distributors, Delhi.
5. Relevant Indian Standard Specifications and Codes.

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	L	H	H	H	M	H	H	L		H		H
CO2		L		H		M	H			H		M
CO3	H	H	H	H		M	L					H
CO4		M		H	L	M						M

**1 – High 2 – Medium 3 – Low**

**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Question & answer / Numerical solution
3. Group discussion
4. Other if any

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## CE 3005 Laboratory - Transportation Engineering

Scheme of Teaching		Scheme of Evaluation	
Practical's	2 Hours /Week	Term Work	25 Marks
Total Credits	01	Practical Exam /Viva Voce	25 Marks

Prerequisites – Not Applicable

### Course Description

The course covers evaluation of properties of materials required for road construction, IRC specifications and guidelines

### Course Outcomes

After successful completion, students will be able to :

CO1	Sketches of bridges, roads, railways, airport, Docks and harbors
CO2	Choose the appropriate tests on material and perform the practical.
CO3	Prepare the material Mix design for pavement materials

### List of Experiments

Preform any six experiments.

Sr. No.	Details
1	Different Tests on Aggregates Gradation ,Impact Value, crushing strength, Sp.Gravity, Water absorption, Abrasion Value, Soundness , Flakiness and Elongation etc
2	Different Tests on Bitumen Ductility, Penetration, Softening Point ,Viscosity, Fire and Flash Point, Sp. Gravity, Stripping Value etc
3	Material mix design for flexible pavement
4	Material mix design for Rigid pavement
5	Marshal stability Method
6	Benkelman Beam Method for deformations of pavements
7	Laboratory and Field C.B.R. Methods
8	Design of flexible Pavement
9	Design of flexible Pavement
10	A report based on site visit to any Road or Bridge project during the academic term

  
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**Term Work – To write the journal based on conducting the practicals in the Laboratory**

**Practical Examination/Viva Voce Examination**

**In case of Practical /Oral examination across the table , panel of examiners shall evaluate the understanding /knowledge of the students by asking appropriate questions /asking students to perform /demonstrate the experiments based on syllabus**

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		L									L
CO2		M	H		L							M
CO3		M	H									M
CO4			H			M						M

**H-High M – Medium L - Low**

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## CE 3006: Laboratory- Environmental Engineering

Scheme of Teaching		Scheme of Evaluation	
Practical	2 Hrs/Week	Term Work	25 Marks
Total Credits	1	Practical Examination/Viva Voce	25 Marks
		Total Marks	50 Marks

**Prerequisite: “ Not Applicable”**

### **Course Description:**

This course introduces about characteristics of water and sewage, function of various units of water and sewage treatment plant, identification of suitable method of treatment to be used for removal of impurities, design of conventional water and wastewater treatment plant and analyse water and wastewater distribution system

### **Course Outcomes:**

After successful completion, students will be able to:

1. Perform the experiments to determine characteristics of water and sewage
2. Specify the function of each unit of water and sewage treatment plant
3. Design the water and sewage treatment plant
4. Specify standards for design of water and sewage treatment plant

### **Detailed Syllabus:**

1. Detail Design report of water and sewage Treatment Plant for given population of town
2. **List of Experiments:** (Any eight)
  1. Determination of hardness
  2. Determination of turbidity
  3. Determination of alum dose by jar test
  4. Determination of chlorine dose and chlorine demand
  5. Determination of fluoride by U-V spectrophotometer
  6. Determination of trace metal concentration by AAS
  7. Determination of BOD
  8. Determination of COD
  9. Determination of different types of Solids
  10. Determination of SVI

### **Term Work:**

The term work shall consist of a record of laboratory experiments as mentioned below and detail Design report of water and sewage Treatment Plant for given population of town

### **Practical Examination/Viva Voce Examination:**

The panel of examiner shall consist of course coordinator as an internal examiner and

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one external examiner appointed by the Head of the Department. Panel of examiners, as described above, shall evaluate the understanding/knowledge of the student by asking appropriate questions/asking students to perform/demonstrate experiments, etc. The practical examination shall consist of viva-vice based on following experiments and their applications.

**References**

1. IS 3015 Part 1 to 50 : 1987 Methods of sampling and test (physical and chemical) for water and wastewater
2. Standard Methods for the Examination of Water.22nd Ed® APHA
3. IS 10500: 2012

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			H	H				L	L	L	
CO2	M	L		S	H	M			M	L	L	
CO3	H	M	M	H	H	H			M	M	L	
CO4	H	H	H	M	M	M			H	M	M	

1 – High 2 – Medium 3 – Low

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## CE 3007: Lab Geotechnical and Foundation Engineering

Scheme of Teaching		Scheme of Evaluation	
Practical	02 --Hrs/Week	Term Work	25 Marks
Total Credits	<b>01</b>	Practical Examination/Viva Voce	25 Marks
		Total Marks	50 Marks

**Prerequisite:** Not Applicable

**Course Description:** This course introduces the determination of various index and engineering properties of soil. Soil classification as per Indian Standards. Choice of type of foundation as per site situations.

### Course Outcomes:

After successful completion of the course, students will be able to:

1. Experience the theoretical concepts through the experimentation.
2. Determine various index and engineering properties of soil.
3. Classify soil as per Indian Standards.
4. Apply knowledge of various soil properties and to choose type of foundation to suit field conditions.

### Detailed Syllabus:

**List of the experiments/assignments (Perform any six experiments)**

Sr. No.	Details
1	Water content determination and Specific gravity determination of soil.
2	Sieve analysis and I.S. classification of soil.
3	Determination of consistency limits and soil classifications.
4	Field density by core cutter, sand replacement and water displacement method.
5	Determination of coefficient of permeability by constant head and variable head method.
6	Direct shear test.
7	Unconfined compression test.
8	Vane shear test.
9	Standard proctor test.
10	Differential free swell test.
11	Assignments: Methods of exploration, General types of foundations, Choice of foundation type and preliminary selection, Types of settlements.

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**Term Work:**

The term work shall consist of the detailed report of the experiments conducted in the laboratory and assignments.

**Practical Examination/Viva Voce Examination:**

The practical /viva voce examination shall be conducted by the panel of examiners consisting of internal and external examiner. The panel of examiners, as described above, shall evaluate the understanding/knowledge of the student by asking appropriate questions/asking students to perform/demonstrate experiments, and assignments.

**Reference Books:**

1. J. E. Bowles, "Physical and Geotechnical Properties of soils" McGraw Hill International Editions.
2. T. W. Lambe, "Soil Testing for Engineers" Wiley.

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	H	H	H	H	H	H	H					
CO2	H	H	H	H	H	H						
CO3	H	H	H	H	M	M						
CO4	H	H	H	H	M	M	H					

1 – High 2 – Medium 3 – Low

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## CE 3008 Open Elective-II : DISASTER MANAGEMENT

Teaching Scheme		Evaluation Scheme	
Theory	3Hrs/Week	Class Test – I	15 Marks
Tutorial		Class Test -II	15 Marks
Total Credits	3	Teachers Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

### Prerequisites: Not Required

**Course description:** This course introduces the elements of different types of disasters and Describes earthquake, cyclone, fire, flood, tsunami, avalanches, Landslides, lightening, thundering . Role of Government .NGO, Local Bodies

### Course Outcomes

After successful completion of the course, students will be able to

CO1	To understand medical and psycho-social response to disasters
CO2	Analyze different parameters required for disaster management.
CO3	To enhance awareness of disaster risk management and to build skills to respond to disaster.
CO4	Preparation detail program for pre disaster and post disaster

### Detailed Syllabus:

<b>Unit 1</b>	<b>Introduction to Types of Disasters</b> Concept and definition of disaster, types of disaster, natural disaster (earthquake, cyclone, floods, volcanoes), man-made disaster (armed conflicts and civil strip, technological disaster, human settlement, slow disaster (famine, draught, epidemics) and rapid onset disaster (air crash, tidal waves, tsunami), difference between accident and disaster, human resettlement and rehabilitation issues during and after disasters, effect on structural element.	<b>6 Hours</b>
<b>Unit 2</b>	<b>Disaster risk reduction strategies</b> Disaster risk reduction strategies, disaster cycle – its analysis, phases,, culture of safety, prevention, mitigation and preparedness, early warning system models in disaster preparedness, community based DRR, structural and nonstructural measures in DRR, policies for disaster preparedness programs, preparedness planning, roles and responsibilities, DRR master planning for future, capacity building.	<b>6 Hours</b>
<b>Unit 3</b>	<b>Disaster and its Policies</b> Hazard and vulnerability profile of India, disaster management Indian scenario, India's vulnerability profile, Components of disaster relief : Water, flood, sanitation, shelter, health, waste management, Institutional arrangements (Mitigation, response and preparedness,	<b>6 Hours</b>

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	disaster management act 2005 and policy guidelines, other related policies, plans, programmes and legislation)	
<b>Unit 4</b>	<b>Disaster Management Framework</b> Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.	<b>6 Hours</b>
<b>Unit 5</b>	<b>Pre disaster and Post Disaster Planning</b> Pre disaster planning and measures Retrofitting of Structures, Sources of weakness in framed buildings, Classification of retrofitting techniques, Conventional and non-conventional methods, Comparative study of various methods and case studies. Introduction to Base Isolation systems. IS code provisions for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques	<b>6 Hours</b>

**Recommended Books:**

1. Mukesh Kapoor Disaster Management ISBN: 8189005324
2. Nitish Kumar Disaster Management 2013-1850, Neeraj Publications MPA
3. A.K.Jain Disaster Management

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2		H							L			
CO3			M		M	M						
CO4			M									M

**H-Strong M – Medium L – Low**

**Teacher's Assessment:** Teachers Assessment of 10 marks is based on one or more of the following

1. Technical Quizzes on Disaster Management
2. Application Development
3. Question & answer / Numerical solution
4. Study of any one of different types of disasters and its management
5. Other if any -Power point presentation

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### HS 3001: Constitution of India and Professional Ethics

Teaching Scheme		Evaluation Scheme	
Theory	3 Hrs/Week	Class Test-I	15 Marks
		Class Test-II	15 Marks
Total Credits	3	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** Prerequisite not required

**Course Description:**

Our constitution is not a mere pedantic legal text; it contains human values, cherished principles and spiritual norms. It upholds the dignity of human being. The Constitution of India is the supreme law of India. It lays down the framework defining fundamental political principles, establishes the structure, procedures, powers and duties of government institutions and sets out fundamental rights, directive principles and the duties of citizens. This course introduces the salient features of constitution, fundamental rights and directive principles, judiciary system, electoral process and importance of acts.

**Course Outcome:** After successful completion of the course, students will be able to:

1. Recognize the importance of constitution of India and fundamental rights
2. Describe the role of Union Executives, Judiciary system & Electoral Process
3. Justify the professional ethics, moral standards
4. Recognize the importance of Intellectual Property Rights

**Detailed Syllabus:**

<b>Unit -1:</b>	Introduction to the Constitution of India, The making of the constitution and Salient features of the constitution. Preamble to the Indian Constitution, Fundamental rights, Directive Principles & Fundamental Duties of the Indian citizen	<b>06 Hrs</b>
<b>Unit -2:</b>	Union Executives-President, Prime Minister, Parliament, Supreme Court of India; State Executives-Governor, Chief Minister, State Legislature, High Court of State and Judiciary system	<b>06 Hrs</b>
<b>Unit -3:</b>	Electoral Process in India, Amendment procedures, Important Amendments, Powers and functions of Municipalities, Panchyats and Co-Operative Societies	<b>06 Hrs</b>
<b>Unit -4:</b>	Different Intellectual Property Rights, International aspect of intellectual property, Principles behind The Patents Act, Patents : What is patent, Inventions not patentable, Applications for patents, Publication and Examination of application, Grant of patent and rights conferred thereby, Copyright act and its implementation	<b>06 Hrs</b>
<b>Unit -5:</b>	Scope and aims of engineering ethics, Responsibility of Engineers,	<b>06 Hrs</b>

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Impediments to Responsibility, Risks, Safety and liability of Engineers, Code of conduct of different engineering organizations
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**Reference Books:**

1. Constitution of India (Full Text)/ India Portal-<http://india.gov.in>
2. The Constitution of India, Bare Act with short comments-Published by Professional Book Publishers, Delhi
3. Intellectual Property Laws, Bare Act With Short Comments-Published by Professional Book Publishers, Delhi
4. C.S.V.Murthy, 'Business Ethics'-Himalaya Publishing House

**Table-1 Mapping of Course outcome with Program Outcomes (Civil Engineering)**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						H	H	M				
CO2						H	H	M				M
CO3			M		L	M	H	H				M
CO4					H	H	H	H				M

1 – High 2 – Medium 3 – Low

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### AM 3009: Design of RCC Structures

Teaching Scheme		Evaluation Scheme	
Theory	4 -Hrs/Week	Class Test-I	15 Marks
Tutorial	--	Class Test-II	15 Marks
Total Credits	4	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		<b>Total</b>	<b>100 Marks</b>

**Prerequisite:** AM-1001 Engineering Mechanics, AM-2001 Solid Mechanics, AM-2008 Structural Analysis


**Course Description:** To introduce the concept of structural design using RCC sections, basic principles of design philosophies used in RCC design and make the students aware of the code provisions for design. To make the students to understand the design procedures and detailing of various structural RCC members

**Course Outcomes:** After successful completion of the course, students will be able to:

1. Interpret the provisions of IS 456-2000 for the design of RCC structural elements.
2. Design RCC structural members using relevant codes and standards.
3. Complete detailing after the design of RCC structural elements.
4. Associate the design concept with overall design of RCC structures.

**Detailed Syllabus:**

<b>Unit -1:</b>	<p><b>A Design Philosophy:</b> Introduction to various design philosophies R.C structures, Historical development, working stress method, ultimate load method and limit state method. Characteristic strength, characteristic load, concept of safety - Partial safety factors for material strengths and loads. Study of structural properties of concrete.</p> <p><b>B Limit state of collapse (flexure):</b> Assumptions of Limit state method, strain and stress variation diagram, design. parameters for singly reinforced rectangular R.C. section, Moment of resistance of Under reinforced and balanced section, M.R. of doubly reinforced rectangular section and flanged section. Design of Simply supported, continuous and cantilever beams. Redistribution of moments</p>	<b>8 Hrs</b>
<b>Unit -2:</b>	<p><b>A Limit state of collapse (Shear and Bond):</b> Shear behavior up to failures. Types of failure, Factor affecting shear failure, strength of R.C. beams in shear, design of shear reinforcement as per I.S. recommendations.</p> <p>Bond : types of bond. Factor affecting bond resistance, check for development length</p> <p><b>B Limit state of Serviceability and Durability :</b> limit state of serviceability and limit state of durability, Significance of deflection,</p>	<b>8 Hrs</b>

  
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	types of deflection, types of deflections and I.S. requirements. classification and types of cracks, causes, mechanism & effects, bar detailing rules.	
<b>Unit -3:</b>	<b>Design of slab:</b> One way slab: simply supported, cantilever and continuous slabs. Two way slab: simply supported, cantilever, continuous and restrained. Design of staircase: Dog legged	<b>10 Hrs</b>
<b>Unit -4:</b>	<b>Design of Column:</b> Introduction, strain and stress variation diagrams, axially loaded short column with minimum eccentricity requirements. Design of short column for axial load, uni-axial, Biaxial bending using interaction curves, interaction diagrams, Analysis and design of sections using I.S.456 and SP-16 Column design charts of section	<b>8 Hrs</b>
<b>Unit -5:</b>	<b>Design of Footing :</b> Design of isolated column footing for axial load, uni-axial and biaxial bending.	<b>6 Hrs</b>

**References:**

1. Pillai S.U. and Devdas Menon, Reinforced Concrete Design, Tata-McGraw-Hill Publishing Company Limited, New Delhi.
2. Punmia B.C and A K Jain, Comprehensive Design of RCC Structures, Laxmi Publications (P) Ltd, New Delhi
3. Ramamrutham S., Design of Reinforced Concrete Structures, Dhanpat Rai Publishing Company, New delhi,
4. Shah V. L. and S R Karve, Limit State Theory and design of reinforced Concrete, Structures Publications, Pune, 2011
5. Jain A.K. "Reinforced Concrete Limit state Design". Nem Chand & Brothers 2007
6. Sinha S.N. "Reinforced Concrete Design". Tata –Mc-Graw-Hill New Delhi.

**Indian Stanards:**

- 1 IS 456: 2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi
- 2 Handbook on Concrete Reinforcement and detailing, Special Publication SP 34, Bureau of Indian Standards, New Delhi, 1987

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	H	H	H									
CO2	H	H	H		M							
CO3	M	H	H		M							
CO4	H	H	H	M	L							

**H – High M – Medium L – Low**

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**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Question & answer / Numerical solution

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## CE 3010: Water Resources Engineering

Teaching Scheme		Evaluation Scheme	
Theory	4 Hrs/Week	Class Test-I	15 Marks
Tutorial	--	Class Test-II	15 Marks
Total Credits	4	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** CE 2002 Fluid Mechanics

**Course Description:** This course introduces the elements of hydrology and describes precipitation, evaporation and infiltration, demonstrate runoff and hydrograph. Topics ranges from hydrology, runoff, hydrograph, flood, ground water, dams, spillways, canal, canal fall, weirs, barrages, cross drainage works and outlets

**Course Outcomes:** After successful completion of the course, students will be able to:

1. describe different terminologies related with hydrology
2. analyze hydrological parameters required for water resource management.
3. describe appropriate hydraulic structures such as dam, spillway, cross drainage works, weir, barrages, canal, outlet and canal fall.
4. compute the trial section of gravity dam, earthen dam, canal and stability checks

### Detailed Syllabus:

<b>Unit-1:</b>	<b>Hydrology:</b> Introduction, Precipitation: forms of precipitation, measurement of precipitation, rain gauge network, presentation of rainfall data, mean precipitation over an area, depth area distribution curves and frequency of rainfall, probable maximum precipitation, evaporation and evapo-transpiration, evaporation process, evaporimetres, reduction in evaporation, infiltration process, infiltration capacity, measurement of infiltration, infiltration indices	<b>8 Hr</b>
<b>Unit-2:</b>	<b>Runoff and Hydrographs:</b> Different routes of runoff, rainfall runoff correlation, Strange's tables, factors affecting runoff, flow distribution curve, flow mass curve and uses. Hydrograph, Introduction, Factors affecting Flood Hydrograph, Components of a hydrograph, Base flow separation, Effective rainfall, Unit Hydrograph, Use and Limitations of unit hydrograph, Derivation of unit hydrograph, Synthetic Unit Hydrograph, Instantaneous Unit Hydrograph, Flood Studies: Design Flood and method of its estimation, empirical formula, frequency analysis	<b>8 Hr</b>
<b>Unit-3:</b>	<b>Groundwater Hydrology and Crop Water Requirements:</b> Aquifer and their types, aquifer parameters, specific yield of well, Thiem's and Dupuit's theory for wells in confined and unconfined aquifers, recharge of ground water, various methods and their suitability, factors affecting crop water requirement, irrigation water standards, wilting point, crop period and base period, optimum utilization of irrigation water, irrigation efficiencies, delta, duty, determination of duty, important crops in India, their seasons, cropping pattern, crop rotation, design and	<b>8 Hr</b>

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	frequency of irrigation, various methods of applying water to crops and their comparison.	
<b>Unit-4:</b>	<b>Dams:</b> Site selection for dam, classification of dam, storage capacity estimation, Gravity Dam: forces acting, stability analysis, design of low and high gravity dams, galleries, types of earth dam, elements of earthen dam and their functions, construction aspects, causes of failure, design of section, design of filters, rock toe and pitching, seepage and its control through earth dam and its foundation, Arch and buttress dam: types and suitability	<b>8 Hr</b>
<b>Unit-5:</b>	<b>Hydraulic Structures:</b> Types of spillways, spillway capacity, energy dissipation, spillway gates, canal: types, factors influencing alignment, design of canal in non alluvial soils, Kennedy's and Lacey's silt theories, Types of cross drainage works, necessity, canal falls: necessity, location, types, head and cross regulators, types of weir and barrages, design of weir by Bligh and Khosla's theory, dam outlets	<b>8 Hr</b>

#### References:

1. K. Subramanya, "Engineering Hydrology" Tata Mc Graw Hill, New Delhi
2. Vijay P. Sing, "Elementary Hydrology" Prentice Hall of India, New Delhi
3. Chow V. T., D. R. Maidment, L.W. Mays "Applied Hydrology" McGraw-Hill International Editions, New York
4. Garg, S.K. Water Resources Engineering (Vol.I and II ) "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, 4575/15, Onkar House, Daryaganj, New Delhi - 110 002
5. Punmia, B. C. and Pande, B.B.L. "Irrigation and Water Power Engineering", Laxmi Publications Pvt. Ltd, New Delhi
6. Modi, P.N. "Irrigation Water Resources and Water Power Engineering", Standard Book House, Delhi
7. Wurbs, R.A. and James, W.P. "Water Resources Engineering", Prentice Hall of India Pvt. Ltd, New Delhi
8. Aswa G. L. "Irrigation and Water Resources Engineering" New Age International (P) Ltd.
9. Varshnoy R.S. "Concrete Dams", Oxford and IBM Publishing Company

**Table 1: Mapping of Course outcome with Program Outcomes**


Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M									L
CO2	M	H										
CO3			M		M							M
CO4	M		H									M

**H-High M – Medium L – Low**

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**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Application development
3. Question & answer / Numerical solution
4. Group discussion
5. Other if any



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## CE 3011: Engineering Geology

Teaching Scheme		Evaluation Scheme	
Theory	4 Hrs/Week	Class Test-I	15 Marks
Tutorial	- Hrs/Week	Class Test-II	15 Marks
Total Credits	4	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** Not Applicable

**Course Description:** This course introduces the elements of engineering geology and earth science. It also mentions importance of principles of geology in various stages of civil engineering project. It also describes occurrence and character of common building materials. It explains structural geology and its importance in civil engineering. It covers natural hazards such as landslide, earthquake and their remedial measures.

**Course Outcomes:** After successful completion of the course, students will be able to:

1. explain basic principles of engineering geology
2. differentiate between various rock types and their applications in civil engineering
3. identify favorable conditions for construction of buildings, roads, dams and tunnels
4. understand the geological hazards and remedial measures to prevent damage to civil engineering project

### Detailed Syllabus:

<b>Unit-1:</b>	Geology definition, scope, important in Civil Engineering, Mineralogy introduction, important rock forming minerals their groups. Igneous rock: cooling of magma, textures classification and mineral composition, important igneous rocks. Sedimentary rocks: formation, classification, sedimentary rocks classification, consolidation, textures, characteristics residual, chemical and organic deposits, important secondary rocks, Metamorphic rocks: agents of metamorphism, and types of metamorphism structures, important metamorphic rocks.	<b>8 Hr</b>
<b>Unit-2:</b>	Strike, dip, parts And important types of folds, faults, fractures and joints unconformity, discontant and concordant igneous intrusions, river youth mature and old stages, geological work, river rejuvenation, river capture, earthquake, seismic waver, seismograph, location of epicentre, effects, Zones volcano products fissure, and cone and crater type. Mountain building activity and Introduction to Plate tectonics, Historical geology: Principles of stratigraphy, geological time scale, Indian geology, physiographic divisions of India, significance of their structural characters in major civil engineering activities.	<b>8 Hr</b>
<b>Unit-3:</b>	Geological investigations of Civil Engineering sites, significance of stratification strike dip fold faults joints fractures dykes in this study, surface and subsurface surveys, use of pits trenches, exploratory drilling in subsurface exploration, preparation of geological maps and sections limitations of ach method. Sub surface water types, water table porosity permeability Zones, perched water table	<b>8 Hr</b>

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	occurrence of subsurface water, geological conditions favorable for natural springs and seepages, depression and contact springs, hot springs and geysers, wells and drill holes	
<b>Unit-4:</b>	Building stones, requirement of good building stones and their dependability on geological characters of rocks, common building stones, Building stones of India, Land slide, angle of repose, causes, stability of hill slopes, relation of dip, amount of slope with stability of hill slopes, preventive measures for landslides. , fluctuations in water table levels by geo physical electrical resistivity method	<b>8 Hr</b>
<b>Unit-5:</b>	Dams, requirements of good dam and reservoir site, Influence of Geological conditions on types and design of a dam. Dams on sedimentary rocks, folded strata dykes fractures zones, fault zones and on carbonate rocks. Tunnels types, seepage of subsurface water, over break, support during tunneling, lining after tunneling, rate of tunneling, tunnels in soft rocks, in hard rocks in sedimentary rocks, in jointed rocks in folded strata. Tunnels across fracture zones and fault zones, Bridges, types, requirements of good site	<b>8 Hr</b>

**References:**

1. Gupte R.B. "Text Book of Engineering Geology", P.V.G. Publications, Pune
2. Parbin Singh "A Text Book of Engineering and General Geology", S.K. Kataria & Sons New Delhi
3. M. S. Krishnan, "Geology of India and Burma" CBS Publishers, New Delhi
4. Arthur Holmes, "Physical Geology", ELBS Publication.
5. M. P. Billings, "Structural Geology", Prentice Hall India Learning Private Limited
6. F G H Blyth and De Frietus, "Engineering Geology" Reed Elsevier India Ltd.
7. Bell F G, "Engineering Geology", Butterworth - Heinemann

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										
CO2	M	M										L
CO3	L	L	M									L
CO4	H	M	M									

**H-High M – Medium L – Low**

**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Application development
3. Question & answer / Numerical solution
4. Group discussion
5. Other if any

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## CE 3012: Lab- Water Resources Engineering

Scheme of Teaching		Scheme of Evaluation	
Practical	2 Hrs/Week	Term Work	25 marks
Total Credits	1	Practical Examination/Viva Voce	25 marks
		Total Marks	50 marks

**Prerequisite:** Not Applicable

**Course Description:** Water is an important resource. This laboratory course deals with different aspects related to availability of water, equitable distribution of water and hydrological aspects. It also deals with stability analysis of different hydraulic structures. It also covers field visit to acquire the relevant field knowledge.

### Course Outcomes:

After successful completion of the course, students will be able to:

1. Sketch flow distribution curve, mass curve, unit hydrograph and other water resources engineering structures
2. Choose the appropriate hydraulic structures such as dam, spillway, canal and canal fall.
3. Compute the trial section of gravity dam, earth dam
4. Design suitable hydraulic structures/ dam, canal and check stability of it.

### Detailed Syllabus:

**List of the experiments/assignments/ field visits if any (Perform any six exercise).**

Sr. No.	Details
1	Writing brief report on laws related with equitable distribution of water or water availability in different basins or study of Maharashtra ground water act
2	Derivation of Unit Hydrograph from given data
3	Stability analysis of gravity dam
4	Single step / Multiple step method of design of gravity dam
5	Stability analysis of earth dam
6	Design of spillway crest and ogee shape profile
7	Design of canal by using silt theories
8	Design of any one type of cross drainage work
9	Design and analysis of weir on permeable foundation
10	A report based on visit to any irrigation project during the academic term

### Term Work:

The term work shall consist of information, exercise based on at least six exercise mentioned in detailed syllabus above.

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**Practical Examination/Viva Voce Examination:**

Viva-voce examination across the table shall be conducted by the panel of examiners, to evaluate the understanding/knowledge of the student by asking appropriate questions/asking students to demonstrate experiments/exercises, etc.

**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			L									M
CO2			H									M
CO3	M	M	H		L							M
CO4	M	M	H									M

**H – High      M – Medium      L - Low**

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### CE 3013: Lab-Engineering Geology

Scheme of Teaching		Scheme of Evaluation	
Practical	2 Hrs/Week	Term Work	50 marks
Total Credits	1	Practical Examination/Viva Voce	-----
		Total Marks	50 marks

**Prerequisite:** Not Applicable

**Course Description:** This course introduces with practical aspects of engineering geology and earth science. It deals with identification and classification of important rock forming minerals and rocks, study of geological maps and geological features. Case study of 'Geophysical Exploration' and field visit is also included in the course.

**Course Outcomes:**

After successful completion of the course, students will be able to:

1. recognize the sample of rock and explain brief about mineralogy of rock
2. analyze the geological maps
3. select suitable method for geophysical explorations

**Detailed Syllabus:**

**List of the experiments/assignments/ field visits if any**

Sr. No.	Details
1	Identification and classification of important rock forming minerals and rocks
2	Study of solutions to engineering geological problems with the help of these maps
3	Geological map reading, construction of section of geological maps consisting of horizontal, and inclined beds, unconformity, faults, folds, dykes etc
4	Case study of 'Geophysical Exploration' by electrical resistivity method or seismic refraction method from literature
5	One site visit to study geology and its engineering applications

**Term Work:**

The term work shall consist of information, exercise based on detailed syllabus above.

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**Table 1: Mapping of Course outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H		L	L							
CO2	M	M	M		L							
CO3	H	L	L		M							

H : High

M:Medium

L: Low

  
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## AM 3014 Lab-Structural Design and Drawing (Steel)

Scheme of Teaching		Scheme of Evaluation	
Practical,	4 -- Hrs/Week	Term Work	50
Total Credits	2	Practical Examination/Viva Voce	50
		Total Marks	100

**Prerequisite:** AM-3001 Design of steel Structures

**Course Description:** . To expose the students to analysis and design of roof truss. and analysis and design of plate girder/gantry girder. To expose the students to design and prepare steel structural detailing using softwares.

**Course Outcomes:**

After successful completion of the course, students will be able to:

1. Analyse and design industrial steel structures
2. Prepare detailed drawing of industrial steel structures.
3. To use software for design and drawing of steel structural members

**Term Work:** The term work shall consists of

**UNIT-1** Design and drawing of factory shed consisting of roof truss, column and column bases, Plate girder /gantry girder etc. using recent IS codes

**UNIT-2** Design and drawing of factory shed using softwares

**NOTE:** Minimum two drawing sheets must be prepared by manual drawing and other drawing or using any drafting software.

**Practical Examination/Viva Voce Examination:**

In case of oral/practical examination across the table, the panel of examiners, as described above, shall evaluate the understanding/knowledge of the student by asking appropriate questions/asking students to perform/demonstrate experiments, etc.

**References (if any):**

1. Subramanian N , “ Design of Steel Structure” Oxford University Press, New Delhi.
2. .Duggal S.K , “. Limit state Design of steel structures by Limit State Method” as per IS: 800- 2007 Tata McGraw Hill Education Private limited New Delhi

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3. Bhavikatti S S, "Design of steel structure by Limit State Method" as per IS: 800- 2007, I K International Publishing House, New Delhi.
4. Shah V.L. & Gore, "Limit state design of Steel Structure" Structures Publication, Pune.
5. Teaching Resource Material by INSDAG.
6. IS 456-2000: Code of practice for plain and R. C. BIS, New Delhi.
7. I.S.800:2007,"Code for general construction in steel structures," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
8. I.S.875 (part I to part V)," Code Of Practice For. Design Loads," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
9. I.S.808:1989,"Code for Classification of Hot Rolled Steel ," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
10. I.S.808:1989,"Code for Classification of Hot Rolled Steel ," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.
11. I.S.816:1969," Code of practice for use of metal arc welding for general construction in mild steel," Bureau of Indian Standards,Manak Bhavan,9,Bhadur Shah Zafar Marg, New Delhi.

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	H	H	H	M	M	M						M
CO2	H	M	H	M	M							M
CO3	M	M	M		M							M

**1 – High 2 – Medium 3 – Low**

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## CE 3015-: Seminar

Scheme of Teaching		Scheme of Evaluation	
Seminar	2-Hrs/Week	Term Work	25 Marks
Total Credits	01	Viva Voce Examination	25Marks
		<b>Total Marks</b>	<b>50Marks</b>

**Prerequisite: Not Necessary**

**Course Description:** The students have to collect, compile, comprehend and present literature in any field of Civil Engineering /Structural Engineering.

**Course Outcomes:** After successful completion of the course, students will be able to:

1. To search literature from different sources to appraise the state-of-the-art.
2. To compile and prepare a technical report from the collected literature.
3. To present the literature in a comprehensive manner.

**Detailed Syllabus:**

Collection of papers and information on any field of Civil Engineering /Structural Engineering from various national and international refereed journals, national and international conferences, and books etc. .

**Term Work:**

The seminar shall consist of collection of current literature from a chosen field of Civil Engineering and allied branches of Civil Engineering /Structural Engineering from various sources such as refereed journals in civil engineering/structural engineering, national or international conference proceedings, BE (Civil) and ME (Civil/Structural Engg) reports/thesis/dissertation, published reports/articles/documents etc from at about 10 current references.

The course shall be administered as below.

1. The student shall choose a topic and carry-out literature survey of the chosen topic.
2. The student shall prepare a spiral bound technical report, preferably printed on both the sides of pages, in the prescribed format and submit within the prescribed due date.

The term-work shall be evaluated by the guide based on the volume of quality literature collected and quality of the technical report prepared whereas the practical examination shall be evaluated by panel of examiners based on the presentations.

**Viva Voce Examination:** It consists of two parts.

**Part-I: Mid-Term Evaluation for 10 Marks:** A mid-term evaluations for 10 marks out of 25 marks shall be done as per the schedule given in the institute academic calendar. Students should prepare a power point presentation and present before the panel of examiners and class students and should be able to answer questions asked by the panel of examiners and class students. Panel of examiner consists of guide as internal examiner and one faculty members

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appointed by the Head of the Department as external examiners. The panel of examiner will assess the seminar contents and seminar presentation and gives the suggestions/modifications/correction, if any and assigns the marks out of 10 marks.

**Part-II: End Semester Evaluation for 15 Marks:** Students should prepare a power point presentation and present it before the panel of examiners as above and class students and should be able to answer questions asked by the panel of examiners and class students. The panel of examiner will assess the seminar contents and seminar presentation and assigns the marks out of 15 marks.

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1								H	H	H		H
CO2								H	H	H		H
CO3								H	H	H		H
CO4								H	H	H		H
CO5								H	H	H		H

**H- High M- Medium L – Low**

**Note:** Remaining POs will depend upon the individual topic of the candidate

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## CE 3016 (Open Elective-III) Watershed Management

Teaching Scheme		Evaluation Scheme	
Theory	3 Hrs/Week	Class Test-I	15 Marks
Tutorial		Class Test-II	15 Marks
Total Credits	<b>3</b>	Teacher's Assessment	10 Marks
		End Semester Examination	60 Marks
		Total	100 Marks

**Prerequisite:** CE 3010: Water Resources Engineering

**Course Description:** This course introduces the watershed and different techniques which are used for its sustainable development. The course provides experience in solving the difficulties in watershed management, use of modern techniques, role of various sectors, etc. You will also learn necessity of watershed management.

**Course Outcomes:**

After successful completion of the course, students will be able to:

1. Do planning of watershed management activities
2. Analyze the rainfall runoff process
3. Estimate soil erosion
4. Design sustainable water resources management

**Detailed Syllabus:**

<b>Unit -1:</b>	<b>Introduction and Basic Concepts</b> Concepts of watershed, introduction to watershed management, its necessity and objective, different stake holders and their relative importance, characteristics of watershed, hydrology and hydrogeology, socio-economic characteristics, watershed management policies and decision making.	<b>6 Hrs</b>
<b>Unit -2:</b>	<b>Watershed Modeling</b> Standard modeling approaches and classification, system concepts for watershed modeling, different hydrologic processes accounted in modeling, modeling on rainfall runoff process, subsurface flows and groundwater flows, planning of watershed management activities, preparation of action plans, administrative requirements.	<b>6 Hrs</b>
<b>Unit -3:</b>	<b>Flood and Erosion Control</b> Storm water management, design of drainage system, flood frequency analysis, flood routing through channels and reservoir, flood control and reservoir operation, case studies of flood damages. Types of erosion, soil erosion, estimation of soil erosion, universal soil loss equation, effects of erosion on land fertility and land capability, control measures to erosion, reclamation of saline and alkaline soils.	<b>6 Hrs</b>
<b>Unit -4:</b>	<b>Drought and Rainwater Harvesting</b> Drought assessment and classification, drought analysis technique, drought	<b>6 Hrs</b>

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	mitigation planning. Rainwater harvesting, catchment harvesting, harvesting structures.	
<b>Unit -5:</b>	<b>Integrated Watershed Management</b> Introduction to integrated approach, conjunctive use of water resources. Role of ecosystem, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, social forestry, management of forest, wild land and grass land. Role of GIS in watershed modeling, its need and necessity, data development, and its application.	<b>6 Hrs</b>

**References:**

1. Murthy JVS, "Watershed Management", New Age International Publishers, New Delhi
2. Murthy VVN, "Land and Water Management", Kalyani Publishers, New Delhi
3. Mujumdar D. K., "Irrigation Water Management", PHI Learning Pvt. Ltd., Delhi
4. Suresh R., "Watershed Hydrology", Standard Publishers Distributors, New Delhi
5. Tideman E.M., "Watershed management : Guidelines for Indian Conditions", Omega Scientific Publishers
6. Das Ghanshyam, "Hydrology and Soil Conservation Engineering", Prentice Hall India
7. Singh Rajvir, "Watershed Planning & Management", Yash Publishing House
8. Singh V.P. and Frevert Donald K., "Watershed Models", Taylor & Francis

**Table 1: Mapping of Course Outcome with Program Outcomes**

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H	H		H		L		M			
CO2		H	H			M	M		M			M
CO3		H	H		H		M		M			
CO4		H	H		H		M	M		M		

**1 – High 2 – Medium 3 – Low**

**Teacher's Assessment:** Teachers Assessment of 10 marks may be based on one or more of the following

1. Technical quizzes
2. Application development
3. Question & answer / Numerical solution
4. Group discussion
5. Other if any

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