SHRI SHANKARACHARYA TECHNICAL CAMPUS BHILAI

(An Autonomous Institute affiliated to CSVTU,Bhilai)**Scheme of Examination and Syllabus 2023 Forth Year B. Tech. Civil Engineering 8th semester**

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Category	Course Code	Period per Week			Scheme of Examination			Total Marks	Credit
								Theory/Lab				
					L	T	P	ESE	CT	TA		
1	Civil Engineering	SED-IV	PEC	**CE105801**	3	1	-	100	20	30	150	4
4	Civil Engineering	Professional Elective IV *	HSMC	table IV	2	1	-	100	20	30	150	3
5	Civil Engineering	Open Elective III **	HSMC	table V	3	-	-	100	20	30	150	3
6	Civil Engineering	SED lab	PEC	**CE105811**	-	-	2	25	-	25	50	1
7	Civil Engineering	Advanced geotechnical engg. lab	PCC	**CE105812**	-	-	2	25	-	25	50	1
8	Civil Engineering	Major Project	PSI	**CE101594**	-	-	16	300	-	150	450	8
Total					**8**	**2**	**20**	**650**	**60**	**290**	**1000**	**20**

L : Lecture, T: Tutorial, P : Practical, ESE : End Semester Exam CT : Class test TA: Teacher's assessment

*** Table IV : Professional Elective - IV**

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code
1	Civil Engineering	SA-III	CE105821
2	Civil Engineering	Prestressed Concrete	CE 105822
3	Civil Engineering	Solid Waste Manegement	CE 105823
4	Civil Engineering	Computer Applications in Civil Engineering	CE 105824
5	Civil Engineering	Advanced Environmental Engineering	CE 105825
6	Civil Engineering	Marine Geotechnics	CE105826
7	Civil Engineering	Seismic Design of Structures	CE105827
8	Civil Engineering	Water Shed Management	CE105828

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9	**Civil Engineering**	**Open channel flow**	**CE105829**
10	Civil Engineering	Non-conventional Energy source	CE105830

* * Provide at-least 1 value added courses as Open Elective III in Table

*** Table V : Open Elective - III**

Sl. No.	Board of Studies (BOS)	Courses (Subject)	Course Code
1	**Civil Engineering**	**Disaster Management**	**CE105841**
2	Civil Engineering	Construction Management	CE105842
3	Civil Engineering	Ecology and sustainable development	CE105843

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Subject Code CE105801	Structural Engineering Design-IV	L = 3	T = 1	P = 0	Credits = 4
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	4 Hours

Course Objectives	Course Outcomes
1. Understand the behavior of combined footings. 2. Understand the behavior of retaining walls. 3. Understand the behavior of different types of water tanks. 4. Understand the behavior of different types of bridges. 5. Understand the behavior of prestressed concrete.	**On successful completion of the course, the student will be able to:** **CO1:** Capable of designing combined footings. **CO2:** Capable of designing retaining walls. **CO3:** Capable of designing simple water tanks. **CO4:** Capable of designing solid slab bridges. **CO5:** Capable of analyzing prestressed concrete beams .

UNIT I Combined Footings: Limit State Design of Combined Rectangular and Combined Trapezoidal Footings, Introduction to design of strap footing and Raft Foundation.

UNIT II Retaining walls: Design of Cantilever retaining wall with horizontal and sloping backfill, Counterfort Retaining Wall with horizontal backfill.

UNIT III Water tank and staging: Introduction, Design criteria, Design of rectangular and circular water tank, Design of Intze tank, Staging for overhead tank. Circular tank: with flexible / rigid joint between floor and wall (by approximate method), Design of Circular overhead tank with domed bottom and top (membrane analysis), Intze Tank (Membrane Analysis): Dimensions, Design of top dome, Top ring beam, cylindrical wall, middle ring beam, conical dome, bottom dome.

UNIT IV Bridges: Introduction to bridge engineering, types of Bridges, Investigation for bridges, IRC loadings, Design of slab culvert, Design of super structure for solid slab bridge, Design of cantilever slab for T-Beam bridge. Introduction to design of interior panels and girders of a T-Beam Bridge

UNIT V Prestressed Concrete: Basic concepts, classification and types of prestressing, Prestressing systems, Losses in Prestress, Properties of materials, merits and demerits of prestressed concrete, Analysis of beam for flexure, Kern distances and efficiency of Sections

S. No.	Title	Authors	Publisher
1)	Reinforced Concrete Structures	B.C. Punmia	Laxmi Publications
2)	Prestressed Concrete	N. Krishna Raju	New Age Publications

REFERENCE BOOKS:

S. No.	Title	Authors	Publisher
1)	RCC Design	Sinha & Roy	S. Chand & Co.
2)	Bridge Engineering	R.K. Raina	

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Subject Code CE105821	**Structural Analysis-III**	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	**Course Outcomes**
Objective of the Subject: 1. To learn about the approximate methods of analysis of multistory frames 2. To learn about the flexibility method of analysis of structures. 3. To learn about the stiffness method of analysis of structures. 4. To learn about the finite element method of analysis of structures. 5. To learn about the basics of plastic analysis and methods of plastic analysis of beams and frames.	**CO1:** To be able to analyze multi story frames by approximate methods **CO2:** To be able to analyze beams and frames by flexibility method **CO3:** To be able to analyze beams and frames by stiffness method **CO4:** To be able to analyze, beams and frames by finite element method. **CO5:** To be able to analyze beams and frames by plastic method of analysis

UNIT – I: **CO-1**

Approximate Methods:

Analysis of multistoreyed frames for horizontal loads by Cantilever and Portal Methods. Dead and Live Load (Substitute Frame) Analysis for multistoreyed buildings.

[8Hrs]

UNIT - II **CO-2**

Flexibility Method:

Introduction to Matrix method of analysis, formulation of flexibility matrices, application to simple problems involving not more than two unknowns, analysis of beams, rigid plane frames and pin jointed plane frames. [**7Hrs]**

UNIT - III: **CO-3**

Stiffness Method: Formulation of stiffness matrices, application to simple problems involving not more than two unknowns, analysis of beams, rigid plane frames and pin jointed plane frames.

[7Hrs]

UNIT - IV **CO-4**

Finite Element Method: Cartesian and Natural Coordinates, Element DOF's, shape functions for bar, beams, triangular and rectangular element by generalized coordinates and by using Lagrange Polynomials, Pascal's triangle, assembly of stiffness matrix for springs, bar and beam element. **[7Hrs]**

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UNIT-V **CO-5**

Plastic Analysis: Plastic Hinge Concept, Fully Plastic Moment, Collapse mechanism, plastic analysis of beam and frames. **[7Hrs]**

TEXT BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Theory of Structures, Part – II	Punmia, Jain and Jai	2nd	Laxmi Publications
2)	Structural Analysis, a Matrix Approach	Gupta and Pandit.	2nd	
3)	Finite Element Analysis	S.S. Bhavikatti	3rd	New Age International Publishers, New Delhi

REFERENCE BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Intermediate Structural Analysis	Wang. C.K	3rd	Tata McGraw Hill
2)	Structural Analysis	Structural Analysis	2nd	Pearson Education
3)	Introduction to the Finite Element Method	Desai C.S., Abel J.F		CBS Publishers & Distributors, Delhi.
4)	Introduction to Finite Elements in Engineering	Chandrupatla T.R., Belegundu A.D	5th	Prentice Hall of India Private Limited, New Delhi.

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Subject Code CE105822	**PROFESSIONAL ELECTIVE-2 (PRESTRESSED CONCRETE)**	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	**Course Outcomes**
Students will be able to learn the basic principles and losses of Prestressed concrete structures along with the design of flexural and composite members with their advantages.	**On successful completion of the course, the student will be able to:** **CO1:** Identify various methods of prestressing and their advantages. **CO2:** Analyse the concept of stresses at various stages. **CO3:** Determine the various types of losses of prestressing, IS code provisions for Flexural strength of sections **CO4:** Analyze the stresses for composite beams, anchorage-bond stress and shear calculation of diagonal tension. **CO5:** Design the poles, pipes and water tanks and understand the importance of limit state method.

Unit-1: Methods, Systems and Materials: - **CO1**

Basic principles, methods and systems of prestressing, external, internal, full, partial, pre-tensioning and post-tensioning, standard Fressinet and Gifford Udall cables, quality of concrete and steel, I.S. Code provisions for allowable stresses, Advantages of prestressing and importance of high strength materials.

[7Hrs]

Unit-2: Analysis of Structures for Flexure:- **CO2**

Cases of axial and eccentric prestressing, Stresses in concrete at various stages, lever arm concept and center of pressure, pressure line, kern distances, load balancing cable profiles, critical span, Efficiency of a section. **[8Hrs]**

Unit-3: Losses of Prestressing:- **CO3**

Various types of losses of prestress and their calculation, loss due to friction, I.S. Code provisions, Elastic shortening due to successive tensioning of cables.Design of section for flexure: Types of flexural failure, Design of Flexural strength of sections as per I.S. Code provisions, Stress-strain relationship. **[8Hrs]**

Subject Code	**PROFESSIONAL ELECTIVE-2 (PRESTRESSED CONCRETE)**	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3Hours**

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Unit-4: Composite Beams:- **CO4**

Different types, loading conditions, analysis for stresses, differential shrinkage.

Bond and Anchorage: Bond stress and its significance in pre-tensioned beams, transmission length, and determination of bursting force due to anchor zone stresses and provision of steel according to I.S. Code for prestressed concrete.

Shear: Calculation of diagonal tension and its inclination (including vertical prestressing also) provision of steel according to elastic method and I.S. Code method, advantages of prestressing.

[8Hrs]

Unit-5: Limit State Design:- **CO5**

Limit state of serviceability and strength, calculation of ultimate bending moment for given sections, advantages of limit state method over working stress method.

Miscellaneous uses: Analysis and design of poles and circularly prestressed pipes and tanks.

[8Hrs]

Text Books:

S. No.	Title	Author(s)	Publisher
1.	Prestressed Concrete	Krishna Raju N.	New Age International
2.	Fundamentals of Prestressed Concrete	N.C. Sinha & S.K. Roy	S. Chand & Co.
3.	Prestressed Concrete	K.U. Muthu, Azmi Ibrahim, Maganti Janardhana, M.Vijayanand	PHI Learning Private Limited

Reference Books:

S. No.	Title	Author(s)	Publisher
1.	Design of Prestressed Concrete Structures	T.Y.Lin	John Wiley and Sons, Inc.
2.	Prestressed Concrete	Evans, R.H. and Bennett, E.W.	Champman and Hall, London

IS Code used: 1343: 2012

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Subject: CE105823	**SOLID WASTE MANEGEMENT**	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	Course Outcomes
1: To learn about sources and classification of solid wastes. 2: To learn about composition of solid wastes. 3: To learn about solid waste management. 4: To learn about different techniques and methods to recover energy from solid waste. 5: To learn design of landfill for solid waste disposal.	**CO1**: Identify various types of solid wastes and their sources **CO2:** Examine the physical and chemical composition of wastes **CO3 :**Analyze the activities associated with the management of solid waste **CO4 :**Evaluate the techniques and methods used in recovery of materials and energy from solid wastes **CO5:** Design a sanitary landfill for disposal of solid waste

UNIT – I:

Solid Waste: Definitions, Characteristics, and Perspectives: Types of solid wastes, sources of solid wastes, properties of solid wastes, solid waste management: an overview

CO-1
[8Hrs]

UNIT - II:

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; transfer and transport; processing techniques; ultimate disposal; Integrated SW Management concepts **CO-2**
[7Hrs]

UNIT-III:

Engineering Systems for Resource and Energy Recovery: Processing techniques; RRR approach, materials-recovery systems; recovery of biological conversion products; recovery of thermal conversion products; recovery of energy from conversion products; materials and energy recovery systems.

CO-3
[8Hrs]

UNIT – IV:

Engineering Disposal of Solid Waste: Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment. Identify methods of solid waste disposal during a site visit and follow safety precautions.

CO-4
[7Hrs]

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UNIT-V:

Hazardous Waste Management: Introduction; Concern about Hazardous Waste Management; Characteristics of Hazardous Waste; Transportation and Disposal of Hazardous Waste; Industrial/biomedical waste, E- waste management

CO-5

[7Hrs]

TEXT BOOKS:

S. No.	Title	Authors	Edition	Publisher
(1)	Integrated Solid Waste Management,	Tchobanoglous G, Theisen H and Vigil SA	2014 Indian Edition	McGraw Hill Education,
(2)	Waste Management Practices:	John Pichtel,	2014, 2nd Edition	CRC Press,

RFERENCE BOOKS:

S. No.	Title	Authors	Edition	Publisher
(1)	Handbook of Solid Waste Management,	Tchobanoglous G and Kreith F	2002,2nd Edition	McGraw-Hill Education,
(2)	Hazardous Waste Management,	LaGrega M.D., Buckingham P.L. and Evans J.C.,	2010, Reissue Edition	Waveland Pr Inc

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Subject Code	Computer Applications in Civil Engineering)	**L = 3**	**T = 1**	**P = 0**	**Credits = 3**
CE105824	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objective	**Course Outcomes**
This course will enable students to 1. To learn about various computer applications in Fluid Mechanics using programming language C++ 2. To learn about various computer applications in CPM using programming language C++ 3. To learn about various computer applications in Geotechnical Engineering using programming language C++ 4. To learn about various computer applications in Structural Analysis using programming language C++. 5. To learn about various computer applications in Structural Design using programming language C++.	After studying this course, students will be able to: **CO-1**: To be able to prepare computer programs for Fluid Mechanics. **CO-2**: To be able to prepare computer programs for CPM. **CO-3**: To be able to prepare computer programs for Geotechnical Engineering. **CO-4**: To be able to prepare computer programs for Structural Analysis. **CO-5**: To be able to prepare computer programs for Structural Design .

UNIT- I **CO1**

Fluid Mechanics Applications

Flowcharts, Algorithms and C++ programs for – Flow through pipes, Computation of friction factor, Hardy Cross method of water supply distribution, Determination of depth of flow and discharge in rectangular and circular open channels. [8Hrs]

UNIT – II **CO2**

CPM and survey applications

Flowcharts, Algorithms and C++ programs for – Determination of earliest expected time for an activity, Network analysis and determination of critical path, Survey adjustments,

Determination of RL of various points by Rise & Fall and HI methods. [8Hrs]

UNIT – III **CO3**

Geotechnical Engineering Applications

Flowcharts, Algorithms and C++ programs for – Determination of vertical effective stress at a given depth for any soil profile and water table conditions, Determination of bearing capacity of soil for given soil and water table conditions, Determination of one dimensional preconsolidation settlement under compacted fill, Determination of horizontal and vertical hydraulic conductivities for flow through anisotropic soils.
[8Hrs]

UNIT – IV **CO4**

Structural Analysis Applications

Flowcharts, Algorithms and C++ programs for – Computation of SF & BM at any desired section of a simply supported beam for any loading conditions, Analysis of portal frames by moment distribution method, Determination of maximum shear force at a section of a simply supported beam subjected to a system of rolling loads, Determination of maximum bending moment at a section of a simply supported beam subjected to a system of rolling loads.
[8Hrs]

UNIT – V **CO5**

Structural Design Applications

Flowcharts, Algorithms and C++ programs for – Design of Simply supported beams, Design of Columns, Design of Slabs, Design of Foundations. [8Hrs]

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	"Let us C++ "	Yeshwant Kanitkar	Third	BPB Publications
2	"Problem Solving with C++"	Savitch	one	Addison Wesley Publication

Reference Books:

S.No.	Title	Authors	Edition	Publisher
1	C++ Interactive Course	Lafore	Tenth	BPB Publications
2	C++ Components and Algorithms	Rober Lafore	fourth	Galgotia Publications

Subject Code	Advanced Environmental Engineering	L = 3	T = 1	P = 0	Credits =3
CE105825	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objective	Course Outcomes
To develop solutions for Environmental Engineering problems and design system components and processes to meet the specified needs with appropriate consideration for the public health and safety.	On successful completion of the course, the student will be able to: **CO1**:- Describe Various advance methods of water and air analysis. **CO2**:- To study advance method of wastewater treatment **CO3**:- To study tertiary method of wastewater treatment **CO4**:- Characterizing and Management of Nuclear waste. **CO5**: Characterizing and Management of Biomedical waste and plastic waste.

Unit-1 Instrumental methods for analysis CO-1

Instrumental methods for analysis of contaminants in air, water and soil – colorimetry,Chromatography, spectroscopy, electrochemical probes Indoor and outdoor air pollution – meteorology – influence of solar radiation and wind fields – lapse rate and stability conditions – characteristics of stack plumes – effective stack height.Characteristics and health effects of various air pollutant particulates (PM2.5, PM10) and gaseous pollutants (CO, NOx, SOx, etc) – their behaviour in atmosphere – monitoring.Photochemical reactions – secondary pollutants. Control devices for Particulate and Gaseous pollutants – applications. **[8 Hours]**

UNIT-II: Advances in waste water treatment CO2

Advances in waste water treatment – Aerobic Suspended growth Process – Process for biological nitrogen removal design criteria – anoxic, aerobic process design – sequencing batch reactor (SBR) – process analysis – Process for biological phosphorus removal – design criteria.Aerobic attached growth Process – Rotating biological contactor, Activated Biofilter – Fluidized bed bioreactor (FBBR) design criteria. Anaerobic suspended and attached growth process – Up flow anaerobic sludge blanket reactor. **[8 Hours]**

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UNIT –III:

Tertiary treatment CO3

Tertiary treatment – disinfection of waste water – waste water recycling – Water reuse. Advances treatment units – Removal of organic and inorganic colloidal and suspended solids – Removal of dissolved organic constituents – Removal of dissolved inorganic constituents – Filtration – Membrane filtration – Adsorption – Distillation processes. **[10 Hours]**

UNIT-IV: Management of Nuclear waste CO-4

Nuclear waste: Characteristics – Types – Nuclear waste – Uranium mining and processing – Power reactors – Refinery and fuel fabrication wastes – spent fuel – Management of nuclear wastes – Decommissioning of Nuclear power reactors – Health and environmental effects **[7 Hours]**

UNIT-V: Biomedical waste and plastic waste: CO-5

Introduction to biomedical wastes, sources, classification, collection, segregation, treatment and disposal. Biomedical waste management rules E-waste: introduction, e-waste characteristics; e-waste generation, collection, transport, recycling and disposal methods; Effects of e-wastes on the society and environment. E-waste waste management rules Plastic waste: Plastic Waste – Sources, Production, Global and Indian Context; Plastic Waste Management Practices – Plastic management- recycling, energy production, landfilling, other application. **[8 Hours]**

Text Books:

S.No.	Title	Authors	Publisher
1	Waste Water Engineering Treatment Disposal Reuse	Metcalf and Eddy	Tata McGraw-Hill, 2002
2	Air Pollution Control Engineering	Nevers, Noel De	Tata McGraw-Hill, 2002
3	Waste Management Practices: Municipal, Hazardous and Industrial	John Pichtel	CRC Press
4	Integrated Solid Waste Management, Engineering Principles and Management Issues	Tchobanoglous G, Theisen H and Vigil SA	McGraw Hill Education, 2014, Indian Edition

Reference Books:

S. No.	Title	Authors	Publisher
1	Handbook of Solid Waste Management	Tchobanoglous G and Kreith F	McGraw-Hill Education, 2002, 2nd Edition
2	Hazardous Wastes - Sources, Pathways, Receptors	Richard J. Watts	John Wiley and Sons, 1998, 1st Edition.

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Subject Code	MARINE GEOTECHNICS	L = 3	T = 1	P = 0	Credits = 3
CE105826	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objective	Course Outcomes
This course will enable students to 6. To study the marine sediments. 7. To study the geotechnical challenges 8. To study the in-situ testing procedures. 9. To study the behavior of marine soil deposits.	After studying this course, students will be able to: **CO-1:** Analyze distribution of marine sediments along the Indian coasts. **CO-2:** Analyze geotechnical challenges in case of marine sediments. **CO-3:** Implement in-situ testing procedures for determining the properties of marine clays. **CO-4:** Analyze behavior of marine soil deposits under repetitive loading conditions.

UNIT- I **CO1**

Marine soil deposits: Offshore environment, Offshore structures and foundations, Specific problems related to marine soil deposits, Physical and engineering properties of marine soils [8Hrs]

UNIT – II **CO1**

Behaviour of soils subjected to repeated loading: Effect of wave loading on offshore foundations, Behaviour of sands and clays under cyclic loading, Laboratory experiments including repeated loading, Cyclic behaviour of soils based on fundamental theory of mechanics, Approximate engineering methods which can be used for practical cases [8Hrs]

UNIT – III **CO2**

Site Investigation in the case of marine soil deposits: Challenges of site investigation in marine environment, Different site investigation techniques, sampling techniques, Geophysical methods, Recent advancements in site investigation and sampling used for marine soil deposits [8Hrs]

UNIT – IV **CO3**

Foundations in marine soil deposits: Different offshore and nearshore foundations, Gravity platforms, Jack-up rigs, pile foundations. cassions, spudcans [8Hrs]

UNIT – V **CO4**

Numerical modeling of marine foundations subjected to wave loading: Numerical modeling of cyclic behavior of soils, empirical models, elastic-plastic models, FEM analysis of marine foundations subjected to wave loading [8Hrs]

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	"Marine Geotechnics"	H. G. Poulos	Third	Unwin Hyman Ltd
2	"Offshore Structures"	D. V. Reddy and M. Arockiasamy	one	R.E. Kreiger Pub and Co., 1991

Reference Books:

S.No.	Title	Authors	Edition	Publisher
1	Handbook of Marine Geotechnical Engineering	. D. Thomson and D. J. Beasley	Tenth	US Navy, 2012
2	Marine Engineering	C Venkataramaiah	fourth	New Age International Publishers

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Subject Code CE105827	**Seismic Design of Structures**	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	**Course Outcomes**
Objective of the Subject: 1. To learn about basic principles of seismic design of structures. 2.To learn about the features of earthquake resistant buildings. 3.To learn about the Single degree of freedom systems 4.To learn about the Free vibrations of two and three degree of freedom systems.. 5.To learn about the Lateral forces due to earthquake in RCC & Steel framed structures.	**CO1:** To be able to analyze, design and detail structures from seismic point of view. **CO2:** To be able to analyze features of earthquake resistant buildings. **CO3:** To be able to analyze Single degree of freedom systems **CO4:** To be able to analyze Free vibrations of two and three degree of freedom systems. **CO5:** To be able to analyze Free vibrations of two and three degree of freedom systems.

UNIT – I: **CO-1**

Engineering seismology:
Causes of earthquakes; seismic waves; magnitude, intensity and energy release, characteristics of strong earthquake ground motions, Introduction to theory of vibrations - Flexibility of long and short period structures, concept of response spectrum, Seismic zones.

[8Hrs]

UNIT - II **CO-2**

Seismic design concepts:
Desirable features of earthquake resistant buildings, Building forms for earthquake resistance, Seismic design philosophy, Performance of buildings in past earthquakes, Lessons from structural damage during past earthquakes, Equivalent static lateral earthquake force, codal provisions. **[7Hrs]**

UNIT - III: **CO-3**

Single degree of freedom systems: Response of single degree freedom system, free & forced vibrations.

[7Hrs]

UNIT - IV **CO-4**

Multi degree of freedom structures: Free vibrations of two and three degree of freedom systems.
[7Hrs]

UNIT-V **CO-5**

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Design of Buildings: Determination of Lateral forces due to earthquake in RCC & Steel framed structures. **[7Hrs]**

TEXT BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Earthquake Resistant Design of Structures	S. K. Duggal	2nd	Oxford University Presss
2)	Dynamics of Structures: Theory and Application to Earthquake Engineering	Anil K Chopra	2nd	Pearson Education Publication
3)	Earthquake Resistant Design of Structures	Pankaj Agrawal & Manish Shrikhande		PHI Learning Pvt. Ltd.

REFERENCE BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Design of Earthquake Resistant Buildings	Minoru Wakabayashi		McGraw Hill Publication
2)	Vibration and Structural Dynamics	Timoshenkeo, S.	2nd	VanNostrand Co.
3)	Vibration and Structural Dynamics	Mukyopadhyaya		Oxford & IBH
4)	Structural Dynamics (Theory & computations)	Mario Paz	2nd	CBS Publishers & Distributions New Delhi.

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Subject Code CE105828	Water Shed Management	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	**Course Outcomes**
Objective of the Subject: 1. To introduce Understand the characteristics of watershed 2. To understand disaster zoning and hazard assessm Understand the concept, objective, factor effecting in watershed planning ent. 3. To know about the Analyze the effect on watershed hydrology. 4. To understand management during disaster and construction technology for its mitigation. 5. To identify Analyze the effect on watershed hydrology.	1. Understand the characteristics of watershed, watershed development problems, soil characteristics and land use practices and socio-economic factors 2. Understand the concept, objective, factor effecting in watershed planning and hydrological data also prioritization of watershed. 3. Describes the rain water conservation technologies, and understand the integrated watershed management. 4. Analyze the effect on watershed hydrology, and understand the watershed programmer 5. Remember and understand the Participatory watershed management, and formulation of project proposal for watershed management.

UNIT – I: **CO-1**

Watershed - introduction and characteristics. Watershed development - problems and prospects, investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio-economic factors.

[8Hrs]

UNIT - II **CO-2**

Watershed management - concept, objectives, factors affecting, watershed planning based on land capability classes, hydrologic data for watershed planning, watershed codification, delineation and prioritization of watersheds – sediment yield index. Water budgeting in a watershed.

. [**7Hrs]**

UNIT - III: **CO-3**

Management measures - rainwater conservation technologies - in-situ and ex-situ storage, water harvesting and recycling. Dry farming techniques - inter-terrace and inter-bund land management. Integrated watershed management - concept, components, arable lands - agriculture and

horticulture, non-arable lands - forestry, fishery and animal husbandry.

[7Hrs]

UNIT - IV **CO-4**

Effect of cropping systems, land management and cultural practices on watershed hydrology. Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation.

[7Hrs]

UNIT-V **CO-5**

Participatory watershed management - role of watershed associations, user groups and self-help groups.

Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.

[7Hrs]

TEXT BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	**Watershed Management**	Das M.M	2nd	PH Publications
2)	**Watershed Management**	J.V.S. Murthy	2nd	New Age International Publishers, New Delhi
3)	**Watershed Management**	***Kumar, Suresh et al***	3rd	New Age International Publishers, New Delhi

REFERENCE BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Hydrology and Soil Conservation Engineering:	Ghanshyam Das. 2008	3rd	Including Watershed Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
2)	Structural Analysis	Structural Analysis	2nd	Pearson Education

3)	Introduction to the Finite Element Method	Desai C.S., Abel J.F		CBS Publishers & Distributors, Delhi.
4)	Introduction to Finite Elements in Engineering	Chandrupatla T.R., Belegundu A.D	5th	Prentice Hall of India Private Limited, New Delhi.

SHRI SHANKARACHARYA TECHNICAL CAMPUS BHILAI

(An Autonomous Institute affiliated to CSVTU,Bhilai)**Scheme of Examination and Syllabus 2023 Forth Year B. Tech. Civil Engineering 8th semester**

Subject Code CE105829	**Open channel flow**	**L = 2**	**T = 1**	**P = 0**	**Credits = 3**
Evaluation Scheme	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objectives	**Course Outcomes**
1. To provide an understanding of uniform flow in open channel. **2.** To provide an understanding of concepts & application for specific energy & Momentum. **3.** To provide an understanding of graphical and numerical methods for non-uniform flow. **4.** To provide an understanding of hydraulic jumps. **5.** To provide an understanding of Spatially-varied flow.	**CO1**Students are expected to know about open channel & pipe flow. **CO2:** Students are expected to know about energy & momentum principle **CO3:** Students are expected to know about **Equation**, classification and surface profiles for non-uniform flow. **CO4:** Students are expected to know about classification & equation of hydraulic jumps. **CO5:** Students are expected to know about differential equation of SVF with increasing & decreasing discharges.

UNIT– I Introduction:- **CO1**

Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation. Uniform flow: Chezy's and Manning's equations for uniform flow in open channel, most efficient channel section. **[7Hrs]**

UNIT – II Energy and Momentum Principles:- **CO2**

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.**[8Hrs]**

UNIT – III Non-Uniform Flow in Open Channel:- **CO3**

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods. **[8Hrs]**

UNIT – IV Hydraulic Jump, Surges, Water Waves:- **CO4**

Classical hydraulic jump, evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, equation of motion for unsteady flow, open channel surge, celerity of the gravity wave. **[8Hrs]**

		July 2023	1.00	Applicable for AY 2023-24 Onwards
Member 1	Chairman (BoS)	Date of release	Version	

UNIT-V Spatially-varied flow:- **CO5**

Introduction, SVF with increasing discharge, differential equation of SVF with increasing discharges, control point, classification and solutions, profile computation, SVF with decreasing discharge, differential equation for SVF with decreasing discharge, computations. **[8Hrs]**

TEXT BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Fluid Mechanics	A.K. Jain		(Khanna Publication)
2)	Open Channel Flow .	Subramanya		(Tata McGraw Hill, New Delhi)

REFERENCE BOOKS :

S. No.	Title	Authors	Edition	Publisher
1)	Open Channel Flow	VenTe. Chow		(McGraw Hill)
2)	Flow Through Open Channels	Ranga Raju		K.G. (Tata McGraw Hill, New Delhi, 1993)
3)	Experimental Fluid Mechanics (Vol. 2)	Asawa, G.L.		(Nem Chand and Bros., 1992)

SHRI SHANKARACHARYA TECHNICAL CAMPUS BHILAI

(An Autonomous Institute affiliated to CSVTU,Bhilai)**Scheme of Examination and Syllabus 2023 Forth Year B. Tech. Civil Engineering 8th semester**

Subject Code	Non-conventional Energy source	L = 3	T = 1	P = 0	Credits =3
CE105830	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objective	Course Outcomes
To provide a survey of the most important renewable energy resources and the technologies for harnessing these resources within the framework of a broad range of simple to state- of -the-art energy systems.	On successful completion of the course, the student will be able to: **CO1**:- Discuss non-conventional sources of energy and explain the working of different solar energy applications. **CO2**:- Explore the concepts involved in wind energy conversion system by studying its components, types and performance. explain sources of geothermal energy. **CO3**:- Explain the sources of Biomass and geothermal energy . **CO4**:- Illustrate Chemical Energy and ocean energy and explain the operational methods of their utilization. **CO5**:-Describe the working of magneto hydro dynamic power systems and principles of energy conservation .

UNIT-I: Introduction to Energy Sources:

Energy sources and their availability, non-conventional sources, advantages of renewable energy sources, prospects of renewable energy sources.

Solar Energy: Solar energy collectors – flat plate collectors and concentrating collectors, solar energy storage systems – mechanical, electrical, chemical and electro-magnetic, solar pond, applications of solar energy – solar water heating, solar distillation, solar cooking. **CO-1 [8 Hours]**

UNIT-II: Wind Energy :Basic Principles of Wind Energy conversion Site Selection criterion ,wind Data & Energy Estimation, Types of Rotors, Characteristics, performance & limitations of energy conversion systems.**CO-2 [8 Hours]**

UNIT-III : .

Bio-Mass

Energy – Conversion Technology, Classification of Plants, Advantages & Disadvantages

Geo-Thermal Energy –Sources of Geo-Thermal energy, Thermal energy conversion-electrical /Nonelectrical conversion. Advantage & Disadvantages. **CO-3 [10 Hours]**

UNIT-IV: Chemical Energy sources: Fuel cells -principle of operation of fuel cell, types of fuel cells –hydrogenoxygen, solid-oxide, alkaline, polymer electrolyte membrane fuel cells, advantages, disadvantages and conversion efficiency of fuel cells, applications of fuel cells.

Energy from the oceans: Ocean thermal energy conversion-open cycle and closed cycle systems, energy from tides – basic principle of tidal power, components of tidal power plants, single basin and double basin systems, ocean waves – wave energy conversion systems.

CO-4 [7 Hours]

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UNIT-V: Magneto Hydro Dynamic (MHD), Thermo-electric and Thermo-ionic Power Generations: Principles of MHD power generation – open cycle and closed cycle – advantages and limitations.

Basic principles of thermo-electric and thermo-ionic power generation – advantages and limitations.

Energy Conservation: Economic concept of energy, principles of energy conservation and energy audit, energy conservation technologies, co-generation, waste heat utilization, combined cycle power generation **CO-5 [8 Hours]**

S.No.	Title	Authors	Edition	Publisher
1	Non-conventional Energy source	G.D. Rai	2011	5th ed.Khanna Pub..
2	Solar Energy	S.P. Sukhatme	-	TMH

Subject Code	Disaster Management	L = 3	T = 1	P = 0	Credits = 3
CE105841	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objective	Course Outcomes
• To know about the nature of disaster • Be familiar with the various types of disaster and behaviour of structures in disaster. • To know about impacts of disaster on environment • Learning Code provisions for disaster risk reduction. • Be familiar with Various stages of disaster , environment and its development.	CO-1: Able to plan and handle issues related to Nature of disaster in environment. CO 2: Able to know the behaviour of structures in disaster. CO 3: Able to understand the various types impacts of disaster on environment. CO 4: Able to know the Code provisions for disaster risk reduction. CO 5: Able to apply various types of safety & quality Control in Various stages of disaster , environment and its development.

UNIT- I Introduction:

Nature of disasters – natural and other disasters, Earthquakes, floods, draught, cyclones, fire and other environmental disasters. [8Hrs] **CO1**

UNIT – II Disasters: CO2

Disaster's classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters; Behaviour of structures in disaster prone areas, Disaster zoning. [8Hrs]

UNIT – III Disaster Impacts: CO3

Disaster impacts (environmental, physical, social, ecological, economic,political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters. [8Hrs]

UNIT – IV Disaster Risk Reduction (DRR): CO4

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food

safety, waste management, disease control, security, communications), DRR programmes in India and the activities of National Disaster Management Authority. [8Hrs]

UNIT – V Disasters, Environment and Development: CO5

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods. [8Hrs]

Text Books:

S. No.	Title	Authors	Edition	Publisher
1.	Design of Earthquake Resistant Buildings	Minoru Wakabayashi		McGraw Hill Publication
2.	Dynamics of Structures: Theory and Application to Earthquake Engineering	Anil KChopra	2nd edition	Pearson Education Publication

Reference Books:

S.No.	Title	Authors	Edition	Publisher
1.	Disasters and development	Cuny F		Oxford University Press Publication
2.	Earth quake engineering damage assessment and structural design	S.F. Borg		
3.	Fundamentals of Vibrations	Anderson, R.A.		Mc Millan Publication

SHRI SHANKARACHARYA TECHNICAL CAMPUS BHILAI

(An Autonomous Institute affiliated to CSVTU,Bhilai)**Scheme of Examination and Syllabus 2023 Forth Year B. Tech. Civil Engineering 8th semester**

Subject Code	Construction Management	L = 3	T = 1	P = 0	Credits = 3
CE105842	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours

Course Objective	Course Outcomes
This course will enable students to 10. To study the project life cycle. 11. To study the Strategic planning and Professional construction management 12. To study the value engineering and value planning in construction. 13. To study the material management in construction. 14. To study the various cost indices in construction.	After studying this course, students will be able to: **CO-1:** Able to understand project life cycle and various Legal and regulatory Requirements. **CO-2** Able to understand Strategic planning and project programming **CO-3:** Able to apply value engineering, Innovation and technological Feasibility in construction **CO-4:** Able to understand the effective use of Labour, Material and Equipment. **CO-5:** Able to understand various types of construction cost and also estimate the operation cost.

UNIT- I **CO1**

The Owner's Perspective: Introduction-The project life cycle-Major Types of Construction-Selection of Professional Services-Construction contractors-Financing of constructed facilities-Legal and regulatory Requirements-The changing Environment of the construction Industry-The Role Project Managers

[8Hrs]

UNIT – II **CO2**

Organizing for Project Management: Definition of project management, Trends in Modern Management-Strategic planning and project programming- Effects of project risks on organization -Organization of Project Participants-Traditional designer-Constructor sequence Professional construction management-Owner-Builder-Operation-Turnkey operation Leadership and Motivation for the Project team-Interpersonal behavior in project organization-perceptions of Owners and Contractors.

[8Hrs] **UNIT – III**

CO3

The Design and Construction Process: Design and construction as an integrated system Innovation and technological Feasibility-Innovation and technological feasibility-Design

Methodology-Functional Design-Physical Structures-Construction Site Environment-Value engineering, Value Management and Value Planning-Construction Planning-Industrialized Construction and Prefabrication-Computer –Aided Engineering [8Hrs]

UNIT – IV **CO4**

Labour, Material and Equipment Utilization: Historical Perspective – Labour Productivity-Factors Affecting Job-Site Productivity-Labor Relations in construction-Problems in collective bargaining-Materials Management-Materials Procurement and Delivery- Inventory Control-Tradeoffs of cost in Material Management-Construction Equipment-Choice of Equipment and Standard production Rates-Construction Processes Queues and Resource Bottlenecks.

[8Hrs]

UNIT – V **CO5**

Cost Estimation: Costs Associated with Construction Facilities-Approaches to cost Estimation-Type of construction cost estimates- Effects of scaleon construction cost-Unit cost Method of estimation-Historical cost data-Cost indices-Applications of cost Indices to Estimating Estimate based on Engineers List of Quantities-Allocation of Construction costs over time-Estimation of operating costs, concept of pre and post construction cost management.

[8Hrs]

Text Books:

S. No.	Title	Authors	Edition	Publisher
1	Construction Project Management Planning, Scheduling and Control	Chitkara, K.K.		Tata McGraw Hill
2	Project Management: A systems Approach to Planning, Scheduling and Controlling	Harold Kerzner		CBS Publishers

Reference Books:

S.No.	Title	Authors	Edition	Publisher

1	Project Management	Choudhury, S.		Tata McGraw Hill
2	Construction cost management, learning from case studies	Keith Potts, Taylor and Francis		London and New York

Subject Code	**Ecology and sustainable development**	**L = 3**	**T = 1**	**P = 0**	**Credits =3**
CE105843	**ESE**	**CT**	**TA**	**Total**	**ESE Duration**
	100	**20**	**30**	**150**	**3 Hours**

Course Objective	**Course Outcomes**
Tomake the students learn to deal with environmental and sustainable development aspects	On successful completion of the course, the student will be able to: **CO1**:- Describe Various aspects of ecosystem and biodiversity **CO2**:- Nature of environment and role of individuals. **CO3**:- UnderstandSocial issues in the society. **CO4**:- Understand principle of sustainable development. **CO5**:Understand natural resources and climate change.

UNIT-I:Ecosystem and Biodiversity **CO-1**

Basic concepts of ecosystem, Structure and Functions of an ecosystem, Energy flow, food chains. Impact of humans on various ecosystems like Forest, Grassland and Aquatic ecosystem Ecosystem Bio diversity, Species diversity, Genetic diversity. Importance of biodiversity and Threats to biodiversity.Conservationofbiodiversity. **[8 Hours]**

UNIT-II: The Multidisciplinary Nature of Environment Studies anditsResources **CO2**

Objectives and guiding principles of Environmental Studies: Scope andRelevance.Science of Environment: Lithosphere, Hydrosphere, Atmosphere. Need for Public Awareness, Role of Ministry of Environment and Forest (MoEF), Govt. of India, Role of Technical Students in EnvironmentalProtection. Role of individuals in the conservation of naturalresources.Natural Resources:.
Hours]

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UNIT –III:Social Issues and the Environment

Human population and environment: Definition of overpopulation,Causes and consequences of rapid population growth. Sustainable Development: Energy conservation, Need for energy conservation and Barriers to energy conservation, Methods for promoting energy conservation. Water Conservation: Methods of water conservation, Water Conservation: Strategies to promote water conservation. Rainwater Harvesting- Techniques and Relevance Water ShedManagement.
.**[10 Hours]**

UNIT-IV:Sustainable Development **CO-4**
Introduction to Sustainable Development its principles.Economic Growth and Progress.Continuing Poverty.Environmental Threats. Business As Usual Versus Sustainable Development
.**[7 Hours**]

UNIT-V:Environment and sustainability **CO-5**
Definition of Renewable and Non Renewable Resources.Use and Over exploitation and the Environmental Effects: Forest Resources, Use and Over exploitation and the Environmental Effects: Surface and Groundwater Resources, Use and Over exploitation and the Environmental Effects: Mineral Resources and Energy Resources. Climate Change.Global warming. Case studies
[8 Hours]

Text Books:

S.No.	Title	Authors	Edition	Publisher
1	Environmetal studies	S.K.dha meja	4th edition(2011)	Skkataria& sons, New Delhi
2	Environmetal studies	Benny joseph.	(2005)	Tata ,Mcgraw Hill –

Reference Books:

S. No.	Title	Authors	Edition	Publisher
1	Ecology and sustainable development	P S ramakrishna	2nd edidtion 2015	Paperback publications

Subject Code CE105811	Structural Engineering Drawing-II Lab	L = 2	T = 1	P = 2	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	00	25	25	8 Hours

Experiments to be performed :

1. Details of reinforcement in a simply supported RCC beam (singly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.

2. Details of reinforcement in a simply supported RCC beam (doubly reinforced) with the given design data regarding the size and number of bars, stirrups their size and spacing.

3. Details of reinforcement in a simply supported RCC beam (T section) with the given design data regarding the size and number of bars, stirrups their size and spacing.

4. Details of reinforcement in a one way slab with the given design data regarding the size and number of bars, their size and spacing.

5. Details of reinforcement in a two way slab with the given design data regarding the size and number of bars, their size and spacing.

6. Details of reinforcement in a stair case with the given design data regarding the size and number of bars, their size and spacing.

7. Details of reinforcement for a RCC rectangular column with isolated footing.

8. Details of reinforcement for a RCC circular column with isolated square footing.

9. Detailing of Combined footings.

10. Detailing of Retaining walls.

11. Detailing for Water Tanks.

12. Detailing for R.C.C. slab Bridge.

13. Detailing for R.C.C. T-Beam Bridge.

14. Detailing for Prestressed Concrete Girder.

15. Bar bending schedules for few of the above items.

Field Visit (Minimum 3 times):

Study of complete standard drawing:

1. Multistoried building

2. Bridge

3. Water tank List of Equipments / Machine Required:

1. List of Equipments – Not Required.

SHRI SHANKARACHARYA TECHNICAL CAMPUS BHILAI

(An Autonomous Institute affiliated to CSVTU,Bhilai)**Scheme of Examination and Syllabus 2023 Forth Year B. Tech. Civil Engineering 8th semester**

Subject Code CE105812	Advance Geotechnical Engineering lab	L = 2	T = 1	P = 2	Credits = 3
Evaluation Scheme	ESE	CT	TA	Total	ESE Duration
	25	00	25	25	8 Hours

Advance Geotechnical Engineering lab

List of Experiments:

1. CBR (Un-soaked)
2. Plate load test study
3. Study of penetration test
4. Design and drawing of shallow foundation by Terzagh's
5. Design and drawing of shallow foundation by BIS
6. Design and drawing of pile foundation (individual)
7. Design and drawing of pile foundation (individual)
8. Design and drawing of well foundation
9. Permeability test using Constant-head test method.
10. Permeability test using Falling-head method.

Equipment / Machines / Instruments / Tools / Software Required:

1. CBR Apparatus

2. Oven

3.Constant Head Permeability Test Apparatus

4.Following Head Permeability Test Apparatus

5.Mechanical Sieve Analysis (Complete Sets of Sieves)

6. Soil Sampling Tube, Piston Tube

7. Rammer for Compaction

8.Soil Extractor

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9. Measuring Jar Cylinder(1000CC)
10. Light Compaction Mould
11. Heavy Compaction Mould
12. MS Excel
13. Auto cad Recommended