CURRICULUM & SYLLABUS

B.Tech (Honours) *in* CIVIL ENGINEERING

2024 SCHEME

CURRICULUM

B.Tech (Honours) is an enhanced version of the Bachelor of Technology degree, offering the students the opportunity to undertake additional courses within their own discipline. This pathway allows students to deepen their knowledge in emerging or advanced areas of Engineering relevant to their field of study, providing a stronger foundation for specialized career paths or further academic pursuits.

For the award of B.Tech (Honours) in Civil Engineering, the student shall fulfill all the curricular requirements for B.Tech in Civil Engineering as per SJCET B.Tech Academic Regulations 2024 and shall earn 15 additional credits by undergoing the following courses, which shall be further governed by clause R16 of the Regulations.

Sl. No.	Semester	Course Code	Course Name/Type	Weekly hours			SS	Total Marks		Credits
				L	T	P		CIE	ESE	
1	4	24SJHNCET409	Pavement construction and management	3	1	0	5	40	60	4
2	5	24SJHNCET509	Transportation systems management	3	1	0	5	40	60	4
		24SJHNCEM5XX	Approved MOOC*							
3	6	24SJHNCET609	Earth dams and earth retaining structures	3	1	0	5	40	60	4
		24SJHNCEM6XX	Approved MOOC*							
4	7	24SJHNCET709	Soil dynamics and machine foundations	3	0	0	5	40	60	3
		24SJHNCEM7XX	Approved MOOC*							
Total							**20**			**15**

*MOOC to be approved by the Academic Council on recommendation of the Board of Studies.

Programme Outcomes (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO8: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO9: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO11: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

SEMESTER S4
PAVEMENT CONSTRUCTION AND MANAGEMENT

Course Code	24SJHNCET409	**CIE Marks**	40
Teaching Hours/Week (L: T:P)	3:1:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

Objective of the course is to introduce the principles and practice of Highway construction and infrastructure asset management

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Pavement:** functions and characteristics - Types of pavements: flexible pavement, rigid pavement, comparison- Different layers of flexible and rigid pavement **Pavement materials:** characterization of sub grade soil, soil classification system, properties of road aggregate, principles and methods of gradation of soil aggregate mixes, characteristics and uses of bitumen, emulsion cutback and modified bitumen.	10
2	**Bituminous pavement types:** penetration layer system and premixed aggregate- specification of materials, **Mix design:** physical and volumetric properties of bituminous mix, Marshall method of mix design, Super pave mix design	8
3	**Construction of flexible pavement:** functions of various layers, preparation and construction of sub grade, granular sub base (GSB), WBM, WMM, Bituminous macadam, Different types of wearing courses. specifications/ guild lines, equipment used for the construction of different layers in flexible pavement, quality control for flexible pavement construction **Construction of cement concrete pavement:** material characterization, preparation of subgrade and base, Types of joints in Rigid pavements its functions and design, presetting reinforcement in joints and PCC slab construction	12

4	**Introduction to pavement management system (PMS):** concept, definition, objectives, components, general structure-data collection pavement evaluation, functional and structural evaluation, pavement deterioration models, pavement management levels: network, programme and project level- types of pavement management system, Types of Maintenance and rehabilitation activities, life cycle cost analysis of strategies, popular software	**12**

Course Content and lecture Schedule:

Sl No.	Topic	Course Outcome	No of Hours
1	**Module 1**		
1.1	Functions and characteristics of pavements, Types of pavement and comparison (flexible pavement, rigid pavement)	CO1	1
1.2	Different layers and properties of flexible and rigid pavement	CO1	1
1.3	characterization of sub grade soil and soil classification system	CO1	2
1.4	Properties of road aggregate, principles and methods of gradation of soil aggregate mixes	CO1	3
1.5	Characteristics and uses of bitumen, emulsion cutback and modified bitumen	CO1	3
2	**Module 2**		
2.1	Penetration layer system and premixed aggregate system	CO2	2
2.2	Physical and volumetric properties of bituminous mix, Marshall method of mix design, Superpave Mix design	CO2	6
3	**Module 3**		
3.1	Functions of various layers of flexible pavement, preparation and construction of sub grade, granular sub base (GSB), WBM, WMM, Bituminous macadam, Different types of wearing courses specifications/ guidelines	CO3	4
3.2	Equipment used for the construction of different layers in flexible pavement, quality control for flexible pavement construction	CO3	4
3.3	Construction of cement concrete pavement : material characterization, preparation of subgrade and base	CO4	2
3.4	Types of joints in Rigid pavements its functions and design, presetting reinforcement in joints and PCC slab construction	CO4	2

	Module 4		
4.1	Introduction to pavement management system (PMS): concept, definition, objectives, components, general structure-data collection	CO5	3
4.2	Pavement evaluation, functional and structural evaluation, pavement deterioration models	CO5	3
4.3	Pavement management levels: network, program and project level	CO5	2
4.4	Types of pavement management system, Types of Maintenance and rehabilitation activities	CO5	2
4.5	Life cycle cost analysis of strategies, popular software	CO5	2

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO 1	To understand the characterization of materials used for pavement construction	K3
CO 2	To carry out mix design of various bituminous mixes	K3
CO 3	To study construction practices of flexible pavement and equipment used	K3
CO 4	To understand the construction practices and reinforcement design of rigid pavement	K3
CO 5	To study the fundamentals of pavement evaluation and pavement management system	K3

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	3	3	3	1	-	1	1	-	2	-	1	2	3
CO 2	3	1	3	1	-	1	1	-	1	-	1	2	2
CO 3	3	2	2	1	-	-	-	1	2	-	2	2	3
CO 4	2	-	-	-	-	-	1	-	-	-	2	2	3
CO 5	3	3	3	-	-	3	2	-	-	-	-	2	3

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Highway Engineering	Khanna, S.K, Justo E.G, A Veeraragavan	Khanna Publishers	10th edition, 2018
2	Principles of Highway Engineering	Kadiyali, L. R.	Khanna Publishers	7th Edition 2019

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Pavement Engineering	Rajib B. Mallick and TaharEl-Korchi,	CRC press	4th Edition 2023
2	Principles of Transportation and Highway Engineering,	Rao G. V	Tata McGrawHill,	1996
3	Bituminous Road Construction in India,	Prithvi Singh Khandhal	PHI Learning,	2nd Edition 2023
4	Manual for construction and supervision of Bituminous works, MoRTH 2001			2008
5	Pavement Management for Airports, Roads and Parking lots	Shahin M.Y	Chapman & Hall	2005
6	IRC: 37-2018, Guidelines for the Design of Flexible Pavements, IRC 2018, New Delhi			
7	MoRTH, IRC code for pavement evaluation, data collection			

SEMESTER S5
TRANSPORTATION SYSTEMS MANAGEMENT

Course Code	24SJHNCET509	**CIE Marks**	40
Teaching Hours/Week (L: T:P)	3:1:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Preamble: Objective of the course is to impart an awareness on transportation system management, TSM strategies, promotion of non-transport modes and advanced transit technologies.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	System approach to Transportation Planning; The need for TSM, Long range verses TSM Planning TSM characteristics: TSM planning cycle, TSM strategies, Objectives and Philosophy; Relevance of TSM actions in Indian context. Measures for Improving vehicular flow – one-way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes-Reducing Peak Period Traffic – Strategies for working hours, Congestion Pricing; Traffic calming measures	**10**
2	Public Transport: Preferential Treatment to high Occupancy Vehicles; Transit system operations, Service and characteristics, Transit Service Improvement Measures; Car Pooling; Transit Management Improvement Measure; Multi-Modal Coordination; Transit and Para transit integration;	**10**
3	Bus Route Network Planning and Management: Type of Bus Route Networks; Suitability for a given Urban Area; Types of routes – Corridor routes, activity routes and residential routes; Issues in route networks evaluation – number of route, length of route; Route alignment methods; service coverage and accessibility index	**11**

4	Local area traffic management: Promotion of Non – motorised modes: Measures to promote; Pedestrianisation: Pedestrian facilities and management. Bicycle Transportation – advantages; Planning Bicycle Facilities Junction Treats for cycle tracks; LOS criteria for Pedestrian and bicycle Facilities Advanced Transit Technologies: Conventional and Unconventional Systems; Rapid Transportation System; New technologies – LRT, monorail, Automated Highways- Hovercraft; System Characteristics and Suitability.	**12**

Course Content and lecture Schedule:

No.	**Topic**	**Course Outcome**	**No. of Hrs**
1	**Module 1**		
1.1	System approach to Transportation Planning; The need for TSM, Long range verses TSM Planning	CO1	1
1.2	TSM characteristics: TSM planning cycle, TSM strategies, Objectives and Philosophy; Relevance of TSM actions in Indian context.	CO1	2
1.3	Measures for Improving vehicular flow – one-way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic – Strategies for working hours, Congestion Pricing.	CO1	7
2	**Module 2**		
2.1	Public Transport: Preferential Treatment tohigh Occupancy Vehicles; Transit system operations, Service and characteristics, Transit Service Improvement Measures; Car Pooling;	CO2	5
2.2	Transit Management Improvement Measure; Multi-Modal Coordination; Transit and Para transit integration;	CO2	5
3	**Module 3**		
3.1	Bus Route Network Planning and Management: Type of Bus Route Networks; Suitability for a given Urban Area;	CO2	1
3.2	Types of routes – Corridor routes, activity routes and residential routes;	CO2	1
3.3	Issues in route networks evaluation – number of route, length of route;	CO2	2
3.4	Route alignment methods; service coverage and accessibility index.	CO2	2

3.5	Local area traffic management: Promotion of Non – motorised modes: Measures to promote;	CO3	1
3.6	Pedestrianisation: Pedestrian facilities and management. IRC codes.	CO3	1
3.7	Bicycle Transportation – advantages; Planning Bicycle Facilities Junction Treats for cycle tracks; IRC codes for bicycle facilities. LOS criteria for Pedestrian and bicycle Facilities.	CO3	3
4	**Module 4**		
4.1	Advanced Transit Technologies: low carbon vehicles; Automated Highways: System Characteristics and Suitability, Electric vehicles, Automated vehicles: Planning, infrastructure and implementation; issues.	CO4	6
4.2	Rapid Transportation System; New technologies – LRT, monorail, Bus rapid transit system (BRTS), Rail rapid transit system (RRTS).	CO4	6

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination - 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions.**(4x9 = 36 marks)**	**60**

	Course Outcomes (COs)	Bloom's Knowledge Level (KL)
CO 1	Apply a transportation system management strategy based on TSM goal or objective.	K3
CO 2	Recommend methods to manage a transit system to improve its management efficiency.	K3
CO 3	Recommend measures for the promotion of non-transport modes for a transportation system based on a goal or objective.	K3
CO 4	Assess the suitability of advanced transit technologies in a transportation system.	K3

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO2
CO 1	3	1	-	-	-	2	1	-	-	1	2	2	1
CO 2	2	1	-	-	-	2	1	-	-	1	2	2	1
CO 3	1	-	-	-	-	2	1	-	-	1	2	2	-
CO 4	1	-	-	-	1	2	1	1	-	1	2	1	-

Text Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Transportation Engineering: An Introduction	C. J. Khisty and B. K. Lall	Prentice- Hall India	2003
2	Transportation Demand Management (TDM) Encyclopedia		Victoria Transport Policy Institute. Canada	2006

Reference Books

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Transportation Engineering and Planning	C. S. Papacostas and P. D. Prevedouros	Prentice Hall of India Private Limited	2001
2	Traffic Engineering	Roger P. Roess, William R.McShane & Elena S.Prassas	Prentice- Hall	1990

SEMESTER S6
EARTH DAMS AND EARTH RETAINING STRUCTURES

Course Code	24SJHNCET609	**CIE Marks**	40
Teaching Hours/Week (L: T:P)	3:1:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Preamble: Goal of this course is to impart to the students, in-depth knowledge about the fundamentals of earth dams and Earth pressure theories. After this course, students will be able to analyze stability of earth dams and various types of retaining structures.

Prerequisite: 24SJPBCET504: Foundation Engineering

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Earth dams – types of dams - Selection of type of dam based on material availability - Foundation conditions and topography - Design details – crest, free board, upstream and downstream slopes, upstream and downstream slope protection – central and inclined cores - Types and design of filters - Seepage analysis and control – seepage through dam and foundations – control of seepage in earth dam and foundation	**10**
2	Construction techniques of earth dams – methods of construction - Quality control Instrumentation – measurement of pore pressures - Determination of phreatic line - Stability analysis – critical stability conditions - Desired values of factor of safety for different loading conditions of dam - Evaluation of stability by Swedish Slip Circle Method and sliding wedge method under critical conditions	**10**
3	Earth pressure theories – Rankine‘s and Coulomb’s earth pressure theories for cohesionless and cohesive backfills – Computation of earth pressures for various cases – inclined – with surcharge – submerged and partly submerged – stratified backfills - Rigid retaining structures – active and passive earth pressures against gravity retaining walls – Numerical Problems - Computation of	**10**

	earth pressures by Trial wedge method –A mathematical approach for completely submerged and partly submerged backfills - Numerical Problems - Importance of capillarity tension in earth pressure Graphical methods of earth pressure computation – trial wedge method for coulomb‘s and Rankine‘s conditions, for regular and irregular ground and wall conditions -Rebhan‘s construction for active pressure - Friction circle method - Logarithmic spiral method - Design of gravity retaining wall – cantilever retaining walls - Numerical Problems - Flexible retaining structure – type and methods of construction – design strength parameters	
4	Safety factor for sheet pile walls – Computation of earth pressures against cantilever sheet piles in cohesionless and cohesive soils – Numerical Problems - Anchored sheet piles – free earth method – fixed earth method – Rowe‘s moment reduction method - Stability of sheet piling - Diaphragm walls and coffer dams – types of diaphragm walls and their construction techniques in various soil types - Earth pressure on braced cuts and coffer dams – Design of coffer dams	**14**

Course Contents and Lecture Schedule:

Module	Contents		Hours
1	**Module 1**		
1.1	Earth dams – types of dams	CO 1	1
1.2	Selection of type of dam based on material availability	CO 1	1
1.3	Foundation conditions and topography	CO 1	2
1.4	Design details – crest, free board, upstream and downstream slopes, upstream and downstream slope protection – central and inclined cores	CO 1	2
1.5	Types and design of filters	CO 1	2
1.6	Seepage analysis and control – seepage through dam and foundations – control of seepage in earth dam and foundation	CO 1	2
2	**Module 2**		
2.1	Construction techniques of earth dams – methods of construction	CO 1	1
2.2	Quality control Instrumentation – measurement of pore pressures	CO 1	1
2.3	Determination of phreatic line	CO 1	2
2.4	Stability analysis – critical stability conditions	CO 1, CO 2	2
2.5	Desired values of factor of safety for different loading conditions of dam	CO 1, CO 2	1
2.6	Evaluation of stability by Swedish Slip Circle Method and sliding wedge method under critical conditions	CO 1, CO 2	3
3	**Module 3**		
3.1	Earth pressure theories – Rankine‘s and Coulomb’searth pressure theories for cohesionless and cohesive backfills – Computation of earth pressures for various cases – inclined – with surcharge – submerged and partly submerged – stratified backfills	CO 3	2
3.2	Rigid retaining structures – active and passive earth pressures against gravity retaining walls – Numerical Problems	CO 3, CO 4	2

3.3	Computation of earth pressures by Trial wedge method – A mathematical approach for completely submerged and partly submerged backfills	CO 3	2
3.4	Numerical Problems	CO 3, CO 4	2
3.5	Importance of capillarity tension in earth pressure	CO 3	2
4	**Module 4**		
4.1	Graphical methods of earth pressure computation – trial wedge method for coulomb‘s and Rankine‘s conditions, for regular and irregular ground and wall conditions -Rebhan‘s construction for active pressure	CO3, CO4	2
4.2	Friction circle method - Logarithmic spiral method	CO3	2
4.3	Design of gravity retaining wall – cantilever retaining walls - Numerical Problems	CO5	2
4.4	Safety factor for sheet pile walls – Computation of earth pressures against cantilever sheet piles in cohesionless and cohesive soils – Numerical Problems	CO3, CO4	2
4.5	Anchored sheet piles – free earth method – fixed earth method – Rowe‘s moment reduction method	CO3, CO4	2
4.6	Stability of sheet piling	CO3, CO5	1
4.7	Diaphragm walls and coffer dams – type of diaphragm walls and their construction techniques in various soil types, Earth pressure on braced cuts and coffer dams – Design of coffer dams	CO3	3

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination - 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes: After completion of the course the student will be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO 1	Understand the fundamentals of earth dams	K2
CO 2	Analyze slope stability of earth dams	K3
CO 3	Explain the basic concepts & theories of Earth pressure	K3
CO 4	Calculate earth pressure for different types of retaining structures	K3
CO 5	Design Rigid and Flexible Retaining Walls applying the earth pressure theories	K3

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO2
CO 1	3	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO 3	3	-	-	-	-	-	-	-	-	-	-	2	1
CO 4	2	3	-	-	-	-	-	-	-	-	-	2	1
CO 5	2	2	3	-	-	-	-	-	-	-	-	1	1

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Foundations, Retaining and earth structures	Tschebotarioff G P	2nd edition, Mcgraw Hill Pub.,	1973
Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Earth Pressure and Earth-Retaining Structures,	Clayton, Milititsky and Woods	Taylor and Francis,	1996
2	Earth pressure on retaining walls	Huntington	John Wiley and Sons	1957
3	Analysis and Design of Foundations and Retaining structures	Prakash, Ranjan and Saran	Saritha Prakashan, Meerut	1979
4	Foundation Analysis and Design	Bowles	McGraw Hill	1968
5	Earth Reinforcements and Soil structures	Jones	Thomas Telford Ltd	1996
6	IS : 7894 – 1975, Indian Standard Code of Practice for Stability Analysis of Earth Dams			

SEMESTER S7
SOIL DYNAMICS AND MACHINE FOUNDATIONS

Course Code	24SJHNCET709	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	3:1:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Preamble: Goal of this course is to impart to the students, in-depth knowledge about the basic concepts and theories of soil dynamics and machine foundation.

Prerequisite: 24SJ PBCET504: Foundation Engineering

Module No.	Syllabus Description	Contact Hours
1	**Theory of vibrations:** Definitions, Single degree freedom system - Free vibration of a spring mass system. Free vibration with viscous damping- Critically damped system, Over damped system, Under damped system. Logarithmic decrement. Forced vibration with damping. Frequency dependent excitation. **Dynamic soil properties**: Definition and factors affecting. Determination of dynamic soil properties -Cross hole test, Cyclic plate load test, Block vibration test, Correlations of dynamic soil properties with SPT N value.	**10**
2	**Analysis of Machine Foundations**: Modes of vibrations of a rigid foundation block. Linear Elastic Weightless Spring method of analysis for all modes of vibration- Numerical problems. Concept of elastic Half-space method of analysis.	**10**
3	**Design of foundation for reciprocating machines:** Design of foundations for reciprocating machines (IS method of Design) - design requirements and design procedure for block type foundation-Necessary data, design criteria, permissible amplitude. **Design of foundation for Impact type machines-**Design criteria and design procedure for block type foundation (IS method). Properties and requirements of cushion pad, Construction criteria of foundations for impact type of machines.	**10**
4	**Vibration isolation for Machine Foundations**: Choice of vibration isolation -IS Guidelines, Active and passive isolation,	**14**

	Transmissibility, Design of wave barriers (open trench), dynamic properties of vibration isolators- coil springs, rubber springs, cork pads, Design procedure for foundations on absorbers .	

Course Contents and Lecture Schedule

Module	Contents	Hours
1		
1.1	**Theory of vibrations:** Definitions, Single degree freedom system	1
1.2	Free vibration of a spring mass system.	1
1.3	Free vibration with viscous damping- Critically damped system, Over damped system, Under damped system	2
1.4	Logarithmic decrement. Forced vibration with damping	1
1.5	Frequency dependent excitation.	1
1.6	**Dynamic soil properties**: Definition and factors affecting	1
1.7	Determination of dynamic soil properties -Cross hole test, Cyclic plate load test, Block vibration test	2
1.8	Correlations of dynamic soil properties with SPT N value.	1
2		
2.1	**Analysis of Machine Foundations**: Modes of vibrations of a rigid foundation block	2
2.2	Linear Elastic Weightless Spring method of analysis for all modes of vibration	2
2.3	Numerical problems	3
2.4	Concept of elastic Half-space method of analysis.	3
3		
3.1	**Design of foundation for reciprocating machines** -Design of foundations for reciprocating machines (IS method of Design)	3
3.2	Design requirements	3
3.3	Design procedure for block type foundation-Necessary data, design criteria, permissible amplitude	4
4		
4.1	**Design of foundation for Impact type machines**-Design criteria and design procedure for block type foundation (IS method)	3
4.2	Properties and requirements of cushion pad	2
4.3	Construction criteria of foundations for impact type of machines.	2

4.4	**Vibration isolation for Machine Foundations**: Choice of vibration isolation	1
4.5	IS Guidelines	1
4.6	Active and passive isolation, Transmissibility, Design of wave barriers (open trench)	2
4.7	Dynamic properties of vibration isolators- coil springs, rubber springs, cork pads	1
4.8	Design procedure for foundations on absorbers	2

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination -1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

	Course Outcomes:	**Bloom's Knowledge Level (KL)**
CO 1	Analyze single degree of freedom systems under vibration using theory of vibrations	K3
CO 2	Evaluate dynamic soil properties using IS procedures	K3
CO 3	Analyze the response of machine foundations	K3
CO 4	Design machine foundation with reciprocating and Impact type of machines	K3
CO 5	Design of wave barriers	K3

Mapping of course outcomes with program outcomes (Minimum requirement)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PSO1	PSO 2
CO 1	3	-	-	3	-	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-	-	2	1
CO 3	2	3	-	-	-	-	-	-	-	-	-	-	-
CO 4	2	2	3	-	-	-	-	-	-	-	-	2	1
CO 5	3	3	-	-	-	-	-	-	-	-	-	1	1

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Basic and Applied Soil Mechanics	Ranjan G. and A. S. R. Rao	New Age International,	2002
2	Geotechnical Engineering	Arora K. R	Standard Publishers,	2006.
Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Principles of Geotechnical Engineering.	Das B. M.	Cengage India Pvt. Ltd.	2010
2	Geotechnical Engineering	Venkatramaiah	Universities Press,	2000.
3	Soil Mechanics in Engineering Practice,	Terzaghi K. and R. B. Peck,	John Wiley,	1967
4	Numerical Problems, Examples and Objective questions in Geotechnical Engineering,	A V Narasimha Rao and C Venkatramaiah	Universities Press (India) Ltd.,	2000
5	Soil Mechanics and Foundation Engineering	Purushothamaraj P.	Dorling Indersley (India) Pvt. Ltd.,	2013
6	Fundamentals of Soil Mechanics	Taylor D.W.	Asia Publishing House	1948.

Department of
Civil Engineering

Vision

- To develop into a globally reputed center of excellence in the field of Civil Engineering for imparting knowledge and technical skills suiting the needs of the society with distinct identity and character in teaching, research and consultancy.

Mission

- To follow Teaching – Learning process and conducive infrastructure with the support of qualified and committed faculty in Civil Engineering Programs.
- To establish a team of dedicated faculty in academic pace for collaborating with academia and community to serve local and state enterprises.
- To make the students self-learners and socially committed engineers for individual and collective accomplishments and also for nurturing moral and ethical values for their successful careers.

Program Specific Outcomes (PSOs):

- To practice Civil Engineering within industry, government and private practice, working toward sustainable solutions in a wide array of technical specialties including construction, environmental, geotechnical, structural, transportation and water resources.

- To grow professionally in their careers through continued development of technical, management, communication skills and to achieve their professional aims ethically and with cultural competency.

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Developing into a world class, pace setting institute of Engineering and Technology with distinct identity and character, meeting the goals and aspirations of the society.

Mission

- To maintain a conducive infrastructure and learning environment for world class education.
- To nurture a team of dedicated, competent and research-oriented faculty.
- To develop students with moral and ethical values, for their successful careers, by offering variety of programs and services.