



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Institute of Technology  
Semester-2

**Subject :** Construction Techniques of Deep Foundations - METCP12514

**Type of course:** Minor Stream

**Prerequisite:** NIL

**Rationale:** Construction Techniques for Deep Foundations is to ensure the structural stability, safety, and longevity of buildings and infrastructure, particularly in challenging soil conditions or when supporting heavy loads. Deep foundations, such as piles and caissons, are designed to transfer the load from a structure to deeper, more stable soil or rock layers, bypassing weaker surface soils. This is crucial for providing the necessary load-bearing capacity for large buildings, bridges, and other heavy structures, ensuring they can safely bear substantial weights.

In areas with poor surface soil, deep foundations reach more stable strata, preventing settlement and potential structural failure. They also offer stability in regions prone to natural disasters, like earthquakes and floods, by securely anchoring structures. Moreover, deep foundations are designed for durability and longevity, providing a long-term solution that enhances the lifespan and safety of the structure. By addressing these factors, deep foundation techniques ensure the reliability and durability of critical infrastructure projects.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

*Legends: CI-Class Room Instructions; T-Tutorial; P-Practical; C-Credit; ESE-End Semester Examination; MSE-Mid Semester Examination; V-Viva; CA-Continuous Assessment; ALA-Active Learning Activities.*



**Course Content:**

Sr. No	Course content	Hrs	% Weightage
1	<p><b>Introduction to deep foundations:</b> Introduction- Preliminary investigations, subsurface exploration, data interpretation and estimation of various sub-soil properties; Types of deep foundations; Requirements for deep foundations; Codal provisions on safety requirements for deep foundations.</p> <p><b>Bored piles:</b> Classification of bored piles; Construction methods and construction sequences of bored piles; Equipment's used for boring, drilling and concreting; Piling supervision and quality assurance; Design considerations and pile capacity</p>	16	27%
2	<p><b>Driven piles:</b> Classification of driven piles; Selection of type of piles and method of installation; Pile driving equipment's; Construction and quality assurance of driven piles; Advantages and disadvantages of driven piles; Pile damages and pile integrity test; Design considerations and pile capacity</p> <p><b>Well Foundations:</b> Types of wells or caissons; Different shapes of well; Drilled shafts and caissons; Methods and construction sequences; Design procedure; Advantages and disadvantages of well foundation.</p>	16	27%
3	<p><b>Diaphragm wall:</b> Deep excavations and protection systems; Applications of diaphragm wall; Diaphragm wall construction methods; Design procedure; Advantages and disadvantages.</p> <p><b>Sheet piles and Cofferdams:</b> Sheeting and bracing systems in shallow and deep open cuts in different soil types –Cantilever sheet piles, Anchored sheet piles; Construction methods and sequences; Design procedure; Merits and demerits. Types of Cofferdams; Cofferdam components and construction sequences; design procedure for cellular coffer dam; merits and demerits</p>	17	28%
4	<p><b>Reinforced Earth Walls</b> Introduction; Advantages of RE walls; Behaviour of RE walls; Materials for reinforced earth structures; Soil-reinforcement interaction; Internal and external stability conditions; Design criteria; Field applications of RE walls.</p>	11	18%
	<b>Total</b>	<b>60</b>	<b>100</b>



**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<p><b>Case Study Analysis:</b> Provide students with case studies of notable construction projects that involved complex deep foundation installations. Students will analyze these case studies to understand the challenges faced during construction and the innovative solutions employed to overcome them.</p>	10
2	<p><b>Practical Exercise:</b> Divide students into small groups and assign each group a hypothetical construction project with specific soil conditions and structural requirements. Students will propose a deep foundation design for the given project, considering factors such as load capacity, settlement criteria, and construction feasibility. Each group will present their proposed design to the class, explaining their rationale behind the selection of the deep foundation type and construction technique.</p>	10
3	<p><b>Research Component:</b> Students will research and compile information on different types of deep foundations, such as piles (e.g., driven piles, drilled shafts), caissons, and piers. They will explore the advantages, limitations, and suitable applications of each type of deep foundation.</p>	10
<b>Total</b>		<b>30</b>

**Suggested Specification table with Marks (Theory):60**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	NA	NA	NA	NA	NA	NA

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course, the students should be able to:	
CO1	To understand the various types of deep foundations.
CO2	To know the various methods and techniques involved in construction of deep foundations



CO3	To know the various equipment involved in construction of deep foundation.
CO4	To understand the management and safety requirements in construction of deep foundations
CO5	To know the concept of sheet piles, coffer dams and reinforced earth walls.

### List of Assignment

Assignment and tutorial base on above mention topic.

### Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

### Text Books:

[1] Soil Mechanics and Foundation Engineering: Geotechnical Engineering, V.N.S. Murthy

### Reference Books:

[1] Soil Mechanics and Foundations by B.C.Punmia, Lxami Publication(P) LTD.

[2] Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publication

