GUJARATTECHNOLOGICALUNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Geotechnical Engineering

Subject Code: ME02076041

Subject Name: Analysis and Design of Deep Excavation

w.e.f.Academic Year:	2024-25
Semester:	2
Categoryof theCourse:	Professional Elective Course

Prerequisite:	Soil Mechanics, Foundation Engineering and relevant IS codes
Rationale:	Deep excavations are prone to result in excessive ground surface settlement displacement of surrounding existing structures, which could cause severe economic damage, even casualties. Hence, the optimization and evaluation of the stability of the excavation are of paramount importance.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Understand the requirements and principles of deep excavations
02	Understand the analysis and designing of deep excavations
03	Analyse the stress and deformation of deep excavations by various methods
04	Design supporting systems for a deep excavation

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No.of Hours	% of Weightage
1.	Introduction to the analysis and design of excavation - Excavation methods and lateral supporting systems: retaining walls, strutting systems, factors influencing on the selection of the retaining strut system, case history.	10	15
2.	Excavation support system:Types, different forms of excavation support, design consideration in different loading conditions, control of Ground water,Construction considerations	12	25
3	Stress and deformation analysis of excavation: simplified method, beam on elastic foundation method, finite element method - Design of excavation supporting systems: design methods and factor of safety, structural components in braced excavations, strut systems, anchor systems, tests of anchors.	16	40
4	Instrumentation, Monitoring plan: General requirements, types of instruments, Groundwater monitoring and construction consideration as per codal provisions.	10	20
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**25**	**25**	**10**	**10**

WhereR:Remember;U:Understanding;A:Application,N:AnalyzeandE:EvaluateC:Create(asperRevisedBloom'sTaxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Y. O. Chang, Deep Excavation Theory and Practice, Taylor & Francis Group, London, UK, 2006.
2. R. D. Holtz & W. D. Kovaces, An Introduction to Geotechnical Engineering, Prentice - Hall, Inc., Englewood Cliffs, NJ, 1981.
3. R. B. Peck, W. E. Hanson & T. H. Thornburn, Foundation Engineering, John Wiley & Sons, New York,1977.
4. M. R. Hausman, Engineering Principles of Ground Modification, McGraw – Hill Publishing Company, New York, 1990.
5. Malcolm Puller, Deep Excavations: A practical manual (2nd Edition), ICE Publishing, 2003.

(b) Open sources of software and website:

1. NPTEL lecture series
2. MIT open source material

Suggested Course Practical List:

1. Tutorial work shall consist of presentations / problems / preparation of learning material based on above topics. Apart from above assignments a group of students has to undertake one open ended design problem based on engineering application.
2.Visit the site and study the site conditions. Design excavation support system.

List of Laboratory/Learning Resources Required:

Professional Software: 2-D,3-D Finite element analysis, underground wedge 3-D stability analysis

Suggested Project List: --- Student can create excavation/open cut model and measure earth pressure using earth pressure sensors or other devices

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