

## Analysis and Design of Deep Excavations

### 01GT0212 (PEC)

**Objective of the Course:**

- To understand the requirements and principles of deep excavations
- To understand the analysis and designing of deep excavations
- To comprehend and apply the concepts of lateral earth pressure and retaining structures
- To design supporting systems for a deep excavation

**Credit Earned: 3**
**Students learning outcomes:**

After successful completion of the course, it is expected that student will be able to,

1. To understand the requirements and apply the principles of deep excavations
2. To analyse and design deep excavations
3. To apply the concepts of lateral earth pressure and retaining structures
4. To analyse the stress and deformation of deep excavations by various methods
5. To design supporting systems for a deep excavation

#### Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	CSE (I)	IA (M)	Viva (V)	Term Work (TW)	
03	00	00	03	50	20	30	25	25	150

**Detailed Syllabus**

Sr. No.	Title of the unit	Number of hours
<b>1</b>	<b>Analysis and design of excavation</b>	<b>14</b>
	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.	
<b>2</b>	<b>Lateral earth pressure</b>	<b>13</b>
	Lateral earth pressure: Rankine's and Coulomb's earth pressure theory - earth pressure for design of excavation - Stability analysis: free and fixed earth support method - shear failure of strutted walls, push in, basal heave, upheaval, sand boiling.	
<b>3</b>	<b>Stress and deformation analysis of excavation</b>	<b>15</b>
	simplified method, beam on elastic foundation method, finite element method - Design of excavation supporting systems: design methods and factor of safety,	

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	structural components in braced excavations, strut systems, anchor systems, tests of anchors.	
		<b>42</b>

**Suggested Theory Distribution**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	5%	20%	25%	25%	20%

**Instructional Method and Pedagogy:**

1. Use of Learning Management system like canvas
2. Demonstration through presentations on power point and videos and lectures
3. Brainstorming and group discussion sessions
4. Collaborative learning

**Recommended Study Material:**
**Reference Book:**

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.