**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY JAMSHORO**
**Department of Civil Engineering**

**LESSON PLAN**

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| COURSE TITLE: **Foundation Engineering (Theory)** | COURSE CODE: **CE426** | CREDIT HOURS: **03** | MINIMUM CONTACT HOURS: **48** |
| COURSE INSTRUCTER: **Dr. Zaheer Ahmed Almani (A+B)/ Engr. Lal Chand (C+D)** | | | |
| Batch: 19CE | Semester: 8th | Semester Starting Date: 03-07-2023 | Semester Suspension Date: 20-10-2023 |

**COURSE LEARNING OUTCOMES:**

| CLO No. | Description | Taxonomy level | Associated PLO |
|---|---|---|---|
| 1 | DISCUSS soil investigation techniques, in situ tests and equipment. | C2 | 5 |
| 2 | DESIGN shallow and pile foundations discuss earthen dam components and design parameters | C6 | 3 |

**LESSON CONTENTS AND ASSOCIATED CLO(s)**

| Contents | CLO No. | Marks Assigned | Delivery Methods | Assessment Methods (Marks) |
|---|---|---|---|---|
| **SOIL EXPLORATION**<br>• Importance of soil exploration and planning of soil exploration program,<br>• -Soil exploration methods: probing, test pits, auger boring, wash percussion and rotary drilling and geophysical methods<br>• Soil samplers: disturbed and undisturbed sampling.<br>• In situ tests: standard penetration test, cone penetration test, and field vane shear test.<br>• Coring of rocks, core recovery and RQD.<br>• Borehole logs and sub soil exploration report.<br>**No. of lectures required: 11** | **1** | **22** | Class Lecture<br>Discussion<br>Problems | Mid Exam (20)<br>Assignment I (2) |
| **FOUNDATIONS**<br>• Purpose and types of foundations. Selection of foundation type<br>• Types of bearing capacities of foundation.<br>• -Gross and net pressures on footing.<br>• -Failure modes in foundations and their characteristics and criterion.<br>• General requirements for foundation design.<br>- **No. of lectures required: 03** | **2** | **06** | Class Lecture<br>Discussion<br>Problems | Final Exam (06) |

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| | **SHALLOW FOUNDATIONS**<br>• Techniques to obtain bearing capacity of shallow Foundations<br>• Development of bearing capacity theory.<br>• Terzaghi's theories to calculate bearing capacity.<br>• Effects of water table.<br>• Design of strip, isolated, combined and raft footings.<br>• Bearing capacity theories of Meyerhof's, Hansen's, Vesic's and skempton.<br>• Elastic settlement of shallow foundations based on theory of Elasticity.<br>• Elastic and consolidation settlement of shallow foundations on saturated clays.<br>• Settlement of sandy soil. Presumptive values.<br>• Plate load test.<br>• Problems on geotechnical design of shallow foundations<br><br>**No. of lectures required: 15** | **2** | **32** | Class<br>Lecture<br>Discussion<br>Problems | Class Test-I (05)<br>Final Exam (24)<br>Assignment -II (03) |
| | **PILE FOUNDATIONS**<br>• Introduction to deep foundations. Types of deep foundations.<br>•Reasons to use piles. Classification of piles. Methods of Installation.<br>•Load transfer mechanism of piles, Load carrying capacity of piles in different soils. Negative skin friction.<br>•Empirical relationships.<br>• Settlement of Piles.<br>• Pull out resistance of piles.<br>• Pile driven formulas. Pile load test.<br>• Group piles: Group efficiency<br>• Elastic and consolidation settlement of group piles<br>• Up lift capacity of group piles.<br>• Problems on geotechnical design of pile foundations<br>**No. of lectures required: 15** | **2** | **32** | Class<br>Lecture<br>Discussion<br>Problems | Assignment-III (3)<br>Class Test-II (05)<br>Final Exam (24) |

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| **FOUNDATIONS ON DIFFICULT SOILS**<br>• Foundation on collapsible soils<br>• Foundations on expansive soils<br>**No. of lectures required: 03** | **2** | **06** | Class<br>Lecture<br>Discussion<br>Problems | Final exam (06) |
| **EARTHEN DAMS**<br>• Types of earthen dams, components and their functions.<br>• General design considerations and typical cross-section<br>**No. of lectures required: 01** | **2** | **02** | Class<br>Lecture<br>Discussion<br>Problems | Assignment-IV (02) |

**ASSESSMENT DETAILS**

| S. No. | Assessment Activities | Marks | Activities | | CLO(s) to be assessed |
|---|---|---|---|---|---|
| 1 | Class Test/Assignment/Project Design/ Presentation/Quiz/Field Report | **20** | Assignment(s) | 4 | 1 and 2 |
| | | | Class Test | 2 | 2 |
| 2 | Mid Semester Exam | **20** | 1 | | 1 |
| 3 | Final Semester Exam | **60** | 1 | | 2 |

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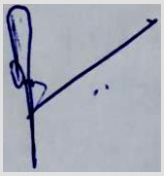
| Prepared by: Dr. Zaheer Ahmed Almani<br>Signature:<br>  <br>Signature:<br>Dated: 09-05-2021 | Reviewed by: **Curriculum Review Committee**<br>  <br>Signature:<br>Dated: 18-04-2023 | Approved by: **Chairman, CED**<br>  <br>Signature:<br>Dated: 18-04-2023 |