**20CE2203 – GEOTECHNICAL ENGINEERING – II**

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| **Course Category**  | Professional Core | **Credits**  | 3 |
| **Course Type**  | Theory | **Lecture - Tutorial - Practical**  | 2 - 1 - 0 |
| **Prerequisite**  | Geotechnical Engineering – I | **Sessional Evaluation**  | 40 |
| **Semester End Exam Evaluation**  | 60 |
| **Total Marks**  | 100 |

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| **Course Objectives** | 1. To analyze slope stability of infinite and finite slopes.
2. To explain various types of earth pressure in various soils under different types of loading and demonstrate stability of retaining walls.
3. To study the various methods of site exploration and preparation of site investigation reports.
4. To study the bearing capacity of shallow foundations.
5. To understand the design of pile foundation
6. To illustrate the various types and characteristics of caisson and well foundation.
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| **Course Outcomes** | CO1 | Analyze infinite and finite slopes. |
| CO2 | Calculate earth pressure in various soils under different types of loading using analytical and graphical methods. Analyze stability of retaining walls. |
| CO3 | Understand the various methods of site exploration and write site investigation reports. |
| CO4 | Evaluate bearing capacity of shallow foundations. |
| CO5 | Compute pile load capacities of individual piles and design of pile groups |
| CO6 | Outline the basic concepts of caisson and well foundation. |
| **Course Content** | **UNIT – I****STABILITY OF SLOPES:** Stability analysis of infinite slopes – Stability analysis of finite slopes – Swedish circle method – Friction circle method – Tailor’s stability number and use of charts – Bishop’s method - Improving stability of slopes.**UNIT – II****EARTH PRESSURES:** Theories of lateral earth pressure – Active and passive earth pressures in cohesion less and cohesive soils (with and without surcharge) – Rankine’s and Coulomb’s earth pressure theories. Graphical methods due to Rebhann and Culmann.**EARTH RETAINING STRUCTURES:** Types of retaining structures – Stability consideration of gravity and cantilever retaining walls – Drainage in retaining walls – Joints in retaining walls**UNIT – III****SITE INVESTIGATIONS AND SUB-SOIL EXPLORATION:** Site reconnaissance – Depth of exploration – Lateral extent of exploration – Test pits – Auger borings – Wash borings – Soil sampling – Split – spoon sampler – Penetration tests – Geophysical methods – Seismic refraction and electrical resistivity methods – Sub soil investigation reports.**UNIT – IV****BEARING CAPACITY OF SHALLOW FOUNDATIONS :** Types of foundations – Depth of foundation – Terzaghi’s bearing capacity equation – Bearing capacity of square, circular, rectangular and continuous footings – Meyerhof’s theory – Skempton’s method – Brinch Hansen’s method – Effect of ground water table on bearing capacity – Bearing capacity from building codes - Types of settlements – Tolerable settlements – Settlement analysis. **UNIT – V****PILE FOUNDATIONS:** Classification of piles – Pile driving – Load carrying capacity of piles – Dynamic formulae – Static formulae – pile load tests – In situ penetration tests – Group action of piles – Negative skin friction.**UNIT – VI****CAISSONS**: Introduction – types of caissons – design and construction aspects of caissons – component parts of pneumatic caisson – Merits and demerits of pneumatic and floating caisson. **WELL FOUNDATIONS:** Introduction – Different shapes of wells – Components of wells – Functions **-** depth of well foundation **–** forces acting on a well foundation – construction and sinking of wells – Tilts and shifts. |
| **Textbooks****and****References** | **TEXTBOOKS:**1. A.S. Rao & Gopal Ranjan, *Basic and applied soil mechanics*, New Age International Publishers, 3rd edition, 2016.
2. K. R. Arora, *Soil Mechanics and Foundation Engineering*, Standard Book House, 7th edition, 2018.
3. B.C. Punmia, A. K. Jain & A. K. Jain, *Soil Mechanics and Foundation Engineering*, Laksmi publications, 17th edition, 2017.

**REFERENCE BOOKS:**1. B. M. Das, *Principles of Geotechnical Engineering*, Cengage learning, 9th edition, 2017.
2. V.N.S. Murthy, *Soil Mechanics and Foundation Engineering*, CBS Publishers, 4th edition, 2018.
3. C. Venkatramaiah, *Geotechnical Engineering*, New Age International Private Limited, 5th edition, 2017.
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**CO-PO Mapping:** 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping, - -Not Mapping

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | 3 | 2 | 1 | - | - | - | - | 2 | 2 |
| **CO2** | 2 | 1 | 2 | 2 | 2 | 1 | - | - | - | - | 1 | 2 |
| **CO3** | 2 | - | 1 | 2 | 2 | - | - | - | - | - | 2 | 2 |
| **CO4** | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 2 | 2 |
| **CO5** | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 2 | 2 |
| **CO6** | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | 2 | 1 |