

| Semester: 4 <sup>th</sup> Subject: |          | Soil Mechanics (PC/CE/7-T)  |         |
|------------------------------------|----------|---|---------|
| Week                               | Lec. Day | Topics  | Remarks |
| 1 <sup>st</sup>                    | 1.       | <b>Soil Formation and Composition:</b> Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, |         |
|                                    | 2.       | major soil deposits of India, particle size, particle shape, inter particle forces, soil structure, principal clay minerals.                                |         |
|                                    | 3.       | <b>Basic Soil Properties:</b> Introduction, three phase system, weight-volume relationships,  |         |
| 2 <sup>nd</sup>                    | 4.       | soil grain properties, soil aggregate properties, grain size analysis   |         |
|                                    | 5.       | sieve analysis, sedimentation analysis, grain size distribution curves  |         |
|                                    | 6.       | consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.   |         |
| 3 <sup>rd</sup>                    | 7.       | <b>Classification of soils:</b> Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity,            |         |
|                                    | 8.       | plasticity chart, Indian Standard Classification System   |         |
|                                    | 9.       | <b>Permeability of Soils:</b> Introduction, Darcy's law and its validity, discharge velocity and seepage velocity   |         |
| 4 <sup>th</sup>                    | 10.      | factors affecting permeability, laboratory determination of coefficient of permeability,  |         |
|                                    | 11.      | determination of field permeability, permeability of stratified deposits  |         |
|                                    | 12.      | <b>Effective Stress Concept:</b> Principle of effective stress, effective stress under hydrostatic conditions,  |         |
| 5 <sup>th</sup>                    | 13.      | capillary rise in soils, effective stress in the zone of capillary rise,  |         |
|                                    | 14.      | effective stress under steady state hydro-dynamic conditions,   |         |
|                                    | 15.      | seepage force, quick condition, critical hydraulic gradient, two-dimensional flow,  |         |
| 6 <sup>th</sup>                    | 16.      | Laplace's equation, properties and utilities of flow net,   |         |
|                                    | 17.      | graphical method of construction of flow nets, piping, protective filter  |         |
|                                    | 18.      | <b>Compaction:</b> Introduction, role of moisture and compactive effect in compaction   |         |
| 7 <sup>th</sup>                    |          | <b>MINOR TEST I</b>   |         |
| 8 <sup>th</sup>                    | 19.      | laboratory determination of optimum moisture content, moisture density relationship,  |         |
|                                    | 20.      | compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.                                    |         |
|                                    | 21.      | <b>Compressibility and Consolidation:</b> Introduction, components of total settlement,   |         |
| 9 <sup>th</sup>                    | 22.      | consolidation process, one-dimensional consolidation test,  |         |
|                                    | 23.      | typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays,   |         |
|                                    | 24.      | Casagrande's graphical method of estimating pre-consolidation pressure,   |         |
| 10 <sup>th</sup>                   | 25.      | Terzaghi's theory of one-dimensional primary consolidation,   |         |
|                                    | 26.      | determination of coefficients of consolidation, consolidation settlement,   |         |
|                                    | 27.      | Construction period settlement, secondary consolidation   |         |
| 11 <sup>th</sup>                   | 28.      | <b>Shear Strength:</b> Introduction, Mohr stress circle,  |         |
|                                    | 29.      | Mohr-Coulomb failure-criterion, relationship between principal stresses at failure,   |         |
|                                    | 30.      | shear tests, direct shear test,   |         |
| 12 <sup>th</sup>                   | 31.      | unconfined compression test, triaxial compression tests   |         |
|                                    | 32.      | drainage conditions and strength parameters,  |         |
|                                    | 33.      | Vane shear test, shear strength characteristics of sands  |         |
| 13 <sup>th</sup>                   | 34.      | shear strength characteristics of normally consolidated clays, over-consolidated clays and partially saturated soils  |         |
|                                    | 35.      | sensitivity and thixotropy.   |         |
|                                    | 36.      | <b>Earth Pressure</b><br>Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium                                     |         |
| 14 <sup>th</sup>                   |          | <b>MINOR TEST II</b>  |         |
| 15 <sup>th</sup>                   | 37.      | Rankine's earth pressure theory   |         |
|                                    | 38.      | Coulomb's earth pressure theory,  |         |
|                                    | 39.      | Culmann's graphical construction, Rebhann's construction.   |         |