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| Name of teacher | |  | | | Rohit | |  |
| **Discipline** | |  | **:** | | **Civil Engg.** | |  |
| **Semester** | |  |  | **:** | 4TH SEMESTER | |  |
| **Subject** | | **:** |  |  | **SOIL & FOUNDATION ENGG** | |  |
|  | | | | | | | |
| **Lesson Plan Duration** | |  | **:** |  | **15 weeks** | **Practical** |  |
| **Week** | **Theory** | | | | | **Practical** |  |
|  |  | | | | | **Day** |
|  | **Lecture** | **Topic (including assignment / test)** | | | | 1. | **Topic** |
|  | **Day** |  | | | |  |  |
| 1. | 1. | 1. Introduction: | | | |  | 1. To determine |
|  |  | 1.1 Importance of soil studies in Civil | | | |  | the Moisture |
|  |  | Engineering, Scope of Soil Mechanices in | | | |  | content of a given |
|  |  | Civil Engg. | | | |  | sample of soil. |
|  | 2. | 1.2 Geological origin of soils, soil profiles | | | |  |  |
|  |  | in India: residual and transported soil, | | | |  |  |
|  |  | alluvial deposits, lake deposits, local soil | | | |  |  |
|  |  | found in J&K, dunes and loess, glacial | | | |  |  |
|  |  | deposits, black cotton soils, conditions in | | | |  |  |
|  |  | which above deposits are formed. | | | |  |  |
|  | 3. | 1.3 Names of organizations dealing with | | | |  |  |
|  |  | soil engineering work in India, soil map of | | | |  |  |
|  |  | India, classification of Soil as per major | | | |  |  |
|  |  | deposits in India. | | | |  |  |
|  | 4. | 2. Physical Properties of Soils: | | | | 2. |  |
|  |  | 2.1 Constituents of soil and phase | | | |  |  |
|  |  | diagram | | | |  |  |
| 2. | 1. | 2.2 Definitions of void ratio, porosity, | | | |  | 2. Auger Boring |
|  |  | water content, degree of saturation, | | | |  | and Standard |
|  |  | specific gravity, unit weight, bulk | | | |  | Penetration Test |
|  |  | density/bulk unit weight, dry unit weight, | | | |  | a) Identifying the |
|  |  |  | | | |  | equipment and |
|  |  |  | | | |  | accessories b) |
|  |  |  | | | |  | Conducting boring |
|  |  |  | | | |  | and SPT at a given |
|  |  |  | | | |  | location c) |
|  |  |  | | | |  | Collecting soil |
|  |  |  | | | |  | samples and their |
|  |  | identification  d) Preparation of boring log and SPT graphs e) Interpretation of  test results |
| 2. | saturated unit weight and submerged unit weight of soil grains and correlation  between them | | | |
| 3. | 2.3 Simple numerical problems on phase diagrams | | | |  |

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|  | 4 | 3. Classification and Identification of Soils | 3. |  |
|  | 3.1. Particle size, shape and their effect |  |
|  | on engineering properties of soil, particle |  |
|  | size classification of soils |  |
|  | 3.2 Gradation and its influence on |  |
|  | engineering properties |  |
| 3. | 1. | 3.3 Relative density and its use in |  | 3. Extraction of |
|  |  | describing cohesionless soils |  | Disturbed and |
|  |  | 3.4 Behaviour of cohesive soils with |  | Undistrubed |
|  |  | Đhange in water Đontent, Atterďerg’s |  | Samples |
|  |  | limit - definitions, use and practical |  | a) Extracting a |
|  |  | significance |  | block sample b) |
|  | 2. | 3.5 Field identification tests for soils |  | Extracting a tube |
|  |  | 3.6 Soil classification system as per BIS |  | sample c) |
|  |  | 1498; basis, symbols, major divisions and |  | Extracting a |
|  |  | sub divisions, groups, plasticity chart; |  | disturbed samples |
|  |  | procedure for classification of a given soil |  | for mechanical |
|  | 3. | 4. Flow of Water Through Soils: (04 hrs) |  | analysis. d) Field |
|  |  | 4.1 Concept of permeability and its |  | identification of |
|  |  | importance |  | samples |
|  |  | 4.2 Darcy's law, coefficient of |  |  |
|  |  | permeability, seepage velocity and |  |  |
|  |  | factors affecting permeability |  |  |
|  | 4. | 4.3 Comparison of permeability of | 4. |  |
|  |  | different soils as per BIS |  |  |
| 4. | 1. | 4.4 Measurement of permeability in the |  | 4. Field Density |
|  |  | laboratory |  | Measurement |
|  |  |  |  | (Sand  Replacement and Core Cutter Method)  a) Calibration of sand b) |
| 2. | 1. Effective Stress: (Concept only)    1. Stresses in subsoil    2. Definition and meaning of total stress, effective stress and neutral stress and their interrelationships. |  |
|  |  |  | Conducting field |
|  |  |  | density test at a |
|  |  |  | given location c) |
|  |  |  | Determination of |
|  |  |  | water content |
|  |  |  | d) Computation |
|  |  |  | and interpretation |
|  |  |  | of results |
|  | 3. | 5.3 Principle of effective stress. |  |
| 4. | 5.4 Importance of effective stress in engineering problems | 5. |

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| 5. | 1. | REVISION |  | 5. Liquid Limit and Plastic Limit Determination:  a) Identifying various grooving tools b) Preparation of sample c) Conducting the test d) Observing soil behaviour during tests e) Computation, plotting and interpretation of results |
| 2. | FIRST SESSIONAL |
| 3. | 1. Deformation of Soils    1. Meaning, conditions/situations of occurrence with emphasis on practical significance of: a) Consolidation and settlement b) Creep c) Plastic flow |
| 4 | d) Heaving e) Lateral movement f) Freeze  and thaw of soil | 6. |
| 6. | 1. | * 1. Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.   2. Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects | 6. Mechanical Analysis  a) Preparation of sample b) Conducting sieve analysis c) Computation of results d) Plotting the grain size distribution curve  e) Interpretation of the curve |
| 2. | * 1. Settlement due to construction operations and lowering of water table   2. Tolerable settlement for different structures as per BIS |
| 3. | 1. Shear Strength Characteristics of Soils:    1. Concept and Significance of shear   strength |
| 4 | DO |  |
|  |  |  | 7. |  |
| 7. | 1. | DO | REVISION |
| 2. | 7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law and application in soil mechanices. |
| 3. | 7.3 Examples of shear failure in soils |
| 4 | DO | 8. |
| 8. | 1. | DO | 7. Laboratory |

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|  | 2. | 1. Compaction:    1. Concept and necessity of compaction and consolidation. |  | Compaction Tests (Standard Proctor Test)  a) Preparation of sample b) Conducting the test c) Observing soil behaviour during test d) Computation of results and plotting e) Determination of optimum moisture content and maximum dry density |
| 3. | 8.2 Laboratory compaction test (standard and modified proctor test as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive  efforts |
| 4 | 8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation  to compaction | 9. |
| 9. | 1. | 9. Soil Exploration: |  | 8. Demonstration of Unconfined |
|  |  | 9.1 Purpose and necessity of soil exploration | Compression Test  a) Specimen preparation b) Conducting the test c) Plotting the graph d) Interpretation of results and finding/bearing capacity |
| 2. | DO |
| 3. | 9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly  dealt) |
| 4 | DO | 10. |
| 10. | 1. | 9.3 Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, | REVISION |
| 2. | recovery ratio of samples and their significance, number and quantity of samples, resetting,  Sealing and preservation of samples. |
| 3. | 9.4 Presentation of soil investigation results |

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|  | 4. | REVISION | 11. |  |
| 11. | 1. | SECOND SESSIONAL | 9. Demonstration of: a) Direct Shear and Vane Shear Test on sandy soil samples b) Permeability test apparatus |
| 2. | 1. Bearing Capacity of soil    1. Concept of bearing capacity |
| 3 | 10.2 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure |
| 4 | 10.3 Guidelines of BIS (IS 6403) for  estimation of bearing capacity of soil | 12. |
| 12. | 1. | 10.4 Factors affecting bearing capacity |  |  |
|  | 2. | 10.5 Concept of vertical stress distribution in soils due to foundation loads, pressure bulb |  |
| 3. | 10.6 Applications of SPT, unconfined compression test and direct shear test in  estimation of bearing capacity |
| 4 | 10.7 Plate load test and its limitations | 13. |
| 13. | 1. | 10.8 Improvement of bearing capacity by sand drain method, compaction, use of  geo-synthetics. | REVISION |
| 2. | 11. Foundation Engineering: Concept of shallow and deep foundation; |
| 3. | types of shallow foundations: |
| 4. | Isolated, combined, strip, mat, and their suitability. | 14. |
| 14. | 1. | Factors affecting the depth of shallow foundations, deep foundations, type of  piles and their suitability; | REVISION |
| 2. | Pile classification on the basis of material, pile group and pile cap. |
| 3. | REVISION |
| 4 | THIRD SESSIONAL | 15. |
| 15. | 1. | PREPARATION FOR FINAL EXAM | REVISION |
| 2. | DO |
| 3. | DO |
| 4. | DO |  |