Name of Faculty: Prof. Rashid Mustafa	
Discipline: Civil Engineering (5th Semester)	
College: Katihar Engineering College	
Subject: Geotechnical Engineering-I (CE 304)	
Course Credit : 04 (3-0-2)	
Course Objective	Provide students with knowledge of origin and classification of soil, Index properties of soil, Effective stress principle, seepage analysis, vertical stress in soil and basic understanding of compaction.
Subject Synopsis/ Indicative Syllabus	**Module 1:** Introduction–Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, unit weight- percent air voids, saturation- moisture content, moisture content- specific Gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycnometer method, measuring flask method.Unit weight by water displacement method, submerged weight method, core-cutter method, sand-replacement method. **Module 2:** Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system. **Module 3:** Permeability of Soil - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets. **Module 4:** Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition. **Module 5:** Compaction of Soil-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control. **Module 6:** Stresses in soils – Introduction, stresses due to point load, line load, strip load, Uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart. Contact pressure under rigid and flexible area,computation of displacements from elastic theory.
Gate Syllabus of Soil Mechanics	Origin of soils, soil structure and fabric; Three-phase system and phase relationships, index properties; Unified and Indian standard soil classification system; Permeability - one dimensional flow, Darcy's law; Seepage through soils - two-dimensional flow, flow nets, uplift pressure, piping; Principle of effective stress, capillarity, seepage force and quicksand

	condition; Compaction in laboratory and field conditions; One-dimensional consolidation, time rate of consolidation; Mohr's circle, stress paths, effective and total shear strength parameters, characteristics of clays and sand. Earth pressure theories -Rankine and Coulomb; Stability of slopes - finite and infinite slopes, method of slices and Bishop's method; Stress distribution in soils-Boussinesq's and Westergaard's theories.
Reading List and References	**Recommended Text** Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R.Rao Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning Soil Mechanics by Craig R.F., Chapman & Hall **References** Das, B M "Introduction to Geotechnical Engineering". ISE. 2nd edition, 2008, Thomson. Murthy, V.N.S "Soil Mechanics and Foundation Engineering". STC 4th edition, 1993. Arora, K.R. "Soil Mechanics and Foundation Engineering". Standard Pub. And Dist.,Delhi.,1992 Terzaghi et.al (1976), "Soil Mechanics in Engineering Practice". John Wiley and Sons Inc. New York, 1967. Taylor, "Fundamentals of Soil Mechanics". John Wiley and Sons Inc New York, 1948.