Course Code	Course Name	L-T-P-Credits	Year of Introduction
CE305	GEOTECHNICAL ENGINEERING - II	3-0-0-3	2016

Pre-requisite CE208 Geotechnical Engineering - I

Course objectives:

- To impart to the students, in-depth knowledge about the basic concepts and theories of foundation engineering;
- To enable the students to acquire proper knowledge about various methods of foundation analysis for different practical situations.

Syllabus:

Stresses in subsoil due to loaded areas of various shapes, Boussinesq's formula, Newmark's chart, Lateral earth pressure, Rankine's and Coulomb' theories, Influence of surcharge, inclined backfill, water table and layering, Terzaghi's bearing capacity theory for isolated footings, Local and general shear failure, Total and differential settlements, soil improvement techniques, combined footings, raft foundations, well foundation, Problems encountered in well sinking, Pile foundations, Bearing capacity of single pile static and dynamic formulae, Capacity of Pile groups, Machine foundation, Methods of vibration isolation, site investigation, Guidelines for choosing spacing and depth of borings, boring methods, Standard Penetration Test.

Expected Outcomes:

The students will be able to understand

i. the basic concepts, theories and methods of analysis in foundation engineering;
ii. the field problems related to geotechnical engineering and to take appropriate engineering decisions.

Text Books :

1. Braja M. Das, "Principles of Foundation Engineering", Cengage Learning India Pvt. Ltd., Delhi, 2011.
2. K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers, 2011
3. Murthy V N S., "Advanced Foundation Engineering", CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2007

References:

1. Alam Singh., "Soil Engineering in Theory and Practice", Vol.1, CBS Publishers & Distributors Pvt. Ltd., New Delhi. 2002
2. Gopal Ranjan and and Rao A.S.R., " Basic and Applied Soil Mechanics", New Age International (P) Limited, New Delhi, 2002.
3. Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling Kindersley(India) Pvt. Ltd., 2013
4. TengW.E., "Foundation Design", Prentice Hall , New Jersey, 1962.
5. Venkataramiah, "Geotechnical Engineering", Universities Press (India) Limited, Hyderabad, 2000.

COURSE PLAN			
Module	**Contents**	**Hours**	**Sem. Exam Marks %**
I	Stresses in soil due to loaded areas - Boussinesq's formula for point loads – assumptions [no derivation required] – Comments - numerical problems Vertical stress beneath loaded areas of strip, rectangular and circular shapes(no derivation required)- Newmark's chart[construction procedure not required] - Isobars- Pressure bulbs- numerical problems	6	15
II	Lateral earth pressure – At-rest, active and passive earth pressures – Practical examples Rankine's and Coulomb' theories[no derivation required]-Influence of surcharge, inclined backfill and water table on earth pressure- numerical problems Earth pressure on retaining walls with layered backfill- numerical problems	6	15
FIRST INTERNAL EXAMINATION			
III	Bearing capacity of shallow foundations – Ultimate, safe and allowable bearing capacity. - Failure mechanism, assumptions and equation of Terzaghi's bearing capacity theory for strip footing[no derivation required] – Terzaghi's formulae for circular and square footings numerical problems Local and general shear failure - Factors affecting bearing capacity – Influence of water table - numerical problems Total and differential settlement- Causes - Methods of reducing differential settlement–Brief discussion on soil improvement through installation of drains and preloading.	7	15
IV	Combined footings- Rectangular and Trapezoidal combined footings - numerical problems Raft foundations (Design Concepts only) - Allowable Bearing capacity of Rafts on sands and clays - Floating foundation. Deep foundations - Elements of a well foundation – Problems encountered in well sinking – Methods to rectify tilts and shifts	6	15
SECOND INTERNAL EXAMINATION			
V	Pile foundations - Point bearing and friction piles - Bearing capacity of single pile in clay and sand[I.S. Static formulae] - numerical problems Dynamic formulae(Modified Hiley formulae only) - I.S. Pile load test [conventional]- Negative skin friction - numerical problems Group action - Group efficiency - Capacity of Pile groups- numerical problems	8	20

VI	Brief introduction to Machine foundation –Mass spring model for undamped free vibrations - Natural frequency – Coefficient of uniform elastic compression – Methods of vibration isolation Brief introduction to site investigation –Objectives - Guidelines for choosing spacing and depth of borings [I.S. guidelines only] - Auger boring and wash boring methods - Standard Penetration Test – procedure, corrections and correlations.	9	20
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN (End semester exam)

Maximum Marks :100 **Exam Duration: 3 Hrs**

Part A -Module I & II : 2 questions out of 3 questions carrying 15 marks each

Part B - Module III & IV: 2 questions out of 3 questions carrying 15 marks each

Part C - Module V & VI : 2 questions out of 3 questions carrying 20 marks each

Note : 1.Each part should have at least one question from each module

2.Each question can have a maximum of 4 subdivisions (a, b, c, d)