SOIL STRUCTURE INTERACTION

PROF.KOUSIK DEB

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PRE-REQUISITES : Soil Mechanics and Foundation Engineering

INTENDED AUDIENCE : Civil Engineering,Geotechnical engineering, Environmental Engineering, Geoenvironmental Engineering

INDUSTRIES APPLICABLE TO : Most of the Civil Engineering companies

COURSE OUTLINE :

The course will focus on the different soil-structure interaction models for shallow foundation under various loading conditions and subgrade characteristics. Piles under uplift and lateral loading conditions will also be discussed. In the undergraduate core course on Foundation Engineering, these topics are either not covered or discussed in simplified form. Beams and plates on elastic foundation problems & different foundation models and their solution with the help of Finite Difference Method (FDM) will be discussed. The application of foundation models in real life problems will also be discussed. This course is useful for both UG and PG student. The course is also suitable for students who are preparing for competitive examination. Field Engineers can be benefited from this course as the design of foundations under critical conditions considering soi-structure interaction (those are not generally covered in UG core foundation engineering course) will be discussed here.

ABOUT INSTRUCTOR :

Prof. Kousik Deb is presently working as Associate Professor in Civil Engineering at IIT Kharagpur. Dr. Deb has more than 11 years of research experience and working in the areas of Geosynthetic-Reinforced Earth, Numerical Modeling, and Embankment stability. He has published/accepted 100 research articles including about 60 papers in referred journals. He has developed number of numerical and analytical models to study the behavior of improved grounds, embankment stability and underground structures. Under Dr. Deb's guidance, 5 Ph.D. are awarded and 5 more are in progress. He has also supervised 13 M.Tech dissertations. Dr. Deb has completed 2 sponsored research projects funded by DST. He has successfully completed more than 12 consultancy projects. As a visiting research fellow at RWTH, Aachen, Germany under DAAD Fellowship; He is the recipient of IIT Roorkee Shamsher Prakash Research Award for outstanding research contribution in Geotechnical Engineering by Young Indian Researcher. He also received IEI Young Engineers Award; Excellent Paper Award to Junior Individuals-2008 given by International Association for Computer Methods and Advances in Geomechanics (IACMAG), USA. Dr. Deb also selected for Endeavour Research Fellowship to undertake a Postdoctoral Research programme in Australia. Dr. Deb has gained expertise in the cutting edge technologies on ground improvement such as applications of geosynthetics in roadways. Dr. Deb has offered course on Foundation Engineering under NPTEL Online Certification Programme.

COURSE PLAN :

Week 1 **:** Introduction, critical study of conventional methods of shallow foundation design: bearing capacity and settlement calculation.

Week 2 **:** Critical study of conventional methods of shallow foundation design (continued), contact pressure and soil-structure interaction for shallow foundation, concept of subgrade modulus, determination of subgrade modulus, parameters influencing subgrade modulus.

Week 3 **:** Determination of subgrade modulus and parameters influencing subgrade modulus (continued). Different foundation models (such as one-parameter, two-parameter models etc.) with linear and non linear stress-strain characteristics.

Week 4 **:** Time-dependent response, Beams on Elastic Foundation, infinite beam.

Week 5 **:** Infinite beam (continued), infinite beam subjected to various loading conditions, semi-infinite beam.

Week 6 **:** Semi-infinite beam (continued), beams with finite length.

Week 7 **:** Beams with finite length and various end conditions, continuity among the foundation soil layers.

Week 8 **:** Continuity among the foundation soil layers (continued), beams on two-parameter soil medium (infinite and finite beam), beam with variable EI and subgrade modulus.

Week 9 **:** Plates on Elastic Foundation (rectangular and circular), plates on two-parameter soil medium, use of Finite Difference Method (FDM) for soil structure interaction problems

Week 10 : Use of Finite Difference Method (FDM) for soil structure interaction problems (continued), computer programs based solution of different interaction problems such as beams, plates, application of foundation models in real life problem.

Week 11 : Group action of pile, Elastic Analysis, settlement of pile group under compressive load by Interaction Factor Approach, negative skin friction.

Week 12 : Laterally loaded piles, Reese and Matlock's generalized solution, displacement of pile group under lateral load by Interaction Factor Approach, Uplift capacity of piles and anchors.