Specialization: PhD Level

Code: GENVE 865

Course: Geotechnical & geoenvironmental engineering with emphasis on earthquake related geohazards

Instructor: Associate Professor Yiannis Tsompanakis

Bibliography
4. Γ. Γκαζέτας, Εδαφοδυναμική και σεισμική μηχανική, Εκδόσεις Συμεών, 1996. (In Greek)
5. K. Πιτιλάκης, Γεωτεχνική σεισμική μηχανική, Εκδόσεις Ζήτη, 2010. (In Greek)
6. Α. Κωμοδρόμος, Τεχνική Ηλεκτρονικής και Ηλεκτρονικής Ινστιτούτων, Εκδόσεις Κλειδάριδος, 2008. (In Greek)
7. Α. Κωμοδρόμος, Υπολογιστική γεωτεχνική μηχανική: Αλληλεπίδραση εδάφους-κατασκευών, Εκδόσεις Ζήτη, 2001. (In Greek)

Course objectives
Students will improve their knowledge of the issues covered in the context of the course in order to be able:
1. To understand and optimize the process required to achieve an effective solution for complex problems in geotechnical & geoenvironmental engineering.
2. To understand and deal with issues related to the protection of the environment, the population and energy infrastructure (transportation networks, pipelines, compressors, tanks, platforms, etc) mainly from natural (and man-made) disasters.
3. To understand and be able to deal with errors that may arise during the numerical simulation and solution of static and dynamic problems in geotechnical & geoenvironmental engineering.
4. To be able to effectively utilize advanced capabilities of specialized software for static and dynamic analysis of various types of geostuctures and energy infrastructure and to become capable of understanding and interpreting the results.

Course Syllabus
- Computational geotechnical engineering.
- Geotechnical & geoenvironmental engineering with emphasis on earthquake related geohazards.
• Importance of engineering seismology in the design and construction of various types of engineering infrastructure.
• Propagation of seismic waves - Amplification (or de-amplification) of the seismic motion.
• Special issues of engineering seismology and geotechnical earthquake engineering
• Soil dynamics - Impact of local soil conditions on seismic response of structures.
• Dynamic structure interaction - soil / liquid (dams, liquid storage tanks, etc).
• Dynamic nonlinear behavior of geomaterials.
• Failures due to earthquakes - Interpretation of damages due to earthquakes on geostructures.
• Dynamic response assessment of geotechnical and geoenvironmental projects against seismic actions.
• Seismic vulnerability of dams, waste landfills, tailings dams, etc.
• Seismic design and dynamic analysis of geostructures and infrastructure (dams, landfills, transportation networks and pipelines, etc).
• Seismic design of tunnels and pipelines against seismic waves and permanent ground deformations.
• Seismic design of hydrocarbon storage tanks, platforms and terminal stations.
• Seismic design of on-shore and off-shore pipelines against geohazards (landslides, active faults, soil liquefaction, etc).
• Seismic design of on-shore and off-shore wind turbines with emphasis on dynamic soil-structure interaction.
• Application of the finite element method in the static and dynamic analysis of complex problems in geotechnical & geoenvironmental engineering using sophisticated software (commercial and/or open-source).

**Work load**
1. Weekly exercises
2. Semester project report

**Student evaluation**
1. Weekly exercises (20%)
2. Semester project report (50%)
3. Final presentation (20%)