Soil Dynamics and Geotechnical Earthquake Engineering

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Module number	Credits	Workload	Semester[s]	Duration	Group size
SE-CO-7	6 CP	180 h	3. Sem.	1 Semester[s]	no limitation

Courses	Contact hours	Self-study	Frequency
a) Soil Dynamics	a) 2 WLH (30 h)	a) 60 h	a) each winter
b) Geotechnical Earthquake Engineering	b) 2 WLH (30 h)	b) 60 h	b) each winter

Module coordinator and lecturer(s)

Prof. Dr.-Ing. Torsten Wichtmann

a) Dr.-Ing. Meisam Goudarzy

b) Dr.-Ing. Felipe Prada, Dr.-Ing. Nazanin Irani

Admission requirements

Learning outcome, core skills

After successfully completing the modules, the students are able to

- understand soil dynamic problems and describe them mathematically,
- design and evaluate laboratory or field testing programs to determine dynamic soil properties,
- estimate dynamic soil properties by means of empirical approaches,
- design foundations subjected to dynamic loading (e.g. machine foundations),
- determine the loading resulting from earthquakes considering the ground conditions,
- estimate the risk of soil liquefaction and choose suitable countermeasures,
- design geotechnical structures (e.g. foundations, slopes) against earthquake loads.

Contents

a)

The lecture deals with the fundamentals of Soil Dynamics:

- Fundamentals of vibration theory
- Homogeneous systems
- Wave propagation in elastic isotropic half space
- Laboratory tests on dynamic characteristics of soils
- Methods to estimate dynamic characteristics of soils
- Dynamic field measurement methods
- Design of dynamically loaded foundations
- Soil-structure interaction under dynamic loading
- High cyclic loading of soils (practical problem: offshore wind turbines)
- Laboratory exercise (Resonant column experiment, wave velocity measurements).

b)

The lecture covers the effects of a seismic event on geotechnical structures and the design of such structures against earthquakes:

- Principles of Engineering Seismicity: earthquake description, source characterization, intensity, magnitude and duration parameters, maximum magnitude, concept of response spectra, ground motion prediction (attenuation equations)
- Deterministic and probabilistic estimation of seismic hazard. Microzoning studies.

- Causes of soil liquefaction under seismic loading; methods to estimate the liquefaction risk; countermeasures
- Design of slopes against seismic loading
- Design of retaining structures against seismic loading
- Ground response analysis

Educational form / Language

a) Lecture with tutorial / English

b) Lecture with tutorial / English

Examination methods

• Written exam 'Soil Dynamics and Geotechnical Earthquake Engineering' (180 min., Part of modul grade 100 %)

• Homework with bonus points for the exam for both parts of the module.

Requirements for the award of credit points

- Passed final written examination

Module applicability

- M.Sc. Subsurface Engineering

Weight of the mark for the final score

Percentage of total grade [%] = 6 * 100 * FAK / DIV

FAK: The weighting factors can be taken from the table of contents.

DIV: The values can be taken from the table of contents.

Further Information