

Module Nr.	Credits	Workload	Semester	Frequency	Duration
SE-CO-7	6 CP	180 h	3	Yearly (WS)	1 Semester
<b>Courses</b>			<b>Contact time</b>	<b>Self-study</b>	<b>Group Size</b>
a) Problematic soils			2 h/week	60 h	---
b) Soil dynamics			1 h/week	45 h	
c) Geotechnical earthquake engineering			1 h/week	15 h	
<h2 style="color: green;">Problematic Soils and Soil Dynamics</h2> <p><b>Learning outcomes</b></p> <p>After successfully completing the modules, the students are able to</p> <ul style="list-style-type: none"> <li>• assess special soil mechanical properties, phenomena, and the behavior of problematic soils and can design an appropriate experimental program (laboratory / field tests) for an investigation of problematic soils,</li> <li>• understand soil dynamic problems and describe them mathematically,</li> <li>• determine the loading resulting from earthquakes and design geotechnical structures for these loads,</li> <li>• assess difficult ground and loading conditions and develop solutions for these situations.</li> </ul> <p><b>Content</b></p> <p>a) Problematic soils</p> <p>The course deals with different phenomena, that can cause difficulties in civil works for some types of soils:</p> <ul style="list-style-type: none"> <li>• Soft plastic and organic soils</li> <li>• Swelling and shrinkage behaviour</li> <li>• Collapsible soils</li> <li>• Physico-chemical effects</li> <li>• Structure and fabric, compacted soils</li> <li>• Unsaturated soils</li> <li>• Experimental methods for investigations on these soils and phenomena</li> </ul> <p>b) Soil dynamics</p> <p>The lecture deals with the fundamentals of Soil Dynamics:</p> <ul style="list-style-type: none"> <li>• Fundamentals of vibration theory</li> <li>• Wave propagation in elastic isotropic half space</li> <li>• Laboratory tests on dynamic characteristics of soils</li> <li>• Methods to estimate dynamic characteristics of soils</li> <li>• Dynamic field measurement methods</li> <li>• Design of dynamically loaded foundations</li> <li>• Soil-structure interaction under dynamic loading</li> <li>• High cyclic loading of soils (practical problem: offshore wind turbines)</li> <li>• Laboratory exercise (Resonant column experiment, Bender elements).</li> </ul> <p>c) Geotechnical earthquake engineering</p>					

<p>The lecture covers the effects of a seismic event on geotechnical structures and the design of such structures against earthquakes:</p> <ul style="list-style-type: none"> <li>• Causes of soil liquefaction under seismic loading; methods to estimate the liquefaction risk; countermeasures</li> <li>• Design of slopes against seismic loading</li> <li>• Design of retaining structures against seismic loading</li> <li>• Ground response analysis</li> </ul>
<p><b>Teaching methods / Language</b></p> <p>a) Lectures with accompanying exercises (2 h/week) / English  b) Lectures with accompanying exercises (1 h/week) / English  c) Lectures with accompanying exercises (1 h/week) / English</p>
<p><b>Modes of assessment</b></p> <p>Final written exam (180 min.)</p> <p>Project work (15 h) for a) (Presentation on selected topic or case study based on scientific literature). (Deadline will be announced at the beginning of the course)</p> <p>Project work (15 h) for b) (Analysis of laboratory tests)</p> <p>Project work (10 h) for c) (Calculation tasks)</p>
<p><b>Requirements for the award of credit points</b></p> <p>Passed final written examination</p> <p>Project works for a), b) and c) (Date for presentation for a) will be announced at the start of the semester)</p> <p>Attendance of laboratory exercise for b) (Date will be announced at the start of the semester)</p>
<p><b>Module applicability</b> (in other study programs)</p> <p>-</p>
<p><b>Weight of the mark for the final score</b></p> <p>5 %</p>
<p><b>Module coordinator and lecturer(s)</b></p> <p>Prof. Dr.-Ing. habil. T. Wichtmann (coordinator)</p> <p>a) Dr.-Ing. W. Baille  b) Dr.-Ing. M. Goudarzy  c) Dr.-Ing. F. Prada</p>
<p><b>Other information</b></p> <p>Recommended previous knowledge: Completed module in Computational Methods-1 (Soil behaviour and simple constitutive models for soils).</p>