

Module Nr.	Credits	Workload	Semester	Frequency	Duration
SE-CO-11	10 CP	300 h	3	Yearly (WS)	1 semester
<b>Courses</b>			<b>Contact time</b>	<b>Self-study</b>	<b>Group size</b>
a) Geophysical Inverse Problems			3 h/week	105 h	--
b) Seismic and electromagnetic field methods			3 h/week	105 h	
<b>Ground Exploration Methods</b>					
<b>Learning outcomes</b>					
<ul style="list-style-type: none"> <li>• Students understand the theoretical foundations of seismic and electromagnetic field methods and know up-to-date measuring and data-acquisition procedures. They know and understand state-of-the-art methods of data analysis and interpretation.</li> <li>• Students understand the general philosophy of how to properly set up and solve geophysical inverse problems to create subsurface models from geophysical field surveys. They know different approaches to mathematically formulate an inverse problem and various techniques to obtain solutions in practice. They are able to solve small-scale problems themselves by writing a computer program.</li> </ul>					
<b>Content</b>					
a) Geophysical Inverse Problems					
Mathematical precursor on linear vector and Hilbert spaces, the continuous linear inverse problem with exact and uncertain data, discrete linear inverse problems with uncertain data, singular value decomposition, resolution analysis, conjugate gradient minimization, linearized iterative inverse problems					
b) Seismic and electromagnetic field methods:					
Data acquisition in reflection seismics, seismic data processing, ray and wave-equation migration, basic electromagnetic theory, electromagnetic fields in matter, geoelectric sounding and induced polarization, electromagnetic diffusion and waves in matter and ground penetrating radar					
<b>Teaching Methods / Language</b>					
Lectures accompanied by assignments to be worked out and solved at home encompassing mathematical problems and programming tasks / English					
<b>Modes of assessment</b>					
written module examination, 120 minutes					
<b>Requirements for the award of credit points</b>					
passed module examination, bonus points for voluntary presentation of solutions to exercises					
<b>Module applicability (in other study programs)</b>					
Master Geosciences					
<b>Weight of the mark for the final score</b>					
8.33 %					

**Module coordinator and lecturer(s)**

Prof. Dr. W. Friederich

**Other information**

Literature: Parker, R.: Geophysical Inverse Problems; Menke, W.: Geophysical Data Analysis, Discrete Inverse Theory; Feynman: Lectures on Electrodynamics; Telford, Geldart, Sheriff: Applied Geophysics, Everett, M., Near surface applied geophysics, 403 pp. Cambridge University Press, 2013