GEW-MF11 Fundamentals of Digital Seismology	Number of credit points (LP): 12
Module type (mandatory or elective module)	Advanced module
Contents and qualification objectives of the module	**Contents** Properties of linear time-invariant systems (LTI), filter theory, description of filters using Fourier, Laplace, and Z-transforms, concepts of impulse response, frequency response, and transfer function, sampling process, alias problem, analog and digital filter design, application to seismological data acquisition, analysis, and interpretation. Basic methods of array analysis (DF beamforming, frequency-wavenumber spectrum, spatial autocorrelation, gradiometry), arrays as multichannel filters, spatial sampling and artifacts, array geometry and array response function, array applications in current research. **Qualification goals** Students - deepen their understanding of digital signal processing and systems theory using the example of seismic time series - understand the mode of action of different types of filters - can design and apply different types of filters for seismogram analysis and interpretation, deconvolution of seismograms and instrument correction - learn the analysis of seismic wave fields by means of array methods - understand multichannel filter process - understand the relationship between array geometry, inherent array resolution limits, or spatial aliasing artifacts, and strategies to avoid them - develop, design and install an array in practice - understand the advantages of array techniques and their fields of application, e.g. to investigate interdisciplinary geoscientific relationships in the Earth system - are able to perform scientific analysis of interactions in the Earth system - possess the basics for independent scientific work
Module examination (number, form, scope)	An examination of the following forms: Portfolio examination, consisting of: Report (15-20 pages) and corresponding presentation (20-30 minutes). Term paper, 20-25 pages Written exam, 90-120 minutes
Self-learning time (in time hours)	200

Events (teaching forms)	Contact time (in semester hours)	Secondary examination (number, form, scope)		Partial module examination accompanying the course (number, form, scope)
		For the completion of the module	For admission to the module examination	
Lecture and exercise I (lecture and exercise)	2V+2T	-	-	-
Lecture and exercise II (lecture and exercise)	2V+2T	-	-	-
Field exercise (exercise)	5 days	-	-	-

Frequency	Winter semester (V+T I) and summer semester (V+T II+field exercise)
Prerequisite for participation in the module	None
Teaching unit(s)	Geosciences