

Module No.	Semester	Teaching staff	Module-coordinator (designated each sem.)
Geo_M107	1	Prof. Dr. Jochen Schiewe, Prof. Dr. Karl-Peter Traub, Prof. Dr. Thomas Schramm	Prof. Dr. Jochen Schiewe

Module name	Subject areas	Duration/sem.	Frequency of offering	Type (C/CE/E)	Emphasis in overall grade / %
Base Technology in Geographical Information Sciences	Specialisation Hydrography	1 Semester	each WiSe	CE	4,16 %

CP (according to ECTS)	Workload / h.	Self-study / h.	Contact time / h.	Contact hours / week (SWS)	Type of examination
5CP	150	94	56	3 + 1	written (graded)

Previous knowledge / Conditions for participation (in form and content)

Basic knowledge in geodata acquisition, specially in Remote Sensing and Photogrammetry.

Educational aims of the module (Learning objectives/results, skills)

Remote Sensing:

Capability to estimate the application potential of remotely sensed data and methods for demands from various disciplines (like environment, planning). Ability to develop suitable solutions and implement those with (eventually adopted) standard software.

Digital Elevation Models:

Capability to evaluate strengths and weaknesses of various data sources for the generation of Digital Elevation Models (DEMs); ability to evaluate and to apply suitable uncertainty parameters; capability to compare advantages and disadvantages of regular raster and TIN DEMs for given applications; ability to describe algorithms for important DEM processing steps; capability to select suitable visualization forms for given applications.

Advanced Filtering Techniques:

Capability to select and to apply various techniques of interpolation, approximation, filtering and smoothing depending on a given application.

Course contents

Remote Sensing:

Based on a short introduction to / repetition of satellite remote sensing, practical project work related to marine or hydrographical applications is carried out. This includes image pre-processing, classification and postprocessing using a commercial IP-software (IDRISI).

Digital Elevation Models:

Terminology; Data sources (topographic DEMs, bathymetric DEMs, file formats, quality and standards); DEM sampling approaches (raster, TIN); Selected DEM processing approaches (interpolation, extraction of elevation features, mass computation, visibility analysis) DEM visualization.

Practice: Typical DEM processing steps (import, deriving parameters like slope etc., visualization).

Advanced Filtering Techniques:

Interpolation: direct polynomial interpolation, interpolation after Lagrange, Newton, Akima; spline interpolation. Complex variables: complex numbers, fundamental operations, Cartesian and polar representation, products, powers, quotients, and roots of complex quantities. Approximation: linear approximation approach and optimization criteria, mean approximation, orthogonal approximation, approximation using algebraic polynomials, trigonometric approximation (Fourier series), trigonometric approximation with a complex e-function representation, Fourier and Laplace transformations. Filtering and smoothing: general filtering and smoothing approach, simple filtering and smoothing (moving averages), filtering, smoothing, and prediction following the least-square principle (Wiener filter) as a significant example of a stationary, ergodic stochastic process, smoothing with compensating spline functions.

Teaching and learning methods

Taught seminars, practical training

Condition for awarding the ECTS-credits

- Successful completion of the practical training in Remote Sensing (not graded)
- Successful completion of the combined written examination in Remote Sensing and Digital Elevation Models (graded)
- Successful completion of the written examination in Advanced Filtering Techniques (graded)

Additional Information