DOCTORAL SCHOOL OF INFORMATICS
COMPLEX EXAM SUBJECT

Map Projections in Geoinformatics
(recommended subject)

The aim of the complex exam is to demonstrate the knowledge of students about the properties of various spatial reference systems and the possibilities for conversion between them. Candidates must be familiar with the coordinate systems used in terrestrial positioning, the types of map projections, and their distortion characteristics. The exam topics pay special attention to the geodetic and high accuracy GIS applications of the theory of map projections. The main topics covered in the exam are:

- The most common units of measurement used on maps.
- Planar, spatial, and curvilinear (especially spherical and ellipsoidal) coordinate systems.
- The relationship between astronomical latitude, longitude interpreted on the geoid, height above sea level and ellipsoidal coordinates, geodetic datums, and transformation possibilities between reference frames.
- Conversion between coordinate systems of reference frames (direct and inverse fundamental tasks of geodesy on spheres and ellipsoids of revolution, metacoordinates), auxiliary spheres.
- Distortions of map projections, Tissot's theory of distortion.
- Common conical map projections used in topographic mapping. Common conformal projections used for mapping European countries.
- Definition of coordinate systems in GIS environment, definition of custom map projections.
- Distortion properties of ellipsoidal map projections.
- Conical projections of the ellipsoid.
- Ellipsoidal versions of common transverse and oblique map projections, with special regard to the topographic projection systems used in Europe in the past and today.
- Non-conical projections of the ellipsoid of revolution used in topography.
- Conversion possibilities between mapped coordinate systems.
- Applications of complex functions for map projections, conversion between conformal projections using complex power series.

Literature:

- Snyder, J. P.: Map projections: A working manual U. S. Government Printing Office. Washington D.C. 397 p., 1987, ISBN: 9781782662228
- Grafarend, E. W., Krumm F. W.: Map Projections: Cartographic Information Systems. Springer Berlin, Heidelberg, 714 p. 2006, ISBN: 9783540367024
- Fenna, D.: Cartographic Science: A Compendium of Map Projections, with Derivations. CRC Press, Boca Raton, 504 p., 2007, ISBN: 9780367390037