**Study Card**

<table>
<thead>
<tr>
<th>Module-No.</th>
<th>Semester</th>
<th>Teaching staff</th>
<th>Module-coordinator (designated each sem.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geo_M201</td>
<td>2</td>
<td>Prof. Dr.-Ing. D. Egge</td>
<td>Prof. Dr.-Ing. D. Egge</td>
</tr>
</tbody>
</table>

**Module-name**

<table>
<thead>
<tr>
<th>Subject areas</th>
<th>Duration/sem.</th>
<th>Frequency of offering</th>
<th>Type (C/CE/E)</th>
<th>Emphasis in overall grade / %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Geodesy</td>
<td>Hydrography</td>
<td>1 Semester</td>
<td>each SuSe</td>
<td>C</td>
</tr>
</tbody>
</table>

**CP (according to ECTS)**

<table>
<thead>
<tr>
<th>Workload / h.</th>
<th>Self-study / h.</th>
<th>Contact time / h.</th>
<th>Contact hours / week (SWS)</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>5CP</td>
<td>155</td>
<td>99</td>
<td>56</td>
<td>4 + 0</td>
</tr>
</tbody>
</table>

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

- 

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

The students learn the essential fundamentals of spherical trigonometry and are able to apply them in practical examples. Further they learn basic elements of ellipsoidal and three-dimensional geodesy, as well as geodetic projections currently used in practice. They are enabled to solve datum problems. Finally, the basics of physical geodesy and gravimetry are presented.

**Course contents**

**Mathematical Geodesy:**

Spherical Trigonometry:

Elements of spherical trigonometry: sphere, small circles, great circle, spherical twiangle, spherical triangle, fundamental rules in the spherical triangle, equations of Delambre and Napier, Napier’s rule, differential formulas, applications. Forward and reverse computations for orthodromic and loxodromic curves on the sphere.

Mathematical Geodesy:

Reference ellipsoid: ellipsoid parameters, latitudes, curvature radii.

Three-dimensional geodesy: 3D ellipsoidal and Cartesian coordinates, coordinates in local geodetic and astronomical frame, coordinate conversion, observation equations in three-dimensional geodesy.

 Differences between natural end ellipsoidal coordinates.

The geodesic curve on the rotational ellipsoid: normal section curve and geodesic, mathematical description of the geodesic. Angle and distance corrections from observed to ellipsoidal values: azimuth and angle corrections, distance corrections. Direct and reverse problems of geodesy: computation of distance and azimuths of a geodesic, coordinate transfer to a new point.

Geodetic mapping of the ellipsoid surface onto a mapping plane: general relationships, important mappings (Mercator, Gaussian, UTM, Lambert, polar stereographic). Mapping equations, magnification (point scale factor), meridian convergence, (T-t) correction, distance correction.

Overview of other mappings. Geodetic datums: comparison of different geodetic datums, transformation parameters, transformation equations, Molodensky transformation.

**Physical Geodesy:**

Gravity and gravity potential, parameters of the normal gravity field, computation of normal gravity, height systems (dynamic, orthometric normal), vertical datum. Disturbing quantities in the gravity field: gravity disturbance and anomaly, deflections of the vertical. Geoid determination: gravimetric method, astrogeodetic method, combined methods. Earth models, high resolution gravity field representations.

**Teaching and learning methods**

Taught seminars

**Condition for awarding the ECTS-credits**

Written examination

**Additional Information**

Latest update: 06/2011