

Study Programme: Geodesy
Course Unit Title: Geodetic reference systems
Course Unit Code: GE21
Name of Lecturer(s): Associate Professor Siniša Delčev
Type and Level of Studies: Basic academic studies
Course Status (compulsory/elective): Compulsory
Semester (winter/summer): Summer
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 5
Prerequisites: None
<p>Course Aims:</p> <p>Introducing students with the fundamentals of geodesy as a science dealing with the study of the size and shape of the Earth and its external gravitational field. Introduction to students with reference systems used in geodesy.</p>
<p>Learning Outcomes:</p> <p>Students are introduced with the geometry of the rotational (equipotential) ellipsoid, the basics of the Earth's motion, and the reference celestial and terrestrial geodetic systems.</p>
<p>Syllabus:</p> <p><i>Theory</i></p> <ol style="list-style-type: none"> 1. week Introduction. Definition of geodesy. History of geodesy, shortly. The shape and size of the Earth. Reference systems and frames. 2. week Rotational, equipotential ellipsoid and geodetic coordinates. Basics of the ellipsoid geometry. Curve radius. Length of meridian arc. Length of parallel arc. Double normal intersections. Geodetic line. Characteristics of the geodetic line on the ellipsoid. 3. week Geodetic coordinates. The first main geodetic task. The second main geodetic task. 4. week Coordinate systems on the ellipsoid. Ellipsoid mapping to the plane. National coordinate system. 5. week Transformation between geodetic and orthogonal Descartes coordinates. Transformation between nearby zones. 6. week Natural (astronomical) coordinates. Transformation between geodetic and natural coordinates. Celestial coordinate systems: ecliptic, equatorial and horizontal systems. 7. week I colloquium. 8. week Terrestrial reference system. Examples of horizontal geodetic Datums. International terrestrial reference system. Datums transformation. 9. week Celestial reference system. The movement of the Earth - precession and nutation. Systematic influences - the own motion of celestial bodies. 10. week Systematic influences - aberration, parallax, refraction. 11. week Relationship between the terrestrial and the celestial reference system (frame). The movement of the earth's poles, middle (conventional) celestial pole. Transformations. 12. week Time systems. Sidereal time. Universal time. Dynamic time. Atomic time.

13. week The field of Earth's gravity. Reference gravimetric systems.
 14. week II colloquium.
 15. week Other approximations shape of the earth - the geoid, quasigeoid...

Practice

He follows the course of theoretical classes.

Required Reading:

1. Vaniček P., Krakivsky E., Geodesy: the concept, North-Holland Publishing company, Amsterdam - New York - Oxford, The Netherlands, 1980.
2. Heiskanen Weiko, H. Moritz, Physical geodesy, W. H. Freeman & Co, San Francisco and London, 1967.
3. Script.

Weekly Contact Hours:	Lectures: 30	Practical work: 30
------------------------------	---------------------	---------------------------

Teaching Methods:

Lectures, exercises, colloquiums, consultations.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	Final exam	points
Active class participation	5	written exam	(40)
Practical work	5	oral exam	50
Preliminary exam(s)	40	

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.