Level: bachelor

Course title: Geometry

Status: elective

ECTS: 6

Requirements: Mathematical methods I

Learning objectives

Getting the basic knowledge from analytical geometry, spherical trigonometry and differential geometry.

Learning outcomes

At the end of the course, students should have the basic knowledge from analytical geometry, spherical trigonometry and differential geometry; have developed skills in finding and using scientific literature, and the ability of knowledge application. In addition, students are expected to know how to find relation between coordinates of point in the plane in starting system and system that we get with some congruence or similarity transformation; to be able to from given equations of curves of second order determine the species of curve and find its parameters; to be able to from polar form get standard form; to derive Neper formulas, application of basic theorems in spherical geometry for calculating azimuth and distance between two points in the Earth; to for given curve calculate flexion and torsion in the point and also equations of basic elements of natural coordinate system in point of that curve.

Syllabus

Theoretical instruction

Plane and solid analytic geometry. Coordinate transformations: Translation and rotation of coordinate axes, Simultaneous translation and rotation. Conic sections (conics): parabola, ellipse, hyperbola. The most general plane quadratic equation. Polar coordinates and polar equations of conic sections. Quadric surfaces (quadrics). A short overview of axiomatic founding of Euclidean geometry and historical overview of non-Euclidean geometry. Realization of elliptic geometry on the surface of a sphere. Spherical geometry - more important definitions and assertions. Spherical law of cosines and spherical law of sines. Solution of a spherical triangle by means of the polar triangle. Napier's rules. Determination of the distance between two points on the surface of Earth. Elements of vector calculus. Curves in the plane and in space: the natural parametrization, the Frenet frame, the relationship between the radius of flexion and torsion. Reparametrization, Curvature and Torsion. Equations of the elements of the Frenet frame. Frenet-Serret formulas. Surface in three dimensions: Tangent plane, Surface normal, First fundamental form, geodesic curve

Practical instruction

Numerical exercises.

Weekly teaching load				Other:
Lectures: 3	Exercises: 2	Other forms of teaching:	Student research:	