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Course title: DIFFERENTIAL GEOMETRY I

ECTS credit allocation (and other scores): 5

Semester: spring

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30 lectures + 30 classes = 60 hours

Course coordinator/ Department and e-mail: Erasmus coordinator Anna Szczepkowska/ WMil,  
erasmuswmil.uwm.edu.pl

Type of classes: classes and lectures

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Substantive content

CLASSES:

Examples of curves, Calculation of curvature and torsion. Examples of surfaces. Definition of surfaces using equations and parametrizations. Relations between determination of surfaces by equations and by parametrizations. Determining the smoothness of surfaces. Calculation of tangent spaces. Calculation of principal curvatures and Gauss curvature.

LECTURES:

The notion of a curve. Frenet frame. Curvature and torsion of a curve. Notion of surface. Methods of determining surfaces. . Tangent space. Shape operator. Normal and Gauss curvature, The first fundamental form. Isometries. Covariant derivative and parallel translation. Theorema egregium. Selected applications of differential geometry in physics and engineering.

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LEARNING PURPOSE

Learning classical differential geometry The use of analysis in description of geometric objects and their properties, in particular, the notion of curvature.

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On completion of the study programme the graduate will gain:

Knowledge:

Students know basic theorems of classic differential geometry, understand the role of this subject among other areas of mathematics, as well as selected applications in physics and engineering.

Skills:

Students are able to formulate definitions and theorems of classical differential geometry in written and oral form, as well as prove easy and moderately difficult theorems. Students understand the notions of smooth surface and its curvature, are able to define various surfaces, calculate various types of curvatures and to understand their physical and geometric meaning.

Social Competencies:

Students understand the limits of their knowledge and the necessity of further learning of both historic and modern aspects of science and are able to find the necessary information in various sources.

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Basic literature:

J. A. Thorpe, Elementary topics in differential geometry, Springer, 1979

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The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 2,52 ECTS points,

Student's independent work: 2,48 ECTS points,