UNIVERSITY OF WARMIA AND MAZURY IN OLSZTYN

Faculty of Technical Sciences

Course title: Strength of materials

ECTS credit allocation (and other scores): 2

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 40

Course coordinator/ Department and e-mail: Wiesław Komar, Department of mechanics and fundamentals of machine design, komar@uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES: Problem – solving exercises covering the topics discussed during the lectures: Strain energy density. Energy theorems: Castigliano's theorem and Menabrea's theorem. Stresses and strains in curved beams. The three-moment equation. Eccentric tension/compression of a bar. Torsion of bars with arbitrary cross-sections. Rotating rings and discs. Creep and stress relaxation.

LECTURES: Presentation of the theoretical concepts and topics included in the course: Elastic strain energy in a three-dimensional stress state. Energy methods, including Castigliano's and Menabrea's theorems. Curved beams. The three-moment equation. Eccentric loading of bars in tension and compression. Free torsion of bars with non-circular cross-sections. Rotating discs. Fundamentals of rheological behaviour and related engineering problems.

Learning purpose: Preparation for the independent analysis and design calculations of non-standard structural elements using the acquired methods and engineering tools.

On completion of the study programme, the graduate will gain:

Knowledge: Fundamentals of the design and advanced structural strength analysis of engineering components.

Skills: Ability to perform independently strength and structural analyses of non-standard structural elements employing the methods and tools acquired during the course.

Social Competencies: Ability to perform advanced strength analyses of non-standard structures and structural components in an independent and informed manner.

Basic literature: Ugural A., Mechanics of materials, Hoboken: John Wiley & Sons, 2008; Atanackovic T. M., Guran A., Theory of Elasticity for Scientists and Engineers, MA: Birkhäuser Boston, Boston, 2000; Gross D., et al., Engineering Mechanics 2: Mechanics of Materials, Springer nature, 2018.

Supplementary literature: Timoshenko S. P., Huber M., T., Course in Strength of Materials, Książnica-Atlas, Lwów, Warszawa, 1931 (in Polish).

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 40

Student's independent work: 10