Course Unit Descriptor

Study Programme: Mechanical Engineering, Industrial engineering in exploitation of oil and gas, Engineering management

Course Unit Title: Machine materials

Course Unit Code: OAS029

Name of Lecturer(s): Assistant Professor Jasmina Pekez

Type and Level of Studies: Bachelor academic degree

Course Status (compulsory/elective): Compulsory

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:

Acquisition of basic knowledge in the field of material science as well as introduction to the significance of materials selection from the standpoint of their structure, selected technology and designed properties.

Learning Outcomes:

Acquired knowledge is used to carry out research related to manufacturing, processing and machining as well as use of classical and novel engineering materials.

Syllabus:

Theory

Introduction to materials, their significance and engineering. Connection between parameters of obtaining and processing of engineering materials with their properties, i.e. interdependence in triad: technology - structure - properties. Nano, micro and macro structure and its role in crystalline and amorphous materials. Errors in the crystal structure and their practical importance for material engineering. Phase diagrams and their practical significance. Static and dynamic material testing. Plastic deformation of polycrystalline materials. Mechanisms for strengthening crystalline materials. Influence of heating temperatures on the structure and properties of deformed metals and alloys. Metallic materials based on iron, aluminium and copper, their properties and applications. Fe-Fe3C diagram. Steel, definition, types and purpose. Iron, definition, types and purposes. Ceramic, polymeric and composite materials.

Practice

Metal material testing – introduction. Designation of metal materials. Tensile test. Determination of elastic modulus. Compressive test. Bending test. Hardness test: static methods (Brinell, Vickers and Rockwell) and dynamic methods (Poldi and Shore tests). Toughness test. Determination of dynamic strength. Creep.

Required Reading:

Callister, W., Materials science and engineering, John Wiley and Sons, New York, 1997.

Ashby, F.M., Jones, D. R. H., Engineering materials 1 and 2 – An Introduction to Their Properties and Applications, Butterworth-Heinemann, 2002.

Weekly Contact Hours: 4	**Lectures: 2**	**Practical work: 2**

Teaching Methods:

Verbal and textual, illustrative and demonstrative, laboratory and experimental.

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	10	written exam	
Practical work	10	oral exam	55
Preliminary exam(s)	25		
Seminar(s)			