Course Unit Descriptor

Study Programme: Production engineering

Course Unit Title: Advanced materials

Course Unit Code: P2412

Name of Lecturer(s): Dragan Rajnović

Type and Level of Studies: Bachelor level

Course Status (compulsory/elective): elective

Semester (winter/ summer): winter+summer

Language of instruction: english

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

Number of ECTS Allocated: 6

Prerequisites:

Course Aims:.

Mastering the content in the field of advanced materials.

Learning Outcomes:

The competence to critically analyze the existing solutions and synthesize the original solutions in the field of advanced materials

Syllabus.

Classification of modern materials, and comparison with conventional materials. Specificity of the crystalline structure of metal materials, molecular microstructure of the polymers, specificity of the crystalline structure of ceramics, composites. Basic strengthening mechanisms of different materials groups. Iron-based metallic materials: steel - advanced structural, tool, stainless and fire-resistant steels, advanced castings and ADI materials. Advanced copper based metal materials (brass and bronze), aluminum (for plastic deformation and casting). Titanium based alloys, alloying elements, specificity of solution treatment, commercial titanium alloys. Magnesium based alloys. Alloys in the form of intermetal compounds; superalloys based on cobalt and nickel. Polymers: thermoplastics (LDPE, HDPE, UHMWPE, PP, PVC, POM, PA), thermosetting (PF, VF, EP, UPES); elastomers: natural and synthetic. Ceramics (engineering and traditional ceramics).

Required Reading:

Callister, W.D.: Materials Science and Engineering: an Introduction, John Wiley & Sons, New York, 2007
Ashby, Michael F. : Materials Selection in Mechanical Design, Amsterdam: Elsevier. 2011
Smallman, R. E., Bishop, R. J. : Metals and Materials, Buttenvorth-Heinemann, Oxford, 1995
Ratner, B.D., Hoffman, A.S., Schoen, F.J., Lemons, J.E.: Biomaterials Science, Academic Press, 1996
Michel W. Barsoum: Fundamentals of Ceramics, McGraw-Hill, New York, 1997
Strong, B.A.: Plastics : Materials and Processing, New Jersey: Prentice Hall, New Jersey, 2000

Weekly Contact Hours:	**Lectures: 3**	**Practical work: 3**

Teaching Methods:

Lectures are elaborated through the introduction into current and possible new directions in research in introductory lectures, followed by the selection of the theme and formulation of the task in cooperation with the supervisor, the elaboration of a simulator, laboratory models and solution prototypes in the laboratory, a series of laboratory experiments with the task of gathering necessary data, paper elaboration, and the review by the lecturer.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Attendance			
Computer exercises			
Tests (4x)			