Course Unit Descriptor

**Study Programme: Production Engineering**

**Course Unit Title: Surface engineering**

**Course Unit Code: P210**

**Name of Lecturer(s): Škorić Branko, Terek Pal**

**Type and Level of Studies: bachelor**

**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: 7**

**Prerequisites: none**

**Course Aims:**.

The objective of the course is to provide to students knowledge of surface engineering necessary for selection of adequate surface treatments for improvement of physical properties of tools and components. Introduce students to techniques for modification of surface layers. Introduce students to techniques for deposition of thin coatings. Introduce students to types of coatings and their properties. Introduce students to techniques for characterization of modified layers and thin coatings.

**Learning Outcomes:**

Upon successful completion of this course, students will be able to: 1. name, describe and compare techniques for modification of surface layers; 2. name, describe and compare thin film deposition techniques; 3. name and describe key parameters of specific surface layer modification technique, and of specific thin film deposition technique; 4. name types of thin coatings and their properties, and give examples of their application; 5. name, describe and compare techniques for characterization of modified layers and coatings; 6. select adequate characterization techniques for specific surface modified layers and/or specific coating; 7. name and describe friction and wear mechanisms; 8. recognize wear type in specific application and predict which properties are required for increasing the wear resistance of specific tool or component; 9. analyze given part and in accordance with required physical properties, part geometry and quantity select adequate surface treatment and/or coating.

**Syllabus**.

Introduction to surface engineering. Introduction to physics of plasma. Modification of surface layers by ion bombardment. Modification of surface layers by plasma diffusion processes. Thin film deposition techniques. Diamond coatings. Diamond like coatings. Cubic boron nitride coatings. Thermal barrier coatings. Hard ceramic coatings. Nanocomposite coatings. Techniques for characterization of modified surface layers and thin coatings. Introduction to tribology. Application of hard coatings

**Required Reading:**

**H. Frey, H.R. Khan Handbook of Thin-Film Technology Springer 2015**
**K. Holmberg, A.Matthews Coatings Tribology: Properties, Mechanisms, Techniques and Applications in Surface Engineering Elsevier 2009**
**Seshan K. Handbook of Thin Film Deposition Elsevier 2011**

| **Weekly Contact Hours:2** | **Lectures: 3** | **Practical work: 0** |
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**Teaching Methods:**

Teaching is held interactively as lectures and laboratory practice.

**Knowledge Assessment (maximum of 100 points):**

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