| Course unit title:<br>**DESIGN AND MATERIALS SELECTION**<br>**PROJEKTOWANIE I DOBÓR MATERIAŁÓW INŻYNIERSKICH** | | | |
|---|---|---|---|
| Field of study:<br>**DESIGN AND MATERIALS SELECTION**<br>**PROJEKTOWANIE I DOBÓR MATERIAŁÓW INŻYNIERSKICH** | | | Course unit code:<br>IM.KK.C3.60 |
| Type of course unit:<br>**obligatory** | Level of study:<br>**study - II level** | Form of study:<br>**Stationary studies** | Year: **I**<br>Semester: **II** |
| Teaching methods:<br>**Lecture, Tutorials, Laboratory, Seminar, Project** | Number of hours/week:<br>**2, 0, 1, 0, 0** | | Number of ECTS credits:<br>**ECTS 4** |

**Course guide**

**I COURSE CARD**

**COURSE PURPOSES**

C1. Transfer to the students' knowledge about the materials, grade of materials and properties.

C2. Acquainting students with the graph of materials selection without product shape consideration.

C3. Materials and shape selection.

C4. Transfer to the students' knowledge about costs of production methods for materials and products.

***INITIAL REQUIREMENT FOR THE KNOWLEDGE, ABILITIES AND OTHER COMPETENCES***

1. Basic knowledge of the subjects: physics, chemistry, quality management, materials science
2. Basic knowledge of the safe at work.
3. Ability to work with measurements methods
4. Knowledge of analytical methods,
5. Ability to work independently and in a group.
6. Ability to present own reports and resolutions.
7. Ability to use literature resources and internet resources.

**EDUCATION EFFECTS**

EK 1 – Student has the basic knowledge relating to the issues of designing process.

EK 2 – Student knows classification of materials in engineering design and they properties.

EK 3 – Student knows materials design graphs without product shape consideration.

EK 4 – Student is able to determine functionality factor with product shape consideration.

EK 5 – Student knows rules for materials design with production rate

EK 6 – Provide practical experience in laboratory and reporting

**COURSE CONTENT**

| **Teaching method – LECTURE** | **No of hours** |
|---|---|
| **W1** – Design process: function, material, shape and production method. | **2** |
| **W 2,3 –** Materials classification in practise of engineering. Engineering materials properties. | **4** |
| **W 4 –** Properties of engineering materials - Methods of showing | **2** |
| **W 5,6 –** Graphs for materials design. | **4** |
| **W 7** – Materials design without product shape consideration. | **2** |
| **W 8, 9 –** Understanding Material Selection Charts. | **4** |
| **W 10 –** Objectives in conflict: trade-off methods and penalty functions**.** | **2** |
| **W 11 –** Materials Selection Without Shape Case studies | **2** |
| **W 12, 13** – Materials selection – shape factors. Case studies | **4** |

| | |
|---|---|
| **W 14 –** Materials and Sustainable Development | **2** |
| **W 15 –** Advanced databases. | **2** |
| **Teaching method – TUTORIALS** | **No of hours** |
| **L 1,2,3 –** The materials and processes universe case studies. | **3** |
| **L 4,5,6,7** – Functional factor determination for one project criteria. | **4** |
| **L 8,9 –** Functional factor determination for multi criteria project and materials design. | **2** |
| **L 10,11,12 –** Materials selection – functional factor determination with product shape consideration | **3** |
| **L 13 –** Design of production methods with production rate consideration | **1** |
| **L 14,15 –** CES in research: editing and creating databases in CES Constructor**.** | **2** |

**TEACHNING TOOLS**

| |
|---|
| **1. –** lecture with audio-visual media |
| **2. –** tutorials- problems solving with help of teacher and discussion in group |
| **3. –** Tutorials- case study and CES databases- work with CES EDu PAck 2013 |

**WAYS OF ASSESSMENT ( F – FORMING, P – SUMMARY)**

| |
|---|
| **F1. –** assessment of preparing to tutorials |
| **F2. –** assessment of the skills to apply the knowledge during tutorials |
| **F3. –** assessment of the activity during the course |
| **P1. –** assessment of knowledge gained during tutorials – final test |
| **P2. –** assessment of knowledge gained during lectures |
| **P3.** – assessment of knowledge gained during course-exam |

**STUDENT WORKLOAD**

| **Activity form** | **Average number hours to complete the activity** |
|---|---|
| Contact hours with the teacher | 30L 15T $\rightarrow$ 45h |
| Getting Acquainted with the indicated literature | 15 h |
| Preparing to tutorials | 15 h |
| Preparing to seminar | 15 h |
| Preparing to pass the course | 30 h |
| **Total number of hours** | **$\Sigma$ 120 h** |
| **TOTAL NUMBER OF ECTS CREDITS FOR THE COURSE** | **4 ECTS** |

# BASIC AND SUPPLEMENTARY LITERATURE


| |
|---|
| 1. M. F. Ashby: Materials selection in mechanical design, Pergamon Press, 1992. |
| 2. L.A. Dobrzański: Metalowe materiały inżynierskie, WNT, Warszawa, 2004. |
| 3. I. Hylla : Tworzywa sztuczne–własności–przetwórstwo–zastosowanie, Wyd. P.Śl., 1999. |
| 4. M. Blicharski: Wstęp do inżynierii materiałowej, WNT, Warszawa, 2003. |
| 5. M. F. Ashby, D.R.H. Jones: Materiały inżynierskie, właściwości i zastosowania, WNT, Warszawa, 1995. |
| 6. M. F. Ashby, D.R.H. Jones: Materiały inżynierskie -2, WNT, Warszawa, 1997. |
| D. Askeland: The science and Engineering of Materials, Nelson Thomas Ltd, 2001 |


**LEADING TEACHER (NAME, SURNAME, E-MAIL ADRESS)**

1. **dr inż. Pawel Wieczorek pawel@wip.pcz.pl**

**MATRIX OF REALIZATION OF EDUCATION EFFECTS**

| Education effect | The reference of the effect to the effects defined for the entire program | Course purposes | Course content | Teaching tools | Ways of assessment |
|---|---|---|---|---|---|
| **EK1** | K_W05, K_W07, K_W08 K_U01, K_U03, K_U09, K_K02 | C1 | W1, W4 | 1,4,5 | F2 P2 |
| **EK2** | K_W05, K_W08, K_W10, K_U17, K_U20 | C1, C2 | W2-4 L 1,2,3 | 1,2,3 | P2 P3 |
| **EK3** | K_W08, K_U26, | C2 | W5-9 L4,5,6,7 | 2, 4, 5 | F1 F2 P1 P3 |
| **EK4** | K_W08, K_W10, K_U8,K_U12, K_U28,K_U30 | C3 | W10-13 L10-12 | 1,2,3 | F2 F3 P2 P3 |
| **EK5** | K_W20, K_U15, K_U19, K_U26, | C3 | W14 L13 | 1-4 | F1 F4 P2 P3 |
| **EK6** | K_W10,K_W11, K_W12,K_W21, K_U17, K_U23, K_U25, K_U29, | C4 | W15 L13-15 | 2, 4, 5 | F1 F2 F3 P1 |

**II. ASSESSMENT FORM – DETAILS**

| | For grade 2 | For grade 3 | For grade 4 | For grade 5 |
|---|---|---|---|---|
| **Effect 1** Student has the basic knowledge relating to the issues of design processes | Student has no basic knowledge relating to the issues of design processes | Student is able to define basic concept of design processes | Student is able to define concept of design processes. Student is able to create design model. | Student is able to name and discuss in details design methods to assess IMS and make such assessment for the individual case. |
| **Effect 2** Student knows the classification of engineering materials in practise. | Student is not able to classification of materials. | Student is not able to use knowledge for case study without teacher help. | Student is able to use knowledge and resolve some problems by self during the tutorial. | Student is able to achieve adequate investigation methods for typical testing and materials classification. |

| | | | | |
|---|---|---|---|---|
| **Effect 3**<br>Student knows basics graph and rules of materials designing without product shape consideration | Student do not knows any rules of materials designing without product shape consideration | Student is not able to use rules and graphs of materials designing without product shape consideration for case study without teacher help. | Student is able to use rules and graphs of materials designing without product shape consideration for case study during the tutorials. | Student is able by self to design material for specific condition from multistructural and composed materials. Student is able to discuss in details about this choice. |
| **Effect 4**<br>Student is able to determine functional factors for design with product shape consideration. | Student is not able to determine any functional factors for design with product shape consideration. | Student is able to determine some basics functional factors for design with product shape consideration. | Student is able to determine advanced and basics functional factors for design with product shape consideration | Student is able to determine own advanced functional factors for design with product shape consideration. Student is able to discuss about this factors. |
| **Effect 5**<br>Student knows rules for materials design and production processes with production rate consideration. | Student is not able to design production process for determined production rate. | With teacher help student is able to design production process for determined production rate. | Student is able to choice production process for correct production process for determined production rate | Student is able to choice production process for correct production process for determined production rate. Student is able to discuss about the important factors |
| **Effect 6**<br>Student provides practical experience in tutorials and reporting its. Student is able to use database for materials. | Student is not able to provide practical experience in tutorials and reporting. Student is not able to use database for materials. | Student is able to create practical report for typical case study of simple product. Student is able to use database for materials. | Student is able to create practical report for advanced case study of product. Student is able to use database for advanced materials | Student is able to create practical report for advanced case study of product. Student is able to create own database for any case of materials design |

## ***III. OTHER USEFUL INFORMATION ABOUT THE COURSE (web site WIPMiFS PCZ)***

1. Information where presentation of classes, instruction, subjects of tutorials can be found, etc.
2. Information about the location of the classes,
3. Information about the date of the course (day of the week/time).
4. Information about the consultation (time + place).