STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Basics in Machine Construction**		Code **1010401141010210547**
Field of study **EDUCATION IN TECHNOLOGY AND**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 4**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**

Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**

No. of hours Lecture: **2** Classes: **1** Laboratory: **-** Project/seminars: **1**	No. of credits **5**

Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**

Education areas and fields of science and art **technical sciences** **Technical sciences**	ECTS distribution (number and %**)** **5 100%** **5 100%**

Responsible for subject / lecturer: dr inż. Paweł Jasion email: pawel.jasion@put.poznan.pl tel. 2175 Faculty of Mechanical Engineering and Management ul. Piotrowo 3 60-965 Poznań	Responsible for subject / lecturer: dr inż. Paweł Jasion email: pawel.jasion@put.poznan.pl tel. 2175 Faculty of Mechanical Engineering and Management ul. Piotrowo 3 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of mathematics, strength of materials, engineering drawing. Basic knowledge of fields of studies related with his or her field of study.
2	**Skills**	Solving basic problems in the field of mechanics of solid body. Solving elementary tasks in geometry and calculus. Ability to extract information from literature, data bases and catalogs. Ability to arrange self-education process. Ability to use information and communication techniques to solve engineering tasks.
3	**Social competencies**	Understanding the need of self-improvement. Understanding the social aspects and results of engineering. Understanding the importance of a team work assuming various roles.

Assumptions and objectives of the course:

Present the basic rules of design and typical parts of machines. To show in a comprehensible way the selected problems of mechanical engineering design. To indicate constraints typical for engineering design owing to safety, reliability, regulations and norms. The review of basic models of joints used in the design of machine parts and theirs assemblies. To point out the economical and ecological aspects of engineering. To take note of the attainable set of solutions and optimal solution of the task. To enlighten the complexity of the design process and the necessity of systemic approach.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has basic theoretical knowledge of mechanical engineering design related to the scope of his or her field of study. - [K_W10]

2. Understands the basic models and computational methods used in mechanical engineering design. - [K_W17]

3. Awareness of the importance of the subject owing to safety and reliability of the machine. - [K_W18]

4. Has the knowledge of simple machines, theirs parts, assemblies and joints. - [K_W10; K_W17]

5. Understands the way of work of simple machines assemblies and theirs service conditions. - [K_W17]

6. Understands the need of minimization of vibrations and noise generated by machines owing to health hazards and environmental impact. - [K_W05]

Skills:

1. Is able to design selected parts of machines subjected to simple load. - [K_U07; K_U10]

2. Is able to design selected types of joints subjected to simple load. - [K_U10]

3. Is able to classify machines according to theirs use. - [K_U16; K_U20]

4. Understands the principle of work and service conditions of basic machine assemblies: gears, clutches, brakes. - [K_U25]

Social competencies:

1. Understand the need of life-long learning related to development of technical science. - [K_K03]

2. Understands the social and systemic results of engineering. - [K_K06]

3. s able to make a proper decision based on the attainable set of solutions. - [K_K01; K_K07]

4. Understands the importance and advantages of teamwork. - [K_K01]

Assessment methods of study outcomes

Written and oral examination covering the knowledge presented in lectures.

Two colloquiums verifying the understanding of mathematical models of joints and machine elements and verifying the ability to use these models in engineering tasks.

Individual projects to verify his or her activity, commitment and ability to work independently.

Course description

Introduction: explaining the importance of the machine engineering design in a modern technical knowledge; classification of machines; limitations and constraints in the design process; fatigue failure; tolerances;

Engineering materials: characteristic and mechanical properties of metals, polymers and ceramics; modern materials ? light alloys, nanomaterials, metal foams, composites; experimental techniques in materials.

Joints: general characteristic of permanent and non-permanent joints (welded, riveted, bonded, screwed etc.); mathematical models of selected joints and design procedures.

Springs and energy absorbers: types of springs; examples of usage of different types of springs; spring rate; design of helical springs; analysis of a simple energy absorber.

Shafts and axes: general description and design approaches to shaft design; strength and stiffness of shafts; analytical method of determining the diameter of the shaft.

Bearings: description of friction phenomenon; design of friction bearing; classification and selection procedure of rolling bearing ? load, life and reliability.

Gears: types of gears and teeth weels; nomenclature of spur-gear teeth; involute and its properties; gear forces; stress in gear teeth; Hertz contact stress; friction gears; chain and belt transmission; types of belts; stress in a flat belt.

Power transmission system: elements of power transmission system; clutches ? basic functions, principle of operation, types and structure of clutches; brakes ? basic function, classification and structure.

Horizontal cylindrical tanks: types and structure of selected tanks, design procedures.

Summary: problem of vibration and noise; occupational diseases; ecological aspects of engineering.

Basic bibliography:

1. Magnucki K.: Podstawy konstrukcji maszyn. Wydawnictwo Politechniki Poznańskiej, wydanie II, 2008.

2. Shigley J.E., Mischke C.R., Budynas R.G.: Mechanical engineering design. McGraw-Hill, 2004.

3. Dietrich M. (Red.) Podstawy konstrukcji maszyn. Warszawa, WNT, 1999.

4. Rutkowski A.: Części maszyn. Warszawa, WSiP, 2003.

Additional bibliography:

1. Osiński Z.: Podstawy konstrukcji maszyn. Warszawa, Wyd. Naukowe PWN, 2002.

2. Mazanek E (Red.): Przykłady obliczeń z podstaw konstrukcji maszyn. Warszawa, WNT, 2005.

3. Skoć A., Spałek J.: Podstawy konstrukcji maszyn. Warszawa, WNT, 2006.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Classes	15
3. Project	15
4. Consultations	5
5. Preparation for classes	30
6. Elaborating project	45
7. Preparation for colloquiums	15
8. Preparation for examination	30
9. Participation in examination	3

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	188	5
Contact hours	68	2
Practical activities	120	3

http://www.put.poznan.pl/