STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Modelling of mechanical systems		**1010642221010640413**
Field of study: **Mechanical Engineering**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **1 / 2**
Elective path/specialty: **Mechatronics**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **1** Classes: **2** Laboratory: **-** Project/seminars: **-**		No. of credits: **3**
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 %): **3 100%** **3 100%**

Responsible for subject / lecturer:

prof. dr hab. inż. Janusz Mielniczuk
email: janusz.mielniczuk@put.poznan.pl
tel. 61 665 2335
Working Machines and Transportation
ul. Piotrowo 3, 60-965 Poznań

Responsible for subject / lecturer:

mgr inż. Dominik Wojtkowiak
email: dominik.wojtkowiak@put.poznan.pl
tel. 61 665 2053
Working Machines and Transportation
ul. Piotrowo 3, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of mathematics, materials science, mechanics, basics of machine design, theory of machines and strength of materials acquired during the first degree studies.
2	**Skills**	Basics of vector and tensor analysis, solve simple problems of strength, the ability to solve differential equations.
3	**Social competencies**	Students are creative and consistent in the implementation of the tasks has autonomy to solve problems, acquire and improve their knowledge and skills.

Assumptions and objectives of the course:

-Learning a new mathematical apparatus necessary in the process of modeling materials and machines (mechanisms), learn the basics of physical and mathematical modeling of construction materials, machinery and equipment, some physical processes.

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

Knowledge:

1. Has a basic knowledge of the mechanics of solids and discrete systems with many degrees of freedom - [K2A_W02]
2. Mathematical modeling of physical and mechanical systems based on the principle of d - [K2A_W02]

Skills:

1. He can use the assimilated knowledge of the mechanics of materials of construction for the simulation of mechanical systems, mechanisms and machines. - [K2A_U05]
2. Is able to assess potential negative impacts for the natural environment and humans, originating from the designed machine or a vehicle from the selected equipment group.- - [K2A_U14]

Social competencies:

1. Understands the need for lifelong learning; is able to inspire and organize the learning process of others. - [K2A_K01]
2. Is aware of and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment, is aware of responsibility for decisions - [K2A_K02]
3. Is aware of social role of mechanical engineer, understands the need for and is able to deliver opinions and knowledge in the field of machine design, particularly through the media - [K2A_K06]

Assessment methods of study outcomes

-Written test, written tests on exercises, passing thesis.

Course description

-Notes on modeling - a goal of modeling entities. The modeling process - stages of modeling scheme. Physical modelling - simplifying assumptions, the physical parameters, examples of physical models. Mathematical modelling - basics model, the size of tensor, coordinate systems, principles for the formulation of constitutive relationships, formulate and solve the equations of motion of mechanical systems. Mathematical models of construction materials - one-parameter models, complex models, some models nonclassical. Mechanical systems one and two-parameter - equations of motion, vibration, undamped and damped, resonance, self-excited oscillations, vibrations of beams and shafts. Mathematical models of selected processes - thermal systems, hydrodynamic systems. The parallels between the worlds of physical. Mathematical modelling of machines and devices ? forward and reverse kinematics, dynamic stresses.

Basic bibliography:

1. Ostrowska-Maciejewska; Podstawy mechaniki ośrodków ciągłych, PWN, Warszawa 1982
2. W. Flügge; Tensor analysis and continuum mechanics, Springer-Verlag, Berlin 1972
3. R. H. Cannon jr.; Dynamika układów fizycznych, WNT, Warszawa 1973
4. Derski W., Ziemba S., Analiza modeli reologicznych, Wyd. PWN, Warszawa 1968.
5. Wrotny L.T., Zadania z kinematyki i dynamiki maszyn technologicznych i robotów przemysłowych, Wyd. PW, Warszawa 1998.

Additional bibliography:

1. Z. Parszewski; Drgania i dynamika maszyn, WNT, Warszawa 1982
2. R. Scanlan, R. Rosenbaum; Drgania i flatter samolotów, PWN, Warszawa 1964
3. W. Tarnowski; Modelowanie systemów, Wyd. Politechniki Koszalińskiej, Koszalin 2004
4. Czemplik A., Modele dynamiki układów fizycznych dla inżynierów

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	15
2. Consultations	2
3. Preparation for the test	4
4. Exam	2
5. Participation in exercises	30
6. Consultations	2
7. Preparation for the test	10
8. Test	2

Student's workload

Source of workload	hours	ECTS
Total workload	67	3
Contact hours	53	2
Practical activities	0	0