# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | Code |
|---|---|
| **Modelling of mechanical systems** | **1010612221010630413** |

| Field of study | Profile of study (general academic, practical) | Year /Semester |
|---|---|---|
| **Mechanika i budowa maszyn** | **general academic** | **1 / 2** |
| Elective path/specialty | Subject offered in: | Course (compulsory, elective) |
| **Product engineering (Inżynieria produktu)** | **English** | **obligatory** |

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

| No. of hours | No. of credits |
|---|---|
| Lecture: **1** Classes: **2** Laboratory: **-** Project/seminars: **-** | **3** |

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

| Education areas and fields of science and art | ECTS distribution (number and %) |
|---|---|
| **technical sciences** | **3 100%** |
| **Technical sciences** | **3 100%** |

## Responsible for subject / lecturer:

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## 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'Alembert and Lagrange equations, mathematical description of materials with constitutive equations - [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 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. |

| **Course description** |
|---|
| Notes on modeling - a goal of modeling entities. The modeling process - stages of modeling scheme. Physical modeling? simplifying assumptions, the physical parameters, examples of physical models. Mathematical modeling? 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 physical worlds. |

**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

**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

**Result of average student's workload**

| Activity | Time (working hours) |
|---|---|
| 1. Lecture participation | 15 |
| 2. Consultation | 2 |
| 3. Preparation for assessment | 4 |
| 4. Assessment participation | 2 |
| 5. Exercises participation | 30 |
| 6. Consulation | 2 |
| 7. Test preparation | 4 |
| 8. Test participation | 2 |

**Student's workload**

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 61 | 3 |
| Contact hours | 53 | 3 |
| Practical activities | 0 | 0 |