# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | | Code |
|---|---|---|
| **Modelling of Physical Systems** | | **1010625311010642212** |

| Field of study | Profile of study (general academic, practical) | Year /Semester |
|---|---|---|
| **Transport** | **(brak)** | **1 / 1** |
| Elective path/specialty | Subject offered in: | Course (compulsory, elective) |
| **Ecology of Transport** | **Polish** | **obligatory** |

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

| No. of hours | | | | No. of credits |
|---|---|---|---|---|
| Lecture: **9** | Classes: **9** | Laboratory: **-** | Project/seminars: **-** | **2** |

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

| Education areas and fields of science and art | ECTS distribution (number and %) |
|---|---|
| **technical sciences** | **2 100%** |
| **Technical sciences** | **2 100%** |

## Responsible for subject / lecturer:

dr inż. Berdychowski Maciej
email: maciej.berdychowski@put.poznan.pl
tel. 612244512
Faculty of Transport Engineering
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'Alembert - [K2A_W02]

### Skills:

1. Can use the assimilated knowledge of the mechanics of construction materials for the simulation of mechanical systems, mechanisms and machines. - [K2A_U05]
2. Is able to use acquired mathematical theories to create and analyze simple models - [K2A_U14]

### Social competencies:

1. Understands the need and knows the possibilities of lifelong learning, knows the need for acquiring new knowledge for professional development. - [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 and responsibility for own decisions in short and long-term aspect. - [K2A_K02]
3. Is able to act in a professional manner, comply with the rules of professional ethics and respect for cultural diversity. - [K2A_K03]
4. Has a sense of responsibility for one?s own work and is willing to comply with the principles of teamwork and taking responsibility for collaborative tasks - [K2A_K04]

## Assessment methods of study outcomes

Written exam

## Course description

Notes on modeling - a goal of modeling. The modeling process - stages of modeling scheme. Physical modeling simplifying assumptions physical quantities, examples of physical models. Mathematical modeling of the base model, tensors , coordinate systems, principles for the formulation of constitutive compounds

Solving 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 equation of motion, undamped and damped oscillations, resonance, self-excited oscillations, vibrations of beams and shafts. Mathematical models of selected processes thermal systems, hydrodynamic systems. The analogy between the worlds of physical.

## 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. W. Tarnowski; Modelowanie systemów, Wyd. Politechniki Koszalińskiej, Koszalin 2004
3. R. Scanlan, R. Rosenbaum; Drgania i flatter samolotów, PWN, Warszawa 1964

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Lectures | 9 |
| 2. Strengthening the lecture | 8 |
| 3. Consultations | 2 |
| 4. Preparation to pass the exam | 5 |
| 5. Participation in the exam | 2 |
| 6. Participation in the exercises | 9 |
| 7. Consolidation of the exercises | 9 |
| 8. Consultations | 2 |
| 9. Preparation for the test | 8 |
| 10. Test | 2 |

## Student's workload

| Source of workload | hours | ECTS |
|---|---|---|
| Total workload | 58 | 2 |
| Contact hours | 26 | 1 |
| Practical activities | 0 | 0 |