STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Mathematical models in biology and technical sciences	**1010342541010347418**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mathematics	**(brak)**	**2 / 4**
Elective path/specialty	**Subject offered in:**	**Course (compulsory, elective)**
Mathematical modelling	**polish**	**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: **-** Laboratory: **1** Project/seminars: **-**	**3**

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 %)
the sciences	**3 100%**
Mathematical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student should has a basic knowledge of mathematics (mathematical analysis: differential and integral calculus, ordinary and partial differential equations, difference equations complex numbers, vector algebra; algebra; geometry: right triangle, plane trigonometry; elements of differential geometry), numerical methods, and mechanics (statics), variational calculus
2	**Skills**	Student solves algebraic systems of linear equations with constant coefficients; Student solves the partial and ordinary differential equation Student calculates integrals
3	**Social competencies**	Student knows his own limitations of knowledge and understands the need for further education; Student can search some information in literature by himself also in foreign languages

Assumptions and objectives of the course:

Theoretical knowledge of modeling in technical sciences (particularly in mechanics ? displacements of the cross-sections of the beam), or biological phenomena (particularly population models).

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

Knowledge:

1. Student is able to relate issues of the modeling to theoretical and applied mathematics - [K_W07++]
2. Student is able to apply appropriate computational techniques supporting the work of mathematicians and understands their limitations - [K_W08++]

Skills:

1. Student uses adequate tools of mathematics for describing technical and biological phenomena, and for solving formulated problems - [K_U05++]
2. Student is versed in methods to solve differential equations approximately, classical difference equations, and applies them in typical practical issues - [K_U06++]
3. Student can construct mathematical models that are used in specific advanced applications of mathematics - [K_U16+++]

Social competencies:

1. Student knows his own limitations of knowledge and understands the need for further education - [K_K01++]
2. Student can search some information in literature by himself also in foreign languages - [K_K06++]

Assessment methods of study outcomes

Lectures:

- Assessment of knowledge and skills based on the model developed by student

Laboratory:

- Assessment of knowledge and skills related to solving the tasks on the basis of short tests
- Assessment of student preparation to laboratory (the questions devoted to previously mentioned issues / tasks discussed during the lecture)

Course description

Equilibrium equations . External and internal forces and moments. States of stress and strain.
Bending and compression of the beam. The stresses and displacements. Generalized Hooke's law.
Static moments and moments of inertia of beam cross-sections.
The principle of the total potential energy.
Or
Population models. Generations separate and continuous. Logistic equation.
The relations that occur between the two populations.

Basic bibliography:

1. Wytrzymałość materiałów w zadaniach, K. Magnucki, W. Szyc, Wyd. Naukowe PWN, Warszawa-Poznań, 2000
2. Matematyka w biologii, J.M. Smith, Państwowe Wyd. Wiedza Powszechna, Warszawa, 1974

Additional bibliography:

1. 1. Artykuły z czasopism z listy filadelfijskiej

Result of average student's workload

Activity	Time (working hours)

Student's workload

Source of workload	hours	ECTS
Total workload	84	3
Contact hours	44	2
Practical activities	40	1