COURSE DESCRIPTION CARD - SYLLABUS

Course name
Computational methods in technology

Course

Field of study
Biomedical Engineering

Year/Semester
3/6

Area of study (specialization)
-

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Witold Stankiewicz

email: Witold.Stankiewicz@put.poznan.pl

tel. 665 2167

Wydział Inżynierii Mechanicznej

ul. Jana Pawła II 24, 60-965 Poznań

Responsible for the course/lecturer:
dr inż. Krzysztof Kotecki

email: Krzysztof.Kotecki@put.poznan.pl

tel. 665 2101

Wydział Inżynierii Mechanicznej

ul. Jana Pawła II 24, 60-965 Poznań

Prerequisites

KNOWLEDGE: the student has a basic general knowledge about the structure of the surrounding world and the laws that govern it. He has basic knowledge of mathematics, mechanics and computer science.

SKILLS: the student is able to integrate the obtained information, interpret it, draw conclusions, as well as formulate and justify opinions

SOCIAL COMPETENCES: the student understands the importance of self-education and broadening his knowledge.

Course objective

Learning advanced computational methods, especially useful in technology. Familiarization with

examples of practical applications. Acquiring the ability to select and use the known methods and numerical tools in engineering problems.

Course-related learning outcomes

Knowledge

Has a basic knowledge of computer science that allows to apply the basics of algorithmics, numerical methods, compilers and programming languages, linear algebra systems, software and Internet tools and computer-aided engineering systems in biomedical engineering and technology.

Has knowledge of mathematics that allows to understand analytical geometry, algebra, numerically solve systems of linear equations and own problems; use differential and integral calculus; can calculate ordinary and partial differential equations and understand elements of vector, tensor and operator calculus, mathematical statistics.

Skills

Can plan and carry out computer simulations, interpret the obtained results and draw conclusions. Can use computer aids to solve technical tasks and can interpret test results and evaluate measurement errors.

Is able to formulate and solve engineering tasks to use analytical and simulation methods. Can formulate problems and use mathematical methods and the laws of physics in the analysis of technical issues.

Has the ability to self-educate.

Social competences

Understands the need for lifelong learning; can inspire and organize the learning process of other people.

Can properly define priorities for the implementation of a task set by himself or others.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Colloquia. Assessment of individually performed tasks.

Programme content

Interpolation methods. Numerical integration: the trapezoidal rule; Simpson; Romberg. Direct and iterative methods for solving algebraic equations. Methods for determination of matrix eigenvalues and eigenvectors. Algorithms for solving ordinary differential equations. Solving partial differential equations using finite difference and finite element methods.

Teaching methods

Information / problem lecture, Case study, computer lab.

Bibliography

Basic

1. Fortuna Z., Macukow B. Wąsowski J.: Metody numeryczne. WNT Warszawa 2006

2. Jankowscy J. i M.: Przegląd metod i algorytmów numerycznych. WNT 1988

3. Stoer J., Bulirsch R.: Wstęp do metod numerycznych. PWN Warszawa 1980

Additional

1. http://wazniak.mimuw.edu.pl/index.php?title=Metody_numeryczne

2. Press W.H., Flannery B.P., Teukolsky S.A., Vetterling W.T.: Numerical Recipes: The Art of Scientific Computing. Cambridge Press, 1986

3. Saad Y.: Iterative methods for sparse linear systems. PWS publishing company Boston, 1996

4. Saad Y.: Numerical Methods for Large Eigenvalue Problems, Manchester Univ. Press, 1992

5. Pozrikidis C.: Numerical Computation in Science and Engineering. Oxford University Press 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	2,0
Classes requiring direct contact with the teacher	40	1,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests, project preparation) [1]	35	1,5

[1] delete or add other activities as appropriate