



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Numerical methods in technology

Course

Field of study

Year/Semester

Transport

1/2

Area of study (specialization)

Profile of study

-

general academic

Level of study

Course offered in

Second-cycle studies

Polish

Form of study

Requirements

full-time

compulsory

Number of hours

Lecture

Laboratory classes

Other (e.g. online)

15

15

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Witold Stankiewicz

Responsible for the course/lecturer:

dr inż. Krzysztof Kotecki

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Wydział Inżynierii Mechanicznej

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ul. Piotrowo 3 60-965 Poznań

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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 numerical 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 advanced and in-depth knowledge of transport engineering, theoretical foundations, tools and means used to solve simple engineering problems.

Has advanced detailed knowledge of selected issues in the field of transport engineering.

He knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport.

Skills

Can plan and carry out experiments, including measurements and simulations, interpret the obtained results and draw conclusions, as well as formulate and verify hypotheses related to complex engineering problems and simple research problems.

Can use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems.

Social competences

Understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems.

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	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	30	1,0

¹ delete or add other activities as appropriate