COURSE DESCRIPTION CARD - SYLLABUS

Course name
Numerical methods in technology [N2Trans1>MNwT]

Course

Field of study
Transport

Year/Semester
1/2

Area of study (specialization)
Railway Transport

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
9

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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:

Learning outcomes presented above are verified as follows:
Colloquia. Assessment of individually performed tasks.

Programme content

Numerical methods and algorithms for interpolation, integration, solving of systems of equations, differential equations and eigenvalue problems, and their applications in technology.

Course topics

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	48	2,00
Classes requiring direct contact with the teacher	18	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00