STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Numerical Methods in Technology		**1010612321010650404**

Field of study	Profile of study (general academic, practical)	Year /Semester
Transport	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Road Transport	**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 %)
technical sciences	**3 100%**
Technical sciences	**3 100%**

Responsible for subject / lecturer:

dr hab. inż. Witold Stankiewicz
email: Witold.Stankiewicz@put.poznan.pl
tel. 665 2167
Faculty of Transport Engineering
ul. Piotrowo 3 60-965 Poznań

Responsible for subject / lecturer:

dr nż. Krzysztof Kotecki
email: Krzysztof.Kotecki@put.poznan.pl
tel. 665 2101
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 and computer science, as for all graduates of Transportation (first degree)
2	**Skills**	Basic skills in mathematics and computer science, as for all graduates of Transportation (first degree)
3	**Social competencies**	Student is able to cooperate in a group, taking the different roles. Student is able to to set priorities important to solve given tasks. The student demonstrates self-reliance in solving problems, acquiring and improving his knowledge and skills.

Assumptions and objectives of the course:

Learning advanced numerical methods, particularly useful in technology. Familiarization with examples of practical applications. Acquiring the ability to select and use known methods and numerical tools in engineering problems.

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

Knowledge:

1. knows advanced methods, techniques and tools used to solve complex engineering tasks and conduct research in a selected area of ??transport - [T2A_W06]
2. has advanced detailed knowledge of selected issues in the field of transport engineering - [T2A_W03]
3. has advanced and in-depth knowledge in the field of transport engineering, theoretical foundations, tools and means used to solve simple engineering problems - [T2A_W01]

Skills:

1. can acquire information from literature, databases and other sources (in Polish and English), integrate them, make their interpretation and critical evaluation, draw conclusions and formulate and justify opinions - [T2A_U01]
2. can plan and carry out experiments, including measurements and simulations, interpret the results obtained and draw conclusions and formulate and verify hypotheses related to complex engineering problems and simple research problems - [T2A_U03]
3. can use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems - [T2A_U04]

Social competencies:

1. understands the importance of using the latest knowledge in the field of transport engineering in solving research and practical problems - [T2A_K02]
2. understands the importance of popularizing activities regarding the latest achievements in the field of transport engineering - [T2A_K03]

Assessment methods of study outcomes

Colloquia. Individual assessment of the performed tasks.

Course description

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.

Basic bibliography:

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 bibliography:

1. Press W.H., Flannery B.P., Teukolsky S.A., Vetterling W.T.: Numerical Recipes: The Art of Scientific Computing. Cambridge Press, 1986
2. Saad Y.: Iterative methods for sparse linear systems. PWS publishing company Boston, 1996
3. Saad Y.: Numerical Methods for Large Eigenvalue Problems, Manchester Univ. Press, 1992
4. Pozrikidis C.: Numerical Computation in Science and Engineering. Oxford University Press 1998

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	15
2. Consolidation of the lecture	2
3. Preparation to pass (lecture)	3
4. Preparation for classes	10
5. Participation in the classes	15
6. Consolidation of contentof the classes	10
7. Consultations	8
8. Preparation to pass	8

Student's workload

Source of workload	hours	ECTS
Total workload	71	3
Contact hours	38	2
Practical activities	51	2