STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Computer Methods in Railway Engineering**		Code **1010102121010121994**
Field of study **Civil Engineering Second-cycle Studies**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 2**
Elective path/specialty **Railways**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **-** Laboratory: **30** Project/seminars: **-**		No. of credits **3**
Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **from field**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **3 100%** **3 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has knowledge of range of computer programs supporting analysis and design of railway line; knows rules of construction and design of transportation infrastructure
2	**Skills**	Uses specialized tools in order to find useful information or software supporting the work of a designer or an organizer of the construction process; is able to define a computer model of construction and to conduct linear and non-linear analysis of railway structures; is able to critically assess results of numerical analysis; is able to choose tools for solving engineering problems
3	**Social competencies**	Can work individually and in a group on a given task or eventually manage a team; Takes responsibility for solidity of own and team work?s results; complements and enhances knowledge about railway construction; Takes responsibility for own and team?s safety; Consciousness about a need to improve professional skills and personal competence

Assumptions and objectives of the course:

Acquaintaince with expert computer programs, computer calculations and computer-aided decision in railway track operation and maintenance

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

Knowledge:

1. Student is able to carry out a numerical analysis of railway issues - [K_W09]
2. Student knows expert systems applied in PKP (Polish Nation Railways) - [K_W08]
3. Student knows procedures of supporting decisions in the design, operation and maintenance of railway lines - [K_W16]

Skills:

1. Student is able to use computer programs to evaluate railway subgrade?s state and strengthen subgrade - [K_U013]
2. Student is able to solve non-linear calculation of track statics - [K_U06]
3. Student knows computer-aided decisions in operation and maintenance of railway lines - [K_U05]

Social competencies:

1. Student can work individually, in a group or eventually manage a team - [K_K01]
2. Student alone complements and enhances knowledge about railway lines - [K_K03]
3. Student in conscious about a need to improve professional skills and personal competence - [K_K06]

Assessment methods of study outcomes

Verification of knowledge: class participation and colloquium at the end of semester. Getting points for: active participation in the classes, knowledge presented at the colloquium. Verification of skills: active participation in the laboratories; colloquium verifying the ability to use computers. Getting points for: activity in the classroom, skills presented in the colloquium.

Course description

1. Issues related to the stability of the CWR track.
2. Computer-aided evaluations of roadbed and it?s strengthening.
3. Computer-aided decisions in operation and maintenance of railway lines.
4. Finite-element method for the analysis of railway sleepers? work

Basic bibliography:

1. Björck ?., Dahlquist G.: Metody numeryczne. PWN, Warszawa 1983
2. Stoer J.: Wstęp do metod numerycznych. PWN, Warszawa 1979, tom I
3. Stoer J., Bulirsch R.: Wstęp do metod numerycznych. PWN, Warszawa 1980, tom II,
4. Waszczyszyn Z.: Metoda elementów skończonych w stateczności konstrukcji. Arkady, Warszawa 1990
5. Maxfield B.: Essential Mathcad For Engineering, Science and Math ISE. Second Edition, Elsevier 2009
6. Pritchard P. J.: Mathcad: A Tool For Engineering Problem Solving. Second edition, McGraw-Hill, 2008

Additional bibliography:

1. Esveld C.: Modern Railway Track. Delft, 2001
2. Chmielewski T., Nowak H.: Mechanika budowli ? wspomaganie komputerowe, WNT, Warszawa, 1996
3. Van M. A.: Stability of continuous welded rail track. Delft 1995

Result of average student's workload

Activity	Time (working hours)
1. Student?s attendance to lectures	15
2. Current preparation to lectures	15
3. Preparation to final exam and student?s attendance to colloquium	20

Student's workload

Source of workload	hours	ECTS
Total workload	75	3
Contact hours	45	2
Practical activities	45	2