STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Railway Roads**		Code **1010125121010121019**
Field of study **Structural Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 2**
Elective path/specialty **Road-Train Engineering**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **16** Classes: **10** Laboratory: **-** Project/seminars: **18**		No. of credits **5**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **5 100%** **5 100%**

Responsible for subject / lecturer:

DSc Eng. Michał Pawłowski
email: michal.pawlowski@put.poznan.pl
tel. 61 665 24 07
Faculty of Civil and Environmental Engineering
ul. Piotrowo 5, 60-965 Poznań

Responsible for subject / lecturer:

dr hab. inż. Włodzimierz Bednarek
email: wlodzimierz.bednarek@PUT.POZNAN.PL
tel. +48 61 665 2638
Faculty of Civil and Environmental Engineering
ul. Piotrowo 5 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge from mathematics and physics required to solve tasks dealing with railroad construction. Knowledge and skills for drawing and reading geodesic maps, including drawing using CAD software. Knowledge of fundamentals of mechanics and strength of materials. Knowledge of fundamentals of soil mechanics. Knowledge of properties, scope of utilisation and investigations of construction materials. Basic knowledge of design, construction and maintenance.
2	**Skills**	Ability to evaluate and tally loads acting on railway track; Ability to choose and use appropriate tools for the design of the railway line; Ability to read construction drawings and geodesic maps; Ability to prepare graphical documentation.
3	**Social competencies**	Can work individually and in a group on a given task; Takes responsibility for solidity of own work?s results and interpretation, 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:

Getting to know elements and construction of superstructure, their design parameters and assessment of their technical conditions. Improve knowledge of design, construction and reconstruction of railroads.

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

Knowledge:

1. Has extended knowledge of design and reconstruction of railway lines in plane - [K_W09]
2. Knows rules and methods of optimization of railway track geometry - [K_W09]
3. Has extended knowledge of design and reconstruction of railway lines in profile - [K_W09]

Skills:

1. Can design a reconstruction of railway track geometry in plane in complex terrain conditions - [K_U06]
2. Can design a reconstruction of railway track geometry in profile in complex terrain conditions - [K_U06]
3. Is able to prepare technical documentation of reconstruction of railway track geometry in plane and in profile - [K_U16]

Social competencies:

1. Can work individually and in a group on a given task - [K_K01]
2. Is responsible for solidity of own work?s results and interpretation - [K_K02]
3. Formulate conclusions and describes the results of own work?s - [K_K09]

Assessment methods of study outcomes

Outcome of the lectures - written exam - checking master the knowledge presented in the lectures. Graduation from 51%.

Outcome of the classes - written test - checking master the knowledge presented in the classes. Graduation from 51%.

Outcome of the projects on the basis of: substantive assessment of designed documentation, systematic work (entries in the consultation card and attendance at exercises), the projects? defense (written or oral).

Course description

Lectures: learning method - lecture / problem lecture / lecture with multimedia presentation

Rails ? types, permissible tolerances, tests. Sleepers ? types, permissible tolerances, tests. Ballast ? material, parameters, tests. Track joints ? their use, tests. Track fasteners ? types, tests. Railroad switches ? introduction. Non-traditional track ? advantages and disadvantages, requirements. Classification of the tracks. Vehicle construction gauge. Installations in the rail road. Tracks on bridges. Construction and reconstruction of railway subgrade. Building embankments and excavations. High embankments and deep excavations, Designing earthworks. Embankments and cuttings in specific locations. Drainage subgrade.

Classes: learning method - exercise method

Selection of construction and materials of railway tracks. Calculating the geometric arrangement of the track in the horizontal and vertical.

Projects: learning method - project method (practical project)

Project of section of a railway line, with a detailed analysis of the earthworks.

Basic bibliography:

1. Bałuch. H., Bałuch M.: Układy geometryczne toru i ich deformacje. KOW, Warszawa 2010.
2. Batko M.: Budowa i utrzymanie dróg kolejowych, WKiŁ, Warszawa 1985.
3. Bogdaniuk B., Towpik K.: Budowa, modernizacja i naprawy dróg kolejowych. KOW, Warszawa 2010.
4. Cieślakowski S.: Stacje kolejowe, WKiŁ, Warszawa 1992.
5. Cyunel B., Kulczycki B.: Kolejowe budowle ziemne. Tom II. Technologia, organizacja budowy i modernizacji. WKiŁ, Warszawa 1987.
6. Id-1. Warunki techniczne utrzymania nawierzchni na liniach kolejowych. PKP Polskie Linie Kolejowe S.A., Warszawa 2005.
7. Id-3. Warunki techniczne utrzymania podtorza kolejowego. PKP Polskie Linie Kolejowe S.A., Warszawa 2009.
8. Kiewlicz S., Łączyński J., Pelc S.:Nawierzchnia kolejowa typu S60, S49, S42. WKiŁ, Warszawa 1974.
9. Klonowski P., Kluczycki B., Lenkiewicz W., Wasilewski Z., Wyszyński K.: Technologia zmechanizowanych robót kolejowych. Wydawnictwo Politechniki Warszawskiej, Warszawa 1983.
10. Lewinowski C., Zimnoch S.: Ogólne zasady projektowania robót ziemnych dróg samochodowych i kolejowych. PWN, Warszawa 1987.
11. Matylla S.: Technologia zmechanizowanych robót kolejowych. Wydawnictwo Politechniki Poznańskiej, Poznań 1981.
12. Sancewicz S.: Nawierzchnia kolejowa. KOW, Warszawa 2010.
13. Semrau A., Zamięcki H.: Budowa i utrzymanie dróg kolejowych, tom II, WKiŁ, Warszawa 1975.
14. Skrzyński E., Sikora R.: Kolejowe budowle ziemne. Tom I. Utrzymanie i naprawy. WKiŁ, Warszawa 1990.
15. Sysak J. (red.): Drogi kolejowe. PWN, Warszawa 1986.
16. Sysak J.: Odwodnienie podtorza. WKiŁ, Warszawa 1980.
17. Szajer R.: Drogi żelazne, WKiŁ, Warszawa 1970.
18. Towpik K.: Utrzymanie nawierzchni kolejowej. WKiŁ, Warszawa 1990.

Additional bibliography:

1. Wiłun Z.: Zarys geotechniki, WKiŁ, Warszawa 2005.
2. Transport Miejski i Regionalny, Stowarzyszenie Inżynierów i Techników Komunikacji Rzeczpospolitej Polskiej, Warszawa
3. Infrastruktura Transportu, ELAMED, Katowice
4. Przegląd Komunikacyjny, Stowarzyszenie Inżynierów i Techników Komunikacji Rzeczpospolitej Polskiej, Warszawa.
5. Technika Transportu Szynowego, EMI-PRESS, Łódź

Result of average student's workload

Activity	Time (working hours)

1. Student?s attendance to lectures	16
2. Student?s attendance to classes	10
3. Student?s attendance to projects	18
4. Current preparation to lectures and classes	25
5. Designing project	18
6. Preparation for the exam from lectures	16
7. Preparation for the test from classes	10
8. Consultations	12

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	125	5
Contact hours	56	2
Practical activities	83	3