

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Maintenance and operation of railways		Code 1010102121010126035
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: 45 Classes: 15 Laboratory: - Project/seminars: 30		No. of credits 7
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 %) 7 100% 7 100%
Responsible for subject / lecturer: DSc. Eng. Włodzimierz Bednarek email: wlodzimierz.bednarek@put.poznan.pl tel. 2407 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań		Responsible for subject / lecturer: dDSc. Eng. Michał Pawłowski email: michal.pawlowski@put.poznan.pl tel. 2407 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Has knowledge of managing business in the construction sector, knows the standards and guidelines for the design of linear structures; knows and applies acts of law, standards and guidelines
2	Skills	Uses specialized tools in order to find useful information, software supporting the work of the designer and organizer of the construction process; knows how to prepare a schedule of construction works, manage the construction process; is able to analyze the risks during the performance of projects and operation of building
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: Getting to know the technologies in the earthworks, repairs of the broken rails and improve the efficiency of railway superstructure's maintenance		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows the planning of the work, work schedules, organization of construction process, acceptance and settlement of the works - [K_W11]		
2. Student knows the technologies used for the construction, maintenance and modernization of the railway line - [K_W14]		
3. Student knows the technologies used for the improvement the efficiency of railway superstructure's maintenance - [K_W17]		
Skills:		
1. Student is able to choose an appropriate technology for railway works - [K_U05]		
2. Student is able to draw the graph of construction progress for each technology - [K_U10]		
3. Student is able to choose an appropriate machineries used in the construction and maintenance works of the railway lines - [-]		
Social competencies:		
1. Student is responsible for solidity of own work's results - [K_K02]		
2. Student alone complements and enhances knowledge about railway lines - [-]		
3. Student in conscious about a need to improve professional skills and personal competence - [-]		

Assessment methods of study outcomes		
<p>Verification of knowledge: class participation and exam at the end of semester. Getting points for: active participation in the classes, knowledge presented at the exam. Verification of skills: active participation in the projects; completing 2 projects, oral defense of the projects and studies; discussion of the solutions used in projects. Getting points for: activity in the classroom, knowledge of the issues presented in the projects, substantive quality of the projects</p>		
Course description		
<p>1. Technology of railway works. 2. Drawing the graph of construction progress for a given technology. 3. Repairing of the broken continuous welded rails. 4. Technologies used for the improvement the efficiency of railway superstructure?s maintenance. 5. The geometric and kinematic assessment of rail track. 6. Degradation of railway superstructure. 7. The process of maintenance railway superstructure</p>		
Basic bibliography:		
<p>1. Maszyny i urządzenia do robót torowych, tom I, Koktyusz, M. Bernaś, WKiŁ, Warszawa, 1990 2. Budowa i utrzymanie dróg kolejowych, M. Batko, WKiŁ, Warszawa, 1985 3. Budowa i utrzymanie dróg kolejowych, tom II, Semrau, H. Zamięcki, WKiŁ, Warszawa, 1975 4. Budowa, modernizacja i naprawy dróg kolejowych, Bogdaniuk B., Towpik K., KOW, Warszawa 2010 5. Praca zbiorowa pod red. J. Sysak: Drogi Kolejowe. PWN, Warszawa 1986 6. Podstawy dróg kolejowych, J. Sysak, WKiŁ, Warszawa 1982 7. Kolejowe budowle ziemne, Skrzyński E., Sikora R., Tom II. WKiŁ, Warszawa 1987 8. Utrzymanie nawierzchni kolejowej, K. Towpik, WKiŁ, Warszawa, 1990 9. Wpływ temperatury na pracę toru kolejowego, Łoś M, WKiŁ, Warszawa 1974</p>		
Additional bibliography:		
<p>1. Modern Railway Track, C. Esveld, Delft, 2001 2. Stability of continuous welded rail track, M. A. Van, Delft, 1995 3. Dziennik Ustaw Rzeczypospolitej Polskiej, Warszawa, dnia 15 grudnia 1998 r., Nr 151, Poz. 987: Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 10 września 1998 r. w sprawie warunków technicznych, jakim powinny odpowiadać budowle kolejowe i ich usytuowanie 4. Przepisy Id-1 (D-1) Warunki techniczne utrzymania nawierzchni na liniach kolejowych, Warszawa, 2005 5. Przepisy Id-3 (D-4), Warunki techniczne utrzymania podtorza kolejowego, Warszawa, 2004</p>		
Result of average student's workload		
Activity	Time (working hours)	
1. Student?s attendance to lectures	30	
2. Current preparation to lectures	30	
3. Preparation to final exam and student?s attendance to exam	40	
Student's workload		
Source of workload	hours	ECTS
Total workload	175	7
Contact hours	100	4
Practical activities	75	3