FACULTY OF CIVIL ENGINEERING

SUBJECT CARD

Name in English:	**Railways**
Name in Polish:	**Koleje**
Main field of study (if applicable):	***Civil Engineering***
Specialization (if applicable):	**Civil Engineering**
Level and form of studies:	**~~1st /~~ 2nd level*, full-time ~~/ part-time~~***
Kind of subject:	**obligatory / ~~optional / university-wide*~~**
Subject code:	**CEB004062**
Group of courses:	**~~YES~~ / NO***

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**30**			**30**	
Number of hours of total student workload (CNPS)	**30**			**60**	
Form of crediting	~~Examination~~ / crediting with grade *	Examination / crediting with grade *	Examination~~-~~/ crediting with grade *	~~Examination~~ / crediting with grade *	Examination~~-~~/ crediting with grade *
For group of courses mark (X) final course					
Number of ECTS points	**1**			**2**	
including number of ECTS points for practical (P) classes				**1,8**	
including number of ECTS points for direct teacher-student contact (BK) classes	**1,0**			**1,1**	

* delete as appropriate

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Ability for English language use (understanding, writing and speaking) on B2 level.
2. General, basic knowledge on railroads.
3. Skills of reading and use of maps and technical drawings.
4. Skills of use normal cross sections of railway track.

SUBJECT OBJECTIVES	
C1.	Acquiring of basic skills to design the layouts of railway tracks and stations.
C2.	Acquiring of basic skills to design the railway station drainage systems.
C3.	Acquiring of knowledge on layout of railway tracks and stations.
C4.	Acquiring of knowledge on various track structures.
C5.	Acquiring of basic knowledge on railway works technology.

SUBJECT EDUCATIONAL EFFECTS	
Relating to knowledge:	
PEK_W01	Knows and understands railway network structure, distinguishes between types of operating posts and knows their function.
PEK_W02	Knows railway infrastructure elements, their function and way of work.
PEK_W03	Distinguishes types of railway track structures, knows their pros and cons.
PEK_W04	Knows conditions of railway infrastructure work (loads and ambient conditions) and understands the matter of their proper drainage and protection.
PEK_W05	Knows basic technologic processes in railway technology.
Relating to skills:	
PEK_U01	Knows how to design a railway line in plane, in profile and in cross section.
PEK_U02	Knows how to design a track layout of a small station and the auxiliary objects for passenger and freight services.
PEK_U03	Knows how to design a drainage system of a railway line and station.
Relating to social competences:	
PEK_K01	Is able to work on completing tasks alone and in group
PEK_K02	Understands the need of collecting and passing to the society information and opinions on engineering activity

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec1	Definitions of the rail road. Basic facts of railway engineering history. Elements of railway infrastructure. Classification of railway lines.	2
Lec2	Elements of track. Technical standards of track.	2
Lec3	Railway track subgrade. Rules for shaping and material requirements. Elements of drainage system of railway lines and stations.	2
Lec4	Kinematics of the train move. Rail-wheel co-operation. Basic assumptions for track geometry calculations.	2
Lec5	Track geometry design in plane and in profile. Railway structure gauge.	2
Lec6	Tramway. History of city transportation. Elements of tramway track. Design of track and platforms.	2
Lec7	Continuous welded track. Track on grade crossing..	2
Lec8	Ballastless track. Track on bridges.	**2**
Lec9	Turnouts. Ladder track. Derailers. Trap points and bump stops. Turning tables and shift tables. Gauntlet track.	2
Lec10	Railways in Poland and in the world. Elements of railway infrastructure. Operation posts. Intermodal transport.	2
Lec11	Stations. Classification, functions, track alignments.	2
Lec12	Basic technologic processes in railway technology.	2
Lec13	Machines and devices in railway technology.	2
Lec14	Modernization of railway lines. Rules for design and applied technologies.	2
Lec15	Final test. Results disscussion.	2
	Total hours	30

Form of classes - class		Number of hours
Cl1		
…		
	Total hours	

Form of classes - laboratory		Number of hours
Lab1		
…		
	Total hours	

Form of classes - project		Number of hours
Proj1	Organization of work. Requirements and rules. Issuing of the data for the project. Description of the project scope.	2
Proj2	Railway line section in plane. Geometry of the track layout.	2
Proj3	Characteristic cross section of the track. Shaping of embankments at bridges and viaduct.	2
Proj4	Profile of railway line. Geometric correlation between plane, profile and cross section.	2
Proj5	Drainage design. Shaping of ditches in plane, profile and cross section.	2
Proj6	Design of protection layers in subgrade. Students work review (plane, profile).	2
Proj7	Resume of the first part of the project. Students work review (plane, profile, cross sections)	2
Proj8	Introduction to the design of small station. Plane layout, requirements and rules.	2
Proj9	Track alignment and track profile requirements.	2
Proj10	Number and length of station tracks. Calculation of the main auxiliary tracks number.	2
Proj11	Station equipment for passenger and freight services. Calculation of warehouse, stack square and loading ramp.	2
Proj12	Sataion drainage system. Side ditches and shallow drainage in plane, profile and in cross section.	2
Proj13	Elements of drainage system on station –geometric design.	2
Proj14	Cross section of the station. Design of platform, pedestrian grade crossing, footbridge and underpass.	2
Proj15	Resume of the second part of the project. Students work review.	2
	Total hours	**30**

Form of classes - seminar		Number of hours
Sem1		
…		
	Total hours	

TEACHING TOOLS USED	
N1.	Lecture: multimedia presentation, blackboard
N2.	Design: multimedia presentation, blackboard.
N3.	Design: exemplary design drawing, model of the railway station drainage system.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1 (project)	PEK_U01 PEK_U02 PEK_U03 PEK_W04	project assessment
F2 (project)	PEK_K01 PEK_K02	project assessment
P (project) = 0,65×F1 + 0,2×F2 + 0,15×systematic work (review of the design)		
P (lecture)	PEK_W01 PEK_W02 PEK_W03 PEK_W04 PEK_W05	final test

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Dz. U. nr 151.: Rozporządzenie Ministra Transportu i Gospodarki Morskiej w sprawie warunków technicznych, jakim powinny odpowiadać budowle kolejowe i ich usytuowanie.

[2] Dz. U. nr 33.: Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 26 lutego 1996 r. w sprawie warunków technicznych jakim powinny odpowiadać skrzyżowania linii kolejowych z drogami publicznymi i ich usytuowanie (ze zmianami: Dziennik Ustaw Rzeczpospolitej Polskiej Nr 100 z 9.11.2000, pozycja 1082.

[3] Bonnet, Clifford F.: Practical Railway Engineering. London: Imperial College Press, 2005.

[4] Esveld C.: Modern Railway Track, 2nd ed. Zaltbommel: MRT-Productions, 2001.

SECONDARY LITERATURE:

[1] Id-1 (D-1) Warunki techniczne utrzymania nawierzchni na liniach kolejowych - PKP Polskie Linie Kolejowe S.A., Warszawa 2005.

[2] Id-3 (D-4) Warunki techniczne utrzymania podtorza kolejowego - PKP Polskie Linie Kolejowe S.A., Warszawa 2005.

[3] PN-EN 13803-2. Railway applications – Track – Track alignment design parameters, 2007

SUBJECT SUPERVISOR (NAME AND SURNAME, DIVISION, E-MAIL ADDRESS)

PhD. CE Jarosław Zwolski, Katedra Mostów i Kolei, jaroslaw.zwolski@pwr.edu.pl

MEMBERS OF THE EDUCATIONAL TEAM (NAME AND SURNAME, E-MAIL ADDRESS)

PhD. CE Igor Gisterek, igor.gisterek@pwr.edu.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Railways
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY ***Civil Engineering***
AND SPECIALIZATION **Civil Engineering**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)**	Subject objectives ***	Programme content ***	Teaching tool number ***
Knowledge				
PEK_W01	K2S_CEB_W19	C3	Lec1, Lec6, Lec10, Lec11, Proj8, Proj11, Proj14	N1
PEK_W02	K2S_CEB_W19	C1, C3, C4	Lec1, Lec2, Lec3, Lec6, Lec7, Lec8, Lec9, Lec10, Lec11, Proj8, Proj11, Proj14	N1
PEK_W03	K2_W06, K2_W07, K2S_CEB_W19	C4	Lec6, Lec7, Lec8, Lec9	N1
PEK_W04	K2S_CEB_W19, K2S_CEB_W21	C1, C2	Lec2, Lec3, Lec5, Lec7, Lec8, Lec11, Proj5, Proj12, Proj13, Proj14	N1
PEK_W05	K2S_CEB_W21	C5	Lec12, Lec13, Lec14	N1
Skills				
PEK_U01	K2_U04, K2_U05, K2S_CEB_W19, K2S_CEB_W21	C1, C2, C3	Lec2, Lec3, Lec5, Proj1, Proj2, Proj3, Proj4, Proj5, Proj6, Proj7, Proj15	N2
PEK_U02	K2_U04, K2_U05, K2_U12, K2S_CEB_W19, K2S_CEB_W21	C1, C2, C3	Lec2, Lec3, Lec11, Proj8, Proj9, Proj10, Proj11, Proj12, Proj13, Proj14, Proj15	N2, N3
PEK_U03	K2_U04, K2_U05, K2_U12, K2S_CEB_W19, K2S_CEB_W21	C1, C2	Lec3, Proj5, Proj6, Proj7, Proj12, Proj13, Proj14, Proj15	N2
Social competences				
PEK_K01	K2_K01, K2_K03	C1, C2	Lec1, Proj1, Proj6, Proj13, Proj15	N2
PEK_K02	K2_K06	C1, C2	Lec1, Lec6, Lec7, Lec8, Proj1, Proj6, Proj15	N1, N2

** - enter symbols for main-field-of-study/specialization educational effects
*** - from table above