COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of railway lines

Course

Field of study	Year/Semester
Civil Engineering	1 / 1
Area of study (specialization)	Profile of study
Road, Bridge and Railway Engineering	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
45	10	0
Tutorials	Projects/seminars	
15	30	

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

DSc Eng. Michał Pawłowski

email: michal.pawlowski@put.poznan.pl

phone: 61 665 2485

Faculty of Civil and Environmental Engineering

ul. Piotrowo 5 60-965 Poznań

Responsible for the course/lecturer:

DSc Eng. Jeremi Rychlewski

email: jeremi.rychlewski@put.poznan.pl

phone: 61 665 2431

Faculty of Civil and Environmental Engineering

ul. Piotrowo 5 60-965 Poznań

Prerequisites

KNOWLEDGE: student has knowledge of mathematics and physics useful in solving tasks connected with railway construction; student knows rules governing drawing and reading geodesic maps, including their making using CAD programs; student has knowledge on theoretical mechanics and strength of materials, soil mechanics and constructing foundations; student has basic knowledge on design, construction and maintenance of railroads.

SKILLS: student has an ability to adjust and use tools appropriate for designing railways; student can read construction, geodesic and topographic maps and prepare graphical documentation concerning construction process.

SOCIAL COMPETENCIES: student is able to work individually and in a group on a given task; student takes responsibility for the accuracy and reliability of working results and their interpretation; student is responsible for safety of own and group's work; student realises a necessity to improve professional and personal competence.

Course objective

Extending students' knowledge on design, construction and modernisation of railroads. Acquainting students with methods for optimising geometrical track layout. Acquainting students with classification of railway traffic and expedition posts. Passing to the students knowledge about designing station's track layouts and turnout ways. Passing to the students knowledge about management of rail passengers and cargo.

Course-related learning outcomes

Knowledge

1. Has extended knowledge on railroad design and modernisation in plane and profile;

2. Knows rules and methods for optimisation of track geometric layout;

3. Knows rules, codes and standards for designing track layout of stations.

Skills

1. Can design a reconstruction of a geometric track layout in plane and profile in a difficult (complex) terrain;

2. Can design a track layout of a railway station;

3. Is able to prepare technical documentation of track geometry (in plane and profile) and station's track layout reconstruction.

Social competences

1. Takes responsibility for accuracy and reliability of working results and their interpretation;

2. Can work individually or in a team on a given task;

3. Is conscious about a need to increase professional and personal competences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The acquired knowledge from the lectures is verified by a written exam. The form of the exam is presented by the lecturer during the first class. With a small number of students the form may be changed into an oral colloquium - details should be given at the first lecture. To pass the exam, students should acquire at least 50% of points. Activity during the lectures may be taken into account during the exam's score evaluation.

Skills acquired during tutorials are tested by a colloquium on the last tutorial. To pass the colloquium, students should acquire at least 50% of points. Activity and competency during the tutorials may be taken into account during the colloquium's score evaluation.

Skills and competencies acquired during laboratory classes are veryfied in class according to students' own work and quality of acquired documentation. Activity and competencies shown during class are taken into account for evaluation.

Skills and competencies from projects are tested by quality evaluation of the presented project, social competencies presented during consultations, systematic work (notices on consultancy card and presence during classes) and a possible defence of the presented project (written or oral).

Grade scale: 50-60% 3,0; 60-70% 3,5; 70-80% 4,0; 80-90% 4,5; 90-100% 5,0.

Programme content

Lecture:

1. Introduction; special railway lines: monorail, rack, magnetic;

2. Railroad in plane: dependence between speed, curve radius and side acceleration; tilt (cant) and tilt ramp, transition curve with linear and curvilinear tilt ramp; joining horizontal curves with different radius; widening of intertrack distance; advantages from using cars with tilt possibility, rules for designing transition curves for such cars; design of track geometric layout in harsh conditions; optimisation of track geometric layout; track geometric layout for high speed lines.

3. Railroad’s vertical profile: railroad’s gradient: maximal, traversable, adverse and advisable, lost, ruling, grade of stable movement resistance; optimisation of railroad’s track profile; design of railroad’s profile in harsh terrain and for high speed.

4. Railroad’s subgrade: usefulness of soil types for embankment construction; distribution of soil types in embankment’s cross sections; embankments and excavations in specific locations, high embankments and deep excavations; rules and methods of subgrade construction, evaluation of subgrade’s stability; methods of constructing embankments and excavations; design of earth works, earth works distribution, soil transport calculations, choice of machines for earth works; methods of subgrade reconstruction; upper subgrade’s layer: requirements, geotechnical investigations, reconstruction; rules for design, use and construction of protective layers; subgrade’s drainage; use of geosynthetics in subgrade.

5. Operational posts on railway network: traffic and expedition posts; most important rules of train traffic control; classification of stations.

6. Shaping of stations’ track layout: length of tracks and width of intertrack distance; turnouts and shaping of turnout ways; passenger service at stations; cargo service at stations; infrastructure for cargo loading / unloading / storage; technology of station’s traffic.

Tutorials: Optimisation of railroad track’s geometrical layout in plane and profile.

Laboratories: Calculation of trakc's layout parameters and rail traffic quality using a computer programme.

Project: Design of a station's track layout including turnout ways, passenger and cargo service and drainage.

Teaching methods

An informative or problemative lecture including elements of a conversation lecture, utilising a multimedia presentation with an occasional use of a blackboard. A choice of films available on the Internet.

Tutorials utilising tutorial method.

Laboratories - tutorial and design methods.

Project – design method.

Bibliography

Basic

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5. Id-1. Warunki techniczne utrzymania nawierzchni na liniach kolejowych. PKP Polskie Linie Kolejowe S.A., Warszawa 2005.

6. Id-3. Warunki techniczne utrzymania podtorza kolejowego. PKP Polskie Linie Kolejowe S.A., Warszawa 2009.

7. Lewinowski C., Zimnoch S.: Ogólne zasady projektowania robót ziemnych dróg samochodowych i kolejowych. PWN, Warszawa 1987.

8. Massel A.: Projektowanie linii i stacji kolejowych. KOW, Warszawa 2010.

9. Sysak J. (red.): Drogi kolejowe. PWN, Warszawa 1986.

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11. Szajer R.: Drogi żelazne. WKiŁ, Warszawa 1970

12. Szczegółowe warunki techniczne dla modernizacji lub budowy linii kolejowych do prędkości Vmax ≤ 200 km/h (dla taboru konwencjonalnego) / 250 km/h (dla taboru z wychylnym pudłem). TOM I - DROGA SZYNOWA. PKP Polskie Linie Kolejowe S.A. Warszawa 2019.

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Additional

1. Batko M.: Budowa i utrzymanie dróg kolejowych. WKiŁ, Warszawa 1985.

2. Bogdaniuk B., Towpik K.: Budowa, modernizacja i naprawy dróg kolejowych. KOW, Warszawa 2010.

3. Cyunel B., Kulczycki B.: Kolejowe budowle ziemne. Tom II. Technologia, organizacja budowy i modernizacji. WKiŁ, Warszawa 1987.

4. Klonowski P., Kluczycki B., Lenkiewicz W., Wasilewski Z., Wyszyński K.: Technologia zmechanizowanych robót kolejowych. Wydawnictwo Politechniki Warszawskiej, Warszawa 1983.

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10. Wiłun Z.: Zarys geotechniki. WKiŁ, Warszawa 2005.

11. Wyrzykowski W.: Ruch kolejowy. WKiŁ, Warszawa 1967.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	100	4,0
Student's own work (literature studies, preparation for tutorials, preparation for exam, project preparation) [1]	50	2,0

[1] delete or add other activities as appropriate