1. Course number and name

RB-S1-18-W2E-42, **Transportation Infrastructure**

2. Credits and contact hours*

3 ECTS, lectures: 30 hours**, classes: 0 hours**, project: 15 hours**

3. Instructor's or course coordinator's name

Bartłomiej Grzesik PhD

4. Text book, title, author, and year

- Nikolaides A.: Highway Engineering. Pavements, Materials and Control of Quality. CRC Press. Taylor & Francis Group, 2014
- Cope G.H.: „British railway track, Design, construction and maintenance". The Permanent Way Institution, Echo Press, England, 1993

a. other supplemental materials

- Regulation of the Minister of Transport and Maritime Economy of 1 August 2019 on the technical conditions for public roads and their location. Journal of Laws 2019 No. 1643

5. Specific course information

a. brief description of the content of the course (catalog description)

Lectures:

(1) Basic information, history of roads, definitions, (2) Road network in Poland, (3) Elements of roads, (4) Drainage of roads, (5) Urban roads, (6) Railways, regulations, (7) History of rail transport, (8) Railroad classifications, (9) Track structure, (10) Elements of traditional railway track, (11) Earthworks, (12) Load bearing function of the track, horizontal forces in rails, (13) Track components, (14) Railroad junctions, (15) Railway stations.

Project:

During Transportation Infrastructure project classes students learn how to prepare design of road geometry. They learn about horizontal alignment, in which they decide how to choose optimal path for road and how to design road in terrain, afterwards the design vertical alignment (profile), where they take care about slopes of the road. In the project they also design upper layers of road construction and earthworks, as they are most consuming during large-scale road engineering investments. The second project reveals basis of railway design in a similar to road design, however, more simplified way.

b. prerequisites or co-requisites

No prerequisites and additional requirements

c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program

Required.

6. Specific goals for the course

a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic

The student can:

- describe selected elements of road and railway and basic mechanisms of load transfer,
- give technical classifications of roads, railways and railway stations,
- prepare a load statement for road pavement and rail track,

- design simple road and railway infrastructure.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

K1A_W06, K1A_U12

7. Brief list of topics to be covered

1. Basic information: regulations; history of roads; definitions; designed landscape; alignment; horizontal alignment; vertical alignment.
2. Road network in Poland: The trans-European road network (TERN); The Pan-European transport corridors; The international E-road network; national roads; voivodeship roads; county roads; communal roads; road numbering system; classification due to traffic structure.
3. Elements of roads: selection of appropriate cross-section elements; clear zone, hinge point, roadway; travelway; median strip; crown; functions of shoulder; drainage channels and side slopes; pavement; subsurface.
4. Drainage of roads: ditches, swales; gutters, kerbs; culverts; slopes (grades): transverse slopes, longitudinal slopes, longitudinal channels; superelevation; friction factor; curve radius.
5. Urban roads: classification; arterial streets; sub-arterial streets; collector streets; local streets.
6. Railways: regulations; technical guidelines.
7. History of rail transport: U-shape iron rails; L-shape rails; gauge evolution; Vignoles rail; electrification of intercity railways; The Warsaw-Vienna Railway; The Central Trans-Andean Railway.
8. Railroad classifications: track gauge; motive power; nonconventional railroads; location; number of tracks; railway category parameters; international agreements; AGC policy; high speed rail; railway transport in Poland – numbers.
9. Track structure: traditional track structure (ballasted track); ballastless track.
10. Elements of traditional railway track: glossary and definitions; cess; shoulder; tangent; superelevation, roadway; field side; right of way; gauge side; roadbed; subgrade and subballast.
11. Earthworks: cutting; embankment; guideline embankment geometry; combined section; features of railroad bed level.
12. Load bearing function of the track: the load transfer works on the principle of stress reduction; schematic representation of the track as a combination of springs and dashpots; model of vehicle-track coupled dynamics for freight car with three-pice bogies; horizontal forces in rails; creep.
13. Track components: ballast; sleepers; rails; coning of wheels in railways; fastenings; joints.
14. Railroad junctions: definitions; railroad switch (turnout); slidings; operations; parts of a switch; details of a crossings; classification.
15. Railway stations: definition; classification (location, size and functions, operations); main elements of stations; purposes; passenger stations; goods or freight stations; mixed freight-passenger; loading stations; marshalling yards; parking stations; traffic control points; expedition points; auxiliary posts; shield posts; passenger stop-platforms; loading points.

*- Consultations were not included in the contact hours
**-per semester