Tárgytematika / Course Description
Road and railway construction

EKNM_KETA037

Tárgyfelelős neve / Teacher's name: dr. Fischer Szabolcs
Félév / Semester: 2024/25/1
Beszámolási forma / Assesment: Vizsga
Tárgy heti óraszáma / Teaching hours(week): 2/1/0
Tárgy féléves óraszáma / Teaching hours(sem.): 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

Goal

Introduction of the recent knowledge of railway track structures. Materials, structural formations and construction technologies. Raw materials and construction technologies of road pavements.

TANTÁRGY TARTALMA / DESCRIPTION

Topics

1. Railway track substructure - General learnings

2. Production of bitumens and bituminous binders. Types, properties and tests of bitumens and bituminous binders. Production of modified bitumens. Types, properties and tests of modified bitumens.

3. Set-up of railway protection layers

4. Production of aggregates for road construction. Types, properties and tests of aggregates. Types, properties, and tests of hydraulically bounded mixtures. Production of hydraulically bounded mixtures.

5. Types, properties and tests of hot bituminous mixes. Mix design of hot bituminous mixes.

6. Railway track superstructure, part 1

7. Laboratory exercise: processing of test data of hot bituminous mixes. Preparation of expertise.

8. Railway track superstructure, part 2

9. Types testing, production and factory production control of hot bituminous mixes.

10. Railway track superstructure, part 3

11. Haulage and paving technology of hot bituminous mixes. Quality testing of bituminous layers.

12. Railway track superstructure, part 4

13. Types, properties and tests of materials for portland cement concrete pavements. Construction technology and quality testing of concrete pavements.

Consultation

At a given time and place.

Student separate work

Studying for the exam: 50 hours.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

Acceptance of semester

Semester of those students will be accepted who

- sufficiently attended the lectures and exercises,

- semester projects shall be performed, accepted projects are rated by teacher,

- two test scripts shall be performed during the semester, the accepted test scripts are rated by teacher.

Exam and evaluation

Exams will be at given time and place in exam period. Enter for an examination by means of NEPTUN-system. Enter for exam is allowed for students with semester acceptance.

Duration of exam 60 minutes, during this time 3 questions should be answered.

Exam questions

1. Planning requirements at set-up of railway track subgrade.

2. Impacts on railway subgrade.

3. Serviceability limit state of subgrade.

4. Set-up of cross section of railway earthwork.

5. Density and load bearing capacity of railway earthwork

6. Functions of protection layer.

7. Coarse-grained soil protection layers for track with velocity V > 120 km/h.

8. Geotextiles in the layer structure.

9. Geogrids in the layer structure.

10. Rails (roles, requirements to rails, process of rail production, quality control tests, HSH rails)

11. Rail connections and expansion devices (roles, requirements to rail connections and expansion devices, construction set-up)

12. Rail weldings (roles, requirements to rail weldings, quality control tests, detailed description of thermit weldings)

13. Railway ballast (roles, requirements to railway ballast, list of tests specified in standard – Aggregates for railway ballast)

14. Increasing of lateral resistance of railway ballast with sleeper anchors, and with glued ballast

15. Under ballast mats (roles, types, necessity of their using in railway tracks)

16. Functions of railway sleepers, advantages and disadvantages of the reinforced concrete sleepers

17. Difference between the pre-stressed and the reinforced concrete sleepers

17. Types and functions of rail fastenings

18. Effective forces on the rail fastening

19. Production, types, properties, application and tests of paving grade bitumens

20. Production, types, properties, application and tests of modified bitumens

21. Production, types, properties, application and tests of bitumen emulsions

22. Aggregates for road construction: production, types, properties, application and tests

23. Types and properties of hydraulic binders for road construction. Design and production of hidraulically bounded mixes.

24. Prevention and delay of reflective cracking in bituminous layers.

25. Types, properties, requirements in Technical Specifications and in European Standards of hot bituminous mixes.

26. Application of hot bituminous mixes in pavement structure.

27. Mix design of hot bituminous mixes. Type testing of hot bituminous mixes.

28. Factory production control system of hot bituminous mixes.

29. Haulage and paving technology of hot bituminous mixes. Requirements and quality testing of bituminous layers.

30. Properties and application of PCC pavements. Properties and tests of raw materials for PCC pavements.

31. Design and testing of PCC mixes.

32. Construction technology, requirements and quality testing of PCC pavements.

Evaluation of semester achievement

Final evaluation is the result of exam.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Literature

Learning can be happened with help of different sources as below:

- ppt presentations on web site

- Bernhard Lichtberger: Track Compendium. Formation, Permanent Way, Maintenance, Economics, - Tetzlaff Verlag GMBH & Co. KG, Hamburg, 2005

- Concrete pavements (Betonburkolatok). Szerk. Dr. keleti Imre. MBBE, Budapest, 2012. ISBN 978-963-08-4585-4

- Bituminous mixtures. test methods for hot mix asphalt. MSZ EN 12697-1…50

- MSZ EN Standards. Bituminous mixtures. Material specifications MSZ EN 13108-1…9.

- MSZ EN 13108-20 Bituminous mixtures. Type testing

- MSZ EN 13108-21 Factory production control

- Road technical specifications

- own lecture notes

- given sources from internet sites.

AJÁNLOTT IRODALOM / RECOMMENDED MATERIAL