Pavement Structures - BMEEOUVMU63

I. Subject Specification

1. Basic Data

1.1 Title

Pavement Structures

1.2 Code

BMEEOUVMU63

1.3 Type

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	4

1.5 Evaluation

Exam

1.6 Credits

5

1.7 Coordinator

name	Csaba Tóth
academic rank	Associate professor
email	toth.csaba@emk.bme.hu

1.8 Department

Department of Highway and Railway Engineering

1.9 Website

https://epito.bme.hu/BMEEOUVMU63
https://fiek2.mywire.org/course/view.php?id=3532

1.10 Language of instruction

english

1.11 Curriculum requirements

Compulsory in the Highway and Railway Engineering (MSc) programme

1.12 Prerequisites

1.13 Effective date

1 September 2022

2. Objectives and learning outcomes

2.1 Objectives

The objective of the course is to get acquainted with unique design principles of road pavement structures. Learning outcomes include the choice of a pavement structure type from the catalogue as well as to create pavement structure models with customised material parameters, in order to provide a better possibility for engineers to design more economical pavement structures.

2.2 Learning outcomes

Upon successful completion of this subject, the student:

A. Knowledge

1. Gets acquainted with the theoretical principles and practice of current design procedures.
2. Gets acquainted with requirements for road pavements.
3. Gets acquainted with material models used for road pavement structures.
4. Gets acquainted with possibilities of calculation of the design traffic.
5. Gets acquainted with principles and steps of the analytic design of new asphalt pavements.
6. Gets acquainted with design principles of concrete pavements and airport pavements.
7. Gets acquainted with technological details of pavement structures for low volume roads and small element pavements.
8. Gets acquainted with the main steps of leading international design procedures.
9. Gets acquainted with calculation and operation principles of leading international pavement structure design software.
10. Gets acquainted with the main distress types of road pavements as well as their causes.
11. Gets acquainted with alternative methods for strengthening of asphalt pavement structures.

B. Skills

1. Is able to create a design model of a road pavement structure, as well as to determine material parameters required for calculations.
2. Is able to determine stresses and strains in the road pavement structure.
3. Is able to determine the damaging effect of a special vehicle.
4. Is able to determine the technical equivalence of different road pavement structures.
5. Is able to design a unique road pavement structure differing from the catalogue types.
6. Is able to design a concrete pavement according to specifications and conditions.
7. Is able to find a connection between distresses on road pavement or in the pavement structure layer and their causes.
8. Is able to apply the acquired software for creating a pavement structure model as well as for determining stresses and strains under loads.
9. Is able to present their own ideas in an ordered oral or written form.

C. Attitudes

1. Co-operates with the instructor in the preparation of the partial performance assessment.
2. Strives to solve tasks accurately and without errors.
3. Strives to accurate professional phrasing in oral and written presentations.
4. Strives to provide an ordered documentation of the expected engineering level in its form and quality at written performance evaluations.

D. Autonomy and Responsibility

1. Responsibly prepares for a successful final performance assessment.
2. Individually fulfils tasks within the partial performance assessment according to their best own knowledge.
3. Receives openly any reasonable critical remark.
4. Applies a systematic approach in their own thinking.

2.3 Methods

Presentations (written and oral), individually prepared homework assignments (design tasks), oral and written communication at performance assessments and examinations.

2.4 Course outline

Week	**Topics of lectures and/or exercise classes**
1.	Historical pavement structures Pavement structure types, Pavement materials
2.	Climatic and traffic loads, deterioration History of pavement structure design Laboratory tests 1 (Stone aggregate, bitumen)
3.	Pavement design theory and practice 1 Calculation of traffic loads
4.	Pavement design theory and practice 2 Structural design of flexible pavements
5.	Asphalt pavement structure catalogue Design of pavement strengthening Laboratory tests 2 (Asphalt mixes)
6.	Pavement design theory and practice 3 Modelling of pavement structures Pavement structure design software
7.	Pavement design theory and practice 4 Structural design of rigid pavements
8.	Airport pavements Stone pavements Laboratory tests 3 (In site measurements)
9.	Asphalt technology Design of asphalt mixes Construction of flexible pavements, Quality control
10.	Concrete technology Design of concrete mixes Construction of rigid pavements, Quality control

11.	Earthworks, geotechnology, drainage Deflection measurements Analysis of deflection data
12.	Pavement condition, surface distresses Pavement widening solutions Pavement structure replacement
13.	Pavement maintenance, preventive maintenance, pavement management
14.	Innovative pavement structures Sustainability, recycling and re-use

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

2.5 Study materials

a) Online materials:

1. András Gulyás PhD habil, Csaba Tóth PhD: Pavement Structures. 2021 Electronic lecture notes

2.6 Other information

1. Attendance to lectures / seminars / exercise classes / laboratory practices is compulsory. The signature and credits from the subject will be refused to students attending less than 70% of classes.
2. Students are evaluated based on their actual individual performance. Students are required to show evidence of their own knowledge and skills. Submitting a work of others, obtaining or giving unauthorized help (e.g., during an exam or test) cheating and plagiarism in any form is unacceptable. Whoever violate the respective Regulations of the University will be given a failing grade (1), without the possibility of retake and repeat, and will be reported to the Dean's Office.

2.7 Consultation

The instructors are available for consultation during their office hours, as advertised on the department website. Special appointments can be requested via e-mail: toth.csaba@mail.bme.hu

This Subject Datasheet is valid for:

Inactive courses

II. Subject requirements

Assessment and evaluation of the learning outcomes

3.1 General rules

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs via tests, homework assignments and class work.

3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. midterm test	ZH1	A.1-A.9; B.1-B.6
2. midterm test	ZH2	A.10-A.11; B.7
attendance and activity	A	A.1-A.11; B.9; C.1-C.4; D.1-D.4
written/oral examination	V	A.1-A.11; B.1-B.9; C.1-C.4; D.1-D.4

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

3.3 Evaluation system

Abbreviation	Score
ZH1	20%
ZH2	20%
Total achievable during the semester	40%
V	60%
Sum	**100%**

3.4 Requirements and validity of signature

The condition for the signature is to get at least 50% of the points available in the semester according to clause 3.3. above, in each performance assessment as well as in summarised points. Moreover, the attendance to lectures is compulsory at least on 70% of lectures.

3.5 Grading system

Grade	Points (P)
excellent (5)	80<=P
good (4)	70<=P<80
satisfactory (3)	60<=P<70
passed (2)	50<=P<60
failed (1)	P<50%

3.6 Retake and repeat

1. Active attendance – based on its nature – is not repeatable, not correctable, not replaceable or taken out any other way.
2. The midterm performance assessments can be retaken or repeated in a summarised form in the retake period, free of charge at the first occasion. In case of a repeat, the result taken is based on the former and the new results, providing the more favourable for the student.

3. In case of a failed retake, there is a second occasion – by paying the appropriate fee determined in the Regulations – for repeating the unsuccessful first retake in a summarised form.

3.7 Estimated workload

Activity	**Hours/semester**
contact hours	14×4=56
preparation for the courses	14×2=28
preparation for the tests	2×10=20
home studying of the written material	14
preparation for the examination	32
Sum	**5×30=150**

3.8 Effective date

1 September 2022

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Inactive courses