

GEO-E2050 Bituminous Materials and Mixtures

Spring 2019, updated 3.12.2018

Instructors:

Lecturer: Michalina Makowska, post-doctoral researcher, michalina.makowska@aalto.fi

Teacher in charge: prof. Jussi Leveinen

Laboratoriomestari Heli Nikiforow, heli.nikiforow@aalto.fi

Laboratoriomestari Petri Peltonen, petri.p.peltonen@aalto.fi

Consulting hour:

To be agreed with students on the first lecture. Students can come and ask questions related to the course within that time. Meeting place is room 318 in Rakentajanaukio 4a

Text book:

Guy Doré & Hannele Zubeck: Cold Regions Pavement Engineering, ASCE Press, 2009 (book will be given for loan for the duration of the course).

Asfalttinormit 2011, Päällystealan neuvottelukunta r.y.,
(The newer version 2017 can be used but is not provided by the school.)

Finnish Asphalt Specifications, 2000, PANK ry (for English speaking students, available as pdf from teacher)

Additional reference material:

Material given in MyCourse

<http://www.pavementinteractive.org/>

Lectures:

Lectures will be posted to MyCourse

Assignments:

Homework problems; submittal to MyCourse.

Requirements:

Student must have a scientific calculator and be able to use it according to the instruction provided by the manufacturer of said calculator. Calculations performed on the exam are performed on calculator not on the computer.

For homeworks computers with excel/word are useful, but exercises are organized in Maari-E computer classroom where students have a computer access provided.

Grading:

Presence during exercises is mandatory. If the student cannot attend the session, then student may attend the consulting hour (or in case of emergency otherwise agree with teacher in charge to get an additional assignment).

Homeworks 2-5 must be submitted by a student before review and feedback session (latest 13.2.). Laboratory exercise involves processing of the data from one experiment, and each student needs to submit test report separately before exam (latest 21.2). Grade from exercises and laboratory report comprises 20% of the final grade.

Final exam is 80% of the course grade covering textbook, lecture materials and calculation exercises. Exam tests the knowledge from lectures, exercises and laboratory visit.

Final Exam:

Fri 22.2.2017 at 9 - 12, Rakentajanaukio 4a, R5

Final exam is open book + calculator (textbook and Asfalttinormit 2011/FAS 2000 are allowed in exam)

Course workload for the students and ECTS:

Learning activity :	Time, h	ECTS
Attending lectures/discussions/exercises	30	1,1
Independent homework	44	1,6
Reading text book and other given material	45	1,7
Preparation to final exam	15	0,6
	134	5,0

Timetable

Tuesday	Lectures	Date	Thursday Exercises	HW	Date	Friday	Lectures	HW	HW DL	Date
History of pavement construction, pavement types, performance	1,2,3	8.1	Algebra, plotting, matrixes, scientific calculator use, hands-on viscosity	warm-up, 2ab	10.1	Bituminous products, viscosity and complex modulus	4, 5a	2ab		11.1
Grading of bituminous products	5b	15.1.	Homework 2abc	2abc	17.1	Viscoelasticity	6	2bc	2a	18.1
Aggregates	7ab	22.1.	Homework 3	3	24.1.	Fines and fillers, additives	8, 9	3	2bc	25.1
Mix design methods, volum	10,11	29.1.	Homework 4	4	31.1.	Volumetric relationships, performance testing	11,12	4	3	1.2.
Construction	13	5.2.	Homework 5	5	7.2.	Asphalt lab tour, rheology lab exercise		5	4	8.2.
Quality control and requirements	14,15	12.2	review of mistakes before exam/asphalt specifications	1,2,3,4,5	14.2	Review of study materias			5	15.2
						Exam			1	22.2

Learning outcomes:

After the course the students knows:

1. What is bitumen and how is it tested and classified
2. How the aggregates are classified
3. How to calculate volumetric relationships in the asphalt mix
4. Which additives are used in the asphalt concrete and what is their purpose
5. How to classify different asphalt mixes and to say what is the difference between them
6. How to choose asphalt mix for the application and what quality criterion should be required
7. How to design an asphalt mix (with use of Finnish Asphalt Specifications)
8. What kind of quality assurance criterion should be defined for an asphalt mix
9. Basic quality control methods
10. The basic equipment used on the construction site
11. What mechanical models are and how to use Maxwell's and Kelvin's model to predict material behavior
12. How to calculate bitumens viscosity from given parameters