

GEO-E2050 Bituminous Materials and Mixtures D

A.Y. 2021-2022. Period III, Spring 2022. Course plan at 16.02.2022 (*Tentative plan*)

Content:

The class provides an overview of asphalt materials used in road engineering. The list of topics includes:

- Introduction to pavements.
- Asphalt binder, characterization, testing (conventional, Performance Grade (PG), Multiple-Stress Creep- Recovery - MSCR, Linear Amplitude Sweep – LAS, etc.), and simple modeling.
- Asphalt Mixture, components (aggregate, additives), mix design, characterization testing, performance.
- Production techniques and recycling.
- Construction and compaction.
- Current road engineering research thematics.

Prerequisites: Basic knowledge in Civil Engineering Construction Materials and Road Pavement Design or equivalent: CIV-E1010 Building Materials Technology, GEO-E1030 Structural Design of Roads.

Course mode: The course is entirely remote, via Zoom (links in MyCourses).

Sessions: Lectures are on Wednesday and Thursday (12:15-14:00) and Friday (10:15-12:00).

Lectures time will be used either for (or a combination of) theoretical explanations, exercise, or seminar guest lectures. Three lectures will be devoted to reviewing the main topics presented during the class.

Intended learning outcomes

After this course, students will be able to:

- Identify different asphalt binder, mixture types, raw materials, production methods, and mechanical performance;
- Select appropriate mixture types and raw materials based on performance requirements;
- Describe how material properties affect pavement performance: durability and deterioration;
- Conduct asphalt binder analysis;
- Perform mix design;
- Present results and analysis in a scientific way.

Schedule (Tentative)

Week	Date	Topic	HW/Presentation/EXAM	
02	We 12.01.	Lecture 1. Introduction. Overview asphalt pavement (history) and materials (ACF)		
	Th 13.01.	Lecture 2. Intro to Asphalt Binder and Characterization (ACF)		
	Fr 14.01.	Lecture 3. Asphalt Binder Grading (ACF)	HW01 Assigned	
03	We 19.01.	Lecture 4. Master Curves, MSCR, LAS (DW)		
	Th 20.01.	Lecture 5. Intro to Asphalt Mixture (ACF)		
	Fr 21.01.	Review 1. Review 1-3 (DC)		
04	We 26.01.	Lecture 6. Asphalt Mixture and Design (ACF)	HW02 Assigned	
	Th 27.01.	Seminar Lecture 1. Asphalt Mixture and Waste Materials (LP)		
	Fr 28.01.	Lecture 7. Asphalt Mixture Performance (DW) Complex modulus and master curves		HW01 Due
05	We 02.02.	Lecture 8. Discussion on the Progress of Homework 2 (DC)	HW03 Paper Presentation Assigned	
	Th 03.02.	Seminar Lecture 2. Asphalt Mixture Design in Finland (TV)		
	Fr 04.02.	Review 2. Review 4-6 (DC)	HW04 Assigned	
06	We 09.02.	Seminar Lecture 3. Moisture Damage in Asphalt Mixtures (SC)		
	Th 10.02.	Seminar Lecture 4. On Asphalt Binder Modification (JZ)		
	Fr 11.02.	Lecture 9. Recycling (DW)		HW02 Due 14.02.2022
07	We 16.02.	Seminar Lecture 5. Different Perspectives on Sustainable and Advance Technologies in Pavement (AAVV)		HW04 Due
	Th 17.02.	Seminar Lecture 6. Airport Pavements (RBN)		
	Fr 18.02.	Review 3. Review 7-9 (DC)	Take-Home EXAM Assigned	HW03 Paper Presentation Due
08	Fri 25.02.	Take-Home EXAM due!		

Instructors

ACF	Augusto Cannone Falchetto, Assistant Professor	augusto.cannonefalchetto@aalto.fi
DC	Daniel Castillo, Postdoctoral researcher	daniel.castillo@aalto.fi
DW	Di Wang, Postdoctoral researcher	di.l.wang@aalto.fi

Guest Lecturer

LP	Lily Poulikakos, Senior Scientist	EMPA, Switzerland
TV	Tommi Valjakka, Peab Asphalt	Peab, Finland
SC	Silvia Caro, Professor	Universidad de los Andes, Colombia
JZ	Jiqing Zhu, Senior Scientist	VTI, Sweden
AAVV	Various experts in Sustainability and Advance technology in Pavement	Various International Schools and Research Institutes
RBN	Ramon Botella Nieto, Senior Scientist	Universitat Politècnica de Catalunya – BarcelonaTech. Spain

Assessment

The grade (100%) is composed of final exam (FE) 40%, 3 homework assignments (**HW**) 45% (15% each), and student presentation (**SP**) 15%. Grading is 0-5. The Final exam grade must be at least 50% to pass the course. Exercises are valid for one year.

Materials and resources

- Lecture Notes
- <https://pavementinteractive.org/>
- Doré, G. & Zubeck, H.K. (2009). *Cold Regions Pavement Engineering*. McGraw-Hill; ASCE Press (main textbook)

Loaning of textbooks at the Department of Civil Engineering is being arranged. More information will be provided during the first week.