

## **GEO-E1030 Structural Design of Roads**

A.Y. 2022-2023. Period II, Autumn 2022. October 24 to December 9, 2022

Course plan at October 24, 2022 (*Tentative plan*)

**Content:** The course covers fundamental principles of road pavement systems in cold regions, including environmental effects, functional and structural evaluation of pavement performance, pavement materials and mechanics, frost protection, and flexible and rigid pavement design methods.

**Prerequisites:** Students should have basic knowledge of civil engineering construction materials and geotechnics, offered in the following courses: CIV-E1010 Building Materials Technology, and GEO-E1020 Geotechnics.

**Course mode:** The course is offered in face-to-face mode mainly. If needed, online lecturing will be used, and students will be informed about it. Recording of the lecture will be performed if recording tools are made available by Aalto University.

**Sessions:** Lectures are on Monday (12:15-14:00) and Friday (12:15-15:00), with the Friday session devoted to reviewing the class topics and assigning homework. Lectures will take place in room R5-265 on Monday and R3-255 on Friday. During week 48, there will be three lecture meetings: **Monday (14:15-16:00)** and **Wednesday (12:15-14:00)** will be shared with the **GEO-E2080** course in room **R5-265**.

Lectures include the presentation of content and some practical examples. Friday sessions provide a space to review the content and homework, ask questions, review weekly reading, guest lectures, and perform additional activities, including a student presentation. We recommend attending lectures and exercises to learn the contents of the course effectively. Lectures will be recorded and uploaded to MyCourses/Panopto if recording tools are made available by Aalto University.

Your participation is essential to facilitate your learning progress. Please, participate, discuss, and ask questions during the course. Changes in the plan are likely; you will be informed in the best timely manner possible. All efforts are being made for the course to work out as smoothly as possible!

### **Intended learning outcomes\***

- *Explain* the concept of pavement environment, what kind of moisture and temperature regimes exist in pavement structures, and how they affect the system, particularly under frost conditions.
- *Assess* pavement performance in cold regions by *classifying* distresses in pavements, *identifying* their formation mechanisms, and *proposing* management and remediation alternatives.
- *Describe and compute* stress regimes in the pavement structure.
- *Integrate* the previous concepts into pavement analysis models to study pavement structures' critical stresses and strains.
- *Use* appropriate software for calculating stresses and strains at appropriate locations in the structures, i.e., multi-layered elastic analysis.
- *Design* a flexible pavement structure provided context by applying the appropriate material, traffic, environment, and other relevant considerations.

- *Get acquainted with* basic laboratory tests related to pavement engineering and materials and their associated output data, analysis, and relevant parameters obtained (e.g., determination of particle size distribution by dry/wet sieving and hydrometer methods; Proctor test to determine optimum water content).
- *Discuss and present* to peers/clients about road construction issues and pavement design and materials professionally.

\*The intended learning outcome might differ depending on the possible changes in the class schedule and organization during Period II

### Schedule (Tentative)

Week	Date	Topic
43	Mon 24.10.	<b>Lecture 1.</b> Introduction. Overview of pavements (ACF+DW)
	Fri 28.10.	<b>Review and activities 1. Student presentations</b> assigned, DL* 02.12. Guest lecture: MO
44	Mon 31.10.	<b>Lecture 2.</b> Pavement environment and performance (ACF Recorded)
	Fri 04.11.	<b>Review and activities 2. Homework 1</b> assigned, DL 11.11. Explain HW01, Guest lectures: FZ, DDY
45	Mon 07.11.	<b>Lecture 3.</b> Pavement mechanics (DW)
	Fri 11.11.	<b>Review and activities 3. Homework 2</b> assigned, DL 18.11. Explain HW02, Guest lectures: WTW, FCG
46	Mon 14.11.	<b>Lecture 4.</b> Pavement Design – Flexible and Rigid Pavement (ACF)
	Fri 18.11.	<b>Review and activities 4. Lab. Visit and report</b> assigned, DL 25.11. Frost protection (HG)
47	Mon 21.11.	<b>Lecture 5.</b> Pavement design in Finland (Marja-Terttu Sikiö, Destia)
	Fri 25.11.	<b>Review and activities 5.</b> Software + assigned final exam
48	Mon 28.11.	<b>Lecture 6*</b> . Recycled and lightweight materials (LKT)
	Wed 30.11.	<b>Lecture 7*</b> . Earth construction (LKT)
49	Fri 02.12.	<b>Review and activities 6. Student presentations.</b>
	Fri 09.12.	<b>Final exam (take-home)</b>

\* DL, Deadline date, at 23.55

\* Shared with GEO-E2080.

### Instructors

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MTS	Marja-Terttu Sikiö, Destia	<a href="mailto:marja-terttu.sikio@destia.fi">marja-terttu.sikio@destia.fi</a>

### Assessment

The grade (100%) is composed of final exam (FE) 30%, homework (HW) 42%, laboratory visit report (LAB) 8%, and student presentation (SP) 20%. 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
- Doré, G. & Zubeck, H.K. (2009). *Cold Regions Pavement Engineering*. McGraw-Hill; ASCE Press (main textbook)
- Huang, Y.H. (2004). *Pavement Analysis and Design*. Pearson, 2nd edition.

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