Aalto-yliopisto

Aalto University, School of Engineering, Department of Civil Engineering

GEO-E2090 Project course in Geoengineering (5cr)

Teaching language: Mainly English. Some of the exercise materials and Infra-BIM instructions are partly in Finnish because the real project in Espoo is done using Finnish code of practice.

Teacher in charge: Henry Gustavsson (henry.gustavsson@aalto.fi), Rakentajanaukio 4A, Room 134, tel. 040-5033859

Lectures and Exercises

Mondays 12:30-16:00, A046

Tuesdays 12:15-14:00, R9 (Zoom).

Teachers: look at Time table

Videos showing how to use Novapoint will be shared to students. The videos are done using older version of Novapoint and guidance is recorded in Finnish. These can be used as supporting material and students should look at the videos before exercises.

First teaching session: Mo 28.2. 12:30-16:00 A046.

Prerequisites

1st year Geoengineering MSc-studies (min 40cr) for Geo and Rock designer. Road designer can be a student from Geoengineering or Spatial Planning and Transportation Engineering Master's Programmes.

For Geotechnical designer including: GEO-E1020 Geotechnics, GEO-E20280 Foundation Engineering and Soil Improvement, GEO-E20210 Advanced Soil Mechanics (possibly at the same time with this course); GEO-E2020 Numerical Methods in Geotechnics is recommended.

For Rock designer including: GEO-E1010 Engineering Geology, GEO-E1040 Rock Excavation, GEO-E2040 Rock Construction (possibly at the same time with this course); GEO-E2030 Rock Mechanics is recommended.

For Road/street designer: GEO-E1030 Structural Design of Roads, GEO-E3040 Geometric Design of Roads (possibly at the same time with this course); GEO-E2050 Bituminous Materials is recommended.

Basic Novapoint and Civil3D/Autocad skills are recommended for all attendants.

Learning outcomes:

-student learns to do basic geometrical and structural design of a road or street,

-student learns to apply the existing data by doing the dimensioning of her/his own discipline (for example geotechnical, pavement or rock engineering),

-student learns to behave as a participant in a project group,

-student learns to analyze and evaluate the site investigation data and create new design based on the data,

-student understands, how a real consultant project is working,

-student get to know colleagues from industry and learn their way of working

-student learns to work and co-operate with other designers and to present the outcomes of the design.

- student gets acquainted to Common InfraBIM Requirements in the design.

Contents:

Project course is a practical design project which includes aspects from geotechnical, rock and highway engineering point of view. The content of the course is to produce needed design documentation of a road. The documentation will include 3D-terrain model with soil and rock layers of the design area. The road planning will be done taking into account subsoil and rock properties and combining all existing and new infrastructural elements together. In addition to the 3D model, some additional documentation, like description of the design case, dimensioning of structures and producing maps and 2D cross-sectional output documentation will be achieved. Common InfraBIM Requirements will be introduced in the design**.**

The students (max. 20 students) are divided into project groups, which include experts (students) from geotechnical, road and rock engineering areas. The teaching method is problem based learning, so that each group produces all the needed design and 3D inframodel planning and documentation for a street/road. Teachers for the exercises will be mainly engineers from consulting companies.

Road design is mainly done using Novapoint ja Civil3D following Väylä's guidelines and criteria. Geotechnical and rock designer will produce needed design reports using applicable software and following Väylä's guidelines and criteria. Participating in exercises and lectures is compulsory (80%).

Evaluating criteria

Assesment based on design documentation: design model, site description, calculations, project work, report (50%), ~~InfraBIM~~ test 25%, presentation of the outcomes (12,5%), self and peer-evaluation (12,5%).

Registration: Sisu.fi, latest 21.2.2022!

Study methods and work load: Lectures (14h), Exercises (40h), Project work (60h), Preparing to test (16h), Presentation of results (2h)

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Time table (Preliminary-2023)

Vko	Ma 12:30-16:00, A046	Ti 12:15-14:00 R9 (Zoom)
9 (28.2.-6.3)	Course presentation. Grouping. HG 1.Exercise: Basics of Novapoint, YIV- Common InfraBIM Requirements. MH, EE.	12:15-13:00 Visiting design site by walking (Kehä I), HG, JA
10 (7.3.-13.3)	2.E. Uploading initial material to database, Initial data model. HS, EE	L. Road Geotechnical Design and reporting, LKT
11 (14.3-20.3.)	3. E. Horizontal and vertical geometry. EE	L Life Cycle Assessment, recycling, emissions… LKT- **Thu 17.3. 14:15-16:00 R266**
12 (21.3.-27.3)	4. E. Road design by modelling. MC. **Delivery of Design Exercise HG.** No Novapoint	L. Rock design, prelimary costs. FH 2 h
13 (28.3-3.4)	5. E. Designing cross sections, detailing superstucture MC.	*DL to return Tunnel cross section to F.Horn.*[1] L Ground improvements, foundation methods, preliminary costs. HG
14 (4.4-10.4)	**6 E. Rock/Tunnel design exercise FH**	No lecture
15 (11.4-17.4) Evaluating week	7. E. Map, longitudinal- and cross-sections, Cont. design (EE 3h).	L Producing road design report (Suunnitelmaselostus), (MC) Geotechnical sections with diagrams and maps (HS)
16 (18.4-24.4) AV-service	2. Easter day	**U344** L. 12-14.Model-based geotechnical design. JL Exercise 14-16. HG. ***DL to show preliminary results***
17 (25.4-1.5) AV-service in A046	8. L. Quantity surveying and costs: FORE, (EV 1h). E. Continuing design, Group work. MC **U344**	L. Tasks of Infra-BIM coordinator, open data exchange format LandXML, handover material, inspection of data, EE U256
18 (2.5.-8.5)	9. E. Output of design model and initial data, producing combination model and documentation of information, EE A046	Continuing design, Group work. Finalizing presentation. HG A046
19 (9.5.-15.5)	10. E. Continuing design, Group work. MC Finalizing presentation.A046	**Th 12.5. 12.15-14.00. R9. Workshop. Presentation of results**. Sitowise's Road Design presentation, PK.
		Test Fri 20.5. 11:00-14:00 R9

[1] The students have the possibility to do all modelling independently. In this case there is no need to return any cross-section to the rock engineering tutor/lecturer (Frans Horn). All necessary instructions will be provided digitally.

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LKT Leena Korkiala-Tanttu, Aalto
JA Juha Antikainen, Aalto
Sitowise:
MH Matti Heikkilä (matti.heikkila@sitowise.com)
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HS, Hannu Saarentaus (hannu.saarentaus@sitowise.com)
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