

Aalto University, School of Engineering, Department of Civil Engineering

GEO-E2090 Project course in Geoenvironment (5cr) (Draft 22.2.2024)

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 12:30-14:00 R266/R5 (see Time table)

Teachers: look at Time table

First teaching session: Mo 27.2. 12:30-16:00 A046.

Test 14.5.2024 at 12:00-14:00, R5

Prerequisites

1st year Geoenvironment MSc-studies (min 40cr) for Geo and Rock designer. Road designer can be a student from Geoenvironment 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%), test 25%, presentation of the outcomes (12,5%), self and peer-evaluation (12,5%).

Registration: Sisu.fi (DL 22.2.2024)

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

Time table (**Preliminary**)

| Week | Mo 12:30-16:00, A046 | Tu 12:30-14:00, R266 (W 9-13) Tu 12:30-14:00, R5 (W 15-21) |
|---|--|---|
| 9 (26.2.-3.3) | Course presentation. Grouping. HG 1.Exercise: Basics of Novapoint, YIV- Common InfraBIM Requirements. EE 2h. Visiting design site by walking (Kehä I), HG 2h | L. Road design by modelling. MC, |
| 10 (4.3.-10.3) | 2.E. Uploading initial material to database, Initial data model. Producing geo-drawings with ground investigation diagrams HS,MC4h | L. Road Geotechnical Design and reporting, LKT |
| 11 (11.3.-17.3.) | 3. E. Horizontal and vertical geometry. MC 3h E. Delivery of Design Exercise HG, 1h | L. Rock design. MD2 h |
| 12 (18.3.-24.3) | 4. E. Designing cross sections, detailing superstructure MC 3h L. <i>Geo-design+drawings, HS 2h</i> | L Ground improvements, foundation methods, preliminary costs. HG <i>DL to return Tunnel cross section</i> |
| 13 (25.3.-31.3) | 5. E. Rock/Tunnel design exercise, MD. | L Producing road design report (Suunnitelmaselostus), (MC). |
| 14 (1.4.-7.4) Holiday 28.3.-3.4. | Easter Monday | Easter Holiday |
| 15 (8.4.-14.4) | 6. E. Map, longitudinal- and cross-sections, Cont. design 4h EE. | L. Tasks of Infra-BIM coordinator, open data exchange format LandXML, handover material, inspection of data, EE |
| 16 (15.4.-21.4) Evaluation week | 7. E. Output of design model and initial data, producing combination model and documentation of information, EE . 3h Rock/Tunnel design, (MD 2h) | L. Life cycle assessment, emissions and use of recycled materials. MIö <i>DL to show preliminary results</i> |
| 17 (22.4.-28.4) | 8. E. Continuing design, Group work. EE, 2h | L. Model-based geotechnical design. JL |
| 18 (29.4.-5.5) | 9. E. Rock/Tunnel design, (MD 2h) Finalizing presentation. EE, 2h Continuing design, Group work. | Labour Day's Eve/Vappuaatto |
| 19 (6.5.-12.5) | 10. L. <i>Quantity surveying and costs: FORE, (EV 1h).</i> E Continuing design, Group work. Finalizing presentation. MC, 2h. | (Excursion for BSc students) |
| 20 (13.5.-19.5.) | 11. E Continuing design, Group work. Finalizing presentation. | 12.15-14.00. R5 Workshop. Presentation of results. Sitowise's Road Design presentation 2h MC. |
| 21 (20.5.-26.5.) | | Test 12.00-14.00 |



HG Henry Gustavsson, Aalto
LKT Leena Korkiala-Tanttu, Aalto
MLö Monica Löfman, Aalto

Sitowise:

EE Eemeli Erkkilä (eemeli.erkkila@sitowise.com)
MC Maija Carlstedt (majja.carlstedt@sitowise.com)
HS, Hannu Saarentaus (hannu.saarentaus@sitowise.com)
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