ACADEMIC SYLLABUS

II LEVEL MASTER in

Geotechnical Design
(Progettazione Geotecnica)

Article 1 - General information

Department responsible: Department of Structural and Geotechnical Engineering (**DISG**)
Faculty: Civil and industrial engineering
Title: Geotechnical Design (Progettazione Geotecnica)
Level: M2

Article 2 - Education

About the Master:
The Master in Geotechnical Design aims to promote a geotechnical culture, providing the opportunity for recent engineering graduates who have already acquired a basic geotechnical background, to further develop the skills already acquired during their university studies. By the end of the course, you will be able to extend your professional scope to tackle design projects with a prevalent geotechnical content.

The Master is under the patronage of the Italian Geotechnical Association (AGI), the Italian Tunnelling Society (SIG), the Italian Foundation Association (AIF), and by selected engineering firms and major construction companies. It is a highly specialized course and aims to forge a solid link between the University and Industry, forming the professional profile of a young engineer with a sound applicative and multidisciplinary knowledge of the design, construction, and management of geotechnical projects (tunnels, underground works, special foundations, landslide stabilization, earth constructions, etc.).
The Master also aims to provide placements for attendees in the fascinating world of design and construction in civil engineering.

Expected outcomes: Our Geotechnical Design Master will help you to develop a sound knowledge of soil and rock mechanics through theoretical and experimental studies. This is the initial step necessary to guarantee a successful project. You will be able to define a suitable geotechnical model useful for addressing each specific application, identifying the most suitable constitutive model and calibrating it by employing the results of specifically designed tests.
The next step is to increase your technical and organizational knowledge to ensure you acquire the tools necessary for the autonomous development of geotechnical projects: works that interact significantly with the earth and soil, such as tunnels, underground works, landslide stabilization projects, foundations, earthworks, etc. Candidates will develop design topics under the supervision of faculty and the daily assistance of tutors selected for this purpose.

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The master also aims to train candidates regarding regulatory aspects, management of construction sites and projects, risk analysis and management, financing of public and private works.

Scientific sectors: ICAR/07 (principal) e ICAR/02 (secondary)

Entry requirements: a university Degree, regardless of age or citizenship**,** in one of the following areas:

- Civil engineering 28/S; LM-23
- Land and environment engineering 38/S; LM-35
- Building systems engineering LM-24
- Building Engineering – Architecture LM-4

The holders of a Degree obtained in Italy according to the system prior to the university reform of the D.M. 509/99 can also access the Master and is equivalent to one of the aforementioned classes.
For non-Italian candidates their degree must be the equivalent of a II cycle degree.

Minimum and maximum number of participants: the maximum number of candidates is 15, and the minimum is 10. On the request of the Director the maximum number of participants may be extended.

Application process: Applicants will be evaluated by an oral exam and their qualifications that must be included in a CV. All candidates will be asked to demonstrate their knowledge of soil engineering, rock mechanics and geotechnical engineering. A motivation letter is also requested.

Course dates: In person courses will start on 1 February 2023 and close on 31 October 2023. The Master will end on 31 January 2024 once the internship has finished, with a final thesis discussion.

Auditors: Auditor students may be admitted to attend specific modules, up to the acquisition of a maximum of 20 credits.

Attendance: Successful applicants must attend at least 75% of classes**.**

Internship: Considering that the internships build on the topics of geotechnical interest developed during the academic year and that they will take place in the last three months of the Master, the offers, the locations and the hosts are defined in the course of the year (2023). In any case, the topics proposed, generally by companies, organizations and companies that support the Master in various capacities, must have a substantial geotechnical content.

Final exam: The final exam consists in the discussion of the master thesis that develops the topic followed as interns. The final paper is presented and discussed before the Examination Board, appointed by the Department Council. Scores are out of 110 and the Board can, unanimously, grant the candidate the highest marks with honors. The minimum grade is 66/110 (sixty-six / one hundred and ten).

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The Master is held in English

Article 3 – Education Plan

60 ECTS credits

Module 1: Geotechnical characterization of soils and rocks (8 ECTs)

This module will help you build on the knowledge previously acquired during your university studies and will develop the following topics: methods to carry out geotechnical tests on site and in the laboratory and how to interpret the results; criteria to select the most appropriate methods for the type of test to be carried out according to the specific application in question; geotechnical characterization. Successful candidates, assisted by a tutor, will perform tests in the laboratory and assist in their execution on-site as well develop exercises aimed at the geotechnical characterization of a site. Generally, the site used for the development of the geotechnical model and the relative geotechnical characterization of soils is that used to develop the individual projects.

Module 2: Geotechnical modeling (6 ECTs)

The module will consolidate and build on the knowledge accrued during your university career. The following topics will be developed: constitutive models that can be used in modeling; criteria to select the constitutive models and perform laboratory tests aimed at their calibration, strategies for solving specific finite boundary value problems, numerical methods, etc. Candidates will also tackle modeling of specific finite problems including numerical analyses.

Module 3: Design of foundations (6 ECTs)

Essential aspects for a correct design are covered: technological and construction aspects, fields of use, limits of applicability, design criteria, verification and testing, regulatory aspects and design standards, technical specifications, costs, etc. Topics related to soil-structure interaction, the analysis of mixed foundations, compensated foundations are explored. Teaching takes place in parallel with the development of selected design topics under the supervision of the teaching faculty and tutors.

Module 4: Design of tunnels and underground works (12 ECTs)

Contents covered include technological and construction aspects, fields of use, limits of applicability, design criteria, verification and testing, regulatory aspects and design standards, technical specifications, costs, etc. Topics related to soil-structure interaction, analysis of the effects induced on pre-existing structures, numerical modeling of excavation and consolidation processes, etc., are explored. Candidates will put into practice, under the supervision of faculty and tutors, content acquired during the by developing a project for a tunnel or underground work.

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Module 5: Design of landslide slope stabilization (6 ECTs).

Indispensable aspects for a correct design are covered, such as design criteria, verification and testing, regulatory aspects and design standards, technical specifications, costs, etc. of landslide stabilization works. Particular attention is paid to technological and construction aspects, the fields of use, the limits of applicability, interventions and works aimed at stabilizing and securing landslides. Modeling of the different systems that can be used for the improvement of stability conditions are also studied. Candidates will tackle a real case planning of stabilization interventions, under the supervision of faculty and tutors.

Seminars and short courses (10 ECTs)

Short courses on selected topics will also be held and include**:**

- Earthquake geotechnics
- Geotechnical engineering of dams
- Geotechnical maritime works
- Rocks and soils improvement
- Risk and Project management
- Geotechnical monitoring

Seminars will be held on:

- Mechanized excavation of tunnels and choice of TBMs
- Design and construction of tunnels with traditional techniques
- Special techniques for the excavation of tunnels (cellular arch, pre-cut, etc) and large section tunnels
- Technologies for the construction of piles and diaphragms (hydro-mill)
- Soil improvement techniques
- Soil improvement techniques
- Soles pile Technology

Technical visits to civil engineering construction sites and educational trips will also be made.

Internship: will he hosted by the society and company sponsors that will also cover the tuition fees for each successful candidate (8 ECTs).

Final exam: (4 ECTs)

Article 4 - Organisation

People: Faculty members of DISG, other engineering departments at Sapienza, as well as other Italian and international universities. Experts from the world of industry.

Venue: Faculty of Civil and Industrial Engineering (ICI), Via Eudossiana, 18 – 00184, Aula Caveau and other lecture theatres of the ICI Faculty and the DISG geotechnical lab.

Occasionally training will also take place at the companies and building sites of our partners.

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Secretariat: Department of Structural and Geotechnical Engineering, Via Eudossiana, 18 - 00184.

Article 5 - Funding

Tuition fees: € 4.000,00. For this edition of the master tuition fees are completely covered by our partner companies and societies for the first 15 successful applicants. From the letters of intent received, the partner companies of the Master have undertaken to support a total number of students equal to 24, higher than the maximum number of admitted participants. At the end of the selections, the Director can request an increase in the number of participants.

Partners and number of funded candidates

Construction firms:

- Webuild n. 8 (https://www.webuildgroup.com/it)
- Ghella n. 3 (https://www.ghella.com/it)
- Amplia Infrastructures n. 3 (https://www.pavimental.it/)
- Pizzarotti n. 1 (https://www.pizzarotti.it/)
- Trevi n. 1 (https://www.trevispa.com/it/)
- Maccaferri n. 1 (https://www.maccaferri.com/it/)
- Cmbcarpi n. 1 (https://www.cmbcarpi.com/)
- BBT n. 1 (https://www.bbt-se.com/it/)

Engineering firms and research bodies:

- Rock Soil n. 1 (https://www.rocksoil.com/)
- SWS-Systra n. 1 (https://www.swsglobal.com/)
- GDG n. 1 (https://www.geotechnicaldesigngroup.it/)
- Tecne n. 1 (https://www.autostrade.it/it/tecne)
- GEEG n. 1 (https://www.geeg.it/)

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