

JTC3 on Education and Training

1. Terms of reference (confirmed at FedIGS meeting in 2020)

The goal of JTC3 is to contribute to broad cooperation between international geo-engineering societies and their members in teaching, training, and outreach facilities. JTC3 addresses to education (institution educators, graduate and undergraduate students) and industry.

- To promote the exchange of information on the courses and their content that are taught on geotechnical engineering, engineering geology, rocks mechanics, and/or geosynthetics in different institutions
- To closely interact with the related technical committees of ISSMGE, ISRM, IAEG, and IGS
- To develop a list of recommended virtual/digital materials to be used for education and professional trainings, considering the current COVID-19 situation.

2. Geo-engineering introduction catalogue

Utilizing “Modern syllabus for introduction to geoengineering,” developed by of the previous term of JTC3 (see Appendix 1), create “**Geo-engineering introduction catalogue**,” in which 1 to 3 excellent digital material(s) available at the web are selected and listed for each subject of “modern syllabus” by the JTC3 members. The catalogue will be opened at the FedIGS web-page, and updated as needed (e.g., 1-year interval). Table 1 shows an example of the product. Digital materials are labelled based on the contents as indicated in the footnote.

Table 1. Examples of “Geoengineering introduction catalogue”

Subject	Materials
1. History of geotechnical engineering	<ul style="list-style-type: none">• Lecture video by Prof. A. Bcde* (Nominated by ISSMGE)• Youtube by Prof. F. Ghij*[§] (Nominated by ISRM)
2. Engineering geology and rocks	<ul style="list-style-type: none">• Lecture video by Prof. K. Lmno[#] (Nominated by IAEG)• Leaflet by Prof. P. Qrst⁺ (Nominated by IGS)
3. Elements of geophysics	• • •

Note (example)

*: For the beginner

+: For the professional who is the member of a sister society but not familiar with this subject

§: For the non-professionals, such as policy makers and general citizens

#: Advanced

3. Geo-Engineering Qualification and Training System

Role of qualification and capacity development systems for geo-engineers will be discussed among the committee members, based on the current situation described in the next paragraph. Information of some systems together with the related issues will be collected by the members.

Geo-engineering projects are sometimes (or usually) difficult to conduct investigations, designs, and constructions in the perfect manner. As a consequence, we anticipate the inadequate performance of geo-infrastructures and/or damages due to natural disasters occur. Because of the large magnitude of such inadequate performances and damages, high responsibility is required to geo-engineers. Some of the reasons for this are listed below:

- (1) Geological materials, such as rock and soil, have properties (e.g., heterogeneity) specific to natural products, which may differ from other engineering materials.
- (2) Most geo-engineering projects are one-product-manufacture and no "precedent" that is exactly the same.
- (3) In spite of (1) and (2) above, lack of understanding of the client or the engineers themselves may sometimes limit the sufficient investigations.
- (4) Proper construction and maintenance may sometimes fill insufficient investigation and design. However, such a practice may not be acceptable to the client or users.

Therefore, geo-engineers are required to master the basics, systematize their experiences, and share what they have accumulated and systematized. Furthermore, it is important to have a system to position such professionals in society. From these aspects, systems on qualifications and capacity developments are believed important. As an example, one national society under the FedIGS umbrella has developed and been operating one professional qualification system (see Appendix 2).

Scope, background, operation (e.g. funds and human resources), application (e.g., to the practice and in the society), PDCA etc. will be discussed. Only the selected qualification systems with distinct features which are accessible to committee members will be discussed because it is unrealistic to cover all the systems that exist in the world.

4. Membership

Each FedIGS Society was asked to nominate the committee members, while only one Society nominated the members. The JTC3 chair apologies that he should have communicated with the Societies earlier to remind them. Once the membership is fixed, the above discussions will start via online.

Appendix 1. “Modern syllabus for introduction to geoengineering” developed by JTC3 (previous term)

Joint Technical Committee on Education, JTC3

Chair: Anna SHIDLOVSKAYA

Paper on “Modern syllabus for introduction to geoengineering “

1. History of geotechnical engineering
2. Engineering geology and rocks
3. Elements of geophysics
4. Sampling and in situ testing
5. Soil particles and mineralogy
6. Weight volume relationships
7. Compaction
8. Classification and tests
9. Stresses and strains in soils
10. Soil constitutive models
11. Flow of fluids through soils (parameters and laws)
12. Flow of fluids through soils (lab and field tests)
13. Flow of fluids through soils (Flow nets and applications)
14. Compressibility of soils (elasticity and the modulus of soils)
15. Compressibility of soils (consolidation tests and settlement magnitude)
16. Compressibility of soils (time rate of consolidation)
17. Shear strength of soils (effective stress case)
18. Shear strength of soils (undrained case)
19. Shear strength of soils (tests and typical values)
20. Shallow foundations
21. Deep foundations
22. Slopes
23. Retaining walls
24. Innovations (reinforced earth, soil improvement)
25. Innovations (geo-environmental, geosynthetics)
26. Innovations (earthquakes, floods)
27. Probability and risk in geotechnical engineering

Appendix 2. Examples of qualification systems related to geo-engineering in Japan (draft)

In the Japanese construction industry, more than 60 qualification systems for engineers exist. Acquisition of qualification will result in the advancements and accumulations of engineering knowledges and skills. Table 1 summarizes five selected qualifications that are related to geo-engineering. The following is an explanation of these five qualifications.

Professional Engineer is an engineer who is recognized by the government as having advanced knowledge and ability in the science and technology. This qualification is one of the most authoritative national qualifications in the engineering field. The PE system is managed by the Ministry of Education, Culture, Sports, Science and Technology. Those who wish to be PE have to pass the first examination (written). Once they pass, they are registered as an Associate PE. After obtaining the registration as an Associate PE, the applicant must have at least four years of working experience before taking the second examination. After they pass the second examination (written and interview), the license for PE is given. When an organization participates bidding for public projects, the number of engineers with professional engineer qualifications is counted. The development of human resources with professional engineer qualifications is essential for the growth of an organization.

The Operation and Management Engineer is a national qualification established for the proper management of construction works and improvement of construction techniques. There are two levels of certification, Level 1 and 2. Those who have the Level 1 certification can engage in construction work as supervising engineers, who are responsible for the construction sites. When an organization participates bidding for public projects, the number of engineers with professional engineer qualifications is counted.

A Professional Engineer for Geotechnical Evaluation is a professional engineer with expertise in geotechnical engineering and a sense of ethics. They evaluate the quality of the ground and provide explanations within the scope of limited information at the request of clients to prevent ground disasters in residential areas. When an organization participates bidding for public projects, the number of engineers with professional engineer qualifications is counted.

The Foundation Engineer is a private-sector qualification established for the purpose of enhancing the technical content and expanding the technical scope of foundation construction. When an organization participates bidding for private projects, the number of engineers with professional engineer qualifications is counted.

Table 1 Qualifications closely related to civil engineering and geotechnical engineering

	Name of the qualification system	Governing body
1	Professional Engineer (P.E.Jp)	Ministry
2	Associate Professional Engineer (As.P.E.Jp)	Ministry
3	Operation and Management Engineer	Ministry
4	Professional Engineer for Geotechnical Evaluation	Public institution (Japanese Geotechnical Society)
5	Foundation Engineer	Private institution (Japan Foundation Engineering Association)