

Admission Requirements for the Geotechnical Discipline

(Candidates must read this leaflet in conjunction with M3 Routes to Membership)

I. General Supplementary Requirements

Candidates applying for the class of Member in the Geotechnical Discipline of the HKIE must satisfy the requirements laid down in the Institution's Membership booklet "M3 Routes to Membership", with the following supplementary provisions:

1. As part of the experience requirement specified in Section 3 of "M3", the candidate should normally have completed a 12-month period on site in the role of geotechnical engineer, of which at least six months should have been continuous full-time services resident on a construction site of a project of medium size. Not more than four months should have been supervision of ground investigations. All candidates should have some contract document preparation and contract administration experience.
2. In addition to the report specified in Section 5.4.1, the candidate is required to submit a report of about 1,000 words on a substantial period of site work, in the role of geotechnical engineer. Activities other than ground investigation must form the major part of the reported site work.
3. It is essential that the documents submitted in compliance with Section 5.4.2 should have been made in the ordinary course of the candidate's employment. It is not necessary for the documents to relate to works that have been carried out, but documents prepared as exercises during student courses are not admissible.

The document package must be accompanied by a one-page description to introduce the package.

4. In fulfilment of the requirements of Sections 5.4.1 and 5.4.2, the candidate must submit documents under a, b & c as follows:
 - a. Training & Experience Report

The objective of the candidate's report is to inform the Assessors about the candidate's training and experience (Section 3 "Training and Experience Requirement"). The report should be concise, between 1,600 and 2,000 words, in English, typewritten on single sides of A4 paper and submitted in duplicate. At the top of the report the candidates must set out the specific periods of training and experience that they have acquired in chronological order, giving inclusive dates in months and years.

The report must not be a mere inventory of work prepared and executed. Candidates should:

- (i) describe in chronological order the tasks in which they have been employed and explain clearly the precise position they have occupied in each case and the degree of responsibility they have been assigned;
- (ii) use the first person (I, me, my) to show their personal contribution;

- (iii) the size and cost of the works;
- (iv) elaborate on any particular problems they have encountered and how they arrived at viable solutions;
- (v) provide evidence for the competences set out in the HKIE Competence Standard for Professional Engineers (Corporate Members) are achieved by adding notations in the right margin for the competences (C1, C2...etc.) next to the passage of text. At most four relevant competences should be quoted at a time.

(Paragraph 4 a (v) is not applicable to candidates who apply for or resit the non-competence-based Professional Assessment.)

b. Project Report

The Project Report of about 4,000 words should be typewritten on A4 paper may include up to 4 supporting drawings, calculations, quantities, etc. The aim of the report is to demonstrate the candidate's technical and professional competence in the geotechnical field. The Report should describe a project or parts of a project on which the candidate has been employed in a major role during the period of post-graduate training and practical experience. The Report should contain the following and satisfy the requirements as stated in 4 a (ii) & (v) *(Paragraph 4 a (v) is not applicable to candidates who apply for or resit the non-competence-based Professional Assessment.)*:

- (i) the results of a study including topography, geology, groundwater, surfacewater, site history, public utilities, drains and sewers and other services and local geotechnical records;
- (ii) the results of ground investigation including comprehensive details of equipment and procedures used;
- (iii) the results of site monitoring of groundwater, building and land;
- (iv) critical examination and interpretation of (i), (ii) and (iii) above, a schedule of geotechnical design assumptions, discussion of anticipated geotechnical problems and outline of variations of the works which should be adopted if, during the carrying out of the geotechnical works, any geotechnical design assumption is found to be different from actual conditions exposed on site; and
- (v) key geotechnical design calculations including assessments of the effects of the geotechnical works on groundwater conditions and adjoining land and buildings.

- c. Technical proposal and cost estimate, or specification and bill of quantities, including taking-off (or rough working) sheets, preferably for a significant investigation/laboratory testing programme, or a geotechnically related aspect of a project such as a ground improvement scheme, piled foundations, etc. The submission should satisfy the requirements as stated in 4 a (ii) & (v)

d. Logbook (if Scheme “A”)

e. Continuing Professional Development (CPD) Record

All documents should be the candidate’s own work and documents must be verified by a Corporate Member of the Institution or the employer.

Documents submitted will be treated as confidential and will be returned to the candidate. Candidates should however retain copies of all documents submitted as the Institution does not accept responsibility for any documents lost or damaged.

5. Pre-interview Project Presentation

Prior to the interview candidates will be allowed 15 minute to make a presentation of their Project Report. Candidates should plan this presentation carefully to allow themselves to cover the scope of their Report in the time allocated.

The Assessors will not normally ask questions until the presentation has been completed. The Assessors will, however, help a candidate who is clearly having problems due to nervousness.

Candidates may use the supporting documentation, photographs and drawings submitted as part of the 4,000 word Report, and will be permitted to use flipcharts to illustrate the presentation. No visual aids such as slides or overhead projectors will be allowed.

The purpose of this part of the assessment is to ensure that candidates are able to present themselves orally as well as in writing.

II. Requirements for Corporate Members of the HKIE (in disciplines other than Civil)

Corporate members who wish to obtain membership in the Geotechnical Discipline will also be requested to comply with the requirements in Section I.

III. Requirements for Corporate Members of the HKIE in the Civil Discipline

Candidates for Geotechnical Discipline who are already MHKIE or FHKIE in the Civil Discipline and who apply as additional discipline candidates via the Normal Route will normally only be required to undertake the following:-

- (i) Submission of a training and experience report that demonstrates that the training and experience requirements for the Geotechnical Discipline have been fully met.
- (ii) An assessment interview
- (iii) Submission of CPD record

Candidates will not normally be required to submit the report and documents specified in paras 2 and 4 (b) & (c) of the Admission Requirements for the Geotechnical Discipline, provided the Assessors are satisfied (i) that the candidate has adequate design and site supervision experience directly relating to Geotechnical Engineering (ii) that he/she is able to demonstrate a sufficient knowledge of both the relevant scientific principles and their application to the identification and solution of Geotechnical Engineering problems.

For reference to candidates, the definition of scope of Geotechnical Engineering adopted by the Geotechnical Discipline is as follows:-

Geotechnical Engineering encompasses the planning, investigation, design, construction and maintenance of works involving the ground, and works constructed from excavated natural materials. It incorporates the knowledge and skills of engineering geomorphology, engineering geology, hydrogeology, geo-environmental engineering, geophysics, soil mechanics, rock mechanics, foundation engineering, engineering seismology and ground treatment.

IV. Academic Requirements for Earth Sciences Graduates

1. Introduction

Graduates of a degree course not accredited by HKIE could apply for “Individual Assessment” by the Education and Examination Committee (E & E Committee) for eligibility to joining Scheme “A” training or for application for membership of HKIE.

For Earth Sciences degree graduates, the E & E Committee would look at the following aspects when reviewing their “individual assessment” applications.

a. Course content on geology and related subjects

At least 50% of the course content should be on geology and related subjects, excluding applied subjects.

b. Course content or proof of proficiency on engineering and related subjects, including.

Subject	Requirement
Mathematics	Two subject units of six credits each
Soil mechanics	One subject unit of six credits
Rock mechanics	One subject unit of six credits
Basic structural mechanics and behaviour	Half a subject unit amounting to three credits
Hydrogeology/hydrology	One subject unit of six credits
Management	One subject unit of six credits
Project	A research project either in the Bachelor or or higher degree programme
Note: One credit amounts to six teaching hours	

The graduate may have taken the subjects in the first degree or in postgraduate degrees. An example of proof of proficiency is passing the Engineering Council Postgraduate Diploma on the particular subject.

2. Contents of engineering and related subjects

The following gives further indications on the requirements or scope of the engineering and related subjects. More detailed information on intended content of the subjects can be found at www.hkieged.org.

Mathematics

The graduate may fulfill the requirement of Mathematics by taking:

- a. Mathematics courses of HKIE accredited degree programmes; or,
- b. Mathematics courses of other engineering or science degree programmes.

The courses should cover the following topics:

- ✧ Advanced calculus
- ✧ Ordinary and partial differential equations
- ✧ Introduction to probability and statistics
- ✧ Matrix and vector algebra

Soil Mechanics

The subject of Soil Mechanics should cover most of the following:

- ✧ Soil classification and physical soil properties
- ✧ Site investigation techniques
- ✧ Stress and strain behaviour
- ✧ Theory of seepage
- ✧ Consolidation theory
- ✧ Foundations
- ✧ Earth-retaining structures
- ✧ Slope stability

Rock Mechanics

The subject of Rock Mechanics should cover most of the following:

- ✧ Rock materials and rock mass
- ✧ Discontinuity shear strength and stiffness
- ✧ Rock mass classification systems
- ✧ Rock mass characterisation
- ✧ The application of the theory of rock masses
- ✧ The engineering properties of rock fill

- ✧ Case studies of challenges and achievements in engineering slopes, underground excavations and foundations on rock masses

Hydrogeology

The subject of Hydrogeology should cover most of the following:

- ✧ Hydrologic cycle and water budgets
- ✧ Characterization of aquifers
- ✧ Hydraulic head and flow net
- ✧ Basic equations of groundwater flow
- ✧ Groundwater flow to wells, analysis of aquifer test, pumping tests
- ✧ Regional groundwater flow systems
- ✧ Introduction to groundwater numerical model

Basic Structural Mechanics and Behaviour

This subject is to provide the graduate with basic understanding of general behaviour of structural systems especially in respect of foundation and shoring designs. The subject should cover most of the following:

- ✧ Behaviour of structural members subjected to tension, compression, bending, shear and torsion
- ✧ Buckling of compression members
- ✧ Statically determinate and indeterminate structures
- ✧ Load transfer mechanisms of structural systems including foundations and shoring system
- ✧ General behaviour and basic concepts in design of reinforced concrete members
- ✧ Structural design of foundation, and retaining wall

Management

This subject is to provide the graduate with basic knowledge of project management practice and the meaning of professionalism. It should cover most of the following:

- ✧ Engineering processes, programming and procurement strategies
- ✧ Contract management
- ✧ Construction site safety, health and environmental aspects

- ✧ Quality control and quality assurance
- ✧ Professional practice matters

3. The Individual Assessment

The scope of subjects taught varies from university to university and even from year to year. The scope of subjects briefed in Section 2 aims at giving a broad but unambiguous impression of what is expected in each of the subjects. Complete agreement of subject coverage with the scope described is not the condition for counting a course subject in the assessment of the eligibility of an applicant for HKIE Scheme “A” training or MHKIE (Geotechnical).

Parts of a subject may be covered by other subjects in the first or second degrees. For example, site investigation techniques commonly covered by the subject of Soil Mechanics may have been taught under the subject of engineering geology in an Earth Sciences degree. Where sufficient information is available, these supporting subjects may be taken into consideration in individual assessments.

V. Topping Up Opportunities for Earth Sciences or Equivalent Graduates

The Department of Earth Sciences of the University of Hong Kong organizes a Master of Science programme in Applied Geosciences with four to six Themes. The following course modules are offered that would contribute to the academic requirements of the Geotechnical Discipline.

GEOS7012	Site Investigation and Engineering Geological Techniques (6 credits)
GEOS7015	Rock Mechanics (3 credits)
GEOS7016	Soil Mechanics (3 credits)
GEOS7020	Project Part I (6 credits)
GEOS7024	Management (3 credits)
GEOS8001	Hydrogeology (3 credits)
GEOS8002	Professional Practice in Applied Geosciences (3 credits)
GEOS8003	Seminars on Unforeseen Ground Conditions, Geotechnical and Environmental Failures(3 credits)
GEOS8020	Project Part II (12 credits)
GEOS8101	Engineering Geology and Geotechnical Design (6 credits)
GEOS8102	Rock Engineering and Geomaterials (6 credits)
GEOS8204	Basic Structural Mechanics and Behaviour (3 credits)
GEOS8205	Mathematics I (6 credits)
GEOS8206	Mathematics II (6 credits)

Fourteen of these courses are offered in the Engineering Geology with HKIE Approved Courses Theme of the MSc and eleven are offered in the Engineering Geology Theme.

More information of the programme is available on the HKU website and from the programme directors:

Professor Andrew W Malone at 2559 2555 or awmalone@hku.hk
 Professor L S Chan at 2859 8002 or chanls@hku.hk

Admission Requirements to the Geotechnical Discipline (Mature)

(Candidates must read this leaflet in conjunction with M3 Routes to Membership)

Candidates applying for the class of Member in the Geotechnical Discipline via the 'Mature' route must satisfy the requirements laid down in the Institution's Membership booklet: "M3 Routes to Membership", with the following supplementary provisions:

As part of the experience requirement specified in Section 6 of "M3", the candidate should normally have completed a 12-month period on site in the role of geotechnical engineer, of which at least six months should have been continuous full-time services resident on a construction site of a project of medium size. Not more than four months should have been supervision of ground investigations. All candidates should have some contract document preparation and contract administration experience.

**Notes on Professional Assessment for MHKIE(G) –
Basic Geotechnical Engineering Knowledge Requirements**

Candidates are expected to be conversant with basic principles and general knowledge related to geotechnical engineering as illustrated in Table 1. It must be stressed that the subjects listed should not be taken as exhaustive. Candidates should be able to explain geotechnical phenomena in terms of basic geotechnical engineering principles and how to apply theory to practice.

Candidates are expected to possess, in addition to basic geotechnical engineering knowledge, good professional knowledge and experience in the geotechnical area that they have worked on. A broad appreciation of other geotechnical areas would also be required. It is most important that candidates should demonstrate that they exercise original thought and judgment and not blindly work to rules. They should know the basic assumptions behind design methods and software and should be able to give technical explanations on the difference between design and actual performance of the geotechnical works.

Candidates should be able to express ideas in a well-organised, accurate and concise manner and to present technical arguments/explanations logically. They should demonstrate up-to-date knowledge of the latest development in geotechnical engineering.

Table 1 – Basic Geotechnical Engineering Knowledge Requirements

Area	Subject
Soil and rock mechanics	<ul style="list-style-type: none"> ● Principles of effective stress ● Stress analysis, Mohr circles of stress and strain, stress paths ● Soil behaviour in shear, compression and effect of groundwater pressure (seepage and consolidation) ● Groundwater flow, permeability and seepage ● Shear characteristics of discontinuities in rocks ● Measurement and presentation of characteristics of discontinuities in rocks
Engineering geology	<ul style="list-style-type: none"> ● Geological process and implications ● Engineering geology of Hong Kong rocks and soils ● Model approach and engineering geological input into geotechnical engineering applications
Geotechnical information and standards	<ul style="list-style-type: none"> ● Source of geotechnical information ● Knowledge of geotechnical standards in Hong Kong
Ground investigation	<ul style="list-style-type: none"> ● Scope of desk study and sources of information ● Planning and objectives of ground investigation ● Soil and rock descriptions ● Subsurface investigation and sampling techniques (trial excavation, drilling, coring and geophysics) ● Field tests and measurements ● Rock joint surveys and mapping ● Geotechnical instrumentation – groundwater, movements, strain and vibration measurements

Area	Subject
Laboratory testing	<ul style="list-style-type: none"> ● Soil classification and index properties ● Shear testing and soil behaviour – common types of testing methods (triaxial and shear box tests), measurements and analysis ● Consolidation testing
Geotechnical analysis and modelling	<ul style="list-style-type: none"> ● Calculation of settlement – application of elasticity and consolidation theory ● Methods of limit equilibrium – limiting earth pressures, limiting bearing capacity, infinite slope, method of slices and wedge analysis ● Steady state and transient seepage flows – flow nets, finite difference and finite element methods ● Physical and numerical modelling – theory and assumptions used

Prepared by Geotechnical Discipline Advisory Panel
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