THE GEOTECHNICAL INDUSTRIES POST- GRADUATE SPECIALISED AWARD (Revised 2014)

OUTLINE.

1. This Award is for those who already posses a degree. It recognises that those with the award have the basic skills needed for work in ground engineering; the skills that used to be imparted from the former Vocational degrees in Geology, coupled with in-house company training during the formative years of an employee in the profession.

*2. The Award is gained by submitting a file of work which demonstrates the possession of the skills that make up the Award; these are listed below. They take the form of **Core Skills** and **Elected Skills**. Evidence provided may be taken from work completed whilst in employment and supplemented, where that experience is lacking, with work provided by the teaching components of the Award.*

3. There is no minimum time limit for obtaining the Award once Registered.

4. Each skills set can be supported by face-to-face tutorial for those who feel their experience is lacking in some skill set; this would normally be provided via the web.

*5. To obtain the Award the skills in **each** of the Core Modules must be demonstrated **together with those of four** Electives, chosen to suite your work and experience.*

*6. The Award is won by defending your file of work **viva-voce** before two senior professionals of the industry.*

C1. BASIC FIELD SKILLS *(This module requires Field Work)*
Identification and description in the field of basic sedimentary, metamorphic and igneous rocks, and sediments ranging from cobbles to clay, and peat. How samples of rock and soil should be collected, labelled, transported and stored. How water levels are measured and the collection, storage and labelling of fluid samples. Measuring dip and strike, and other structural data, recording information in Field Notebooks, and justifying boundaries seen in the field and recorded on a map. *(See also Elective E5 which may be taken to augment this Module)*

C2. BASIC OFFICE SKILLS
The interpretation of geomorphological and geological maps as illustrated by carefully drawn vertical cross sections and sketches of the ground seen in 3D, at scales ranging from 1:50,000 to 1: 1,250 and a written description (<300 words) typed of each. The accurate superposition of BH data upon such vertical cross sections to its correct scale, showing both strata and waterlevels, and their relevant boundaries, and any relevant anthropological information such as waste, former ground works and buried services, and a

written description(<300 words) typed of each. At least one stereographic projection of bedding and at least 2 joint sets, or the equivalent in igneous rock, annotated and accompanied by a sketch of what the ground looks like in 3D.

C3. BASIC MECHANICS FOR SOILS AND ROCKS

The use by measurement and calculation of length, mass, and time to calculate weight, force and pressure derived from overburden and other sources, using typical data from a ground investigation. The resolution of forces and assessment of their magnitude by graphical solutions using force diagrams. The incorporation of sliding friction into the resistance to movement calculated from a force diagram. The incorporation of water pressure into the resistance to movement calculated from a force diagram. The calculation of moments and their balance about a point. Concepts of elasticity, strength, deformation, stress and strain as demonstrated by the plotting of test data and also by using Mohr circles. Plotting data from tests of permeability to illustrate and quantify the concept of conductivity.

C4. BASIC SOIL MECHANICS *(In addition to the specific skills listed below the module will also introduce aspects of common design and construction in soils; e.g. types of foundation, retaining walls, and relevant aspects of embankments and slopes, in-situ tests and instrumentation. Those not taking this module but simply submitting a file of work, will be expected to be able to converse with the examiners on these topics.)*

Total vertical stress and pore water pressure as calculated from BH data and its use for calculating vertical effective stress. Concept of effective stress in soils, its importance and use as demonstrated by plotting lab data in shear stress vs principal stress space (Mohr circles). Consolidation under increasing vertical load and rebound on unloading as demonstrated by plots from uniaxial consolidation tests; notes on the implication of consolidation and rebound for the calculation of horizontal stress. Residual strength as demonstrated by the plotting of data from shear strength tests and its implications for the choice of strength values for design.

C5. BASIC ROCK MECHANICS *(In addition to the specific skills listed below the module will also introduce aspects of common design and construction in rocks including in-situ tests and instrumentation. Those not taking this module but simply submitting a file of work, will be expected to be able to converse with the examiners on these topics.)*

Assessments of the anisotropy of discontinuity distribution made by the plotting of directional field data as provided by mapping and oriented BH core. Total vertical stress and pore water pressure as calculated from BH data and its use for calculating vertical effective stress. Concept of effective stress in rock, its importance and use as demonstrated by plotting lab data in shear stress vs principal stress space (Mohr circles). The elasticity and strength of isotropic specimens of rock as calculated from lab results, and their comparison with the behaviour of transversely anisotropic specimens. The shear strength of rock joints and bedding, with and without infilling, as determined by plotting lab results obtained under different levels of vertical normal stiffness. The stiffness of a rock mass and its likely in-situ stress as determined from plotting results from in-situ tests. Defining and identifying various shapes of rock volumes e.g. wedges, using stereographic projections, and illustrating these using sketches of how the ground so described would appear in 3D. Identifying volumes whose movement, as derived from such stereographic projections, is kinematically feasible.

C6. GROUNDWATER *(In addition to the specific skills listed below the module will also introduce common aspects of groundwater flow including the use of in-situ tests and instrumentation. Those not taking this module but simply submitting a file of work, will be expected to be able to converse with the examiners on these topics.)*
The measurement and interpretation of hydraulic head and its components, elevation head, pressure head and velocity head, and their representation as water levels in vertical profiles. The installation of piezometers and standpipes to provide the data needed. Plotting water levels to produce maps of water level change. The calculations required to obtain the direction and magnitude of an hydraulic gradient from field data, using graphical 3-point solutions. Calculations of groundwater flow with time, using values of hydraulic gradient and hydraulic conductivity. Identification of the hydrogeological boundaries, from BH data and geological maps, needed to constrain these calculations. The elements needed to sketch flow nets for assessing groundwater discharge. How water levels may be used to identify periods of steady and non-steady flow and the response of groundwater to rainfall.

E1. SURFACE HYDROLOGY
A quantitative understanding of the movement of water from precipitation to groundwater, obtained by calculating volumes of water received, lost and transferred to the ground within a catchment. Defining catchment boundaries and obtaining a water budget based on the quantitative measurement for components of the hydrological cycle, and understanding the services provided by the UK Meteorological Office. Plotting and assessing river hydrographs, interpreting the contributions to river flow from groundwater and linking groundwater to surface water. Assessment of recharge and infiltration to a specific site using the techniques outlined above.

E2. ENGINEERING & ENVIRONMENTAL GEOPHYSICS & MONITORING
(In addition to the specific skills listed below the module will also introduce common geophysical methods used at ground level and in BH's, instrumentation and monitoring. Those not taking this module but simply submitting a file of work, will be expected to be able to converse with the examiners on these topics.)
An overview of commonly used techniques, obtained from the qualitative interpretation of outputs from Ground Penetrating Radar, EM Ground Conductivity, Electrical Resistivity, Magnetics and Microgravity Surveying and Seismic Refraction, as obtained from green field and brown field sites, landfill and contaminated land. An appreciation of signal interpretation gained from identifying the first arrival of compression and shear waves, using graphical methods. The correlation between geophysical data, lithological and structural data, obtained from BH drilling and geophysical logging, by superimposing the

data from each. Using data from Seismic Surface Wave Profiling at a site to quantitatively assess the shear modulus of the ground at depth.

E3. CONCEPTS & TECHNIQUES FOR ENVIRONMENTAL IMPACT ASSESSMENTS

A practical and working understanding of the EIA process gained by defining objectives of such assessments and identifying relevant components of such assessments through worked examples. These will include demonstration of the screening, scoping, and consultations needed, together with the baseline data gathering, impact assessment and mitigation measures needed to assess residual impacts, and the Environmental Measurement Plan that results. From this comes the production of an Environmental Statement, a short example of which will be produced for your file. The role of EIAs within the UK planning process will be similarly demonstrated by worked examples.

E4. LABORATORY WORK WITH SOIL & ROCK

Familiarisation with the types of sample and protocols for sample preparation from inspection of samples recovered from the field. Appreciation of the tests for the classification and description of rock and soil, by inspection of the tests and personal notes, and sketches, which explain how the tests provide the description required, and the use of that description in a classification. Appreciation of types of tests of strength, deformation and conductivity from a knowledge of the loading and drainage arrangements provided by various test arrangements and an inspection of equipment, and illustrated with carefully drawn sketches of test equipment. Practice with the plotting of data from lab tests by deriving from the plotting from raw test data Moisture Content, Unit Weight, Liquid and Plastic Limits, Particle Size, Unconfined Compressive Strength, Young’s Modulus and Poison’s Ratio, Triaxial Shear Strength in terms of total and effective stresses, Shear Strength of smooth and rough sliding surfaces and the Coefficient of Permeability.

E5. FIELD WORK IN PRACTICAL FIELD GEOLOGY *(This requires Field Work)*

Producing geological maps of an area for the needs of a specified geotechnical problem, at scales appropriate to the problem and the geology and supporting this with cross sections and any other graphical displays (e.g. stereonets, rose diagrams etc) that help illustrate the relevant geology. Solid bedrock and Drift are both to be mapped together with groundwater and any Quaternary features of note. The map(s) are to be presented together with a satisfactory key to symbols and stratigraphical column which gives the vertical thickness of strata and stratigraphic position of unconformities. The whole exercise is to be illustrated further with sketches of the geology seen in 3D to illustrate a typed report (<1000 words) of the area. Your Field Notebook should also be included in the file of work to be examined.

E6. DESIGN OF GROUND INVESTIGATION

Familiarity with the design of a Ground Investigation will be demonstrated by the use of desk study and walk over information for a nominated project involving design and analyses, followed by excavation and construction.

Design of the ground investigation will demonstrate the use made of information provided to identify the geological make-up of the site (a conceptual model), its complexity and its relevance to the engineering in mind. It will further demonstrate the thoughtful use of investigation techniques to assess the extent to which the conceptual model for a site can be confirmed, and the sampling and testing needed to both cope with perceived unknowns and to obtain necessary design values. Monitoring should also be considered especially for groundwater. A procurement document should be written and a 500 word statement typed explaining the rational of the investigation and request for resources.