



## **Guideline on Teaching of Surveying**

### **Teaching of Surveying in JBM Accredited Degree Programmes**

#### **Context**

Geomatics is a discipline that integrates the collection, processing, analysis, presentation and management of spatial information. It is thus an all embracing term that includes the subjects of land surveying, setting-out, geodesy, photogrammetry, engineering surveying, hydrographic surveying, mine surveying and cartography together with the recently developed disciplines of geospatial information systems, remote sensing and terrestrial laser scanning.

The geomatics subjects most commonly taught as part of a JBM accredited degree programme include 'land surveying' and 'setting-out', commonly referred to collectively as 'engineering surveying' or simply 'Surveying', as will the remainder of this guideline.

The JBM has confirmed that Surveying continues to be a core component of its accredited programmes at both CEng and IEng level. For MEng and BEng(Hons) programmes there is an expectation that the fundamentals of Surveying are covered in a programme even when it is not one of the five core subjects. Surveying is a compulsory core unit for IEng degree programmes.

Surveying is one of a few subjects where practical skills are covered in a degree programme, developing both hands-on and team-working skills, and employers have an expectation that all student engineers and graduates will have a fundamental knowledge of the subject together with some practical competence.

The purpose of this guideline is to outline the typical coverage that the JBM would expect to see under the surveying subject heading of an accredited degree programme. Individual departments are obviously free to develop any of the geomatics subject areas to a level considered suitable for their own programmes.

#### **Aims**

Through their studies of Surveying in one or more modules, the JBM expects students to gain:

- an understanding of the significance and limitations of spatial information and dimensional control for civil engineering design and construction;
- an understanding of the means by which spatial information is collected, processed and used in practice; and
- theoretical knowledge and practical skills necessary for employment as a junior engineer involved with surveying or setting-out on a construction project.

#### **Knowledge and Understanding**

On successful completion of the module(s) students should have knowledge and a developing understanding of:

- the use of spatial information in design and construction projects;
- the means of obtaining spatial information including specification, procurement and administration of surveys;
- surveying instrumentation commonly used on construction projects;

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- basic techniques used for establishing survey control, undertaking detail surveys and setting-out;
- procedures for practical surveying and setting-out;
- observational and computational errors;
- the use of survey data in design practice including receipt, manipulation and checking of data prior to use;
- basic understanding of Global Navigation Satellite Systems (GNSS) and application to surveying and setting out;
- information and services provided by national mapping organisations (e.g. the Ordnance Survey);
- basics of coordinate systems, including local scale factors, and height datums, and;
- health and safety aspects in the context of surveying of sites/structures prior to construction and setting out on site. In particular, students should be able to appreciate the significant risks associated typically with previous use, state of repair, occupancy, etc, of existing buildings being surveyed and in the detection and tracing of underground utilities.

### **Intellectual Abilities**

On successful completion of the module(s) students should be able to:

- explain the principles and techniques involved in establishing control, detail surveying and setting-out on site;
- specify basic principles and methods used to measure spatial elements (i.e. coordinates, directions, distances, height differences);
- outline the nature of observational errors, apply variance propagation and recognise the benefits of least squares estimation;
- explain the role of standards and specifications in surveying and setting-out;
- perform relevant survey calculations;
- explain the use of spatial information in design and construction projects; and
- outline the means of obtaining spatial information in practice.

### **Practical Skills**

On successful completion of the module(s) students should be able to:

- demonstrate practical skills necessary to use surveying instruments commonly employed on construction projects for surveying and setting-out;
- use relevant data processing and survey adjustment software;
- present field records and derived data in a clear professional manner; and
- use survey data effectively in design work.

### **General Transferable Skills**

On successful completion of the module(s) students should be able to:

- work as a team member;
- solve technical problems using numerical methods, and
- present technical information in a variety of ways (oral, written, graphical).

### **Method of Teaching, Learning and Assessment**

Delivery of the module(s) should preferably be through a mixture of lectures, tutorials and practical work. The practical aspect of the module(s) is considered important because the field environment accelerates development of both subject and transferable skills and should be through regular practical sessions and/or (preferably) a residential field course.