

## CE112 SURVEYING

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**Lecturer:** Dr W.Y. Ochieng (WYO)

**Structure:** 14 hours of lectures, tutorials & practicals with associated coursework plus a 6-day compulsory residential field course

**Links:** Highway Engineering (CE312); Engineering Geomatics (CE313)

### **Aims**


To equip First Year Civil and Environmental Engineering students with the basic surveying techniques required for civil and environmental engineering projects. Lectures supplemented by practicals and tutorials will provide the necessary skills required for the residential survey field course to be held over two sessions, 19/03/05 to 24/03/05 (inclusive) (Weeks 24-25) and 30/03/05 to 04/04/05 (inclusive) (Weeks 26-27)

### **SYLLABUS**

#### Introduction to surveying (2 hours)

Definition; branches of surveying; basic principles of surveying; methods used in surveying and instrumentation; co-ordinate systems; errors in surveying; recent advances in surveying, navigation and geo-informatics particularly satellite positioning systems and geographical information systems.

#### Conventional survey methods (2 hours)

Instruments for ection (angle) and horizontal distance measurements, particularly the theodolite, the tape and EDM; establishment of horizontal control for civil engineering surveying concentrating on traversing; detail surveying techniques including radiation methods and setting out.

#### Levelling (2 hours)

Definition, objectives and concepts; levelling instrumentation; levelling techniques and procedure; levelling observation reduction and computation; errors in levelling and their compensation techniques; uses of levelling in civil engineering including setting out, sectioning and contouring.

#### Areas and volumes (2 hours)

Area and volume determination for civil engineering earthworks; areas enclosed by straight lines; areas enclosed by irregular lines; volumes from cross-sections, contours and spot heights.

#### Introduction to the Field Course (2 hours)

Objectives; logistics, safety, environmental and legal issues; high level review of the surveying process for road construction including recce, planning, control, detail mapping, map/plan compilation, environmental appraisal, alignment design, sectioning, earthworks and setting out.

#### Practicals and Tutorials (6 hours)

Practical and tutorial sessions aimed at familiarisation with the basic surveying equipment will also be run to supplement the lectures. Two practical sessions will be

run on *traversing* and *levelling*. A special session introducing students to the survey field course will also be run. Students are reminded also that they must comply with all safety requirements during field work sessions. Details are given in the Field Course Specification Document (FCSD) issued shortly before the start of the module.

### Coursework and submission dates

Two coursework assignments will be given to assess the understanding of the lectures. This must be returned completed and any matters arising resolved before the start of the field course.

- Exercise 1 on basic principles of surveying, role of the surveyor in civil engineering and recent developments in surveying. (*Workload = 6 hours; Submission date = 17/03/2005 (week 24); Assessment = Maximum 5 points*)
- Exercise 2 on control survey methods, detail survey methods and levelling. (*Workload = 8 hours; Submission date = 17/03/2005 (week 24); Assessment = Maximum 5 points*).
- Exercise 3 on Field Course (see below) (*Workload = 50 hours; Submission dates = 24/03/2005 (week 25) for session I and 04/04/2005 (week 27) for session II; Assessment = Maximum 25 points*).

### Field Course (6 days)

The field course normally takes place at the Imperial College Field Station, Silwood Park, near Ascot. The cost of accommodation and subsistence which the students are expected to bear is estimated at £200, payable prior to departure to Silwood Park.

The main task of the 6-day residential surveying field course is the setting out of a new road. It integrates practical exercises carried out in small teams including traversing, a simple GPS survey, levelling, detail surveying by radiation methods, plan compilation and drawing, alignment design, setting out of the road, sectioning and determination of the quantity of earthworks. The submissions in the form of booking sheets, earthwork computations, site plan etc will form part of the coursework assessment. Details of the field course will be given in the FCSD).

### Assessment

Coursework assignments and Field Course contribute to a maximum of 35 points.

### Recommended Textbooks/Reading

BANNISTER A and RAYMOND S. Surveying. *Longman Scientific & Technical, Latest Edition.*

UREN and PRICE. Surveying for Engineers. *Macmillan, Latest Edition.*

IRVINE W. 1995. Surveying for construction. *MacGraw-Hill Book Company, 4<sup>th</sup> edition.*

SEEBER G. 1993. Satellite Geodesy-Foundations, Methods and Applications. *Walter de Gruyter.*

### Learning Outcomes

At the end of the module a student should be able to:

- appreciate the role of the engineering surveyor in the civil engineering industry
- plan and execute a topographical survey for engineering development;
- plan, design and set out engineering works;
- manage, organise and execute a given task to meet specifications within a strict deadline;
- work in groups.