**3A1 Engineering Surveying** [5 credits]

**Lecturers:** Asst. Prof. John Gallagher [j.gallagher@tcd.ie] Module Coordinator  
Asst. Prof. Niamh Harty [niamh.harty@tcd.ie]

**Module organization**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Start week</th>
<th>End week</th>
<th>Associated practical hours</th>
<th>Lectures</th>
<th>Tutorials</th>
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<td>Per week</td>
<td>Total</td>
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<tr>
<td>2</td>
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<td>12</td>
<td>24</td>
<td>3</td>
<td>33</td>
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<td>9</td>
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**Total contact hours: 66**

**Module description, aims and contribution to programme**

Engineering surveying is a single semester module that will help you gain a foundation understanding of the principles of surveying, intermediate knowledge of the methods and procedures used on site, and hands-on familiarity with a full range of surveying instruments and equipment.

This module will give students the ability to design and manage surveying projects in a wide range of contexts and environments. Students will gain an appreciation of the importance of accuracy and precision when translating detailed plans when setting out any civil engineering project. This will include addressing the challenges faced for surveyors working in different construction environments, and consider the impact of design changes during project development.

This practical work will be grounded by mathematical theory of analyzing for possible errors that may occur in both surveying instrumentation and the methods used.

**Learning outcomes**

On completion of this module the student will be able to:

1. Design and organize a survey, including estimation of probable errors
2. Carry out reconnaissance of an area to establish best possible methods to be used
3. Perform instrument checks to ensure they meet specifications
4. Carry out basic and advanced surveying techniques (levelling, total station and GPS)
5. Map and set out survey coordinates using GIS software
6. Analyse, report and where appropriate distribute the survey errors

**Module content**

The module covers the following topics

- Linear Measurement
- Angular Measurement
- Setting Out
- Horizontal & Vertical Curves
- Levelling
- Total Stations
- Global Positioning System (GPS)
- Geographical Information Systems (GIS)
Teaching strategies

During the practicals the students work in teams to carry out basic engineering tasks that would be encountered in a surveying team. These tasks are designed to enable hands-on work with the range of surveying equipment and accessories covered during the lectures:

- Automatic Levels: Level survey
- Totals Stations: Total station traverse, detail survey
- Global Positioning System (GPS): Using a GPS to conduct a survey
- Geographical Information System (GIS) assignments

Each practical requires submission of a report containing tabular result, sketch, error reporting, and commentary on the methods used.

Assessment

The assessment for this module will consist four parts:
Pt.1: The written exam comprises 50% of the year assessment.

Pt.2: Two computer laboratory assessments using ArcGIS software to develop your geographical information systems (GIS) skills. The two assessments will contribute to 10% of your final module grade.

Pt.3: Three basic practical demonstrations contributing towards 15% of the final module grade. This will provide the fundamental skillset in using automatic level, total station and GPS surveying equipment. A report will be written and submitted to demonstrate your understanding of each practical and professional writing skills.

Pt.4: Three advanced practical demonstrations in Phoenix Park to apply your knowledge of the automatic level, total station and GPS surveying equipment in examples of real-world survey projects. This may include designing and preparing a road section for a pipe installation, realigning or widening road section including cut/fill requirements and setting out a building/structure on a site. The reports should be supported with GIS maps, CAD drawings and other illustrations. These assignments will contribute towards 30% of the overall module grade.

1 Each report should, at a minimum, include sections on (i) the scope and purpose of the practical, (ii) results and analysis, and (iii) conclusions. They should be supported with graphical illustrations throughout the reports that relate to practical preparations, methodology and results.

Required/relevant textbooks

*Uren & Price*, Surveying for Engineers, Palgrave Publishing


*Banister, Raymond & Baker*, Surveying, Longman Publishing

*Wolf & Ghilani*, Elementary Surveying, Prentice Hall Publishing

Further information

https://www.tcd.ie/Engineering/