

## **CE7C05: C5 – Spatial Analysis Using GIS [5 credits]**

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### **Module organisation**

Department of Civil, Structural and Environmental Engineering

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

The aims of the module are:

1. To foster problem solving and critical thinking skills among the MSc and MAI Engineering students, by requiring students to apply the theory learnt as part of the MSc programme to real life projects and engage in discussions with the other experts.
2. To enable students to communicate well in engineering contexts, both when talking about projects, plans and problems, and when writing about these.
3. To achieve a pro-active engagement in built environment problems and spatial analysis, through live project work in and around Dublin.
4. To enable students to identify, formulate, analyse and solve engineering problems by applying the theory and employing GIS software packages and its advanced extensions learnt as part of the module.
5. To solve real world engineering problems as well as to analyse relevant data by exploring spatial patterns.

### **Learning outcomes**

Upon completion of the module, the student will be capable of:

1. Solving Spatial Analysis problems by applying interdisciplinary approaches.
2. Discussing and debating solutions to problems in the environment.
3. Communicating effectively in technical and scientific writing, and presenting scientific/technical ideas concisely to a technical audience that may not be expert in the specific domain of the presentation.
4. Implement technical knowledge to address a spatial analysis problem.
5. Be able to identify and use appropriate mathematical methods, numerical techniques and GIS tools for application to new and ill-defined spatial analysis problems.
6. Have the ability to consult and work with experts in various fields in the realisation of a product or system.
7. Have knowledge and understanding of concepts from a range of areas outside engineering.
8. Be able to describe succinctly, the relevant advantages and disadvantages of various technologies to a lay audience, and to communicate effectively in public.

## Module content

This module introduces students to the framework and methods used in real-life problems related to the field of Spatial Analysis by applying the theoretical knowledge gathered during the module to live project work. The module seeks to impart the necessary skills and knowledge to enable graduates to engage as team members and leaders in the types of large and complex sustainable environment projects that are increasingly being planned across the world.

It aims to help fill a major and increasingly obvious skills gap. A unique feature of this module is the use of Dublin and Ireland as learning laboratory, where the students will take responsibility of a real-life project. The introduction to Advanced Spatial Analysis using GIS module is designed to introduce the student to spatial analysis using a Geographic Information Systems (GIS) platform and guide him/her through the learning process of advanced ArcGIS extensions dedicated to network analysis, spatial data mining and environmental phenomena modelling.

- Introduction – outline of the module and its milestones.
- Allocation of the projects.
- Ad-hoc tutorials and guest lectures, to be defined in line with the proposed projects.
- GIS and Spatial analysis theory and practical applications.
- Project completion in accordance to relevant standards and best practice.
- Reports, executive summaries and presentations.

## Teaching strategies

- Problem based learning.
- Guest lectures.
- Tutorials.
- Interim presentations and discussions.

## Assessment

The assessment for this module is made of the following components:

- Personal project (worth 90%);
- Interim and final presentations (worth 5% each);

Students are required to present their achievements at the project half way point. This presentation will comprise an executive summary, a clear statement of the objectives of the project, a report on the current situation with discussion on the necessity of the intervention and its foreseen impacts, a report on the progress made to date and a work plan for completion.

Students are required to complete a report based upon the work conducted for the project. The report should be approximately 6,000/7,000 words. Students will be provided with detailed guidance on writing the report. When all project work has been completed and the report submitted students are required to present and defend their project to members of the academic staff, three of whom will act as assessors. The students are assessed on the presentation quality and style, technical understanding, progress and evidence of organisation and planning.

**Required textbook**

A list of recommended reading materials, standards, manuals, best practice documents is provided in the introduction section of the module. Each list is relevant to each specific project.

**Further information**

School of Engineering weblink.