

Geographic Information Systems

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Module Description

A Geographical Information System (GIS) is a computer system designed to facilitate the collection, management, and analysis of large volumes of geographical knowledge. This module will focus on the fundamental principles of GIS, the practical techniques of implementing a GIS and the creation and use of a GIS for spatial analysis.

Module Aims

The aim of this module is to take students from no prior knowledge of GIS to a position where they (i) understand the role and current state of the art in Geographical Information Systems, (ii) can analyse a problem in GIS and build an appropriate solution and (iii) are familiar with the basic techniques of spatial analysis and modelling.

Learning Outcomes 1

On completion of this module, the successful learner will be able to:

1. Understand the role of GIS and its application in solving practical problems.
2. Understand how geographic data is represented in a computer.
3. Understand the unique character of geographic data and how this is mapped to the real world.
4. Be able to confidently use the market-leading commercial GIS package.

Learning Outcomes 2

5. Understand the rudiments of spatial databases and when and where to use database technology.
6. Understand how GI data is created and acquired and be aware of possible sources of data.
7. Understand the art and science of cartography and map design.
8. Solve problems in spatial analysis especially in the areas of visualization, query/measurement and design/modelling.

Module content

The module content will include the following topics. Material may be added to or deleted from this list over the lifetime of the module to reflect the changing nature of the relevant technologies.

Principles

Introduction to GIS and its applications.

Representing geography and the nature of geographic data.

Georeferencing.

The notion of uncertainty in GI data.

Techniques

GIS software.

GIS data collection.

Creating and managing GI data.

Introduction to distributed and web GIS.

Analysis

Cartography and map production.

Visualization of GI data.

Query and measurement

Data summary and inference

Introduction to spatial modelling

There will be also be hands-on work with the leading GIS software packages and students will apply the course material to practical problems and case studies.

Assessment

The methods of assessment to be used to measure the learning objectives stated above are written examination and continuous assessment including one or more of assignment, essay, problem-solving exercise, oral presentation, and class or lab tests.

Continuous Assessment is worth 50%. Examination is worth 50%. The written examination takes place at the end of Semester 1.

Reading List

Main Text

An Introduction to Geographic Information Systems
The course text is Ian Heywood, Sarah Cornelius, Steve Carver, An Introduction to Geographical Information Systems, 4th ed.; Prentice Hall, 2011; ISBN: 9780273722595.

ArcGIS

Practical hands-on experience using GIS software will be provided through the use of ArcGIS from ESRI.

Supplementary Reading

Extra material in Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, Geographic Information Systems and Science, 3rd ed.; Wiley, 2010; ISBN: 978-0-470-72144-5.

We will also be using some material from Kang-tsung Chang, Introduction to Geographic Information Systems, 5th ed.; McGraw Hill, 2009; ISBN: 978-007-126758-8.

There is some additional material in Michael de Smith, Michael F. Goodchild and Paul A. Longley, Geospatial Analysis - a comprehensive guide, 2nd ed.; Winchelsea, 2007; ISBN: 978-1906221-980.

Additional material of interest can be found in Shashi Shekhar & Sanjay Chawla, Spatial Databases: A Tour; Prentice Hall, 2003; ISBN: 0-130-17480-7.