

ENVIRONMENT DEPARTMENT

Module title: Spatial Analysis

Lecturers: Dr Colin McClean

MAC module code: 2580032

Weighting: 10 credits

Status: Optional

Pre-requisites: None.

Student Workload:

Contact hours: Practicals - 25

Private study: 75 hours

Total: 100 hours

Assessment:

A project using ArcGIS will be set in Week 3. This should be handed into the Environment Department Office by Monday 21st December 2009. This will contribute 100% of the final module mark.

Module summary:

Most environmental problems have a spatial dimension. Plant and animal species, as well as the ecosystems they form, all have their own geographical or spatial ranges over which they are found. Similarly, different types of human economic activity are distributed about the globe in different spatial patterns. The resulting sources and flows of environmental pollutants, as well as patterns of environmental change and damage, are also distributed unevenly through space over a continuum of scales. Spatial analysis allows spatial data, such as these, to be handled and analysed using computers. Today, this is predominantly achieved by using Geographical Information Systems (GIS). This has many advantages over the static representations provided by traditional paper maps.

This module introduces participants to the approaches and tools provided by GIS. To achieve the learning outcomes of the module computer practicals will be used. Introductions to the practicals will introduce the necessary theory. The main practical sessions using the ArcGIS software will ensure participants gain hands-on experience of a real system. This will enable them to tackle a small spatial analysis problem of their own. This practical experience, as well as the theory taught during the module, should allow students to engage with the scientific literature that reports the results of applying GIS and more advanced spatial analysis techniques to environmental issues.

Aims:

This module aims to:

- Introduce participants to spatial analysis using GIS software
- Introduce the theoretical problems associated with capturing, handling and analysing spatial data
- Explore these issues through the practical use of ArcGIS, a widely used commercially available GIS software package.

Learning outcomes:

Successful participants will be able to:

- Appreciate the nature of spatial data types
- Perform a basic spatial analysis of environmental data using ArcGIS
- Interpret the scientific literature that applies spatial analysis and GIS techniques

Synopsis:

Week 2

Practical 1

⇒ Introduction to GIS and ArcGIS.

Practical 2

⇒ Vector data overlay and proximity analysis

Week 3

Practical 3

⇒ Getting data into a system and spatial interpolation

Week 4

Practical 4

⇒ Using raster data - Spatial analyst and Grid

Week 5

Practical 5

⇒ More raster data handling and digital terrain modelling

Week 6

Practical 6

⇒ Working with raster surfaces

Week 8

Practical 7

⇒ Using networks in ArcGIS.

Week 9

Practical

⇒ Project help session

Week 10

Practical

⇒ Project help session

Recommended reading:

Core texts:

Burrough, P.A. and McDonnell, R.A. (1998) *Principles of Geographical Information Systems*. Oxford University Press.

Jones, C.B. (1997) *Geographical Information Systems and Computer Cartography*. Longman, Harlow.

Additional texts:

Chomitz, K.M. and Gray, D.A. (1996) Roads, Land Use and Deforestation: A Spatial Model Applied to Belize. *The World Bank Economic Review*, v. 10, n.3, pp. 487-512

de Smith, M., Goodchild, M.F. & Longley, P. (2008) *Geospatial Analysis - a comprehensive guide*. 2nd edition – <http://www.spatialanalysisonline.com/output/>

Fotheringham, A.S., Brundson, C. and Charlton, M. (2000) *Quantitative Geography: Perspectives on Spatial Data Analysis*. Sage, London.

Geoghegan, J., Wainger, L.A. and Bockstael, N.E. (1997) Spatial landscape indices in a hedonic framework: an ecological economics analysis using GIS. *Ecological Economics* v.23, n.3, pp.251-264

Goodchild, M.F., Steyart, L.I. And Parks, B.O. (1993) *Environmental Modelling with GIS*. Oxford University Press.

Lam, N.S. (1983) “Spatial Interpolation Methods: a review” *The American Cartographer*, v.10, n. 2, pp. 129-149

Marble, D.F.and Peuquet, D. (1990) *Introductory readings in geographic information systems*. Taylor & Frances, London.

Martin, D. (1995) *Geographic information systems: socioeconomic applications*. Routledge, London.

Peuquet, D.J. (1990) “A conceptual framework and comparison of spatial data models.” In: Marble, D.F. and Peuquet, D.J. (Eds) *Introductory readings in geographical Information Systems*. Taylor & Francis, London.

Useful web link:

The National Center for Geographic Information and Analysis
<http://www.ncgia.ucsb.edu/>