



FACULTY OF SCIENCE

SCHOOL OF BEES

GEOS3821

GEOGRAPHIC DATA ANALYSIS

AND

GEOS9017

Advanced GIS

T1, 2022

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3. Course details

[Course Description](#)²
(Handbook Entry)

GEOS3821:

The field of Geographic Information Systems has expanded considerably over the past decade and the world has become very much richer in digital geographic information. Vast amounts of geographic data are routinely collected, with approximately 80% of all data collected having geographic attributes. This course explores a toolbox of conceptual approaches and methods to model and analyse a range of highly complex, often non-deterministic, geographic problems. It explores a true enabling technology for the natural sciences in addition to a rich source of computational and representational challenges for the computer sciences. This course emphasises a range of GIS and spatial data analysis approaches via a disparate selection of real-world applications.

GEOS9017:

Geographic information systems have improved considerably over the past decade in response to a world that has become very much richer in digital geographic information. The requirement to build complex applications and simulations has become more urgent with the need to plan for a changing climate, to feed an increasing population and to provide pinpoint marketing analysis for business. This course explores a toolbox of conceptual approaches and methods to model and analyse a range of highly complex, often non-deterministic problems. It provides a true enabling technology for the natural sciences and a rich source of computational and representational challenges for the computer sciences. Topics covered include spatial dynamic spatio-temporal modelling; geostatistics; error analysis and data accuracy; network analysis; and machine learning and artificial intelligence methods in GIS.

Graduate Attributes Developed in this Course

Science Graduate Attributes

FOCUS
0 = NO FOCUS
1 = MINIMAL
2 = MINOR
3 = MAJOR

Activities / Assessment

| | | |
|---|---|---|
| 1. Research, inquiry and analytical thinking abilities | 3 | All will be achieved through the main project |
| 2. Capability and motivation for intellectual development | 3 | |
| 3. Ethical, social and professional understanding | 1 | |
| 4. Communication | 2 | |
| 5. Teamwork, collaborative and management skills | 3 | |
| 6. Information literacy | 3 | |

Major Topics (Syllabus Outline)

See the lecture sequence

Relationship to Other Courses within the Program

This course explores the application of advanced conceptual approaches and techniques to model and analyse a range of highly complex, often non-deterministic spatial problems. Such approaches are essential for the modern study of many different components of the environmental and geosciences. It provides examples of what can be done using such spatial data, as well as a grounding in how to effectively use such data.

4. Rationale and strategies underpinning the course

Rationale for learning and teaching in this course – How this course is taught

Spatial analysis is technical in nature, in that one needs to use software to achieve one's aims. However, this course is not about teaching software. It is about the principles of GI Science and spatial analysis (software changes rapidly while principles do not).

There are three elements that you should use for learning in the course. The textbooks provide an overview of the subject, and are a key reference source. In the case of the software, there are detailed online manuals that

**Access to the
lecturer**

I am available immediately after lectures, and the labs are devoted to the major project. If you encounter a problem outside of the scheduled contact periods, then what you should do depends on the nature of the problem.

If your problem is conceptual then please contact me by email or telephone to arrange a time to discuss it. I often have other meetings or am away from the university, so this will save you long periods of waiting around or trying to find me. Please provide a short summary of the area

5. Course schedule

| Week | Lectures & topics | Labs | Assignment and Submission dates |
|------|--|---|---------------------------------|
| 1 | 1. Course introduction and overview 2. Spatial analysis concepts: Local & global; autocorrelation, dependence, structure; MAUP; geographic neighbourhoods | Explore data sets and select which you will use for the course. Try some initial analyses. <i>Tuesday only</i> | |
| 2 | Univariate spatial analysis of continuous field data 6. Local: G_i^* hotspots, Moran's I_{autm} | t qt | |

6. Additional r

7. Required Equipment, Training and Enabling Skills

Required equipment Provided in the computer labs.

**Enabling skills -
training which may be
required to complete
this course** Working knowledge of ArcGIS Desktop or ArcGIS Pro.

8.

10. Administrative Matters

Expectations of Students

You are expected to attend all lectures and laboratories. All assessable items are compulsory.

Assignment Submissions

Assignments are to be submitted using the Moodle assignment submission system. Extensions will not be granted unless supported by documentation (e.g.

11. UNSW Academic Honesty and Plagiarism

available to UNSW Staff and students. See <http://www.it.unsw.edu.au>. You can also consider the Mendeley or Zotero packages (<http://www.mendeley.com>; <https://www.zotero.org>). Learning how to use such software will make writing assignments considerably easier, and will solve most of your problems with building referencing lists (providing your database is correct). Most journal web sites also now support the direct export of citations into reference management software.