

## Course Outline

**Code: ENS253**

### **Title: An Introduction to Geographic Information Science and Technology**

<b>School:</b>	Science & Engineering
<b>Teaching Session:</b>	Semester 1
<b>Year:</b>	2019
<b>Course Coordinator:</b>	Dr Sanjeev Kumar Srivastava Tel: 07 54594819 Email: <a href="mailto:ssrivast@usc.edu.au">ssrivast@usc.edu.au</a>
<b>Course Moderator:</b>	Dr Mohammad Reza Ghaffariyan Email: <a href="mailto:mghaffar@usc.edu.au">mghaffar@usc.edu.au</a>

Please go to the USC website for up to date information on the teaching sessions and campuses where this course is usually offered

#### **1. What is this course about?**

##### **1.1 Description**

Geographic information systems (GIS)—are applied in diverse multidisciplinary settings and GIS skills are highly sought after in the job market. This course will include all three aspects of GIS: theories covering the science behind GIS technology; the technology in the form of software; and its applications to the real-world using geospatial analysis. On completion, you will acquire GIS knowledge and skills that can be applied in your respective discipline areas. Furthermore, the course will lead into an advanced GIS course.

##### **1.2 Course topics**

The course will cover following GIS topics:

- Introduction to geographical information science and technology and its history
- Geographic representation with GIS data models
- Metadata
- Conventional and GIS maps
- Map-scale for conventional maps and GIS maps
- Coordinate systems and geodetic datum types
- Cartography and geographic representation
- GIS data creation and collection
- Vector and raster based GIS analysis
- GIS attributes and geospatial query
- Geospatial analysis to address real-world issues
- Spatial interpolations
- Future of GIS and advanced GIS applications

#### **2. What level is this course?**

200 level Developing - Applying broad and/or deep knowledge and skills to new contexts. May require pre-requisites and introductory level knowledge/skills. Normally undertaken in the 2nd or 3rd year of an undergraduate program

**3. What is the unit value of this course?**

12 units

**4. How does this course contribute to my learning?**

<b>Specific Learning Outcomes</b> On successful completion of this course, you should be able to:	<b>Assessment tasks</b> You will be assessed on the learning outcomes in task/s:	<b>Graduate Qualities or Professional Standards mapping</b> Completing these tasks successfully will contribute to you becoming:
Critically identify and use geospatial data and geospatial techniques to address different real world issues	1, 2, and 3	Creative and critical thinkers.
Apply GIS tools and technique to address a real-world issue	1 and 2	Empowered.
Demonstrate spatial thinking	1, 2, and 3	Empowered.
Communicate geospatial discourse in different discipline specific contexts	2 and 3	Empowered.

**5. Am I eligible to enrol in this course?**Refer to the [USC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.**5.1 Enrolment Restrictions**

Nil

**5.2 Pre-requisites**

Nil

**5.3 Co-requisites**

Nil

**5.4 Anti-requisites**

Nil

**5.5 Specific assumed prior knowledge and skills (where applicable)**

Basic knowledge of computer operation.

**6. How am I going to be assessed?****6.1 Grading scale**

Standard – High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL)

**6.2 Assessment Tasks**

Task No.	Assessment Tasks	Individual or Group	Weighting	What is the duration / length?	When should I submit?	Where should I submit it?
1	Activities and group discussions on GIS data sets, map scale and coordinate systems	Individual Group	30%	Activities involving map-scale, sketch, scanning, georeferencing, and assigning metadata and coordinate system, and group discussions	Week 8 Parts of this task has to be submitted during Weeks 2, 3, 4, 6 and 8 for formative feedback	Blackboard Weeks 2, 3 and 6 activities will be submitted to instructor during the lecture
2	Real-world application of GIS while integrating your disciplinary knowledge	Individual	40 %	Assignment proposal and final 2000 words report with maps and metadata	Week 7 and 13	Blackboard
3	Final exam	Individual	30	Objective and short answer questions	Week 12	During week 12 lecture
			100%			

**Assessment Task 1: Activities and group discussions on GIS data sets, map-scale and coordinate systems**

<b>Goal:</b>	This task is designed to develop your spatial thinking as you go through the interrelated steps of translating a hand drawn map into a final and complete GIS data set, separate activity on map-scale, and group discussions on coordinate systems. These activities will span several teaching weeks and will involve the creation of different elements that will be given formative feedback and will be marked with the final product which will be a complete GIS data set with well-defined coordinate system and metadata. The group discussions on coordinate systems will be held during week 6 lectures and will continue on the Blackboard.
<b>Product:</b>	Complete GIS data sets with metadata and well-defined coordinate system. Group discussion sheets prepared during week 6 lecture and further discussed on the Blackboard.
<b>Format:</b>	The final GIS data set, activity sheets and group discussion sheet
<b>Criteria:</b>	You will be assessed on: <ul style="list-style-type: none"> <li>• Understanding of map-scale</li> <li>• Cartographical quality of the submitted map</li> <li>• Georeferencing of the map</li> <li>• Metadata</li> <li>• Defining coordinate system and datum</li> <li>• Response to formative feedback on previously submitted elements</li> <li>• Knowledge on coordinate systems</li> </ul>
<b>Generic skill assessed</b>	<b>Skill assessment level</b>
Information literacy	Developing
Applying technologies	Developing

**Assessment Task 2: GIS in your Discipline**

<b>Goal:</b>	This is a major project where you will use all of your previous learning and apply it to a real-world context/issue for your discipline. You will produce a proposal, identification of a problem, data sets and map for feedback and then use that information to perform GIS analysis and subsequently preparing a report.	
<b>Product:</b>	GIS analysis and related elements	
<b>Format:</b>	Details for this project will be on Blackboard and discussed in tutorials	
<b>Criteria:</b>	You will be assessed on: <ul style="list-style-type: none"> <li>• Use of geospatial data and geospatial techniques</li> <li>• Application of GIS tools</li> <li>• Spatial Thinking</li> <li>• Use of geospatial discourse</li> <li>• Response to formative feedback on previously submitted elements</li> </ul>	
<b>Generic skill assessed</b>		<b>Skill assessment level</b>
Organisation		Developing
Problem solving		Developing

**Assessment Task 3: Exams**

<b>Goal:</b>	This assessment task will facilitate your learning of science behind GIS, spatial thinking and critical use of geospatial data and analysis tools.	
<b>Product:</b>	Exams during week 12 lecture	
<b>Format:</b>	A combination of multiple-choice questions, and short-answer questions	
<b>Criteria:</b>	You will be evaluated on: <ul style="list-style-type: none"> <li>• Your understanding of geographical information science and technology terms, concepts and its appropriate uses</li> </ul>	
<b>Generic skill assessed</b>		<b>Skill assessment level</b>
Information literacy		Developing
Applying technologies		Developing

**7. What are the course activities?****7.1 Directed Study Hours**

PER WEEK:

- 2 hr lecture
- 2 hr computer laboratory tutorial

**7.2 Teaching Semester/Session(s) Offered**

Sippy Downs: Semester 1

**7.3 Course content**

Teaching Week / Module	What key concepts /content will I learn?	What activities will I engage in to learn the concepts/content?	
		Directed Study Activities	Independent Study Activities
1	Introduction to GIS and its evolution	Lecture on course objectives and structure, Introduction to geographical information systems (GIS), and its evolution. Tutorials on: Introduction to Windows XP and ArcGIS, ArcGIS Explorer and Google Earth software. Exposure to learning resources	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
2	Maps and GIS	Lecture on conventional map, its types and its comparison with GIS maps Tutorial on creating a map document and exploring GIS map	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
3	Map scale and data quality	Lecture on map scale and geographic data quality. Tutorial on map scale and data quality using real-world examples.	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
4	Geographic communication	Lecture on geographic communication. Tutorials on producing cartographic quality maps using appropriate map layout, colour combination, text, and symbols.	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
5	Geographic representation	Lecture geographic representation using data models. Lecture on metadata and its significance. Tutorial on understanding digital geographic representation and metadata.	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
6	Geodetic datum types and coordinate systems	This will be a flipped class where lecture recording as well as materials on geodetic datums and coordinate systems will be provided before the lecture. The discussions will be held in the Visualisation and Collaboration studio. In this week 3d simulations of GIS data models will occur in a fully immersive environment. We believe that using this immersive technology will enhance and support your understanding of key GIS concepts. Tutorials on datums and coordinate systems.	Lecture recordings, book chapters specified in the lecture notes and participation in BlackBoard's discussion board
7	GIS data creation and search	Lecture on GIS data creation and search. Tutorial on creating GIS datasets and their search on the web.	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
8	GIS analysis 1	Lectures on vector-based GIS analysis. Tutorial on vector-based GIS analysis	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board

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9	GIS analysis 2	Lectures on raster-based GIS analysis. Tutorial on raster-based GIS analysis	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
10	Attribute information in GIS data and queries	Lecture and tutorial on GIS attribute table and spatial query	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
11	Spatial interpolation and geospatial analysis to address real-world issues	Lecture on geospatial analysis with real-world examples Tutorial on geospatial analysis. and spatial interpolations	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
12	Examination	Examination and geospatial analysis tutorials	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board
13	Advanced GIS	Lecture and tutorial on advanced GIS analysis and 3d visualisation	Book chapters specified in the lecture notes and participation in BlackBoard's discussion board

Please note that the course activities may be subject to variation.

## 8. What resources do I need to undertake this course?

Please note that course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Blackboard site. Please log in as soon as possible.

### 8.1 Prescribed Text(s)

Please note that you need to have regular access to the resource(s) listed below as they are required:

Author	Year	Title	Publisher
Longley P., Goodchild, F. M., Maguire, D. & Rhind, D.	2015	Geographic information systems and science 4 <sup>th</sup> Edition.	John Wiley & Sons, New Jersey.

### 8.2 Required and Recommended Readings

Author	Year	Title	Publisher
Burrough P. A., McDonnell, R. A. & Lloyd, C. D.	2015	Principles of geographical information systems	Glasgow: Oxford University Press
Jensen J. & Jensen, R.	2013	Introductory Geographic Information Systems	Glenview: Pearson Education Inc
Chang K.	2010	Introduction to Geographic information systems	New York: McGraw-Hill College
Clarke K. C.	2010	Getting Started with Geographic Information Systems	New Jersey: Prentice Hall
DeMers M.	2009	Fundamentals of Geographical Information Systems	New York: John Wiley & Sons
Heywood D. I., Cornelius, S. & Carver, S.	2011	An introduction to geographical information systems	Harlow: Pearson Education Limited
Slocum T. A., McMaster, R. B., Kessler, F. C. & Howard, H. H.	2013	Thematic cartography and geovisualization	Upper Saddle River: Pearson/Prentice Hall

### 8.3 Specific Requirements

Students must purchase the tutorial manual from the Reprographics and Print Services. PDF version will be available on the Blackboard. A free copy of students' version of ArcGIS will be provided for installation of the software on home computer.

## 9. Risk management

Health and safety risks for this course have been assessed as low.

It is your responsibility as a student to review course material, search online, discuss with lecturers and peers, and understand the health and safety risks associated with your specific course of study. It is also your responsibility to familiarise yourself with the University's general health and safety principles by reviewing the online Health Safety and Wellbeing training module for students, and following the instructions of the University staff.

## 10. What administrative information is relevant to this course?

### 10.1 Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Blackboard, are electronically checked through SafeAssign. This software allows for text comparisons to be made between your submitted assessment item and all other work that SafeAssign has access to.

### 10.2 Assessment: Additional requirements

#### Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:

- a) The final mark is in the percentage range 47% to 49.4%
- b) The course is graded using the Standard Grading scale
- c) You have not failed an assessment task in the course due to academic misconduct

### 10.3 Assessment: Submission penalties

Late submission of assessment tasks will be penalised at the following maximum rate:

- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day
- 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task.

Weekdays and weekends are included in the calculation of days late.

To request an extension, you must contact your Course Coordinator and supply the required documentation to negotiate an outcome.

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#### 10.4 Study help

In the first instance, you should contact your tutor, then the Course Coordinator. Additional assistance is provided to all students through Academic Skills Advisers. To book an appointment or find a drop-in session go to [Student Hub](#).

Contact Student Central for further assistance: +61 7 5430 2890 or [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)

#### 10.5 Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Administration of Central Examinations
- Deferred Examinations
- Student Academic Misconduct
- Students with a Disability

Visit the USC website:

<http://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

#### 10.6 General Enquiries

In person:

- **USC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **USC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **USC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **USC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay

**Tel:** +61 7 5430 2890

**Email:** [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au)