

# ENS253 Geographic Information Science and Technology

School: School of Science, Technology and Engineering

2024 Semester 1

UniSC Sunshine Coast  
UniSC Moreton Bay

**BLENDED  
LEARNING**

Most of your course is on campus but you may be able to do some components of this course online.

Online

**ONLINE**

You can do this course without coming onto campus.

Please go to [usc.edu.au](http://usc.edu.au) 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 spatial 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. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
<b>BLENDED LEARNING</b>			
<b>Learning materials</b> – Asynchronous Online learning materials	2hrs	Week 1	13 times
<b>Laboratory 1</b> – Tutorials in computer labs.	2hrs	Week 1	13 times
<b>ONLINE</b>			
<b>Learning materials</b> – Asynchronous online learning material	2hrs	Week 1	13 times
<b>Laboratory 1</b> – Online labs	2hrs	Week 1	13 times

### 1.3. 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

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## 2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

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

12 units

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

COURSE LEARNING OUTCOMES	GRADUATE QUALITIES MAPPING	PROFESSIONAL STANDARD MAPPING *
On successful completion of this course, you should be able to...	Completing these tasks successfully will contribute to you becoming...	Competencies from multiple Professional Bodies (see below) *
1 Critically identify and use geospatial data and geospatial techniques to address different real world issues	Creative and critical thinker	3
2 Apply GIS tools and technique to address a real-world issue	Empowered	1, 1.2, 2, 3
3 Demonstrate spatial thinking	Empowered	3
4 Communicate geospatial discourse in different discipline specific contexts	Empowered	1, 3

\* Competencies by Professional Body

- |   |  |
|---|--|
| 1 | Knowing: Demonstrate a coherent geographical understanding of trends, processes and impacts that shape Australian and other environments and/or societies at different spatial and temporal scales.  |
| 2 | Knowing: Demonstrate an understanding of Geography as an academic discipline, including awareness of its concepts, history and principal subfields, whilst acknowledging the contested, provisional and situated nature of geographical understanding. |
| 3 | Thinking: Apply geographical thought creatively, critically and appropriately to specific spaces, places and/or environments.  |

- |     |   |
|-----|---|
| 1.2 | Knowledge and Skill Base: Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. |
|-----|---|

## 5. Am I eligible to enrol in this course?

Refer to the [UniSC Glossary of terms](#) for definitions of “pre-requisites, co-requisites and anti-requisites”.

### 5.1. Pre-requisites

Not applicable

### 5.2. Co-requisites

Not applicable

### 5.3. Anti-requisites

Not applicable

### 5.4. 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 Grading (GRD)

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

### 6.2. Details of early feedback on progress

Task 1 will start in week 2 and students will get feedback on this formative task by week 3/4

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Artefact - Technical and Scientific, and Written Piece	Individual	30%	Activities involving map-scale, sketch, scanning, georeferencing, and assigning metadata and coordinate system, and group discussions	Refer to Format	Online Submission
All	2	Report	Individual	40%	Assignment proposal and final 2000 words report with maps and metadata	Refer to Format	Online Submission
All	3	Examination - Centrally Scheduled	Individual	30%	Objective and short answer questions	Exam Period	Exam Venue

**All - 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 a well-defined coordinate system and metadata. The group discussions on coordinate systems will be held during week 6 and will continue on Canvas.	
<b>PRODUCT:</b>	Artefact - Technical and Scientific, and Written Piece	
<b>FORMAT:</b>	The final GIS data set, activity sheets and group discussion sheet. Submit: Week 8 Parts of this task has to be submitted during Weeks 2, 3, 4, 6 and 8 for formative feedback	
<b>CRITERIA:</b>	<b>No.</b>	<b>Learning Outcome assessed</b>
	1	Understanding of map-scale <span style="float: right;">1</span>
	2	Cartographical quality of the submitted map <span style="float: right;">4</span>
	3	Georeferencing of the map <span style="float: right;">1</span>
	4	Metadata <span style="float: right;">2</span>
	5	Defining the coordinate system and datum <span style="float: right;">2</span>
	6	Response to formative feedback on previously submitted elements <span style="float: right;">3</span>
	7	Knowledge of coordinate systems <span style="float: right;">2</span>

### All - 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>	Report	
<b>FORMAT:</b>	Details for this project will be on Canvas and discussed in tutorials Submit: week 7 and week 13.	
<b>CRITERIA:</b>	<b>No.</b>	<b>Learning Outcome assessed</b>
	1 Use of geospatial data and geospatial techniques	1
	2 Application of GIS tools	2
	3 Spatial Thinking	3
	4 Use of geospatial discourse	4
	5 Response to formative feedback on previously submitted elements	4

### All - Assessment Task 3: Exam

<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>	Examination - Centrally Scheduled	
<b>FORMAT:</b>	A combination of multiple-choice questions, and short-answer questions	
<b>CRITERIA:</b>	<b>No.</b>	<b>Learning Outcome assessed</b>
	1 Your understanding of geographical information science and technology terms, concepts and its appropriate uses	4

## 7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

### 7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
1 Introduction to GIS and its evolution	Learning materials 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 learning materials and participation in Canvas' discussion board
2 Maps and GIS	Learning materials on a 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 learning materials and participation in Canvas' discussion board

PERIOD AND TOPIC	ACTIVITIES
3 Map scale and data quality	Learning materials on map scale and geographic data quality. Tutorial on map scale and data quality using real-world examples. Book chapters specified in the learning materials and participation in Canvas' discussion board
4 Geographic communication	Learning materials on geographic communication. Tutorials on producing cartographic quality maps using appropriate map layout, colour combination, text, and symbols. Book chapters specified in the learning materials and participation in Canvas' discussion board
5 Geographic representation	Learning materials geographic representation using data models. Learning materials on metadata and its significance. Tutorial on understanding digital geographic representation and metadata. Book chapters specified in the learning materials and participation in Canvas' discussion board
6 Geodetic datum types and coordinate systems	This will be a flipped class where video recording, as well as learning materials on geodetic datums and coordinate systems will be provided. Tutorials on datums and coordinate systems. Video recordings, book chapters specified in the learning materials and participation in Canvas' discussion board
7 GIS data creation and search	Learning materials on GIS data creation and search. Tutorial on creating GIS datasets and their search on the web. Book chapters specified in the learning materials and participation in Canvas' discussion board
8 GIS analysis 1	Learning materials on vector-based GIS analysis. Tutorial on vector-based GIS analysis Book chapters specified in the learning materials and participation in Canvas' discussion board
9 GIS analysis 2	Learning materials on raster-based GIS analysis. Tutorial on raster-based GIS analysis Book chapters specified in the learning materials and participation in Canvas' discussion board
10 Attribute information in GIS data and queries	Learning materials and tutorial on GIS attribute table and spatial query Book chapters specified in the learning materials and participation in Canvas' discussion board
11 Geospatial analysis to address real-world issues	Learning materials on geospatial analysis with real-world examples Tutorial on geospatial analysis. and spatial interpolations Book chapters specified in the learning materials and participation in Canvas' discussion board
12 Spatial interpolation	Learning materials and Tutorial on spatial interpolations Book chapters specified in the learning materials and participation in Canvas' discussion board
13 Advanced GIS	Learning materials and tutorial on advanced GIS analysis and 3d visualisation Book chapters specified in the learning materials and participation in Canvas' discussion board

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

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

## 8.1. Prescribed text(s) or course reader

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Recommended	Gretchen N. Peterson	2020	GIS Cartography	n/a	CRC Press
Recommended	John R. Jensen,Ryan R. Jensen	2012	Introductory Geographic Information Systems	n/a	Prentice Hall
Recommended	Kang-Tsung Chang	0	ISE Introduction to Geographic Information Systems	n/a	n/a
Recommended	Michael N. DeMers	2008	Fundamentals of Geographic Information Systems	n/a	John Wiley & Sons
Recommended	D. Ian Heywood,Ian Heywood,Sarah Cornelius,Steve Carver	0	An Introduction to Geographical Information Systems	n/a	n/a
Recommended	Terry A. Slocum,Robert B. McMaster,Fritz C. Kessler,Hugh H. Howard	2013	Thematic Cartography and Geovisualization	n/a	Pearson
Recommended	Paul A. Longley,Michael F. Goodchild,David J. Maguire,David W. Rhind	2015	Geographic Information Science and Systems	4th	John Wiley & Sons
Recommended	Peter A. Burrough,Rachael McDonnell,Rachael A. McDonnell,Christopher D. Lloyd	2015	Principles of Geographical Information Systems	n/a	Oxford University Press

## 8.2. Specific requirements

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

## 9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility 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 and to familiarise yourself with the University's general health and safety principles by reviewing the [online induction training 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 Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

## 10.2. Assessment: Additional Requirements

### Eligibility for Supplementary Assessment

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

The final mark is in the percentage range 47% to 49.4%

The course is graded using the Standard Grading scale

You have not failed an assessment task in the course due to academic misconduct

## 10.3. Assessment: Submission penalties

Late submission of assessment tasks may 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 to negotiate an outcome.

## 10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: [07 5430 1168](tel:0754301168) or using the [SafeZone](#) app. For general enquires contact the SafeUniSC team by phone [07 5456 3864](tel:0754563864) or email [safe@usc.edu.au](mailto:safe@usc.edu.au).

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call [07 5430 1226](tel:0754301226) or email [studentwellbeing@usc.edu.au](mailto:studentwellbeing@usc.edu.au).

## 10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the [Learning Advisers](#) web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or [studentcentral@usc.edu.au](mailto:studentcentral@usc.edu.au).

## 10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to [Student Hub](#), email [studentwellbeing@usc.edu.au](mailto:studentwellbeing@usc.edu.au) or call 07 5430 1226.

## 10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, [AccessAbility Services](#) can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to [Student Hub](#), email [AccessAbility@usc.edu.au](mailto:AccessAbility@usc.edu.au) or call 07 5430 2890.

## 10.8. 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
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit <https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching>

## 10.9. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The [Student Charter](#) sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.



## 10.10.General Enquiries

### In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

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