Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates UG OBTL+ or PG OBTL+
If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to Data Transformation Status for more information.

Expected Implementation in Academic Year	AY2025/26
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Asst Prof Perrine Hamel
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Course Title	GIS and the Earth System
Course Code	ES2802
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	ES1003, ES2001 (can take concurrently)
Co-requisites	N/A
Pre-requisite to	ES3202
Mutually exclusive to	N/A
Replacement course to	N/A
Remarks (if any)	N/A

Course Aims

In this course, you will become familiar with Geographic Information Systems (GIS) for Earth sciences. You will use an open-source GIS software to perform common tasks required in the study of Earth systems, including importing and exporting datasets, producing scientific-grade maps, and performing basic to advanced geospatial analyses. Given the rapid progress in GIS science and technology, you will also learn how to find online resources to perform tasks required in diverse industries (urban planning, landscape architecture, scientific research). The course is primarily targeted at Environmental Sciences students, with applications to Earth science, ecology, and society.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Describe typical applications, strengths and limitations of the use of GIS in Earth systems science
ILO 2	Explain the foundations of GIS science, including concepts such as projections and coordinate reference systems
ILO 3	Create meaningful, attractive maps that illustrate relevant data clearly
ILO 4	Perform basic to advanced GIS tasks such as georeferencing, querying of spatial information, creating and exporting datasets, etc.
ILO 5	Work independently to solve GIS problems, including identifying and processing datasets from global GIS sources

Course Content

This course will cover the use of Geographic Information System (GIS) to explore Earth systems science. The course will start by introducing theoretical foundations of GIS, with concepts such as projections, geographic coordinate systems, etc.

The students then learn and practice the skills to conduct basic to advanced analyses and produce scientific-grade maps in a GIS software. The majority of the course uses the open-source software QGIS, with one tutorial dedicated to alternative software.

Finally, the students work on an independent group project, documenting an Earth Science event and applying the skills they learnt during class.

Reading and References (if applicable)

No textbook – students are provided with appropriate materials (handouts, etc.) in class.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Introduction to GIS	1,2		In-person	Week 1 lecture + software setup
2	Tutorial 1: Introduction to QGIS	1, 2	Review Wk 1 lectures	In-person	Week 2 lecture + tutorial 1
3	Tutorial 2: Earthquakes & calculations	1, 2, 3, 4	Earthquake ground shaking theory	In-person	Quiz 1 + tutorial 2
4	Tutorial 3: Large-scale maps and projections	1, 2, 3, 4	Maps and projections	In-person	Tutorial 3
5	Tutorial 4: QGIS calculations and accessible color choices	1, 2, 3, 4		In-person	Quiz 2 + tutorial 4
6	Tutorial 5: Watersheds and elevation maps	1, 2, 3, 4		In-person	Tutorial 5
7	Tutorial 6: Digitizing maps and working with geodatabases	1, 2, 3, 4		In-person	Quiz 3 + tutorial 6
8	Tutorial 7: ArcGIS and Google Earth	3, 4, 5		In-person	Introduction to project + Tutorial 7
9	Tutorial 8: Cost analysis and ModelBuilder	3, 4, 5		In-person	Quiz 4 + tutorial 8
10	Tutorial 9: DEMs and dams	3, 4, 5		In-person	Tutorial 9

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
11	Project work	1, 2, 3, 4, 5	StoryMaps	In-person	Group project discussion
12	Project work	1, 2, 3, 4, 5		In-person	Quiz 5
13	Project Work	1, 2, 3, 4, 5		In-person	

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Tutorial-based teaching	With the exception of a couple of hours of lectures at the start, the course is entirely tutorial based, allowing students to "learn by doing". The tutorials start with very detailed instructions, and move to higher level prompts as students become more skilled using the GIS software.
Teaching assistance	During tutorial, the teaching staff and assistants will circulate through the room, providing guidance on both techniques and aesthetics, and explaining parts of the labs as necessary. The teaching staff will also provide assistance via office hours and online help. Our goal is to ensure that students do not struggle with minor issues, but gain confidence in your own skills so that you learn how to problem solve on your own.
Project work	Group projects during the final weeks allows students to practice their GIS skills with real-world problems and student-defined objectives.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Assignment(CA1: Tutorial assignments)	3,4,6		35	Individual	Analytic	Extended Abstract
2	Continuous Assessment (CA): Test/Quiz(CA2: Quizzes)	1, 2, 3, 4		25	Individual	Analytic	Extended Abstract
3	Continuous Assessment (CA): Project(CA3 : Final projects)	1,2, 3, 4, 5		25	Team	Holistic	Extended Abstract
4	Continuous Assessment (CA): Class Participation(CA4 : Participation)	1,2, 3, 4, 5		15	Individual	Holistic	Extended Abstract

Description of Assessment Components (if applicable)

Tutorials are assigned on a weekly basis and are expected to take ~6-8 hours each. Some tutorials are graded, others are simply evaluated on a binary “pass/fail” basis

Quizzes: 5 lab quizzes will be held, in class, during the semester. The first one is a content quiz, and the other 4 involve GIS skills (students use the GIS software).

Group project: At the end of the semester, students work in groups to create a final project in ArcGIS StoryMaps that incorporates geospatial skills you have learned over the course of the semester. Students will receive a group grade for this project.

Slack and in-person Participation: The class will have a shared open-ended discussion forum through an online platform. Students are expected to participate in this forum by posting, commenting, or reacting to other posts.

Formative Feedback

1. You will receive both written and verbal feedback from the teaching team about your assignments, quizzes results, and final projects
2. During tutorials, the teaching staff and assistants will circulate through the room, providing guidance on both techniques and aesthetics, and explaining parts of the labs as necessary. The teaching staff will also provide assistance via office hours and online help. Our goal is to ensure that students do not struggle with minor issues, but gain confidence in your own skills so that you learn how to problem solve on your own.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Digital Fluency	Advanced
Global Perspective	Advanced
Problem Solving	Advanced
Embrace Challenge	Intermediate

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

You are expected to complete all assigned readings, activities, assignments, attend all classes punctually and complete all scheduled assignments by due dates. You are expected to take responsibility to follow up with assignments and course related announcements. You are expected to participate in all project critiques, class discussions and activities.

Policy (Absenteeism)

In-class activities make up a significant portion of your course grade. Absence from class without a valid reason will affect your participation grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Policy (Others, if applicable)

ASE Diversity and Inclusion policy
Integrating a diverse set of experiences is important for a more comprehensive understanding of science. It is our goal to create an inclusive and collaborative learning environment that supports a diversity of thoughts, perspectives, and experiences, and that honours your identities (including ethnicity race, gender, socioeconomic status class, sexual orientation, religion or, ability., etc.).

To help accomplish this:

- If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with one of the instructors or an ASE faculty member. We want to be a resource for you.
- Your classmates and instructors (like many people) are still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to the instructors or an ASE faculty member about it.
- As a participant in course discussions, you should also strive to honour the diversity of your classmates. You can do this by: (e.g., using preferred pronouns and names; being respectful of others opinions and actively, making sure all voices are being heard; and refraining from the use of derogatory or demeaning speech or actions., etc.).

We expect all members of the class to adhere to the NTU Anti-harassment policy (https://ts.ntu.edu.sg/sites/policyportal/new/Documents/msrf%20included%20NIE%20staff/Anti-Harassment%20Policy.pdf), if you witness something that goes against this or have any other concerns, please speak to your instructors or an ASE faculty member.

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