

Title: Remote Sensing (RS), Geographical Information Systems and Analysis: Theory and Application

Course Schedule: 10 May – 28 June 2022

Lecturer: TBC

Course Description:

The course aims to provide an introductory understanding of the concepts and principles of Geographical Information Systems (GIS) and remote sensing (RS) and their applications to social-ecological research, management planning, and decision making. This course is divided into two parts. The first part will introduce fundamental concepts of GIS, including some important and commonly used geoprocessing and spatial analysis tools and techniques, such as vector-raster conversion, proximity, surface interpolation, reclassification, map algebra, cross tabulation, and zonal analysis. The second part will focus on RS satellite data processing, including the derivation of various spectral indices and some examples of satellite image classification methods. All of these will be achieved through a series of lectures and guided hands-on training sessions. The course will use QGIS software package.

Learning Outcomes:

The overall goal of this course is for students to gain some understanding of the concepts and principles of GIS and RS, and their applications to social-ecological research, management planning, and decision making. By the end of the course, students will be able to execute some important GIS tools and techniques and process RS data. They will be able to perform at least basic spatial analysis and identify some important social-ecological problems that can be supported by spatial analysis with the use of GIS and RS. Finally, they will be able to connect the outcomes of GIS/RS-based analyses to existing knowledge, management planning, decision making and support their research.

Assessment:

Attendance and class participation	: 20 %
Exercises	: 20 %
Essay (exam) (June 21) and oral presentation (June 28)	: 60 %

Course Outline:

Session	Outline	Date and time
1	Class introduction (lecturers, students (background and topic interest) and class requirements)	May 10, 2022 (14:00-17:30)
	Lecture: Introduction to GIS and Applications of GIS	
2	Hands-on-training: installing QGIS and Overview of QGIS interface	
3	Lecture: Data sources and software packages	May 17, 2022 (14:00-17:30)
4	Hands-on-training: Vector data handling: Geo-referencing, digitizing, and editing	
5	Hands-on-training: Database handling: Create tabular data, convert data from other sources	May 24, 2022 (14:00-17:30)
6	Hands-on-training: Data represent and Layout	
7	Lecture: Introduction to RS and applications of RS	May 31, 2022 (14:00-17:30)
8	Hands-on-training: Satellite image downloading, Satellite image acquisition	
9	Hands-on-training: RS data processing: Image classification (Unsupervised and supervised classification) calculate the accuracy	June 7, 2022 (14:00-17:30)
10	Hands-on-training: Spatial analysis (1) Vector-raster conversion, proximity, surface interpolation	
11	Hands-on-training: Spatial analysis (2) Reclassification, map algebra, cross tabulation, zonal analysis	June 14, 2022 (14:00-17:30)
12	Hands-on-training: Study case: Advanced spatial analysis and modeling with GIS and RS	
13	Lecture: GIScience and RS for the society (SDG, etc.) Consultation about presentation (progress, issues, etc.)	June 21, 2022 (14:00-17:30)
14	Essay (exam)	
15	Oral presentation	June 28, 2022 (14:00-15:40)

Essential Reading

- https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesgis.pdf
- https://webapps.itc.utwente.nl/librarywww/papers_2009/general/PrinciplesRemoteSensing.pdf

Useful Links

- https://docs.qgis.org/3.16/en/docs/training_manual/index.html
- <https://earthdata.nasa.gov/learn/remote-sensing>

Scientific Journals

- Annals of GIS, International Journal of Geographical Information Science, Transactions in GIS, Applied Geography, GIScience & Remote Sensing, Remote Sensing of Environment, ISPRS Journal of Photogrammetry and Remote Sensing, etc.