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

Lecturer: Kensuke Fukushi and Guest Instructor (TBA)

Course Description:

The course aims to provide a broad understanding of the spatial analysis techniques and their use in aspects of environmental research, management and policy making. This course is divided into two parts: (1) Methods, Theory and Practice of Spatial Analysis using GIS and (2) Principles of Remote Sensing and Practice on Digital Image Processing. First part session will introduce fundamental concepts of GIS including GIS data storage, coordinate systems, and spatial analysis using GIS to display, interrogate and analyze spatial data. The second part of this course is designed to cover the basic principles of Remote Sensing and Image Interpretation, which cover basics about Remote Sensing Techniques, various satellite systems, and further about Digital Image Processing, image classification, and applications. Practical hands-on experience to process satellite data using ArcGIS in particular is also part of the course. This will be achieved through a series of lectures and hands-on guided training sessions in a variety of application areas that will equip the student with both the theoretical and practical skills to use GIS in future research work. The course is designed around ArcGIS – the world's leading GIS software package.

Learning Outcomes:

The course aims to familiarize students with the theoretical background and practical application of Remote Sensing and GIS. Student will learn the importance of spatial data and how to process satellite data to acquire useful information and their interpretation to solve various global environmental problems. They can also utilize this technique to handle various spatial data in creating, producing and analyzing various maps. The assessment of the course is multifaceted with theoretical, practical and managerial elements assessed. By the end of the course, student should be able to understand and organize spatial data in order to solve geographic problems using GIS.

Assessment:

Attendance and class participation	: 30%
Mid-term examination	: 20%
Assignment	: 30%
Final paper and presentation	: 20%

Course Outline:

Session	Outline (to be updated)	Date and time
1	Lecture: GIS introduction and overview	April 15, 2020 (14:00-17:30)
2	Lecture: Principles of Remote Sensing, Platforms, and Sensors	
3	Lecture: Digital Image Processing, Basic concept, and Application	April 22, 2020 (14:00-17:30)
4	Excursion	
5	Mid-term examination	April 29, 2020 (14:00-17:30)
6	Hands-on-training: Overview of ArcGIS (1) Digitizing, editing & structuring of map data	
7	Hands-on-training: Overview of ArcGIS (2) Georeferencing, projection and database creation	May 13, 2020 (14:00-17:30)
8	Hands-on-training: Spatial data analysis (1) Proximity, overlay and generalization	
9	Hands-on-training: Spatial data analysis (2) Raster calculation	May 20, 2020 (14:00-17:30)
10	Hands-on-training: Satellite data processing (1) Satellite Image acquisition and data processing	
11	Hands-on-training: Satellite data processing (2) Image Classification	May 27, 2020 (14:00-17:30)
12	Hands-on-training: Web-based GIS (1) Online GIS	
13	Hands-on-training: Web-based GIS (2) Survey tools	June 3, 2020 (14:00-17:30)
14	Policy implementation using GIS and remote sensing techniques (Invited Prof.)	
15	Final presentation and report	June 10, 2020 (14:00-15:30)

Essential Reading
- GIS fundamentals : a first text on geographic information systems (Fifth Edition) by Bolstad (XanEdu, 2016)
- An Introduction to Geographical Information Systems (Fourth Edition) by Heywood, Cornelius, Carver (Prentice Hall,2011)
- Introduction to Remote Sensing (Fifth Edition) by Campbell, Wynne (The Guilford Press,2011)
- Remote sensing of the environment: An Earth Resource Perspective (Second Edition) by John R. Jensen (Prentice Hall,2006)
- Remote Sensing and Image Interpretation (7Th Edition) by Lillesand, Kiefer and Chapman (Wiley publication, 2015)

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