

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

Lecturers: Dr. Kumar, Pankaj, Dr. Kefi, Mohamed, Dr. Kikuko Shoyama

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**Course Description:**

The course aims to provide a broad understanding of the spatial analysis techniques and their use in many aspects of global environment from research to management and policy making. This course is divided into two parts: (1) Methods, Theory and Practice of Spatial Analysis using GIS. (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, Electro-Magnetic Radiation (EMR), interaction with the targets, various satellite systems, and different types of remote sensing techniques and further about Digital Image Processing (DIP), image classification and various 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 aim of the course is 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 unusually multifaceted with theoretical, practical and managerial elements assessed. By the end of the course, a student should be able to understand and organize spatial data in order to solve geographic problems using GIS.

**Assessment:**

Attendance and class participation	: 15%
Mid-term examination	: 25%
Assignment	: 30%
Final paper and presentation	: 30%

## Course Outline:

Session	Outline	Date and time
1	GIS introduction, digitizing, editing & structuring of map data (Kikuko)	April 5, 2017 (11-12:30)
2	Principles of Remote Sensing, Platforms and Sensors (Pankaj)	April 12, 2017 (11-12:30)
3	Digital Image Processing (DIP) Basic concept (Kefi)	April 19, 2017 (11-12:30)
4	Image processing and Application (Kefi)	April 26, 2017 (11-12:30)
5	Mid-term examination	April 28, 2017 (11-12:30)
6	Hands-on-training on overview of ArcGIS 1 (Kikuko) (Georeferencing & projection & GIS database creation)	May 10, 2017 (11-12:30)
7	Hands-on-training on overview of ArcGIS 2 (Kikuko) (Vector and raster based spatial data analysis)	May 17, 2017 (11-12:30)
8	Hands-on-training on satellite data processing-1 (Pankaj & Kefi)	May 24, 2017 (11-12:30)
9	Hands-on-training on satellite data processing-2 (Pankaj & Kefi)	May 31, 2017 (11-12:30)
10	Hands-on-training on satellite data processing-3 (Pankaj & Kefi)	June 7, 2017 (11-12:30)
11	Field Excursion to Space center, Tsukuba JAXA (Suggestion of group work)	TBD
12	Land use change model (Kikuko)	June 14, 2017 (11-12:30)
13	Hydrology application (Pankaj & Kefi)	June 21, 2017 (11-12:30)
14	Vulnerability mapping (Pankaj & Kefi)	June 28, 2017 (11-12:30)
15	Final presentation and report	June 30, 2017 (11-12:30)

## Essential Reading

- An Introduction to Geographical Information Systems (Fourth Edition) by Heywood, Cornelius, Steve Carver (Pearson)
- Introduction to Remote Sensing (Fourth Edition) by James B. Campbell (The Guilford Press)
- Remote sensing of the environment: An Earth Resource Perspective (Second Edition) by John R. Jensen (Pearson)
- Remote Sensing and Image Interpretation (7<sup>Th</sup> Edition) by Lillesand, Kiefer and Chapman (Wiley publication)
- GIS fundamentals: A first text on geographic information systems by Paul Bolstad (Eider press)
- GIS Implementation for Water and Wastewater Treatment Facilities by Water Environment Federation (WEF Press)

**Useful links**

- [https://www.itc.nl/Pub/Home/library/Academic\\_output/ITC-GIS-and-Remote-Sensing-Textbooks.html](https://www.itc.nl/Pub/Home/library/Academic_output/ITC-GIS-and-Remote-Sensing-Textbooks.html)
- <http://www.saylor.org/site/textbooks/Essentials%20of%20Geographic%20Information%20Systems.pdf>
- [https://www.itc.nl/library/papers\\_2009/general/PrinciplesGIS.pdf](https://www.itc.nl/library/papers_2009/general/PrinciplesGIS.pdf)
- [http://library.uoregon.edu/map/map\\_section/listserves\\_tutorials/map\\_Tutorials.html](http://library.uoregon.edu/map/map_section/listserves_tutorials/map_Tutorials.html)