Asian Institute of Technology
School of Environment, Resources and Development (SERD) and
School of Engineering and Technology (SET)
Disaster Preparedness, Mitigation and Management (DPMM)

IN84.02 Remote Sensing and GIS for Disaster Mitigation 3(2-3) **Semester: August**

Course Objective:
This course introduces the basic principles of Remote Sensing (RS) and Geographic Information System (GIS) and the major applications for disaster monitoring and management. This course provides advanced methodologies of Remote Sensing and Geographic Information System, followed by steps from introduction to sensor design and development, geo-spatial data acquisition, digital image processing, future extraction and change detection, geo-spatial data management and updating, spatial analysis and visualization, and the examples of different disaster monitoring and management.

Learning Outcomes:
On completion of this course, the students will be able to:
- Understand fundamental concepts of RS and GIS
- Apply RS and GIS for Disaster Management
- Understand related technologies such as Global Navigation Satellite System (GNSS), Inertial Navigation System (INS), Laser Range Scanning, Mobile Mapping, UAV, Big Data analysis, and Web Mapping Technology
- Understand emergency disaster mapping and International Initiative

Prerequisite: None

Course Outline:

I. Introduction
1. Spatial Information Engineering for Disaster management
2. Applications of Remote Sensing and Geographic Information for Disaster Mitigation

II. Principle of Remote Sensing
1. Satellite Remote Sensing for Damage Detection
2. Optical Sensors
3. Synthetic Aperture Radar (SAR)
4. High Resolution Satellites
5. LIDAR Images
6. Image Processing and Analysis

III. Principle of Geographic Information System
1. Geo-spatial and Thematic Data Analysis
2. GPS and Field Surveying
3. Geological Data Analysis
4. Social and Economical Data Analysis
5. Data Integration and Database Generation
6. Data Management and Updating
7. Spatial Analysis and Visualization
8. Geo-spatial Information Sharing and Services

IV. Advanced Mapping Technology
1. UAV (Unmanned Aerial Vehicle)

2. MMS (Mobile Mapping System)
3. Field Sensor Network

V. Space-Based Technology for Disaster and International Collaborations

1. Activity in United Nations
2. Activity in Asia

VI. Location Based Service

1. Web GIS
2. Geo-Portal
3. Early Warning System

Laboratory Session(s):

I. Remote Sensing

1. Satellite image visualization
2. Geo-coding
3. Land cover classification
4. Disaster mapping

II. Geographic Information System

1. Introduction of GIS software
2. Vector analysis
3. Raster operation

Learning Resources:

Textbooks: No designated textbook, but class notes and handouts will be provided.

Reference Books:

1. Peter A. Burrough (1986), Principles of Geographical Information Systems for Land Resources Assessment, Oxford Science Publications.
2. Paul A. Longley, Michael F. Goodchild, David J. Maguire and David W. Rhind (Eds.) (1999), Geographical Information Systems (Vol.I /II), John Wiley & Sons, Inc., USA.
3. Stan Morain and Shirley Lopez Baros (Eds.) (1996), Raster Imagery in Geographical Information Systems, 1st Edition, ONWORD Press.
4. Brian Tomaszewski (2014), Geographic Information Systems (GIS) for Disaster Management, CRC Press, USA.
5. Shailesh Nayak and Sisi Zlatanova (2010), Remote Sensing and GIS Technologies for Monitoring and Prediction of Disasters, 1st Edition, Springer.

Journals and Magazines:

1. International Journal of Geographical Information Science, Taylor & Francis
2. Photogrammetric Engineering and Remote Sensing, American Society for Photogrammetry and Remote Sensing
3. ISPRS Journal of Photogrammetry and Remote Sensing, International Society for Photogrammetry and Remote Sensing

Others:

1. Sentinel Asia, https://sentinel.tksc.jaxa.jp
2. International Disaster Charter, https://www.disasterscharter.org
3. Munich Re Group, World of Natural Hazards, CD-ROM
4. United Nations Initiative towards Earthquake Safe Cities, Risk Assessment Tool for Diagnosis of Urban Areas against Seismic Disasters, CD-ROM, http://www.unisdr.org

Teaching and Learning Methods:
Lectures and Laboratory Assignments

Time Distribution and Study Load:
- Lectures: 30 hours
- Laboratory sessions: 45 hours
- Self-study: 135 hours

Evaluation Scheme:
The Final grade will be computed according to the following weight distribution:
Mid-semester Exam: 30%
Final Exam: 50%
Laboratory assignments: 20%
Both Mid-semester and Final examinations will be closed book.

An "A" would be awarded if a student can elaborate the knowledge learned in class by giving his/her own analysis on the issues discussed, from journals, books and other sources. A "B" would be awarded if a student demonstrates an overall understanding of all topics, a "C" would be given if a student meets below average expectation on both knowledge acquired and analysis. A "D" would be given if a student does not meet the basic expectations in understanding and analyzing the topics and issues presented in the course.

Instructor(s): Dr. Masahiko Nagai and Dr. Hiroyuki Miyazaki