Course curriculum
JEE 684 - GIS and Remote Sensing
Semester 2/2018
13.30-17.30 – EN 4605, 6th Fl., SEEM Building
Every Monday from 13 January – XX May 2020

Instructors:

Course coordinator: Assoc. Prof. Dr. Savitri GARIVAIT (JGSEE)
Email: savitri_g@jgsee.kmutt.ac.th ; savitri.jgsee@gmail.com

Instructors:
1. **Uday PIMPLE** (JGSEE, Researcher)
Specialized in remote sensing applications to energy related environmental issues with special emphasis on remote sensing of forest environments
Email: upimple@gmail.com, uday.pim@kmutt.ac.th
2. **Dr. Asamaporn SITTHI** (SWU, lecturer): WebGIS, cartography and data mining for social sensing and its application to environmental and social sciences
Email: cherryhihi@gmail.com
3**. Dario SIMONETTI** (JRC, GIS analyst programmer): Development of tools for forest time series analysis with special emphasis on deforestation and degradation
Email: dario.simonetti@ec.europa.eu
4. **Sukan PUNGKUL** (Royal Forest Department, Forest officer) Specialized in forest field survey and forest biomass estimation
Email: mr.sukan@gmail.com

Course context:

This course will focus basic concepts of Geographic Information System (GIS) and Remote Sensing (RS) as tools to better address the energy, environment and sustainability issues in real world applications. The course is project **intensive** with, 40 % course is dealing with the GIS applications, and 60% course is dealing with remote sensing technical background. Each lecture will cover theoretical background of the subject followed by hands-on. The QGIS and ENVI software's will be used for this course.

The main goals of this course are

- Student should able to use any GIS and RS software regardless of being thought that program

- Student should able to understand technical GIS terms and maps that they, their peers or professionals have made
- Student should able to understand the basics of Land Use Land Cover map preparation and logically interpret the results
- Students should be able to understand technical background of GIS and RS and its applications to environmental and energy field
- Students should be able to understand current research, technology and application of third level data to policy development and their potential applications in the energy, environment and sustainability issues.

Expected background: The basic knowledge in **mathematics and statistics** is required. Students must have bachelors or master's degree in science/engineering or equivalent qualification in environmental sciences, renewable energy, natural resource management, forestry, ecology, geology, geography, oceanography, climate sciences, agriculture, water resources management, urban planning etc.

Course assessment:

We will assess student learning through three methods.
The first method is the practical assessment. Can student complete given assignments?
The second method is the theoretical assessment. Can student able to understand the theoretical concepts thought during course?
The third method is practical implementation assessment. Can student able to apply learned practical and theoretical knowledge in application?

The following percent will be allocated to each assessment:

Criteria	Assessment (%)	Assessment of topic
Assignments	20	Assignments (50 % GIS & 50 % RS)
Mid-term exam	20	Written exam on GIS
Final exam	30	Written exam on RS
Mini project	30	Implementation one project per student

Note: Please note that the mini-project evaluation will be conducted based on the understanding of implementation. Mini project will include concise report (not more than 3-5 pages) and short presentation of 15-20 minute.

Course details:

	Date	Topic	Details	Lecturer
1	20-Jan-20 (Monday) 13:30 – 16:30	Introduction to GIS and RS course	• Background evaluation and requirements • Computer (hardware and software) • Introduction to course • Material and literature • Course evaluation system	Dr. Savitri Garivait & Uday PIMPLE
		Introduction to RS	• Definition • History • Principles • Usefulness & applications • Challenges	Uday PIMPLE
2	27-Jan-20 (Monday) 13:30 – 16:30	Physical principles of satellite RS	• Concept of RS • What the sensor measures in RS • EM spectrum basics • Types of RS • Applications • Data available from RS • Tools and software's Lab 1: Introduction to ENVI and satellite image Assignment 1	Uday PIMPLE
3	03-Feb-20 (Monday) 13:30 – 16:30	Basics of electromagnetic radiation and its application in RS	• Concept of system and EM • Radiation principles and sources • Effect of atmospheric radiation • Radiative transfer basics • Basic terminologies related to electromagnetic radiation • Atmospheric and Geometric error and correction • Data preparation Lab 2: image correction Assignment 2	Uday PIMPLE
	10-Feb-2020	Holiday	Holiday	Holiday
4	17-Feb-2020 (Monday) 13:30 – 16:30	RS using Landsat data	•Summary of Landsat history and mission •Data levels •How to download Landsat imagery	Uday PIMPLE (Not available)
		Introduction to image	• What is pre-processing	

		processing theory and techniques	• Why it's important • Image errors and artifact • Geometric correction • Radiometric correction • Effects of topography and clouds and their shadows • Landsat artifacts and corrections Lab 3: image correction Assignment 3	
5	23- Feb -2020 (Sunday) 9:00 – 12:00	Introduction to GIS	• Definition of GIS • Components of a GIS • Role and benefits • GIS application Lab 4: Introduction to QGIS Assignment 4	Dr. Asamaporn Sitthi & Uday PIMPLE
6	23- Feb -2020 (Sunday) 13:30 – 16:30	Data & Map projection	• GIS Data structure • Map projection • Coordinate system • Thermatics Map Lab 5: QGIS: symbol, labels and annotations Assignment 5	Dr. Asamaporn Sitthi
7	24-Feb-2020 (Monday) 13:30 – 16:30	Basics of image processing Digital image classification	• Image properties • Structure of a digital image • Visual interpretation of image • Digital image processing system • Fundamentals of classification • Image classification workflow • Classification approach • Classification types Lab 6: Band math and unsupervised classification Assignment 6	Uday PIMPLE
8	1-Mar-2020 (Sunday) 9:00 – 12:00	• Spatial Data analysis	• Spatial Data analysis • Measurement • Queries and Selection • ReClassification • Proximity Functions and • Buffering • Overlay Operations • Lab 7: Spatial Data analysis Assignment 7	Dr. Asamaporn Sitthi

9	1-Mar-2020 (Sunday) 13:30 – 16:30	Spatial Data analysis (cont)	• Spatial Data analysis (cont) • Interpolation • Point clustering (• Lab 8 Interpolation analysis and NNI & heatmap analysis) • Assignment 8	Dr. Asamaporn Sitthi
10	02-Mar-2020 (Monday) 13:30 – 16:30	Midterm	Midterm	Uday PIMPLE
11	8-Mar-2020 (Sunday) 9:00 – 12:00	Suitability analysis	•Spatial Models and Modeling Lab 9: Suitability analysis Assignment 9	Dr. Asamaporn Sitthi
12	8-Mar-2020 (Sunday) 13:30 – 16:30	Sampling	• Sample calculations • Sampling methods • Allocation of samples Lab 10: Allocation of stratified samples Assignment 10	Dr. Asamaporn Sitthi
13	09-Mar-2020 (Monday) 13:30 – 16:30	Digital image classification	•Training phase (basic concepts) •Supervised classification •Training and testing •Confusion matrix Lab 11: ROI and supervised classification Assignment 11	Uday PIMPLE
	06-Apr-2020	Holiday	Holiday	Holiday
	13-Apr-2020	Holiday	Holiday	Holiday
14	20-APR-2020 (Monday) 13:30 – 16:30	Filed Survey preparation and mini project discussion	Filed Survey preparation and mini project discussion	Uday PIMPLE
15	27-Apr-2020 (Monday) 6:00 – 18:00	Field Survey	Field Survey	Uday PIMPLE Sukan Pungkul
	04-May-2020	Holiday	Holiday	Holiday
16	11-May-2020	Post classification methods and	•Post classification techniques	Uday PIMPLE

	(Monday) 13:30 – 16:30	accuracy assessment	•Accuracy assessment Lab 12: post classification and accuracy assessment Assignment 12	
17	Not confirmed	Final exam	Final exam	Uday PIMPLE
18	15-May-2020 13:30 – 16:30 (Tentative)	Special lecture	IMPACT toolbox for Land use land cover applications Mini project report submission (Deadline)	Dario SIMONTT Uday PIMPLE & Dr. Savitri Garivait
19	25-May-20 13:30 – 16:30	Final exam-mini project	Mini project presentation and report submission 13: 30 – 18:00	Uday PIMPLE Dr. Savitri Garivait

Reference:

Books:

Richards, J.A. and Jia, X. Remote Sensing Digital Image Analysis: An Introduction (4th edition), Springer, Verlag Berlin Heidelberg (2006)

Jensen,J.R. Introductory Digital Image Processing: A Remote Sensing Perspective (3rd Edition), Upper Saddle River, N.J: Prentice Hall (2004)

Canty, M.J. Image Analysis Classification and Change detection in Remote Sensing: with Algorithms for ENVI/IDL and Python (3rd edition), CRS Press Taylor and Francis Group, Boca Raton, FL (2014)

Schowengerdt, R.A., Remote sensing Models and Methods for Image Processing (3rd edition), Elsevier Inc. (2007)

Lavender, S. Practical handbook of remote sensing, Taylor & Francis Group, Boca Raton, FL (2016)

Burrough, Peter A. and McDonnell, Rachael A. Principles of Geographical Information Systems. New York: Oxford university press. (1998).

Chang Kang-tsung.. Introduction to Geographic Information Systems. Singapore: McGraw Hill. (2012).