

Course Name	Code\No.	Number of Credits			
		Theo.	Lab.	Train.	Credit
Application of Remote Sensing in Water Resources	HWR 315	2	-	2	3
Pre-Requests	MATH 110, PHYS110				

Course Objectives:

This course introduces the principles lying behind remote sensing, concentrating on space-borne platforms. The fundamentals of electromagnetic (EM) radiation are explained, as are its interactions with Earth's surface and atmosphere. The course goes on to examine sensor characteristics, satellite orbits and various current and a range of sensors across the visible, radar and microwave components of the spectrum. When dealing with images, the skills of image processing are used to extract meaning and interpretation from the spatial relationships of data, and the basics of image processing are taught. The course includes a large number of examples of applications of remote sensing to water resources management questions.

Course Contents:

Remote Sensing Fundamentals

1. Define and describe remote sensing and explain its applications and history
2. Define and describe the basics of electromagnetic spectrum and interactions with various types of media.
3. Describe sensors and image acquisition methods.
4. Analyze and explain remote sensing purposes, advantages, and limitations
5. Describe basic characteristics of remote sensing imagery

Digital Image Analysis

1. Interpretation and analysis of remote sensing imagery
2. Elements of Visual Interpretation which involves the identification of various targets in an image
3. Image analysis system, with the appropriate hardware and software to process the data
4. Image classification and analysis operations used to digitally identify and classify pixels in the data
5. Manipulation of digital pixel values in an image for better image analysis

Microwaves

1. Radar Basic
2. Viewing Geometry & Spatial Resolution
3. Target interaction
4. Image Properties
5. Advanced Applications

Remote Sensing Applications

1. Soil Water Content Estimation
2. Evaporation and Evapotranspiration estimation
3. Flood and Snow Delineation
4. Estimation of Water Quality Parameters
5. Urban change and its effect on watershed management
6. Vegetation Health and its water requirements

Course outcomes:

It is expected that the student would get acquainted to the following topics:

- Demonstrate detailed, integrated knowledge of the application and history of remote sensing;
- Discuss the nature of electromagnetic radiation and its interaction with the earth's surface and atmosphere;
- Demonstrate a critical understanding of the differences between remote sensing systems and be aware of their characteristics and limitations;
- Competently interpret, process and evaluate remotely sensed images and be able to use remote sensing to achieve self-defined goals;
- Critically identify specific applications where remote processing used as a tool for monitoring and research.

Evaluation Method:

Student can be evaluated upon monthly exams, final exam and class homework, class discussions as well as lab experiments and lab reports

References:

- Lillesand, T. M. and Kiefer, R. W. (2004). Remote sensing and image interpretation. Fifth Edition. Wiley, 736pp.
- Campbell, J.B. (2002). Introduction to remote sensing. (3rd edition). Taylor and Francis (or Guildford), London. 622pp.
- Jensen, J.R. (2007). Remote sensing of the Environment: An earth resource perspective. Second Edition, Prentice-Hall, New Jersey. 544 pp.
- Rees, W. G., (2001) Physical principles of remote sensing 2nd ed, CUP.
- Robinson I S (2005) Measuring Oceans from Space, Praxis.
- Mather, P.M. (2004). Computer processing of remotely-sensed images: an introduction. Third Edition. Wiley and Sons, Chichester. 292pp.
- Jensen, J.R. (2005). Introductory digital image processing: A remote sensing approach. Third Edition. Prentice-Hall.
- Liu J G and Mason P J, Essential image processing and GIS for remote sensing, Wiley- Blackwell, 2009, ISBN: 978-0-470-510131-5
- Steven, M. D. and Clark J. A. (2013). Applications of Remote Sensing in Agriculture, Butterworths, London. ISBN: 0-408-04767-4.