Course title: Principles of Remote Sensing				
Course code: NRG 178	**No. of credits:** 3	**L-T-P:** 26-4-30		**Learning hours:** 45
Pre-requisite course code and title (if any): None				
Department: Department of Natural and Applied Sciences				
Course coordinator: Dr Chander Kr. Singh		**Course instructor:** Dr Chander Kr. Singh		
Contact details: chander.singh@terisas.ac.in				
Course type: Core		**Course offered in:** Semester 1		

Course Description

It introduces the participant to the basic concepts and the operational skills necessary to acquire remote sensing data and extract geo-information from them. The course links the theoretical physical principles and its visualization in form of remote sensed images and thereafter develop understanding of it use for different applications of resource management.

Course objectives

1. To congregate the basic concepts and fundamentals of physical principles of remote sensing
2. To create a firm basis for successful integration of remote sensing in any field of application.

Course content

S.No	Topic	L	T	P
1.	Introduction to Remote Sensing, History of Remote Sensing; History of Space programs of India and World;	2		
2.	EMR wavelength regions and their applications, Atmospheric windows, Interaction of EMR with matter;	4		
3.	Fundamentals of Radiometry: Concept & Laws, radiance, reflectance	4	2	
4.	Resolutions–spatial, spectral, radiometric, temporal	2		
5.	Remote Sensing Systems (Active & Passive; Imagining & Non-imaging), Orbit and Platforms of earth Observation, sensors and scanners; Cameras and Sensor classification: Opto-Mechanical & Push-broom; Sensor for Infrared, Thermal and Microwave bands	4		
6.	Introduction to commonly used multi-spectral remote sensing satellite systems: IRS Series of satellites, LANDSAT, SPOT, IKONOS, QUICKBIRD, MODIS, RADARSAT, NOAA, TERRA, SENTINEL Family, RISAT, RESOURCESAT etc	4	2	

7.	Ground Truth Collection, Visual Interpretation, Digital and analog methods of Image Interpretation	4		
8.	Spectral signature and its response for Soil, Vegetation and Water	2		
	PRACTICALS			
1.	Lab 1. Introduction to ERDAS IMAGINE 2011			4
2.	Lab 2. Plotting Spectral Signature using spectroradiometer data			2
3.	Lab 3. Exploring different websites for sensor and data			4
4.	Lab 4. Satellite image; season, location, sensor			4
5.	Lab 5. Display, analysis and interpretation of black & white images, grey image, pseudo image and FCC			2
6.	Lab 6. File formats. Import / Export of files using ERDAS IMAGINE			2
7.	Lab 7. Pre-processing satellite data (stacking, subsetting, mosaicking)			2
8.	Lab 8. Map rectification of Toposheet using Keyboard or GPS data and Geo-referencing of the toposheet and imageries			4
9.	Lab 9. Collection of GPS points. Ground data collection.			2
10.	Lab 10. Study of the Spectral Signature of water, Built- up, Bare Soil, Vegetation, Plantation, Crop land, Snow and Cloud.			4
Total		**26**	**4**	**30**

Evaluation criteria

- Minor test 1 :Written Test 15% (Modules 1-3)
- Minor test 2 :Written Test 15% (Module 4-6)
- Major test :Written Test 40% (All modules)
- Practical: Lab Exercise +Viva 30%

The major exam will be covering the syllabus in its entirety.

Learning outcomes

Upon completion of this course, student will be able to

1. Apply different type of remote sensing systems for various applications [Minor test 1, Minor test 2 and Major test]

2. Operational skills necessary to acquire remote sensing data and learn to extract information from them.[Practical]
3. Develop skill set to deal with different types and forms of satellite data [Minor test 1, Minor test 2 and Major test]

Pedagogical approach:

The course will be delivered through class lectures, lab exercise, videos and tutorials.

Materials Required

text

Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.

Curran P.J., Principles of Remote Sensing, UK, ELBS.

Jensen J.R. (2007) Remote Sensing of the Environment: An Earth Resource Perspective, 2nd ed., Pearson.

Suggested readings

Jensen J.R. (2005) Digital Image Processing: A Remote Sensing Perspective, 3rd ed., Prentice Hall.

Joseph G., Fundamentals of Remote Sensing, Universities Press India.

Kondratyev K.Y., Buznitov A.A. and Pokrovoky O.M., Global Change and Remote Sensing, John Wiley and Sons.

Lillesand T.M., Kiefer R.W. and Chipman J.W. (2003) Remote Sensing and Image Interpretation, 5th ed., Wiley.

Muralikrishna V., Geographical Information Systems and Remote Sensing Applications, Allied Publishers Private Limited.

Sabins F.F., Remote Sensing: Principles and Interpretation New York: WH Freeman and Company.

Case studies

Websites

Journals

1. Geocarto International
2. International Journal of Remote Sensing
3. ISPRS Journal of Photogrammetry and Remote Sensing
4. Journal of Indian Society of Remote Sensing
5. Remote Sensing of Environment

Additional information (if any)

Magazines

1. Coordinates
2. Geospatial today
3. GIM International
4. GIS World
5. GIS@development
6. GPS World

Student responsibilities

Attendance, feedback, discipline

Course Reviewers:

1. Prof. Saumitra Mukherjee, JNU
2. Prof. P K Joshi, JNU
3. Prof. Javed Mallick, King Khalid University, ABHA
4. Prof. Sunil Bhaskaran, Professor and Director, Geospatial Center of the CUNY CREST Institute(BGCCCI)