Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD527	Microwave Imaging	3	0	0	3

Course Objective

This course will enable the students to learn about fundamentals and application of microwave imaging and also learn about airborne and space borne radar systems.

Learning Outcomes

At the end of this module, students are expected to be able to

- Understand the fundamentals of radar remote sensing and radiometry.
- Apply the concept of radar remote sensing.
- Study about different airborne and spaceborne radar systems.
- Study about special topics in radar remote sensing systems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Passive Survey System: Introduction, History, plane waves, antenna systems, Resolution Concepts, Radiometry, Passive microwave sensing components, Emission laws, Roughness and Dielectric Constant, Radiometers, Components, Brightness temperature, Antenna temperature, Power, temperature correspondence, passive microwave interaction with atmospheric constituents, Emission characteristics of various earth features, Passive missions.	10	Students will be introduced to the fundamentals of remote sensing and radiometry.
2	Data products and Applications Active Survey System: Basics, RADAR operation and measurements, RADAR equation, RAR, frequency bands, SLAR Imaging Geometry, Geometric Distortions, SAR, Concepts, Doppler principle & Processing System Parameters and fading concepts, Target Parameters. Interaction with Earth surface and vegetation, Physical Scattering Models, Surface and Volume Backscattering Platforms.	10	Students will be able to apply the above concepts in radar remote sensing.
3	Sensors and Data Processing: Airborne, Space borne and Indian missions, Data products and selection procedure, SAR Image Processing software, Measurement and discrimination, Backscatter Extraction, Pre-processing and speckle filtering, Image Interpretation, SAR Image Fusion.	10	Students will understand different airborne and spaceborne radar systems.
4	Applications in Agriculture, Forestry, Geology, Hydrology, cryospace studies, landuse mapping and ocean related studies, military and surveillance applications, search and rescue operations, ground and air target detection and tracking - case studies. Imaging and Non Imaging Metrics: SAR interferometry, Basics, differential SAR interferometry, SAR polarimetry, Polarisation Types, Information Extraction, Altimetry, Principle, Location systems, Calibration- applications.	12	Students will be familiar with different radar remote sensing systems.
	Total	**42**	

Text Book:

1. Microwave remote sensing, By Ulaby, F.T., Moore, K.R. and Fung, vol-1,vol-2 Addison-Wesley Publishing, 1986.

Reference Books:

1. Principles and applications of Imaging RADAR, Manual of Remote sensing, vol.2, By Floyd.M.Handerson and Anthony, J. Lewis ASPRS, Jhumurley and sons, Inc, 3rd edition, 1998.

2. Air and space born radar systems-An introduction, By Philippe Lacomme, Jean clandeMarchais, Jean Philippe Hardarge and Eric Normant, Elsevier publications, 1st edition, 2007.
3. Introduction to microwave remote sensing, By Iain H.woodhouse, 1st edition, 2005.
4. Radar Foundations for Imaging and Advanced Concepts, By Roger J Sullivan, Knovel, SciTech Pub., 2004.