

# MICROWAVE REMOTE SENSING AND ITS APPLICATIONS

## Course Objectives:

- To understand the basics of active and passive microwave remote sensing
- To learn the techniques involved in the processing of microwave dataset
- To integrate the knowledge of microwave remote sensing in various applications

CE 827

## Course Content:

Introduction: Microwave remote sensing and its advantages – Active and passive systems – Platforms and sensors  
- Basics - RADAR operation and measurements - RADAR equation - RAR - frequency bands - SLAR Imaging  
Geometry - Geometric Distortions – Onboard satellites: RADARSAT, Sentinel, ERS, JERS characteristics and functions.

SAR – Concepts - Doppler principle & Processing System Parameters and fading concepts, Target Parameter  
Interaction with Earth surface and vegetation - Physical Scattering Models - Surface and Volume Backscattering  
- Data products and selection procedure, SAR Image Processing software - Preprocessing and speckle filtering  
Image Interpretation, SAR Image Fusion.

Passive microwave systems: Background – Mathematical formulation for microwave radiation and simulation  
measurement and analysis of brightness temperature – influence of the atmosphere and active sources – antenna  
and radiometric measurements – applications of various fields – oceanography and meteorology.

Active microwave systems: Basic principles of radar – RADAR equation – resolution, range, phase and angular  
measurements – microwave scattering and its measurements – relationships between scene and sensor parameters  
– Imaging systems – Imagery: characteristics and interpretation – Applications in various fields – Land use/Land  
cover, Soil/Rock, Hydrology.

Microwave interferometry: Theory and mathematical background – Differential interferometry – InSAR  
applications – SAR polarimetry - Polarisation Types - Polarimetric parameters - DEM generation – Glacial  
movement – Landslides – snow avalanches – Hydrology

## References:

1. Ulaby, F.T., Moore, K.R. and Fung, Microwave remote sensing vol-1, vol-2 and vol-3 - Addison - Wesley Publishing Company, London, 1986.
2. Floyd, M. Handerson and Anthony, J. Lewis "Principles and applications of Imaging RADAR", Manual of Remote sensing, Third edition, vol.2, ASPRS, Jhumurley and sons, Inc, 1998.
3. Iain H. Woodhouse, Introduction to microwave remote sensing, 2004, CRC Press; 1st edition, ISBN-13: 978 0415271233
4. Eugene A. Sharkov, Passive Microwave Remote Sensing of the Earth: Physical Foundations, Published by Springer, 2003.

## Course Outcomes:

On completion of this course, the student shall be able to

- Understand the concepts of active and passive microwave remote sensing
- Process and extract information from the microwave imagery
- Understand the various application domain of microwave satellite data

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Senate

GUIDE

CHAIRMAN

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