MICROWAVE REMOTE SENSING IN HYDROLOGY

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INTENDED AUDIENCE : Researchers, UG and PG students of Engineering, Remote Sensing, Industries working in Microwave remote sensing, environment and climate domain, Academicians working in Water resources and hydrology.

INDUSTRIES APPLICABLE TO : RMSI, ERDAS and similarly all firms/companies which have a remote sensing and GIS applications wing shall recognize/value this course

COURSE OUTLINE :

This course shall explain the fundamentals of microwave remote sensing in passive and active domain with application in civil engineering (hydrology, meteorology). An emphasis is made to teach microwave image processing through open source programming languages like python. Further objective of this course is to make a student capable to interpreting and deciphering the microwave data for complex scientific and policy problems in the water arena, all of which require high quality training.

ABOUT INSTRUCTOR :

Prof. J. Indu is currently working as faculty with the Remote Sensing Division, Department of Civil Engineering, IIT Bombay. Dr. J. Indu has been an affiliate at the National Weather Centre, University of Oklahoma through the WISTEMM fellowship. Dr. J. Indu completed her B.Tech in Civil engineering from MACE, Kothamangalam, Kerala and M.Tech in Geoinformatics from IIT Kanpur and PhD from IISc Bangalore. Her research interests are focused towards using microwave images for applications in hydrometeorology, uncertainty analysis using Data Assimilation, Radar Remote Sensing for water resources engineering.

COURSE PLAN :

Week 1: Fundamentals of Electromagnetic Waves, Introduction to microwave remote sensing, Overview of non-imaging and imaging microwave sensors, principles, physical fundamentals, Installation of python using Anaconda Environment and basic commands

Week 2: Scattering of Microwaves, Fundamentals of Synthetic Aperture Radar (SAR), Basics of Image formation, Basics of SAR Image processing using python

Week 3: Radar equation, Image defects - Geometric distortions, Introduction to Sentinel Application Platform (SNAP)

Week 4: Speckle, Doppler Shift in SAR Imagery, Multilooking, Spatial Convolution, Introduction to plotting and image statistics in python

Week 5: Introduction to Texture, GLCM, Introduction to Image statistics in Python

Week 6: Radar remote sensing, Speckle filtering using python

Week 7: Image classification, geometrical basis, Supervised Classification, SAR Image Classification using SNAP

Week 8: Unsupervised classification, Accuracy Assessment, Fuzzy Classification, Handling Active microwave data in Python

Week 9: Active microwave remote sensing: Principles, Application of active microwave remote sensing in hydrology, Doppler weather radar data visualization

Week 10: Radar Altimetry, concepts and applications in hydrology, Measuring soil moisture using active microwave remote sensing, Fundamentals of Passive microwave remote sensing and data handling using python

Week 11: Applications of passive microwave remote sensing in hydrology, Handling Precipitation data in python

Week 12: Radar Interferometry, using phase as a relative distance measure, Digital Elevation Models, Hydrological Models – An Introduction