AMITY UNIVERSITY
UTTAR PRADESH

COURSE CURRICULUM

Course Title: **Thermal and Microwave Remote Sensing**

Course Code:

Credit Units: 4

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	1	-	-	4

Course Level: PG

Course Objectives:

This course will provide a thorough introduction to Microwave remote sensing technology and application. The emphasis in this course is on understanding the underlying principles of acquiring and interpreting data from imaging systems to microwave and applying them

Pre-requisites: Student should basic of remote sensing and computers.

Student Learning Outcomes:

- Analyses Remote Sensing data for finding the problems and develop appropriate methods for studying and/or solving the problems using remote sensing techniques.
- Develop a technical skills for data interpretation and analysis and generate a integrate results for solution findings.
- Formulate and carry out independent research in the general field of remote sensing, possibly as part of a multi-disciplinary research and development project.

Course Contents/Syllabus:

	Weightage (%)
Module I Thermal Remote Sensing and Its Application **Descriptors/Topics** Thermal radiation principles, thermal process and properties, Characteristics of thermal IR images and Factors affecting thermal images, Interaction of thermal radiation with terrain elements, interpretation of thermal IR imagery, temperature mapping with thermal scanner data. Various types of thermal satellites and their characteristics.	**20**
Module II Introduction of Microwave Remote Sensing **Descriptors/Topics** Introduction to microwave remote sensing – Concept and principle, backscattering ,cross section Wavelength, incidence angle, aspect angle, Interactions between radar and surface materials - complex dielectric properties, roughness polarization, Passive microwave sensors, Active microwave sensors.	**20**
Module III RADAR Remote Sensing and its applications **Descriptors/Topics** Side looking radar system, Geometric characteristics of Side looking radar images, Synthetic aperture radar, Transmission characteristics of radar signals and other radar image characteristics. Physics of RADAR waves, spectral characteristics of RADAR waves, microwave radiometers, passive microwave scanners and sensors, Radar image interpretation, Fundamentals of radar interferometry. LIDAR – working principle, scope and applications,	**20**
Module IV Hyperspectral Remote Sensing and its Application **Descriptors/Topics** Fundamentals of Hyperspectral remote sensing. Hyper spectral imaging, imaging spectrometers, principles of spectroscopy, hyper spectral vs multi spectral imaging. Spectral reflectances, absorption process, analysis of spectral curve. Applications of Hyper Spectral Remote Sensing and case studies.	**20**

Module V **Applications of Microwave & Thermal Remote Sensing**	
Descriptors/Topics • Microwave Applications in Agriculture, Forestry, • Microwave Applications in Soil moisture analysis. • Thermal remote sensing in water pollution analysis. • Hyperspectral remote sensing in Mineral targeting • Thermal remote sensing in Earth Sciences	**20**

Pedagogy for Course Delivery:

The course is designed to be taught through the lecture mode and laboratory exercises. However seminar presentations on various themes related to the course and discussion on various case studies. Class room interaction will definitely have to be an integral part of the learning experience.

Lab/ Practicals details, if applicable:

List of Experiments:

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Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
30 %	NA	70 %

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)					
Weightage (%)	10	05	10	05	70

Lab/ Practical/ Studio Assessment:

	Continuous Assessment/Internal Assessment	End Term Examination

Components (Drop down							
Weightage (%)							

Text & References:

- Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
- Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
- Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
- Joseph George, 2003: Fundamentals of remote sensing. Universities Press
- Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
- Sabbins, F.F., 1985: Remote sensing Principles and interpretation. W.H. Freeman and company
- Charles Elachi and Jakob Van (2006) Introduction to the Physics and Techniques of Remote Sensing, Wiley Interscience, A John Wiley and sons Inc.,
- sensing
- Robert N. Colwell (1983)Manual of Remote Sensing Volume 1, Americal Society of Photo - grammetry
- Travett. J. W. (1986)Imaging Radar for Resources Surveys. Chapman and Hall, London
- Ulaby, F.T., Moore, R.K, Fung, A.K, (2001) Microwave Remote Sensing; active and passive,Vol. 1,2 and 3, Addison – Wesley publication company

Research Journals

- International Journal of Geo-Informatics
- International Journal of Remote Sensing
- ISPRS Journal of Photogrammetry and Remote Sensing
- Journal of Indian Society of Remote Sensing
- Remote Sensing of Environment
- IEEE Geoscience and Remote Sensing
- Applied Earth Observation and Geoinformation