



GUJARAT TECHNOLOGICAL UNIVERSITY

Programme Name: Master of Engineering

Level: PG

Subject Code : ME02000071

Subject Name : Remote Sensing

WEF Academic Year :	2024-25
Semester :	2
Category of the Course :	PEC-5

Prerequisite :	Basic knowledge of Satellite communication system, Fundamental knowledge of Radar and Antenna, Basic propagation mechanism, Physics of Remote sensing, Basics of Microwave engineering principles.
Rationale :	PG Students of EC Engineering need to possess good understanding of modern satellite communication system and radar design. The course represents the recent trends and technologies regarding the design and analysis of radars and satellites along with their applications in the upcoming future generation remote sensing systems. The students are expected to be able to gain the theoretical and practical aspect of remote sensing system along with the MATLAB based realization.

Course Outcome :

After Completion of the Course, Student will able to :

No	Course Outcomes	RBT Level*
01	Understand basic concepts, principles and applications of remote sensing, particularly the geometric and radiometric principles	UN
02	Provide examples of applications of principles to a variety of topics in remote sensing, particularly related to data collection, radiation, resolution, and sampling	UN
03	To focus on mathematical analysis of remote sensing techniques	RM
04	To understand the principles and applications of scatterometry, different RADARS, different remote sensing platforms for remote sensing applications	AN
05	Apply the principles of thermal, hyper spectral remote sensing of the terrain mapping for data analysis and interpretation	AP

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Teaching and Examination Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR		Theory		Practical		
			ESE (E)	PA(M)	ESE (V)	PA (I)		
3	0	2	4	70	30	30	20	150



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Course Content :

Sr. No.	Course Content	No. of Hours	% of Weightage
1.	Physics Of Remote Sensing:Electro Magnetic Spectrum, Physics of Remote SensingEffects of Atmosphere-Scattering–Different types–Absorption-Atmospheric windowEnergy interaction with surface features –Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing	7	10
2.	Data Acquisition: Types of Platforms–different types of aircrafts-Manned and Unmanned spacecrafts–sun synchronous and geo synchronous satellites –Types and characteristics of different platforms –LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD etc.	8	15
3.	Photographic products, B/W,color, color IR film and their characteristics –resolving power of lens and film - Optomechanical electro optical sensors –across track and along track scanners-multispectral scanners and thermal scanners–geometric characteristics of scanner imagery - calibration of thermal scanners	8	20
4.	Scattering System: Microwave scatterometry, types of RADAR –SLAR –resolution –range and azimuth –real aperture and synthetic aperture RADAR. Characteristics of Microwave images topographic effect-different types of Remote Sensing platforms –airborne and space borne sensors -ERS, JERS, RADARSAT, RISAT - Scatterometer, Altimeter-LiDAR remote sensing, principles, applications.	8	20
5.	Thermal And Hyper Spectral Remote Sensing: Sensors characteristics-principle of spectroscopy-imaging spectroscopy–field conditions, compound spectral curve, Spectral library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing –thermal sensors, principles, thermal data processing, applications.	8	20
6.	Data Analysis: Resolution–Spatial, Spectral, Radiometric and temporal resolution signal to noise ratio-data products and their characteristics-visual and digital interpretation–Basic principles of data processing –Radiometric correction–Image enhancement–Image classification–Principles of LiDAR, Aerial Laser Terrain Mapping.	7	15
	Total	46	100



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Reference Book :

1. Lillesand.T.M. and Kiefer.R.W,“Remote Sensing and Image interpretation”, 6thEdition,
2. John Wiley & Sons, 2000.
3. John R. Jensen, “Introductory Digital Image Processing: A Remote Sensing Perspective”, 4. 2nd Edition, Prentice Hall,1995.
4. Richards, John A., Jia, Xiuping, “Remote Sensing Digital Image Analysis”,5th Edition,
5. Springer-Verlag Berlin Heidelberg, 2013.
6. Paul Curran P.J. Principles of Remote Sensing, 1st Edition, Longman Publishing Group, 1984.
7. Charles Elachi, Jakob J. van Zyl, “Introduction to The Physicsand Techniques of Remote Sensing”, 2nd Edition, Wiley Serie, 2006.
8. Sabins, F.F.Jr, “Remote Sensing Principles and Image Interpretation”, 3rd Edition, W.H.Freeman& Co, 1978

Suggested Course Practical List :

To use MATLAB/SCILAB

1. For the realization of different remote sensing algorithms,
2. For the simulation of image processing techniques,
3. To compute RADAR parameters,
4. Analyse different techniques ,
5. To understand matched filter and pulse compression technique,
6. To obtain Sensor characteristics to obtain Spectral Resolution,
7. For the interpretation of data of the satellite images
8. Other practicals in the scope of the syllabus Case studies of remote sensing applications

List of Laboratory/Learning Resources Required : NPTEL lectures /IEEE Journals/ /ISRO/NASA publications and Journals

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