

GUJARAT TECHNOLOGICAL UNIVERSITY

REMOTE SENSING SUBJECT CODE: 3714108 M.E. 1st SEMESTER

Type of course: Programme Elective-II

Prerequisite: Microwave Engg, Digital Signal Processing ,Image Processing ,Radar Engineering

Rationale: The purpose of this course is to provide an understanding of modern remote sensing techniques and applications . Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance from the targeted area. Special cameras collect remotely sensed images of the Earth, which help researchers "sense" things about the Earth . Measurements of the earth is made using sensors on airplanes or satellites with geographic information system (GIS) as a computer-based tool for mapping and analyzing feature events on earth. It integrates common database operations, such as query and statistical analysis, with maps.

Topics include:Physics of remote sensing data Acquisition:Types of Platforms, optical sensors ,across track and multispectral scanners. Microwave scatterometry, Thermal And Hyper Spectral Remote Sensing, Data Analysis and Image Resolution.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Sr. No.	Content	Total Hrs	% Weightage
1	Physics Of Remote Sensing:Electro Magnetic Spectrum, Physics of Remote Sensing-Effects of Atmosphere-Scattering-Different types-Absorption-Atmospheric window-Energy interaction with surface features -Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing.	07	10
2	Data Acquisition:Types of Platforms-different types of aircrafts-Manned and Unmanned space crafts-sun synchronous and geo synchronous satellites -Types and characteristics of different platforms -LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD etc	08	20
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.	07	10

4	Scattering System: Microwave scatterometry, types of RADAR –SLAR – resolution –range and azimuth –real aperture and synthetic aperture RADAR. Characteristics of Microwave image topographic effect- different types of Remote Sensing platforms –airborne and space borne sensors -ERS, JERS, RADARSAT, RISAT -Scatterometer, Altimeter- LiDAR remote sensing, principles, applications.	08	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	07	15
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	07	15

References:

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

Course Outcomes:

At the end of this course, students shall be able to

- Understand basic concepts, principles and applications of remote sensing, particularly the geometric and radiometric principles
- Provide examples of applications of principles to a variety of topics in remote sensing, particularly related to data collection, radiation, resolution, and sampling

Journal and Transactions :

- IEEE Transactions on Geoscience and Remote Sensing
- Remote Sensing — Open Access Journal :Remote Sensing (ISSN 2072-4292)
- Journal of Remote Sensing & GIS-Open Access
- **Learning website: www.nptel.ac.in; IEEE explore**

List of Experiments: Simulation Experiments are to be designed looking to the given course contents.