Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NGPC515	Remote Sensing Principles	3	1	0	4

Course Objective

Understanding fundamental of Remote Sensing Principles and Data Acquisition System

Learning Outcomes

Upon successful completion of this course, students will be able to

- Understanding of Electromagnetic Radiation and their interaction with atmosphere and different surface features
- Fundamentals of Optical and Infrared Remote sensing
- Fundamentals of Thermal Infrared Remote Sensing
- Fundamentals of Microwave Remote Sensing

Unit No.	Topics to be Covered	Lecture Hours (L + T)	Learning Outcome
1	Introduction: Basic concepts of Remote Sensing, Key components of Remote sensing system, Ideal Remote Sensing System, Characteristics of Real Remote Sensing Systems, advantages and disadvantages of remote sensing, passive and active remote sensing. Electromagnetic Radiation (EMR), and EMR Spectrum, sources of EMR and governing EMR laws: Plank's quantum theory, Stefan- Boltzman law, Wein's displacement law, Kirchhoff's law, Plank's law of radiation. Remote Sensing Platforms: Ground borne, airborne and space borne platforms; manned and unmanned space missions and satellites; importance and applications of various platforms with reference to remote sensing of earth resources.	**8L +2T**	Fundamental of Remote Sensing
2	Interaction of EMR with atmosphere: Scattering, refraction, reflection, diffraction, path radiance., Atmospheric window, generalize absorption spectrum.	**4L + 2T**	Fundamentals on interaction of EMR with atmosphere
3	Interaction of EMR with different earth's surficial feature in optical-infrared: radiometric quantities, radiation budget, reflectance, transmittance, absorptance, Rayleigh criterion, nature of specular and diffuse reflection, lambertian surface, spectra reflectance curve, spectral signature analysis, Spectral characteristics of soil, rock, vegetation, water body, etc.	**8L + 2T**	Fundamentals on interaction of in optical-infrared with different surface features
4	Interaction of EMR with different earth's surficial feature in Thermalinfrared: Basic concepts of thermal remote sensing emissivity, albedo, relation of kinetic and radiant temperature. thermal properties, thermal conductivity, thermal diffusivity, thermal capacity, thermal inertia, apparent thermal inertia.	**4L +2T**	Fundamentals on interaction of in Thermal-infrared with different surface features
5	Interaction of EMR with different surficial feature on the earth in microwave regions: Basic concepts of passive microwave remote sensing, RayleighJeans approximation, characteristics of vegetation, soil , sea surface, snow, with respect to variable wetness, surface roughness etc. Basic concepts of active microwave remote sensing, characteristics of back scattering coefficient, for vegetation, soil, sea surface, etc., with respect to variable dielectric properties, wetness, surface roughness, incidence angle, polarization etc.	**6L +2T**	Fundamentals on interaction of in Microwave with different surface features

6	Geometry of optical-infrared/thermal infrared remote sensing: orbit of satellite, orbital period, geosynchronous, sun-synchronous, geostationary, swath, nadir, solar elevation, solar zenith, solar azimuth. Image reference system: Path and Row, Sensor resolutions.	**4L + 2T**	Fundamentals on geometry of satellite remote sensing
7	Data acquisition mechanism for optical-infrared/thermal infrared remote sensing: Sensor resolution: Spatial, spectral, radiometric, and temporal, data acquiring using single detector, detector strip, area array detectors; across track and along track scanning. Detector, types of detectors, detector characteristics, responsivity, quantum efficiency, spectral response, noise equivalent power, specific detectivity, time constant.	**4L + 1T**	Fundamentals on types of sensors, types of detectors and their characteristics
8	Geometry of Active microwave data acquisition, Azimuth, Range, Slant range, ground range, Radar swath, incidence angle, look angle, range resolution, azimuth resolution, depression angle, Synthetic aperture radar, Speckle, Radar Equation, SAR Reflectivity, Radiometric Calibration, Scalloping, Radar Geometric Distortions: Foreshortening, Layover	**4L + 1T**	Fundamentals on data acquisition principle and Important Remote Sensing satellites/ space missions
	Total	**42L +14T**	

Text Books:

1. Joseph,George and Jeganathan, C. (2017). "Fundamentals of Remote Sensing", 3rd Edition, Universities press (India) Pvt. Ltd., Hyderabad.
2. B. Bhatta., Remote Sensing and GIS. Third Edition, Oxford University press.

Reference Books:

3. Lillesand, Thomas M. and Kiefer, Ralph, W. (2007). "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York.
4. Jensen, J.R. (2006). "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi.
5. Sabins, F.F. Jr. (2007). 'Remote Sensing – Principles and Interpretation", W.H. Freeman & Co.
6. Reeves, Robert G. (1991), "Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA
7. Seigel, B S and Gillespie, Alan, Remote Sensing in Geology, John Wiley Publication
8. M. Anji Reddy, Remote Sensing and Geographical Information systems
9. Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, Digital Image Processing Using Matlab