

COURSE CODE	COURSE TITLE	L	T	P	C
1152CS212	IMAGE PROCESSING FOR REMOTE SENSING	3	0	2	4

Course Category: Program Elective

A. Preamble:

The aim of the course is to introduce various techniques of processing and information extraction from remotely sensed images.

B. Prerequisite Courses:

Sl. No	Course Code	Course Name
1		Computer Graphics and Image Processing

C. Related Courses:

Sl. No	Course Code	Course Name
1	1152CS124	Soft computing
2	1152CS140	Machine Learning Techniques

D. Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's taxonomy)
CO1	Understand the fundamental concepts in remote sensing	K2
CO2	Apply appropriate radiometric and geometric image correction techniques.	K3
CO3	Apply and analyse various image enhancement techniques on remotely sensed data	K3
CO4	Understand various image classification techniques using machine vision algorithms	K2
CO5	Analyse high-dimensional remote sensing imagery (hyperspectral imagery and texture transforms) for Land Use Land Cover applications	K3

E. Correlation of COs with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	L											L	
CO2	M		L		M								L		
CO3	M										L		L		
CO4	M	L	M		M						L			L	
CO5	M	L			M						L				

F. Course Content:

Unit I Introduction to Remote Sensing

9

Digital image, DIP system: components and functions, basic imaging process, multi-concept in Remote Sensing data analysis, Elements of human and computer assisted interpretation. Formats of digital imagery, colour look up tables.

Unit II Preprocessing of Remotely Sensed Images

9

Geometric distortions and their correction Sources of image geometry errors, altitude, attitude, velocity, earth rotation, map projection, panoramic and Correction of geometric distortions: model based correction, ground control points, mapping Polynomials, geo-referencing, registration, re-sampling, intensity interpolation.

Radiometric distortions and their correction Sources of radiometric distortion, atmospheric effects on remote sensing imagery, correction of radiometric distortions.

Unit III Image Enhancement

9

Image histogram, point operations and look-up tables, False Colour Composite (FCC), Density slicing, contrast enhancements, histogram equalization. Spatial and frequency filtering, linear filters, smoothing, sharpening, High/Low pass filters. Edge detection and enhancement: Edge Detection operators (Conventional filters): First derivative, Edge thinning and linking.

Unit IV Pattern Recognition

9

Pattern, image classification, decision surfaces. Unsupervised classification: K-means clustering, Supervised classification: Maximum likelihood, and minimum distance to means, K-NN, CNN, RNN. Training areas and their characteristics, sampling, refinement of training data. Feature selection: Bhattacharya and Mahalanobis distance. Classification accuracy estimation, Naïve measure, Kappa.

Land use Land cover applications- Agriculture- road map detection- disaster management- change detection – analysis using ERDAS imagine software

THEORY TOTAL: 45 Periods**F. LIST OF EXPERIMENTS****LAB TOTAL: 30 Periods**

1. Segment/Object-based classification
2. Pre-processing of RS data
3. ANN classification
4. Feature selection
5. Land Use Land Cover data analysis

G. Learning Recourses:**i. Text Book**

1. Lilles and, T.M., Kiefer, R.W. and Chapman, J.W., “Remote Sensing and Image Interpretation”, (7th Ed.), John Wiley & Sons, 2015.
2. Jarocińska, Anna, van der Meer, Freek D., “Remote Sensing and Digital Image Processing”, Springer, 2016.
3. John Jensen, “*Introductory Digital Image processing: A Remote Sensing Perspective*”, 4rd edition, Prentice Hall.

ii. Reference Book

1. Robert Schowengerdt , “*Remote Sensing: Models and Methods for Image processing*”, 3rd edition, Elsevier. ISBN: 0-12-369407-8, 2007.
2. Gonzalez, Rafael C. and Richard E. Woods “*Digital Image Processing*”, 3rd Edition, Pearson Education, London.