Credit course Syllabus
SPATIAL INFORMATION TECHNOLOGY

1. PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEM

OBJECTIVE:
To provide exposure to data models and data structure used in GIS and to introduce various Raster and Vector Analysis capabilities of GIS also expose the concept of quality and errors in GIS.

UNIT I: BASICS
Maps: Types – Characteristics – Coordinate systems – Map projections – Definition of GIS – Evolution – Components of GIS – Data : Spatial and Non-spatial – Spatial Data: Point, Line, Polygon/Area and Surface – Non-Spatial Data: Levels of measurement – Database Structures.

UNIT II: DATA MODEL AND INPUT
Raster Data Model – Grid – Tessellations – Geometry of Tessellations — Data Compression – Vector Data Model – Topology – Topological consistency – Vector data input– Raster Vs. Vector comparison – File Formats for Raster and Vector – Vector to Raster conversion- raster formats.

UNIT III: DATA ANALYSIS AND OUTPUT
Raster Data Analysis: Local, Neighborhood and Regional Operations – Map Algebra – Vector Data Analysis: Non-topological analysis, Topological Analysis, Point-in-Polygon, Line-in-polygon, Polygon-in-polygon – Network Analysis – buffering – ODBC – Map Compilation.

UNIT IV: SPATIAL MODELING
Modeling in GIS – types – Digital Elevation Models: Generation, Representation, Applications .

UNIT V: DATA QUALITY AND MISCELLANEOUS TOPICS
Data quality analysis – Sources of Error – Components of Data Quality – Meta Data – Open GIS consortium – Customisation in GIS.

REFERENCES:
1. Lo. C P and Yeung, Albert K W, “Concepts and Techniques of Geographic Information Systems”, Prentice Hall of India, 2002.
2. Robert Laurini and Derek Thompson, “Fundamentals of Spatial Information Systems”, Academic Press, 1996.
3. Peter A Burrough, Rachael A Mc.Donnell, “Principles of GIS”, Oxford University Press, 2000.
4. Allan Brimicombe, GIS Environmental Modeling and Engineering, Taylor & Francis, 2003.
5. Geigraphical Information System and Spatial data by Dr. Arun Sexena. Quantum Publishers
6. GIS a visual approach by Bruce K Davis, Onvvord Press
7. An Introduction to Geoinformatics by GS Srivatsava, McGraw Hill Education Pvt Ltd.

Credit course Syllabus
SPATIAL INFORMATION TECHNOLOGY

2. PRINCIPLES OF REMOTE SENSING

OBJECTIVE:
The objective of this course is to familiarize about the principles of remote sensing and the data acquisition and analysis of satellite data.

UNIT I: INTRODUCTION TO REMOTE SENSING
Introduction 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.

UNIT II: 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 – Photographic products, B/W, colour, colour IR film and their characteristics – resolving power of lens and film - Opto mechanical electro optical sensors – across track and along track scanners – multi spectral scanners and thermal scanners – geometric characteristics of scanner imagery - calibration of thermal scanners.

UNIT III: SCATTERING SYSTEM
Microwave scatterometry – types of RADAR – SLAR – resolution - range and azimuth – real aperture and synthetic aperture RADAR. Characteristics of Microwave imagestopographic effect - different types of Remote Sensing platforms –airborne and space borne sensors – ERS, JERS, RADARSAT, RISAT - Scatterometer, Altimeter- LiDAR remote sensing, principles, applications.

UNIT IV: 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.

UNIT V: 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.

REFERENCES:

1. Lillesand T.M., and Kiefer, R.W. Remote Sensing and Image interpretation, VI edition of John Wiley & Sons-2000.
2. John R. Jensen , Introductory Digital Image Processing: A Remote Sensing Perspective , 2nd Edition, 1995.
3. John A.Richards, Springer –Verlag, Remate Sensing Digital Image Analysis 1999.
4. Paul Curran P.J. Principles of Remote Sensing, ELBS; 1995.
5. Charles Elachi and Jakob J. van Zyl , Introduction To The Physics and Techniques of Remote Sensing , Wiley Series in Remote Sensing and Image Processing, 2006.
6. Sabins, F.F.Jr, Remote Sensing Principles and Image interpretation, W.H.Freeman & Co, 1978.