

COURSE SYLLABUSES

Course-1 : ADVANCED GIS

No	Topics
Cartography & Remote Sensing	
1	Concept of Cartography : Map, scale, coordinate systems, sphere/spheroid, datums, projection, projection parameters etc.
2	Cartography & GIS ; Concept of Geo-visualization.
3	Concept on Remote Sensing: Definition, Process, EMR Spectrum and its properties
4	Concept of Resolutions; sensor, detector, image acquisition, PAN, multispectral, Hyper spectral, Digital camera
5	Fundamentals of aerial photography: Aerial cameras, Photogrammetry; Basic concepts of scale, object height and length.
6	Photographic System; Active and Passive sensors; image referencing system etc.
7	Spectral Signature and its Response; Basics of visual interpretation of satellite images; Hyper-spectral remote sensing.
8	Introduction of ERDAS imagine
9	Image Pre-processing and enhancement using ERDAS Imagine
10	Georeferencing, RMS error, transformation and resampling, contrast enhancement
11	Mosaicking, AOI tools, subsetting (spatial and spectral), Layer Stacking
12	Filtering (convolution, statistical, crisp), image addition, image subtraction, image multiplication
13	Image transformation (using ERDAS Imagine): Colour space transformation, TCT, FFT, fusion
14	Digital Image Processing: Supervised, Unsupervised, Post classification
15	Accuracy assessment, Post-classification vectorisation

Introduction of Open Source GIS	
6	Overview of GIS: Introduction to GIS
7	Spatial data model: Dimensions of GIS data, Conceptual and logical
8	Concepts on co-ordinate system: Map, scale, coordinate systems, datums, projection
9	Process of GIS: Data sources, Raster and vector data processing
10	Introduction to Quantum GIS: Interface & Plugins concepts, Raster handling/processing
11	Image Georeferencing, projection
12	Vector Creation, vector editing, Attribute & spatial query,
13	Import CSV file, Coordinate extraction, Data joining, Projection transformation,
14	Creation of Thematic map, Layout generation
15	Image Classification in Q GIS
16	Spatial Analysis, Geoprocessing
Application of advanced Geospatial Techniques	
20	Introduction to Arc GIS
21	Georeferencing (image to image, image to ground), projection
22	Shape file Creation, editing, Advance editing,
23	Concept of attribute data & spatial data, external database attachment, query
24	Geodatabase design,(generation/editing), Topology
25	Add XY data, external data attachment, create relationship, query
26	Thematic map, Layout generation, Annotation
27	Geoprocessing, ArcScan: Automated R2V conversion
28	Spatial query,attribute query, model buliding
29	Surface model and surface analysis, surface interpolation
30	Network analysis: Suitable site finding, shortest path analysis etc
Application of Python in GIS	
31	Prepare Project report
32	Theory Exam
33	Practical Exam
34	Project Work Submission and Viva

Course -2: DIGITAL IMAGE PROCESSING

SL No	Topic
1	Introduction to Remote Sensing and Image Interpretation
2	Concept on Remote Sensing: Definition, data (in situ / remote sensing), remote sensing process
3	Remote Sensing platforms and sensor characteristics: Platforms, passive/active, orbits, swath, nadir, sensor resolutions, image referencing system, orbital calendar
4	Photographic imaging: Camera, filter, film, vantage point
5	Visual interpretation of photographic images: Interpretation elements, interpretation of optical images, interpretation keys, mapping geographic features, practical
6	Digital optical imaging: Digital image, sensor, detector, image acquisition, PAN, multispectral, hyperspectral, digital camera

7	Concepts on co-ordinate system: Map, scale, coordinate systems, sphere/spheroid, datum, projection, projection parameters
8	DIP (pre-processing and enhancement): Georeferencing, RMS error, transformation and resampling, contrast enhancement
9	Visual interpretation of digital images: Image profile (choosing appropriate band/s), contrast enhancement
10	Pre-processing (using ERDAS Imagine):
11	Georeferencing (image to image, image to ground, image to map)
12	Mosaicking, AOI tools, sub setting (spatial and spectral)
13	DIP (enhancement and transformation): Spatial frequency, filtering (convolution, statistical, crisp), image addition, image subtraction, image multiplication, index
14	Image filtering and transformation (using ERDAS Imagine): Convolution, crisp, change detection, index (iron oxide, clay, NDVI)
15	Image transformation (using ERDAS Imagine): Colour space transformation, TCT, FFT, fusion
16	Microwave remote sensing: Passive and active microwave remote sensing, radar imaging, frequency, polarization, viewing geometry, spatial resolution, speckle, surface geometry, surface roughness, dielectric properties, interpretation of radar image
17	DIP (Classification): Information class, spectral class, supervised vs. unsupervised, decision rules for unsupervised classification
18	Image classification using ERDAS imagine: Unsupervised classification
19	DIP (Classification): Decision rules for supervised classification, accuracy assessment, post-classification filtering
20	Image classification using ERDAS Imagine:
21	Supervised classification, accuracy assessment
22	Unsupervised classification of NDVI image, post-classification vectorisation
23	Layer stack, supervised classification using optical bands in addition to PC images and indexed image, post-classification filtering
24	Classification of change image, pseudo color image preparation
25	Presentation and publication using ERDAS Imagine: Map composition, import/export
26	Digital Photogrammetry: Image acquisition, geometric distortion, orientation and triangulation, digital stereo model, parallax, DEM generation, ortho-rectification, 3D feature

Course -3: ADVANCED PYTHON IN GIS

Python, advantages and disadvantages of Python, Interpreter, Features of Python, Python Installation, knowing different IDLE, First Program in Python, Use of Python in GIS, Need of GIS Automation.

Basics of Python

- Syntax and comments,
- Variables, Data Types,
- Type Casting,
- Basic operators and operations,
- Decision Making and loops, Data Structures & their methods,
- Lists, Tuples, Sets, Dictionary, Functions, Scope & Modules, Iterators,
- Decorators and closure in Python,
- some special functions,
- Lambda function, Map, Filter, Reduce, Generators

Python and OOP

- OOP concepts,
- Class & Objects,

- Constructors in Python,
- Method Overloading in Python,
- isinstance in Python,
- Descriptors, use of self in python, use of new and init,
- Multiprocessing and multithreading in Python,
- Database Access, processing,
- Garbage Collection in Python

Python in GIS

- Introducing Python Using the Python Window in ArcGIS
- GIS data access and manipulation with Python
- Reading vector attribute data
- Accessing data fields
- Reading through records
- Retrieving records using an attribute query
- Retrieving records using a spatial query
- Writing vector attribute data
- Updating existing records
- Inserting new records
- Working with raster

Python for the GIS analysts

- Reading and parsing text using the Python csv module
- Writing geometries
- Automation with batch files
- Running any tool in the box
- Limitations of Python scripting with ArcGIS