**APPLICATION OF GIS WITH PYTHON**

Elective

GE

Lecture: 3 Hrs Year: IV

Tutorial: 1 Hrs Part: I/II

Practical: 1.5 Hrs

Course Objectives:

The objective of this course is to gain familiarity with basic tools and methods of open source remote sensing and geographic information systems. The course intention is to make students try their hands on solving remote sensing and geographic information system problems without using proprietary software.

Course content:

1. Introduction to python programming: 1 Hrs

1.1 Variables, literals, keywords, expression and statements

1.2 Operators, types and precedence

2. Python function: 3 hrs

2.1 Why to use functions and their types

2.2 Built in function

2.3 conversion function

2.4 math function

2.5 Function definitions

2.6 Recursive function

2.7 Some python modules

3. Control statements and repetition: 3 hrs

3.1 If, If...else, nested if, chaining with elif statements

3.2 While and for loops

3.3 Nested loop

4. Strings: 3 hrs

4.1 Concatenation, comparison

4.2 Length of a string, string subscripts, positive and negative indices

4.3 'in' operator

4.4 Strings are immutable

4.5 Strings methods

5. Lists: 3 Hrs

5.1 positive and negative indices

5.2 lists are mutable

5.3 empty list

5.4 'in' operator

5.5 Nested list

5.6 Methods on list

5.7 list as matrices

6. Dictionaries: 3 Hrs

6.1 Key: value pair

6.2 dictionary methods

6.3 dictionaries and matrices

6.4 updating dictionaries

7. Files: 3 Hrs

7.1 Absolute and relative paths

7.2 Current working directory

7.3 Opening and closing to a file

7.4 Reading from and writing to a file

7.5 Copying a file

7.6 Types of files: text and binary

8. Classes and objects: 3 Hrs

8.1 Concept of class and object

8.2 Instantiation

8.3 Copy: shallow copy and deep copy

8.4 Constructors

9. Working with images: 8 Hrs

9.1 Bands and modes

9.2 Handling images: loading images, getting image information, histogram, conversation, splitting and merging bands, masking, cropping and resizing

9.3 Edge detection and segmentation

9.3.1 Edge detection on black and white images

9.3.2 Edge detection on color and hyper spectral images

9.3.3 Hyeperspectral image segmentation

9.4 Image processing

9.4.1 Getting and setting pixels

9.4.2 Filters: blurring, edge enhancement, smoothing, sharpening

9.4.3 Mathematical morphology: erosion, dilation, opening and closing

9.5 Transformations

9.5.1 Affine and perspective transformation

9.5.2 Interpolation: nearest, bilinear and cubic

10. Spatial data processing: 15 Hrs

10.1 Types of spatial data and vector data types

10.2 Reading and writing vector data

10.3 Extract a subset of learners

10.4 Creating geometrics and handling projections

10.5 Calculating attributes of vector data

10.6 Testing Topological conditions

10.7 Spatial analysis methods: difference, symmetric difference, union, intersection, buffer, simplify, merge

10.8 Georeferecing a new image

10.9 Mosaic images, and map algebra

Practical classes:

1. Introduction to Python and Python function

2. Branching and looping in Python

3. String handling and lists in Python

4. Dictionaries and files using in Python

5. Classes and objects in Python

6. Image processing

6.1 Handling images, edges detection and segmentation

6.2 Image processing, transformation batch processing

7. Spatial data processing

7.1 Reading, writing and sub setting vector data

7.2 Creating geometries, handling projections and calculating attributes of vector data

7.3 Testing Topological conditions and familiarizing with spatial analysis methods

7.4 Georeferecing and Mosaic images

7.5 Map algebra

Refrences:

1. John M. Zelle. Python Programming : An Introduction to Compture Science (2nd Edition). Wartburg College Printing Services

2. David M. Beazely .Python Essential Reference (4th Edition) .Addison Wesley Professional

3.http:// www. python.org/

4. http:// docs.python.org/2/library

5. http:// pythonware.com/ library / pil / handbook / image .htm

6. http :// www.gdal.org/

7.http:// www. gdal .org/ogr/

Evaluation Scheme:

The questions should cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| S. No. | Chapter | Hours | marks allocation\* |
| 1 | 1-4 | 10 | 16 |
| 2 | 5,6,7 | 9 | 16 |
| 3 | 8, 10.1-10.4 | 9 | 16 |
| 4 | 9 | 8 | 16 |
| 5 | 10.4-10.9 | 9 | 16 |
|  | Total | 45 | 80 |

\* There may be minor variation in marks distribution