Need of the course:

The course comes under the new emerging and high tech areas of the knowledge which is applicable to all disciplines having both national and global priorities.

Geoinformatics incorporated the disciplines of Remote Sensing (RS), Geographical Information System (GIS), Photogrammetry etc. The application of Geoinformatics is varied in conservation and rational use of resources, disaster management and other emerging areas. It caters the needs of increasing demand of industry and share in the planning of conservation and rational use of natural resources. It is very much useful for planning and decisions making.

Placement Opportunity:

There is abundant placement opportunity in the following fields

- 1. Government Planning Commission
- 2. Government Departments like Collectorate, Forest, Revenue, Agriculture, Geology
- 3. Local Governance Body like Corporation office, ZP
- 4. Non Government Organizations (NGO)
- 5. Corporate Industry
- 6. Educational Institutes/Organizations
- 7. Research Institutes and other fields.

'P.G. Diploma in Geoinformatics'

Course Structure

1) Course Duration: 1 Year (2 Semesters)

2) No. of Students : Total Seats 30, 20 for Shivaji University-15+5

10 for other Universities- 5+5

3) Eligibility for Admission:

The Course is applicable for the Students Passing out of M.A./M.Sc. Geography or

B.Sc./M.Sc. in any subject, B.E. Students from Engineering faculty are also eligible.

4) Selection: Selection is strictly based on merit of entrance.

Nature of Entrance exam: 50 Multiple Choice Questions

a) General Knowledge = 20 marks

Science & Technology Based: Basic & fundamentals of Computer, Remote Sensing & GPS, Space science, India's space development, satellite & space missions.

b) Environmental & Geographical Knowledge = 50 marks

Natural hazards & disaster management, environmental change, global warming & ozone depletion, geography of India. Time zone, Longitude & Latitude,

c) Basic quantitative Aptitude = 30 marks

Reasoning ability & general aptitude.

Department Of Geography Shivaji University,Kolhapur. PG Diploma In Geoinformatics Structure of Course. Semester I

Course Code Paper No. Subject Mark Aerial Photogrammetry & Cartography _____ 1 100 2 Remote Sensing & Image Interpretation 100 ____ 3 Geographical Information system & 100 ____ Database Management System Practical I Practical In Aerial Photogrammetry & 100 ---Cartography Practical In Remote Sensing & Image Practical II 100 ----Interpretation Practical III Practical In GIS & DBMS 100 ____ Semester II Subject **Course Code Paper No.** Mark 4 Mathematics & Statistical Techniques 100 ____ For Digital Image Processing & **Computer Programming** 5 **Digital Image Processing** 100 ____ 6 Advances In GIS/GPS & Surveying 100 ____ Practical IV Practical In Statistics & Computer 100 ____ Programming Practical In DIP Practical V 100 ____ Practical In GIS/GPS & Surveying Practical VI 100 ____ Practical VII **Project Work** 200 ____

Semester I Paper No. -1 Theory: Paper I – Aerial Photogrammetry & Cartography Unit I

i) Aerial Photography

ii) Basic Information & Specification For Aerial Photography

iii) Planning & Execution of Photographic Flights

iv) Aerial Cameras

v) Aerial Film Negatives

Unit II

vi) Completion of Photographic Task

vii) Basic Colour Photography

- viii) Fundamentals of Photogrammetry
- ix) Geometry of Aerial Photographs
- x) Scale, Ground Coverage & Resolution & Aerial Photos

Unit III

xi) Relief Displacement

- xii) Stereo vision, stereo model & stereoscopes
- xiii) Measurement of height from Aerial Photos, Parallax & Parallax measurement
- xiv) Principles of stereophotogrammetry

Unit IV

xv) Model deformation

xvi) Digital Photogrammetry

xvii) Satellite Photogrammetry

xviii) Cartography

Practical -I Practicals in Aerial Photogrammetry and Cartography. Unit I

- 1. Introduction to Leica Photogrammetry Suite. (LPS) of Erdas Imaging
- 2. Introduction to vertical and oblique aerial photographs.
- 3. Indexing of aerial photographs.
- 4. Introduction to stereoscopes.
- 5. Stereoscopic test.
- 6. Orientation & construction of 3-D model under stereoscope.

Unit II

- 7. Fundamentals of Photogrammetry:
- a) Determination of Photo scale.
- b) Determination of height of the object.
- c) Relief displacement & Parallax bar.
- d) Introduction to Parallax bar & Parallax measurements.
- e) Determination of Photo coverage area

Unit III

- 8. Interpretation & Mapping of aerial photographs for:
- a) Landuse & Land cover.
- b) Cultural landscape mapping.
- c) Rock types & structure.

Unit IV

- 9. Classification of Maps: Visual variables of map Generalization.
- 10. Map scale : Types and conversion, Vertical exasseration, enlargement & reduction.
- 11.Map Projection: Concept, classification, Uses & types, Datum
- 12. Map reference system: International system, UTM System & SOI system (Indexing, Scale, grid Reference, Signs & Symbols, Colour Systems)

Semester I Paper 2 Paper II : Remote sensing & Image Interpretation Unit I

1. Basic of Remote Sensing

2. Platforms and Sensors.

3. Thermal Remote Sensing.

4. Microwave Remote Sensing.

Unit II

5. Radiometric and Geometric corrections.

6. Ground investigation in support of remote sensing.

7. Hyper- spectral remote Sensing.

Unit III

- 8. Radar interferometry
- 9. Laser altimetry
- 10. Image interpretation visual.

Unit IV

11. Application of Remote Sensing in various fields.

- a) Urban & Regional Planning
- b) Agriculture & Soil.
- c) Water Resource
- d) forestry
- e) Landuse and Land cover mapping.

Semester- I

Practical - II

Title Practicals in Remote Sensing

Unit I

1) Study of Satellite Image annotation

2) Study of Satellite Imagery Marking Reference System and Image Browsing s

 Study of Radiant thermometer, Collection of Radiant Temperature for selected objects and Drawing of its Graph of Diurnal Variation

Unit II

4) Demonstration of MSS Imagery wing additive colour viewer

5) Study of Given Area in B/W IR, Colour and IR Colour Photographs

6) Study of Satellite Imagery (B/W) in Different bands and Visual Interpretation Study of Thermal Imagery

Unit III

- 7) Image, Interpretation of Various Features and Drawing of Isotherms Study of Radar (Microwave) Imagery and Interpretation of Features
- 8) Interpretation of Cultural Details From IKONOS PAN Image

Unit IV

- Preparation of Land use Map Using Satellite Image (IRS LISS-III and LISS IV Multispectral)
- 10) Prefield Interpretation

Semester I Paper- 3 Geographical Information System & DBMS Unit I

1) Introduction to GIS – A Brief History of GIS Definition, Evolution, Components

Hardware & Software requirements, overview of GIS Software.

Unit II

2) Data Structures for Spatial data:

Raster & Vector Model, Georelational vector data Modal, Topology, Importance of Topology, Non Topological Victor data, Object board data model-Advantages & disadvantages, Raster Data structures, Data conversion, Data input, verification storage & output.

Unit III

3) Geometric Transformation : Map to map & Image to map Transformation,

Transformation methods

Spatial data editing: Location errors, Digitizing errors, Topological errors & Topological editing.

Unit IV

4) Database Management System :

Components, concept, Database scheme, Database desin,relationship(one to one, one to many) Normalisation (1NF, 2NF, 3NF) integrity constrain Database security

Semester I Practical III Practical: GIS & DBMS Unit I

1) Introduction to Autocad Map

a) Getting familiar with Autocad Map :

Starting a drawing, Panning & Zooming , Understanding the layout view command line,

b) Understanding the drafting tools :

Coordinate system changing the grid & snap settings, Object snap

c) Drawing 2D Objects

Drawing straight line, arcs, polygon working with hatch pattern & Solid fills

Unit II

d) Editing objects/ creating text

e) Getting organized with Layers

f) Exploring Autocad Map- Topology, Query Object data, Database, Overlay buffer analysis.

Unit III

Introduction to Arcview

Unit IV

Introduction to Oracle

Semester II

Paper 4

Paper IV-: Mathematics & Statistical Techniques for Digital Image Processing & Computer Programming

Unit I

1) Linear Algebra

2) Matrix (Determinant, cofactor & Inverse of Matrix)

3) Probability Theory

Unit II

- Basic Statistics: Sources of Data, Organisation of Data, The Histogram, Measures of central tendency, Mean Deviation, Standard Deviation, Correlation, Coefficient of correlation, Rank correlation, Regression.
- 5) Multivariate Image Statistics For DIP (Variance-Covariance Matrix & correlation Matrix)

Unit III

6) Geostatistics- Pattern Analysis, Measures of Arrangements & dispersion,

Auto Correlation, Semiveriogram, Kriging

7) Introduction to Fuzzy logic

Unit IV

8) Fundamentals of Computers

9) Introduction to C++ Programming

Semester II Practical IV Practicals in Mathematics & Statistical Methods & Computer Programming

Unit I

Practicals in Statistics : Sources of data, types, Organization, Sampling techniques, frequency distribution, Correlation & regression techniques, Measures of Central tendency.

Unit II

Practicals in Multivariate Image Statistics Variance & Covariance Matrix, Correlation Matrix.

Unit III

Geostatistics

Unit IV

Fundamentals of Computer & C++ Programming: Introduction to C++, Input & Output

functions in C++, Control Constructs, Array & Strings, Painters Structures & Union,

operators, functions, Classes and objects.

Semester II

Paper 5

Paper: Digital Image Processing

Unit I

1) Introduction to Digital Image. Digital data formats & overview of DIP

2) Image Rectification & Registration (Radiometric & Geometric correction)

3) Image Enhancement Techniques (Contrast enhancement, Histogram Equalisation,

Density Slicing, Spatial Filtering etc)

Unit II

4) Image Transformation

5) Image Classification (supervised & unsupervised classification)

Unit III

6) Classification Algorithm & accuracy assessment

7) Image segmentation

Unit IV

8) Membership Function & Fuzzy logic classifier

9) Multisensor Image Fusion

Semester II

Practical V Practical in Digital Image Processing Unit I

- Introduction to Erdas Imagine : Loading of Image Data, Identification of objects, on visual display, study of Histogram and layer information
- Image Rectification & Registration . Radiometric and Geometric Correction, Resampling techniques.

Unit II

- Image Registration : Registration of bases map, image to map, image to Image.
- Image Enhancement Techniques : Linear and Non Linear Contrast Enhancement, Band Rationing, edge enhancement, high pass & Low pass Filtering, density & slicing.

Unit III

- Image Classification Techniques : Unsupervised classification Techniques, Supervised classification techniques, Training sites, Accuracy Assessment, K- means, Mahalonobis distance, Ecludian distance, maximum likelihood classification.
- 6. Image data fusion

Unit IV

- 7. Hyper spectral image analysis (Demo)
- 8. Fuzzy logic classifier (Demo)

Semester II

Paper VI

Advances In Geographical Information.

System/ GPS & Surveying

Unit I

1) Vector Data Analysis: Buffering Application of Buffering, Overlay, Distance

Measurements, Pattern analysis, Map manipulation

2) Raster Data Analysis : Local operations Physical distance measure operations Raster

Data Management, Extraction & Generalization.

Unit II

Surface Analysis : Interpolation methods DEM, DSM & DTM , Triangulated

Irregular Network, Slope, Aspect, Relief & hill Shading, Network analysis,

Application of GIS

Unit III

GPS : Basic concepts , GPS signals , satellite visibility & Availability, Co- Ordinate system & Datum , Types of GPS positioning, Errors, DGPS ,

Unit IV

Surveying: Introduction to Total station & theodolite

Semester II

Practical VI

Practical in Advances in GIS/GPS & Surveying

Unit I

1. Overview of Arc GIS: Arc Map, Arc Catalog, Arc Toolbox, Help etc

2. Geodatabase in Arc Catalog: Feature dataset, feature classes, import of data, spatial data formats, Shape/coverage files and layers, data frames, maps, managing TOC, displaying qualitative/quantitative values, labeling features

Working with layers: Building templates, classification map creation

Unit II

3. Georeferenced data: Editing data: Coordinate system, datum conversions, Map Projections, types, storing- viewing projection information Selecting features, Simple editing functions, creating new features, modifying, schema changes.

Unit III

4. Spatial and aspatial data:

Spatial : Linking features & attributes. geodatabase data format, ways to view data ,metadata etc.

Aspatial : Understanding tables, field types, table manipulations, table relationships Joins and relates, creation of graphs and reports

5. Spatial analysis : Query , identifying, measuring, query by location/ attribute

Spatial analysis: Geoprocessing wizard, spatial analysis functions

Multi- criteria analysis using Boolean logic

Unit IV

6. Network analysis: Network Utility, creating network model, shortest path

7. Presenting data: Map design and map composition

8. Introduction to GPS & Mapsource software

9. DGPS

10. Surveying : Surveying & Preparation maps using Total station & Theodolite.

Conversion of Marks into Grades					
Range of Marks obtained out of 100 (80 + 20)		Grade Points			
From	То				
0	5	0.00			
6	10	1.00			
11	15	1.50			
16	20	2.00			
21	25	2.50			
26	30	3.00			
31	35	3.50			
36	40	4.00			
41	45	4.50			
46	50	5.00			
51	55	5.50			
56	60	6.00			
61	65	6.50			
66	70	7.00			
71	75	7.50			
76	80	8.00			
81	85	8.50			
86	90	9.00			
91	95	9.50			
96	100	10.00			

Marking System for PG Diploma in

SHIVAJI UNIVERSITY, KOLHAPUR DEPARTMENT OF GEOGRAPHY PG DIPLOMA IN GEOINFORMATICS SEMESTER I

Example of Credit system					
Subject Name	Total out of	Grade	Minimum	Total Credit	
	Hundred	Point	Credit	aquired	
	marks	(g)	Required	(gXc)	
	(80 + 20)		©		
Theory I	45	4.5	4	18	
Theory II	56	6	4	24	
Theory III	63	6.5	4	26	
Practical I	65	6.5	4	26	
Practical II	78	8	4	32	
Practical III	81	8.5	4	34	
Total	388		24	160	
Ag					
Examination = [{(g1+c					
(g5+c5) + (g6+c6) / c] [g = grade point obtained, c = minimum			C C7		
credit points of each paper, ci = minimum credit points for the			0.07		
whole course, indicate the paper as above]					
Credit Transferred					
(only in case of					
	Nil				
Total Aggregate credits obtained					
Grade			Α		

SHIVAJI UNIVERSITY, KOLHAPUR DEPARTMENT OF GEOGRAPHY PG DIPLOMA IN GEOINFORMATICS SEMESTER II

Example of Credit system

Subject Name	Total out of	Grade	Minimum	Total Credit	
	Hundred	Point	Credit	aquired (
	marks	(g)	Required	g X c)	
	(80 + 20)		©		
Theory I	45	4.5	4	18	
Theory II	56	6	4	24	
Theory III	63	6.5	4	26	
Practical I	65	6.5	4	26	
Practical II	78	8	4	32	
Practical III	81	8.5	4	34	
Project	150	15	4	60	
Total	388		28	220	
Agrigate credits by					
$[{(g1+c1) + (g2+c2) + (g3+c3)}]$	+ (g4+c4) + (g5	5+c5) + (g6	+c6) / c}] [g		
= grade point obtained, c = minimum credit points of each paper, ci =				7 85	
minimum credit points for the whole course, indicate the paper as				7.05	
Credit Transferred fror					
(only in case of les					
				Nil	
Total Aggreg					
	A+				

Grades	Grade Points	
0	9 to 10	
A++	8 to 9	
A+	7 to 8	
А	6 to 7	
B++	5.5 to 6. 0	
B+	5.1 to 5.4	
В	4 to 5	
С	O to 3.9	

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