Vivekanand College, Kolhapur (Autonomous)

DEPARTMENT OF GEOGRAPHY

POST GRADUATE DIPLOMA

In

GEOINFORMATICS

2022-2023

Onwards

Program Outcomes:

1) Explain the scope of the Geography.
2) Develop scientific thinking for analyzing environmental issues.
3) Understand the new trends in Geographical studies.
4) Understand the Geographical issues of local to global level with reference to resources.
5) Develop the knowledge and thinking power for solution for Geo-environmental Problems.

Structure of Postgraduate Diploma in Geoinformatics

Program Pattern: Annual Examination

Course Code	Theory/ Practical	Course Title	Marks	Credits
PGD-1	Theory	Fundamentals of GIS	100	4
PGD-2	Theory	Fundamentals of RS and Photogrammetry	100	4
PGD-3	Theory	Principles of Computer and Programming	100	4
PGD-4	Practical	Digital Cartography, Spatial Analysis and modeling	100	4
PGD-5	Practical	Advanced Remote Sensing, GIS and Digital Image Processing	100	4
PGD-6	Practical	Project and Internship	100	4

NATURE OF THE QUESTION PAPER **Total Marks 80**

Q.1 A) Multiple choice questions. 10

B) Answer in one or two sentences. 10

Q.2 A) Long answer type question. 20
B) Long answer type question.

Q.3 A) Long answer type question. 20
B) Long answer type question

Q.4 Short Note (any 4 out of 5) 20

Internal Marks : 20

FACULTY INVOLVED IN TEACHING THE COURSE:

Sr. no	Name	Qualification	Designation
1	Dr. G. S. Ubale	M.A., NET, SET, Ph. D. Diploma in Geo-informatics	Coordinator, Asst. Professor
2	Dr. S. S. Kale	M.A., NET, Ph. D.	
3	Mr. Sunil Bhosale	M. A. SET, GIS	Asst. Professor
4	Ms. Aishwarya Hingmire	M.A., SET, Diploma in Geo-informatics	Asst. Professor

Syllabus

Course Title: Fundamental of Geographic Information system and GPS

Course Code: PGD-1
Credits: 04
Marks: 100
Course Outcome

1) The course focuses on the fundamentals Geographical Information System, and GPS
2) Students will demonstrate proficiency and conceptual understanding in using software and automated techniques.
3) Students will to carry out thematic maps and analysis through a series of laboratory exercises and creation of reports.

Module No.	Module Title	Credits
I	**Introduction to GIS** History and development Data models: vector and raster Data type, structure, Spatial and attribute, point, line, polygon- arc, nodes, vertices, . Futre og trends of GIS.	1
II	**Spatial data inputs** Digitization Error identification Types and sources of error Correction editing and topology building	1
III	**Introduction to GPS** History of Positioning System GPS System Description, Error Sources & Receiver Introduction to DGPS and Total Station, GPS Performance and Policy Applications Introduction to open source GIS	1
IV	Introduction to AutoCAD	1

Reference Books:

1. Bolstad, P. (2005) GIS Fundamentals: A first text on Geographic Information Systems, Second Edition. White Bear Lake, MN: Eider Press, 543 pp.
2. Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
3. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-

57230-640-8.
4. Chang, K. (2007) Introduction to Geographic Information System, 4th Edition. McGraw Hill.
5. Curran Paul J Principles of Remote Sensing UK: ELBS,
6. Elangovan, K (2006) GIS: Fundamentals, Applications and Implementations. New India Publishing Agency, New Delhi"208 pp.
7. Heywood, I., Cornelius, S., and Carver, S. (2006) An Introduction to Geographical Information Systems. Prentice Hall. 3rd edition.
8. Jensen, J.R. (2000). *Remote sensing of the environment: an Earth resource perspective*. Prentice Hall. ISBN 0-13-489733-1

Course Title :Fundamentals of RS and Photogrammetry

Course Code: PGD-2
Credits: 04
Marks: 100
Course outcome

1) Students will be able to understand the concept of remote sensing and EMR.
2) Students will of be able to understand fundamental physical principles of remote sensing.
3) Students will of be able to understand visual interpretation and digital image processing exercises.

Module No.	Module Title	Credits
I	**Fundamental of Remote Sensing** Introduction, History, development, stages of remote sensing, EMR & EMR spectrum, EMR Quantities, Energy sources and radiation principles, Theories of EMR, Concept of Energy interactions in the atmosphere, energy Black body, atmospheric windows types of remote sensing interactions with the earth surface features, Spectral reflectance of vegetation, Soil and water,	1
II	**Platform, Orbit and sensor** Platform: Ground based, air-borne, space-borne, Orbit: Geostationary satellite and polar orbiting satellite, Sensor: Types of sensor and cameras, processes of sensor & its characteristics, Whiskbroom and Push broom cameras	1
III	**Techniques of interpretation** Aerial photo interpretation, satellite image interpretation, Recognition elements: Tone, Color, Texture, Pattern, Shape, Size and associated features	1
IV	**Aerial photography** Types, Geometry, Scale, Height and Process of Aerial Photograph, basic requirement of Aerial Photograph, planning & execution of photographic flight, aerial cameras, relief displacement, stereo vision, stereo model & stereoscope, parallax & parallax measurement	1

References books

1. Campbell, J.B. (2002). *Introduction to remote sensing*, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
2. Curran Paul, J. (1984) Principles of Remote Sensing UK: ELBS.
3. Joseph, George (2007) Fundamentals of Remote Sensing Universities Press India
4. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). *Remote sensing and image interpretation*, 5th ed., Wiley. ISBN 0-471-15227-7.
5. Moffitt, F. H. (1980). Photogrammetry. 3rd Ed, Harper & Row, NY.

6. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company
7. Wolf, P. R. (1983). Elements of Photogrammetry. McGraw-Hill, NY.
8. Zorn, H. C. (1980). Introductory Course in Photogrammetry. 6th Ed. ITC, Netherlands

Course Title: Principles of computers and computer programming

Course Code: PGD- 3
Credits: 04
Marks:100
Course objective

1) Students will demonstrate the Application of computer in the field of GIS, DBMS
2) Students will understand the introduction to computers-DBMS, basics of programming languages.
3) Students will demonstrate proficiency and conceptual understanding in data creation and storage.
4) To carry out geographical data for developing and designing application and use of Programming in GIS.

Module No.	Module Title	Credits
I	**Introduction to Computers** Hardware and Software, System requirement, configuration and operating systems and Computer Applications Algorithms and Programming in Computers MS ACCESS and applications	1
II	**Introduction to simple programming in C** Developing programming techniques and solutions for spatial algorithms and problem-solving using VB Getting started with HTML, flash	1
III	**Introduction to Python**	1
IV	**Application of Computer and Python in Geography**	1

Reference Books:

1. Benjamin C. Pierce (2002). Types and Programming Languages, The MIT Press.
2. Bruce J. MacLennan (1999). Principles of Programming Languages: Design, Evaluation, and Implementation, Oxford University Press.
3. Daniel P. Friedman and Mitchell Wand (2001). Christopher Thomas Haynes: Essentials of Programming Languages, the MIT Press.
4. David Gelernter and Suresh Jagannathan (1990). Programming Linguistics, The MIT Press.
5. Goldschlager, L. (1998). A Lister Computer Science - a modern Introduction Prentice Hall, 1988.
6. John C. Mitchell (2002). Concepts in Programming Languages, Cambridge University Press.
7. Michael L. Scott (2005). Programming Language Pragmatics, Morgan Kaufmann Publishers.
8. Ravi Sethi (1996). Programming Languages: Concepts and Constructs, 2nd ed., Addison-Wesley.

Course Title: Digital of Cartography, Spatial Analysis and Modeling

Course Code: PGD- 4
Credits: 04
Marks: 100
Course outcome

1) Students will understand different types of projections and datum used in various locations.
2) Students will demonstrate conceptual understanding in using Manual and carry out thematic maps.
3) Students will demonstrate the art, science, and technologies of cartography and Photogrammetry.
4) Students will understand to develops the ability to understand how maps are created traditionally and digitally

Module No.	Module Title	Credits
I	**Introduction to Cartography** Basics of Map Fundamentals of direction, scale, types, sources Elementary geodesy- Datum and Projection Projection coordinates WGS 84	1
II	**Geographic representation** Map and mapping, map design, symbolization, conventional signs map layout, map referencing and indexing, scale of maps and map contents Field work techniques, socio – economic survey and attribute data.	1
III	**Introduction to analysis.** Significance of spatial analysis, overview of tools for analysis **Spatial analysis of Vector Base** Overlay operations: point in polygon, line polygon, polygon in polygon, Single layer operations, features identification, extraction, classification and manipulation, Multilayer operations: union, Intersection, difference **Spatial analysis of raster base** Map algebra, grid based operations, local, focal, zonal and global functions, cost surface analysis, optimal path and proximity search.	1
IV	**Network Analysis-** Concept of network analysis, Types of network analysis, Evaluation of network complexity using Alpha, Gama indices, Network data model Point pattern- Method for evaluating point patterns, Clustered and random distribution Surface analysis- Interpolation method, DEM, TIN, variance filter, slope and aspect, relief and hill shading	1

Reference Books:

1. Alias A. Rahman and Morakot Pilouk (2008)Spatial Data Modeling for 3D GIS, Springer New York
2. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005). Geographic Information Systems and Science. Chichester: Wiley. 2nd edition.
3. Ott, T. and Swiaczny, F. (2001). Time-integrative GIS. Management and analysis of spatio-temporal data. Berlin / Heidelberg / New York: Springer.
4. Thurston, J., Poiker, T.K. and J. Patrick Moore. (2003). Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging. Hoboken, New Jersey: Wiley.
5. M Goodrich (2000). Data Structures and Algorithms in Java, 2nd Edition Wiley.
6. Malczewski, J. (1999). GIS and Multicriteria Decision Analysis. New York: John Wiley and Sons

7. GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 1999.
8. Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
9. Geographical Information Science, vol. I by Roy P.S. Published by IIRS, 2000.
10. Fundamentals of Geographic Information Systems, 2nd Edition by Demers M.N. published by John Wiley & Sons 2000

Course Title: Advanced Remote Sensing, GIS and Digital Image Processing

Course Code: PGD- 5
Credits: 04
Marks: 100
Course outcome

1) Students will be able to apply mathematical relationships describing fundamental physical, geometric, and computational principles relevant to remote sensing and GIS.
2) Students will understand the Remote sensing application in environmental problems.
3) Students will be able to provide an opportunity to understand and work with latest developments.

Module No.	Module Title	Credits
I	**Advanced Remote Sensing and GIS** Microwave Remote Sensing Thermal Remote Sensing Hyper spectral Remote Sensing LiDAR & Drone **Participatory GIS and Mobile GIS** WebGIS (ArcIMS, MapServer, Geomedia, MapGuide GIS servers, Intermediate softwares and Distributed GIS systems	1
II	**Multi-criteria decision making analysis –** Ranking Rating Pair wise comparison	1

III	**Introduction to Digital Image Processing** □ Visual perception, Image sensing and acquisition, □ Digital Data Formats Image sampling and Quantization □ Basic relationship between pixels. □ Development, scope and fundamental steps involved in Digital Image Processing, components of Image Processing **Image Rectification** □ Radiometric and Atmospheric Correction □ Geometric Correction, Ortho-rectification, calibration and rectification of photo and images, □ Image enhancement in spatial domain and frequency domain, Filtering, Fourier Transform, Noise removal	1
IV	**Multispectral Image Processing** □ Colour Image processing, slicing, Image compression, dilation, Segmentation, Spectral rationing, density slicing and image fusion □ Object recognition, classification, object recognition, feature extraction, accuracy, assessment, change detection Accuracy Assessment and integration with GIS	1

Reference Books:

1. Burger, Wilhelm; Mark J. Burge (2007). Digital Image Processing: An Algorithmic Approach Using Java. Springer. ISBN 1846283795.
2. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
3. Damen MCJ, Sicco Smith G and Kerstappen(Ed) (). Remote Sensing for Resources Development and Environmental Management 3rd.volume Set Netherlands: Balkema
4. Gonzalez, Rafael C.; Richard E. Woods (1992). Digital Image Processing. ISBN 0-201-50803-6.
5. Jensen John R (2007). Introductory Digital Image processing: Remote Sensing Perspective New Jersey: Prentice Hall
6. Joseph, George (2007). Fundamentals of Remote Sensing Universities Press India
7. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
8. Pratt, William K. (1978). Digital Image Processing. ISBN 0-471-01888-0.
9. Romeny, Bart M. (2003). Front-End Vision and Multi-Scale Image Analysis. ISBN1-4020-1507-0.
10. Umbaugh, Scott E (2005). Computer Imaging: Digital Image Analysis and Processing. ISBN 0-84-932919-1.