

**ParvatibaiChowgule College of Arts & Science**

**(Autonomous)**

**Margao – Goa**

**MINUTES OF MEETING OF THE BOARD OF STUDIES IN GEOGRAPHY  
(GEOINFORMATICS)**

**HELD ON 25<sup>th</sup>APRIL, 2023 at**

**Parvatibai Chowgule College of Arts & Science**

**(Autonomous)**

**Margao – Goa**

**Annexure A**

**GEOINFORMATICS 2YEARS LIST OF COURSES 2023-24 UNDER NEP2020  
COURSE STRUCTURE**

<b>SEM EST ER</b>	<b>COURSE CODE</b>	<b>TITLE OF THE COURSE</b>	<b>NOMENCL ATURE/TYP E OF COURSE</b>	<b>CREDI TS</b>
<b>1</b>	PGMP-GIS-DSC-401	Basics of GIS and GPS	DSC	4
	PGMP-GIS-DSC-402	Basics of Remote Sensing and Photogrammetry	DSC	4
	PGMP-GIS-DSC-403	Advanced of Geostatistics	DSC	4
	PGMP-GIS-DSC-404	Advanced Digital Cartography	DSC	4
	PGMP-GIS-DSE-401	Principles of Computer and Programming	DSE	4
	PGMP-GIS-DSE-402	Applications of GIS Techniques in Entrepreneurship	DSE	4
<b>2</b>	PGMP-GIS-DSC-405	Spatial Analysis & Modeling	DSC	4
	PGMP-GIS-DSC-406	Advanced Remote Sensing and GIS	DSC	4
	PGMP-GIS-DSC-407	Digital Image Processing	DSC	4
	PGMP-GIS-DSC-408	Field techniques and Report writing	DSC	4
	PGMP-GIS-DSE-403	Programming & Customization	DSE	4
	PGMP-GIS-DSE-404	GIS for Business and Service Planning	DSE	4

**POST GRADUATE DEPARTMENT OF GEOGRAPHY  
 MASTER OF SCIENCE IN GEOINFORMATICS  
 PROPOSED COURSE STRUCTURE**

<b>Course Code</b>	<b>Course Title</b>	<b>Marks</b> Theory and Practical 50+50	<b>Credits</b> (2+2=4)
<b>SEMESTER I</b>			
PGMP-GIS-DSC-401	Basics of GIS and GPS	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-402	Basics of Remote Sensing and Photogrammetry	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-403	Advanced of Geostatistics	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-404	Advanced Digital Cartography	<b>100</b>	<b>4</b>
PGMP-GIS-DSE-401	Principles of Computer and Programming	<b>100</b>	<b>4</b>
PGMP-GIS-DSE-402	Applications of GIS Techniques in Entrepreneurship	<b>100</b>	<b>4</b>
<b>SEMESTER II</b>			
PGMP-GIS-DSC- 405	Spatial Analysis & Modeling	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-406	Advanced Remote Sensing and GIS	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-407	Digital Image Processing	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-408	Field techniques and Report writing	<b>100</b>	<b>4</b>
PGMP-GIS-DSE- 403	Programming & Customization	<b>100</b>	<b>4</b>
PGMP-GIS-DSE-404	GISforBusiness and Service Planning	<b>100</b>	<b>4</b>

**Note:**

- 1) Each course will have six instructional contact Credits consisting of two Credits of theory and four Credits of practical
- 2) Total Marks: 2000 (entire course is divided into 16 courses consisting 100 marks each for 4<sup>th</sup> semester and a 400 marks project work in 4<sup>th</sup> semester. Each semester will consist of 20 Credits (1 credit = 25 marks) 2 Credits for theory and 2Credits for practical.
- 3) Project/ Internship is the part of course PGMP-GIS-I-501.
- 4) The student should take prior approval from DFC before enrolling for the proposed online course for semester 4 (Online). Maximum four Credits are permissible for ABC transfer.
- 5) Student can opt any one DSE course for Semester I and II.

**PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE**

**M.Sc. in Geoinformatics**

**SEMESTER I**

<b>Course Code</b>	<b>Course Title</b>	<b>Marks</b>	
		<b>Theory and Practical 50+50</b>	
<b>SEMESTER I</b>			
PGMP-GIS-DSC-401	Basics of GIS and GPS	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-402	Basics of Remote Sensing and Photogrammetry	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-403	Advanced Geostatistics	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-404	Advanced Digital Cartography	<b>100</b>	<b>4</b>
PGMP-GIS-DSE-401	Principles of Computer and Programming	<b>100</b>	<b>4</b>
PGMP-GIS-DSE-402	Applications of GIS Techniques in Entrepreneurship	<b>100</b>	<b>4</b>
<b>Total</b>		<b>500</b>	<b>20</b>

## Semester - I

**Course Title: BASICS OF GIS AND GPS**

**Course code: PGMP-GIS-DSC-401**

**Credits: 4**

**Marks: 100**

**Duration 90 Hours**

**Prerequisite courses: NIL**

### Course objective -

1. The course focuses on the fundamentals concept Geographical Information System, and Global Positioning System
2. Introducing the spatial data, non- spatial data, hardware and software used in collection, processing and analysis of geospatial data.

### Course Learning Outcome:

After completion of this course, students will be able to:

**CLO1:** Students will demonstrate proficiency and conceptual understanding in using software and automated techniques to carry out thematic maps and analysis through a series of laboratory exercises and creation of reports.

**CLO2:** Personal effectiveness and workplace competencies are practiced through engagement in discussion boards, following course guidelines, and interactions with the instructor and other students in the class

**CLO3:** To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in geospatial industry and research institute

**CLO4:** Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach

### Course content

Module	Topics	Hours	
		L	P
<b>I</b>	<b>Introduction to GIS</b> <ul style="list-style-type: none"><li>• History and development.</li><li>• Components and Applications trends of GIS.</li><li>• Data models: vector and raster</li><li>• Data type, structure, Spatial and attribute, point, line, polygon- arc, nodes, vertices, and topology. Attribute data.</li><li>• Data processing systems, input and output devices, editing and attributing and linking</li></ul>	<b>10</b>	<b>20</b>
<b>II</b>	<b>Spatial dada inputs</b> <ul style="list-style-type: none"><li>• Digitization</li></ul>	<b>10</b>	<b>20</b>

- Error identification
- Types and sources of error
- Correction editing and topology building

### III Introduction to GPS

10 20

- 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

### Reference book

### Mandatory Reading

1. Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
2. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
3. Chang, K. (2007) Introduction to Geographic Information System, 4th Edition. McGraw Hill.

### Supplementary Reading

- I. Curran Paul J Principles of Remote Sensing UK: ELBS,
- II. Elangovan,K (2006) GIS: Fundamentals, Applications and Implementations. New India Publishing Agency, New Delhi"208 pp.
- III. Heywood, I., Cornelius, S., and Carver, S. (2006) An Introduction to Geographical Information Systems. Prentice Hall. 3rd edition.
- IV. Jensen, J.R. (2000). *Remote sensing of the environment: an Earth resource perspective*. Prentice Hall. ISBN 0-13-609733-1.
- V. Joseph, George Fundamentals of Remote Sensing Universities Press India
- VI. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
- VII. 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.
- VIII. Wise, S. (2002) GIS Basics. London: Taylor & Francis.

### Online resources

- 1) <https://www.nrsc.gov.in/>
- 2) <https://www.iirs.gov.in/>
- 3) <http://www.undp.org/popin/wdtrends/wdtrends.htm>
- 4) [https://www.isprs.org/proceedings/xxxiii/congress/part7/1609\\_XXXIII-part7.pdf](https://www.isprs.org/proceedings/xxxiii/congress/part7/1609_XXXIII-part7.pdf)
- 5) [http://www.tric.u-tokai.ac.jp/ISPRScom8/TC8/TC8\\_CD/headline/JAXA\\_Special\\_Session%20-%206/JTS64\\_20100608144600.pdf](http://www.tric.u-tokai.ac.jp/ISPRScom8/TC8/TC8_CD/headline/JAXA_Special_Session%20-%206/JTS64_20100608144600.pdf)

## **Semester - I**

**Course Title: BASICS OF REMOTE SENSING AND PHOTOGRAMMETRY**

**Course code: PGMP-GIS-DSC-402**

**Credits: 4**

**Marks: 100**

**Duration 90 Hours**

**Prerequisite courses: NIL**

### **Course objective**

1. Give foundational knowledge about remote sensing and its types and different sensors used for remote sensing which will focus on comprehension of the physical, computational, and perceptual basis for remote sensing.
2. Gain familiarity with a variety of physical, biological, and human geographic applications of remote sensing.
3. Gain basic experience in the hands-on application of remote sensing data through visual interpretation and digital image processing exercises.

### **Course Learning Outcome**

After successful completion of a course in student will be able

**CLO1:** Students will be able to understand the concept of remote sensing and EMR apart from this basic level of fundamental physical principles of remote sensing, including the electromagnetic spectrum; the emission, scattering, reflection, and absorption of electromagnetic (EM) radiation; how EM radiation interactions vary across a limited number of substances, geometries, and temperatures; and geometric properties of photographs and imagery.

**CLO2:** To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in geospatial industry and research institute

**CLO3:** Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

**CLO4:** Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

## Course content

Module	Topics	Hours	
		T	P
		30	60
<b>I</b>	<b>Fundamental of Remote Sensing</b>	10	20
	<ul style="list-style-type: none"><li>• Introduction, History, development,</li><li>• stages of remote sensing, EMR &amp; EMR spectrum, EMR Quantities, Energy sources and radiation principles,</li><li>• Theories of EMR, Concept of Energy interactions in the atmosphere, energy Black body, atmospheric windows</li><li>• types of remote sensing interactions with the earth surface features, Spectral reflectance of vegetation, Soil and water,</li></ul>		
<b>II</b>	<b>Platform, Orbit and sensor</b>	10	20
	<ul style="list-style-type: none"><li>• Platform: Ground based, air-borne, space-borne,</li><li>• Orbit: Geostationary satellite and polar orbiting satellite, Sensor:</li><li>• Types of sensor and cameras, processes of sensor &amp; its characteristics, Whiskbroom and Push broom cameras</li></ul>		
<b>III</b>	<b>Techniques of interpretation</b>	10	20
	<ul style="list-style-type: none"><li>• Aerial photo interpretation, satellite image interpretation,</li><li>• Recognition elements: Tone, Color, Texture, Pattern, Shape, Size and associated features</li></ul> <p>Aerial photographyTypes, Geometry, Scale, Height and Process of Aerial Photograph, basic requirement of Aerial Photograph, planning &amp; execution of photographic flight, aerial cameras, relief displacement, stereo vision, stereo model &amp; stereoscope, parallax &amp; parallax measurement</p>		

## References books

### Mandatory Reading

1. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
2. Curran Paul, J. (2000) 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.

### Supplementary Reading

1. Moffitt, F. H. (2000). Photogrammetry. 3rd Ed, Harper & Row, NY.
2. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company
3. Wolf, P. R. (2004). Elements of Photogrammetry. McGraw-Hill, NY.
4. Zorn, H. C. (2006). Introductory Course in Photogrammetry. 6th Ed. ITC, Netherlands.



## Online resources

- 1) <https://www.nrsc.gov.in/>
- 2) <https://www.iirs.gov.in/>
- 3) <http://www.undp.org/popin/wdtrends/wdtrends.htm>
- 4) [https://www.isprs.org/proceedings/xxxiii/congress/part7/1609\\_XXXIII-part7.pdf](https://www.isprs.org/proceedings/xxxiii/congress/part7/1609_XXXIII-part7.pdf)
- 5) [http://www.tric.u-tokai.ac.jp/ISPRScom8/TC8/TC8\\_CD/headline/JAXA\\_Special\\_Session%20-%206/JTS64\\_20100608144600.pdf](http://www.tric.u-tokai.ac.jp/ISPRScom8/TC8/TC8_CD/headline/JAXA_Special_Session%20-%206/JTS64_20100608144600.pdf)
- 6) <https://www.semanticscholar.org/paper/Role-of-Remote-Sensing-in-Disaster-Management-Nirupama-Simonovic/da84562b2057ca5866d933d47ee8815a06f0229c>

**Course Title:** ADVANCED GEOSTATISTICS

**Course code:** PGMP-GIS-DSC-403

**Credits:** 4

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

**Course objective**

1. The course is designed to process geospatial data and use of statistics in the field of GIS.
2. The course focuses on the development of the skills using statistical techniques in understanding, organizing, interpolation, analyzing and interpretation of geostatistical data and to develop the firm foundation to apply it in various fields.

**Course Learning Outcome**

After successful completion of a course in student will be able

**CLO1:** After completion of the course students will understand various types of datasets and applying different statistical techniques to different data sets.

**CLO2:** This will systematically access, analyze and evaluate information and ideas from multiple sources in order to identify underlying assumptions, and formulate conclusions. The course will enhance skills like solving quantitative problems and statistical queries.

**CLO3:** Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

**CLO4:** Workplace competencies are strengthened as students apply the analytical and evaluative tools to GIS mapping and apps

**Course content**

Module	Topics	Hours	
		T	P
		30	60
<b>I</b>	<b>Introduction to Statistics</b>	10	20
	<ul style="list-style-type: none"><li>• Statistical and Graphical foundation, data classification</li><li>• Univariate (Measures of Central Tendency, Measures of Dispersion)</li><li>• Moments (Skewness, Kurtosis)</li></ul>		
<b>II</b>	<ul style="list-style-type: none"><li>• <b>Bivariate and Matrices</b></li><li>• Co-relation Methods (Co-relation Methods)</li><li>• Regressions (Linear, Exponential, Power)</li><li>• Matrices (Types, Addition, Subtraction, Multiplication, Simultaneous Equation with algebra and elimination Method, Co-factor Method,</li></ul>	10	20

- Probability
- Multiple Regression
- Multiple Co-relation
- Principle Component Analysis.

### Reference Books:

### Mandatory Reading

1. Simon W. Houlding, (2000) Practical Geostatistics: Modeling and Spatial Analysis, Springer, Berlin
2. 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.
3. Roy, P.S. (2006). Geoinformatics for Tropical Ecosystems Bishen Singh Mahendra Pal Singh, Dehradun

### Supplementary Reading

1. Ricardo A. Olea (2000) Geostatistics for Engineers and Earth Scientist, Kluwer Academic Publishers, Boston
2. Richard Webster and Margaret A. Oliver: Geostatistics for Environmental Scientists, Statistics in Practice (2<sup>nd</sup> ed) J. Wiley
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. Roy, P.S. (2006). Geoinformatics for Tropical Ecosystems Bishen Singh Mahendra Pal Singh, Dehradun

### Online resources

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

<https://www.esri.com/en-us/home>

<https://www.intergraph.com/>

<https://www.sac.gov.in/Vvom/index.jsp>

[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus\\_campus\\_nrscrc/rrsc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en)

<https://www.iirs.gov.in/>

**Course Title: ADVANCED DIGITAL CARTOGRAPHY**

**Course code:** PGMP-GIS-DSC-404

**Credits:** 4

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

**Course objective**

1. The course gives emphasis on the art, science, and technologies of cartography and Photogrammetry.
2. It develops the user's ability to understand how maps are created traditionally and digitally. Representation and communicate spatial phenomena and their relationships through photogrammetric perspective which emphasis on skills like making of map, map reading signs and symbols etc..

**Course Learning Outcome**

After successful completion of a course in student will be able

**CLO1:** Students will understand different types of projections and datum used in various locations. Proficiency and conceptual understanding in using Manual and computer techniques to carry out thematic maps and special purpose maps.

**CLO2:** Remote sensing, image processing and analysis through a series of laboratory exercises and report

**CLO3:** Be able to demonstrate proficiency in quantitative reasoning and analytical skills

**CLO4:** Acquire of fundamental and advanced knowledge of the different aspect in cartography with the means ability to specialize in a specific field.

**Course content**

Module	Topics	Hours	
		T	P
		30	60
<b>I</b>	<b>Introduction to Cartography</b>	10	20
	<ul style="list-style-type: none"><li>• Basics of Map</li><li>• Fundamentals of direction, scale, types, sources</li><li>• Elementary geodesy- Datum and Projection</li><li>• Projection coordinates</li><li>• WGS 84</li></ul>		
<b>II</b>	<b>Thematic Cartography Characteristics of geographical phenomena</b>	10	20
	<ul style="list-style-type: none"><li>• Principles of colour perception</li><li>• Colour scheme for Univariate choropleth and Isarithmic maps,</li></ul>		

- proportional symbol mapping
- Interpolation methods for smooth continuous phenomena symbolizing smooth continuous phenomena. Dot and asymmetric mapping

### III Geographic representation

10 20

- 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.

#### Reference Books

#### Mandatory Reading

1. ESRI. 2004. ESRI Cartography: Capabilities and Trends. Redlands, CA. White Paper
2. Sircar, D.C.C. (January 2000). Studies in the Geography of Ancient and Medieval India. Motilal Banarsidass Publishers. ISBN 8120806905.
3. Slocum, T. (2003). Thematic Cartography and Geographic Visualization. Upper Saddle River, New Jersey: Prentice Hall. ISBN 0-130-35123-7. Wilford, John Noble (2000). The Mapmakers. Vintage Books. ISBN 0-375-70850-2.

#### Supplementary Reading

1. Kraak, Menno-Jan and Allan Brown (2001): Web Cartography – Developments and prospects, Taylor & Francis, New York, ISBN 0-7604-0869-X.
2. MacEachren, A.M. (2005). Some Truth with Maps: A Primer on Symbolization & Design. University Park: The Pennsylvania State University. ISBN.
3. Monmonier, Mark (2004). How to Lie with Maps. Chicago: University of Chicago Press. ISBN 0-226-53421-9.
4. Monmonier, Mark (2004). Mapping It Out. Chicago: University of Chicago Press. ISBN.
5. Pickles, John (2003). A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World. Taylor & Francis. ISBN 0-415-14497-3
6. Sircar, D.C.C. (January 2000). Studies in the Geography of Ancient and Medieval India. Motilal Banarsidass Publishers. ISBN 8120806905.
7. Slocum, T. (2003). Thematic Cartography and Geographic Visualization. Upper Saddle River, New Jersey: Prentice Hall. ISBN 0-130-35123-7. Wilford, John Noble (2000). The Mapmakers. Vintage Books. ISBN 0-375-70850-2.

#### Online resources

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

<https://www.esri.com/en-us/home>

<https://www.intergraph.com/>

<https://www.sac.gov.in/Vvom/index.jsp>

[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus\\_campus\\_nrscrc/rrsc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en)

<https://www.iirs.gov.in/>

**Course Title:** PRINCIPLES OF COMPUTER AND PROGRAMMING

**Course code:** PGMP-GIS-DSE-401

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

### Course objective

1. The course will explore the Application of computer in the field of GIS, DBMS and programming for GIS customization.
2. The main focus is on introduction to computers-DBMS, basics of programming languages.

### Course Learning Outcome.

After successful completion of a course in student will be able

**CLO1:** Students will demonstrate proficiency and conceptual understanding in data creation and storage, languages or manuscripts techniques to carry out geographical data for developing and designing application and use of Programming in GIS.

**CLO2:** To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in gis industry and research institute.

**CLO3:** Develop an tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach.

**CLO4:** Workplace competencies are strengthened as students apply the analytical and evaluative tools to geospatial mapping and apps

### Course content

Module	Topics	Hours	
		T	P
		30	60
<b>I</b>	<b>Introduction to Computers</b>	10	20
	<ul style="list-style-type: none"><li>• Hardware and Software, System requirement, configuration and operating systems and Computer Applications</li><li>• Algorithms and Programming in Computers</li><li>• MS ACCESS and applications</li></ul>		
<b>II</b>	<b>Introduction to simple programming in C</b>	10	20
	<ul style="list-style-type: none"><li>• Developing programming techniques and solutions for</li></ul>		

- Getting started with HTML, flash

### Reference Books:

### Mandatory Reading

1. Benjamin C. Pierce (2002). Types and Programming Languages, The MIT Press.
2. Bruce J. MacLennan (2000). Principles of Programming Languages: Design, Evaluation, and Implementation, Oxford University Press.
3. Michael L. Scott (2005). Programming Language Pragmatics, Morgan Kaufmann Publishers

### Supplementary Reading

1. Daniel P. Friedman and Mitchell Wand (2001). Christopher Thomas Haynes: Essentials of Programming Languages, The MIT Press.
2. David Gelernter and Suresh Jagannathan (2005). Programming Linguistics, The MIT Press.
3. Goldschlager, L. (2000). A Lister Computer Science - a modern Introduction Prentice Hall.
4. John C. Mitchell (2002). Concepts in Programming Languages, Cambridge University Press.
5. Michael L. Scott (2005). Programming Language Pragmatics, Morgan Kaufmann Publishers.
6. Ravi Sethi (2000). Programming Languages: Concepts and Constructs, 2nd ed., Addison-Wesley.
7. James S. McKeown (2010), Programming in Visual Basic 2010: The Very Beginner's Guide
8. Richard Mansfield (2003), Visual Basic .NET All in One Desk Reference for Dummies

### Online resources

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

<https://www.esri.com/en-us/home>

<https://www.intergraph.com/>

<https://www.sac.gov.in/Vyom/index.jsp>

[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus/campus\\_nrsrc/rsrc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus/campus_nrsrc/rsrc_east?language_content_entity=en)

<https://www.iirs.gov.in/>

## Semester - I

**Course Title:** Applications of GIS Techniques in Entrepreneurship

**Course code:** PGMP-GIS-DSE-402

**Credits:** 4

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

### Course objective -

1. The course focuses on the fundamentals concept Map Objects, and techniques of VBA
2. Introducing the Visual Basic code, Elements, processing and analysis of Arc object beyond VBA.

### Course Learning Outcome:

After completion of this course, students will be able to:

**CLO1:** Students will demonstrate proficiency and conceptual understanding in using software and automated techniques to carry out thematic maps and analysis through a series of laboratory exercises and creation of reports.

**CLO2:** Personal effectiveness and workplace competencies are practiced through engagement in discussion boards, following course guidelines, and interactions with the instructor and other students in the class

**CLO3:** To be able use these skills to identify and analyzed real world problem and preparing them for a successful career in geospatial industry and research institute

**CLO4:** Develop a tendency towards research through the compulsory internship in industry /research/ academic institutes which promote and inculcate professional ethics and code of practice among students, enabling them to work in a team with multidisciplinary approach

### Course content

Module	Topics	Hours	
		L	P
I	Introduction to MapObjects, Introduction to VBA and Visual studio 200#, Getting Started with ArcObjects, Visual Basic code: How, where, and when?	10	20
II	Using variables, Programming with class, COM,OMD, Maps and layers, Data access and creation, Geometry and Geoprocessing	10	20
III	Working with subsets and selections, Symbolizing elements and layers,	10	20



## Reference book

### Mandatory Reading

1. Burrough, P.A. and McDonnell, R.A. (1998) Principles of geographical information systems. Oxford University Press, Oxford, 327 pp.
2. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
3. Chang, K. (2007) Introduction to Geographic Information System, 4th Edition. McGraw Hill.

### Supplementary Reading

1. Curran Paul J Principles of Remote Sensing UK: ELBS,
2. Elangovan,K (2006) GIS: Fundamentals, Applications and Implementations. New India Publishing Agency, New Delhi"208 pp.
3. Heywood, I., Cornelius, S., and Carver, S. (2006) An Introduction to Geographical Information Systems. Prentice Hall. 3rd edition.
4. Jensen, J.R. (2000). *Remote sensing of the environment: an Earth resource perspective*. Prentice Hall. ISBN 0-13-609733-1.
5. Joseph, George Fundamentals of Remote Sensing Universities Press India
6. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
7. 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.
8. Wise, S. (2002) GIS Basics. London: Taylor & Francis.

### Online resources

1. <https://www.nrsc.gov.in/>
2. <https://www.iirs.gov.in/>
3. <http://www.undp.org/popin/wdtrends/wdtrends.htm>
4. [https://www.isprs.org/proceedings/xxxiii/congress/part7/1609\\_XXXIII-part7.pdf](https://www.isprs.org/proceedings/xxxiii/congress/part7/1609_XXXIII-part7.pdf)
5. [http://www.tric.u-tokai.ac.jp/ISPRScm8/TC8/TC8\\_CD/headline/JAXA\\_Special\\_Session%20-%206/JTS64\\_20100608144600.pdf](http://www.tric.u-tokai.ac.jp/ISPRScm8/TC8/TC8_CD/headline/JAXA_Special_Session%20-%206/JTS64_20100608144600.pdf)
6. <https://www.semanticscholar.org/paper/Role-of-Remote-Sensing-in-Disaster-Management-Nirupama-Simonovic/da84562b2057ca5866d933d47ee8815a06f0229c>

**PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE****M.Sc in Geoinformatics****SEMESTER II**

<b>Course Code</b>	<b>Course Title</b>	<b>Marks &amp; Credits</b>	
		<b>Theory and Practical</b>	<b>50+50</b>
<b>SEMESTER II</b>			
PGMP-GIS-DSC- 405	Spatial Analysis & Modeling	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-406	Advanced Remote Sensing and GIS	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-407	Digital Image Processing	<b>100</b>	<b>4</b>
PGMP-GIS-DSC-408	Field techniques and Report writing	<b>100</b>	<b>4</b>
PGMP-GIS-DSE- 402	Programming & Customization	<b>100</b>	<b>4</b>
PGMP-GIS-DSE-404	GIS for Business and Service Planning	<b>100</b>	<b>4</b>
		<b>500</b>	<b>20</b>

## Semester - II

**Course Title: SPATIAL ANALYSIS AND MODELING**

**Course code: PGMP-GIS-DSC-405**

**Credits: 4**

**Marks: 100**

**Duration 90 Hours**

**Prerequisite courses: NIL**

### Course objective

1. The course focuses on fundamental aspects of spatial data modeling specifically on the aspect of two dimensional and three-dimensional (3D) modeling, structuring of raster and vector analysis and its types.
2. It also looks into integration of non-spatial data and its application.

### Course Learning Outcome

After successful completion of a course in student will be able

**CLO1:** Student will able to apply spatial tool and techniques in spatial datasets for carry out Surface and 3d analysis.

**CLO2:** Students will demonstrate proficiency and conceptual understanding spatial model making process.

**CLO3:** Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

**CLO4:** Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.

### Course content

Module	Topics	Hours	
		T	P
		30	60
I	<b>Introduction to analysis.</b>	10	20

- 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.

## **II            Analysis 10   20**

- Network Analysis- Concept of network analysis, Types of network analysis, Evaluation of network complexity using Alpha, Gamma 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

## **III            Spatial modelling 10   20**

- Role of spatial model, explanative, predictive and normative models, handling complex spatial query, case studies.

### **Reference Books:**

#### **Mandatory Reading**

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. 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.

#### **Supplementary Reading**

1. Ott, T. and Swiaczny, F. (2001). Time-integrative GIS. Management and analysis of spatio-temporal data. Berlin / Heidelberg / New York: Springer.
2. 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.
3. M Goodrich (2000). Data Structures and Algorithms in Java, 2nd Edition Wiley.
4. Malczewski, J. (2004). GIS and Multi-criteria Decision Analysis. New York: John Wiley and Sons
5. GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 2002.
6. Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
7. Geographical Information Science, vol. I by Roy P.S. Published by IIRS, 2000.
8. Fundamentals of Geographic Information Systems, 2<sup>nd</sup> Edition by Demers M.N. published by John Wiley & Sons 2000

## Online resources

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

<https://www.esri.com/en-us/home>

<https://www.intergraph.com/>

<https://www.sac.gov.in/Vvom/index.jsp>

[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus\\_campus\\_nrscrc/rrsc\\_east?language\\_content\\_enty=en](https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_enty=en)

<https://www.iirs.gov.in/>

## Semester - II

**Course Title:** ADVANCED REMOTE SENSING AND GIS

**Course code:** PGMP-GIS-DSC-406

**Credits:** 4

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

### Course objective

1. The course will provide latest state of art in remote sensing and GIS technology.
2. It will provide an opportunity Module to understand and work with latest developments remote sensing data base and GIS technology.

### Course Learning Outcome

After successful completion of a course in student will be able

**CLO1:** Students will be able to apply mathematical relationships (at a pre-calculus level) describing fundamental physical, geometric, and computational principles relevant to remote sensing and GIS.

**CLO2:** They will create Remote sensing application

**CLO3:** Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

**CLO4:** Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.

### Course content

Module	Topics	Hours			
		T	P		
I	<b>Advanced Remote Sensing</b> <ul style="list-style-type: none"><li>• Microwave Remote Sensing</li><li>• Thermal Remote Sensing</li><li>• Hyper spectral Remote Sensing</li><li>• LiDAR &amp; Drone</li></ul>	30	60		
		10	20		
		II	<b>Advancement in GIS</b> <ul style="list-style-type: none"><li>• Participatory GIS and Mobile GIS</li><li>• WebGIS (ArcIMS, MapServer, Geomedia, MapGuide</li><li>• GIS servers, Intermediate software and Distributed GIS systems</li></ul>	10	20
				10	20
				III	<b>Multi-criteria decision making analysis –</b> <ul style="list-style-type: none"><li>• Ranking</li><li>• Rating</li><li>• Pair wise comparison</li></ul> <b>Fuzzy logic</b>

## Reference Books:

### Mandatory Reading

1. Asrar Ghassem (2004) Theory and applications of optical remote sensing New York: John Wiley and Sons.
2. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
3. Malczewski, J. (2000). GIS and Multicriteria Decision Analysis. New York: John Wiley and Sons

### Supplementary Reading

1. Mitchel, Tyler (2005): WebMapping Illustrated, O'Reilly, Sebastopol, 350 pages, ISBN 0-569-00865-1. This book discusses various Open Source WebMapping projects and provides hints and tricks as well as examples.
2. Ott, T. and Swiaczny, F. (2001) Time-integrative GIS. Management and analysis of spatio-temporal data, Berlin / Heidelberg / New York: Springer.
3. Peterson, Michael P. (ed.) (2003): Maps and the Internet, Elsevier, ISBN 0-08-044201-3.
4. Skolnik, Merrill I. (2001). Introduction to Radar Systems, McGraw-Hill (1st ed., 1962; 2nd ed., 1980; 3rd ed.), ISBN 0-07-066572-9.
5. 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.
6. Worboys, Michael, and Matt Duckham. (2004) GIS: a computing perspective. Boca Raton: CRC Press.

### Online resources

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

<https://www.esri.com/en-us/home>

<https://www.intergraph.com/>

<https://www.sac.gov.in/Vvom/index.jsp>

[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus/campus\\_nrscrc/rrsc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus/campus_nrscrc/rrsc_east?language_content_entity=en)

<https://www.iirs.gov.in/>

## Semester - II

**Course Title: DIGITAL IMAGE PROCESSING**

**Course code: PGMP-GIS-DSC-407**

**Credits: 4**

**Marks: 100**

**Duration 90 Hours**

**Prerequisite courses: NIL**

### Course objective

1. This course will introduce fundamental technologies of digital image processing i.e. compression, information extraction and analysis.
2. Students will also gain understanding of algorithm, analytical tools, and practical implementations of various digital image applications.

### Course Learning Outcome

After successful completion of a course in student will be able

**CLO1:** Students will demonstrate proficiency and conceptual understanding in using software or manual techniques which will prove how digital technology has come over traditional technology to carry out remote sensing image processing and analysis through a series of laboratory exercises and reports

**CLO2:** Acquire of fundamental and advanced knowledge of the different aspect in DIP with the means ability to specialize in a specific field.

**CLO3:** Workplace competencies are strengthened as students apply the analytical and evaluative tools to GIS mapping and apps

**CLO4:** Be able to demonstrate proficiency in quantitative reasoning and analytical skills

### Course content

Module	Topics	Hours	
		T	P
<b>I</b>	<b>Introduction to Digital Image Processing</b>	<b>10</b>	<b>20</b>
	<ul style="list-style-type: none"><li>• Visual perception, Image sensing and acquisition,</li><li>• Digital Data Formats Image sampling and Quantization</li><li>• Basic relationship between pixels.</li><li>• Development, scope and fundamental steps involved in Digital Image Processing, components of Image Processing</li></ul>		
<b>II</b>	<b>Image Rectification</b>	<b>10</b>	<b>20</b>
	<ul style="list-style-type: none"><li>• Radiometric and Atmospheric Correction</li><li>• Geometric Correction, Ortho-rectification, calibration and rectification of photo and images,</li></ul>		



- Image enhancement in spatial domain and frequency domain, Filtering, Fourier Transform, Noise removal

### III Multispectral Image Processing

10 20

- 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

#### Reference Books:

##### Mandatory Reading

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. Jensen John R (2007). Introductory Digital Image processing: Remote Sensing Perspective New Jersey: Prentice Hall

##### Supplementary Reading

1. Damen MCJ, Sicco Smith G and Kerstappen(Ed) (2000). Remote Sensing for Resources Development and Environmental Management 3rd.volume Set Netherlands: Balkema
2. Gonzalez, Rafael C.; Richard E. Woods (2005). Digital Image Processing. ISBN 0-201-50803-6.
3. Jensen John R (2007). Introductory Digital Image processing: Remote Sensing Perspective New Jersey: Prentice Hall
4. Joseph, George (2007). Fundamentals of Remote Sensing Universities Press India
5. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2007). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
6. Pratt, William K. (2003). Digital Image Processing. ISBN 0-471-01888-0.
7. Romeny, Bart M. (2003). Front-End Vision and Multi-Scale Image Analysis. ISBN1-4020-1507-0.
8. Umbaugh, Scott E (2005). Computer Imaging: Digital Image Analysis and Processing. ISBN 0-84-932919-1

##### Web reference

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

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<https://www.intergraph.com/>

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[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus\\_campus\\_nrscrc/rrsc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus_campus_nrscrc/rrsc_east?language_content_entity=en)

<https://www.iirs.gov.in/>

## Semester - II

**Course Title:** FIELD TECHNIQUES AND REPORT WRITING

**Course code:** PGMP-GIS-DSC-408

**Credits:** 4

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

### Course objective

1. The course is designed to develop field and Survey techniques using different survey instruments and Interpretation of topo sheets and maps.
2. This includes field techniques and importance of field survey in GIS.

### Course Learning Outcome

After successful completion of a course in student will be able

**CLO1:** Students will describe a survey method and different instruments and it's assembled and summarizes relevant survey for relevant work which will skill development in using different instruments.

**CLO2:** Report writing and Interpretation of Maps will focus on writing skills.

**CLO3:** Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

**CLO4:** Acquire of fundamental and advanced knowledge of the different aspect in Geoinformatics with the means ability to specialize in a specific field.

### Course content

Module	Topics	Hours	
		L	P
		<b>30</b>	<b>60</b>
	<b>Introduction to Field Survey</b>	10	20
	Importance of field instrument survey - scope and purpose, principles and application of selected survey instruments.		
I	Chain and Plane Table Survey: Chain survey: use of tapes-open traverse, triangulation survey; Plane table; plan preparation,		
	Resection -one point and two point problem; threepoint problem; tracing paper method.		

	<b>Dumpy level, Auto level and Theodolite Survey</b>	10	20
II	<ul style="list-style-type: none"> <li>Dumpy level: traverse survey, contour plan preparation. Theodolite - horizontal, land vertical (height) measures, accessible and inaccessible method.</li> </ul>		
	<b>Village Survey and Report writing</b>	10	20
III	<ul style="list-style-type: none"> <li>Fundamentals of Village survey, prerequisites of village survey, preparation of questionnaires, data entry, basic analysis in Microsoft excel</li> <li>Interpretation of surveyed maps and Report writing.</li> </ul>		

### Reference book

### Mandatory Reading

1. Clendening, J. Principles and use of Surveying Instruments. 2nd edition, Blockie. A 2000.
2. Negi, Balbir Singh. Practical Geography Third revised Ed. Kedar Nath and Ram Nath, Meerut & Delhi, 2006.
3. Sandover, J.A. Plane Surveying. Arnold 2007.

### Supplementary Reading

1. Hotine, Major M. The re-triangulation of Great Britain. Empire survey review 2005.
2. Mitra, R.P. and Ramesh A : Fundamentals of Cartography Revised Edition, Concept Publication, New Delhi.
3. Monkhouse - Maps and diagrams Methuen 2004.
4. Negi, Balbir Singh. Practical Geography Third revised Ed. Kedar Nath and Ram Nath, Meerut & Delhi, 2006.
5. Sandover, J.A. Plane Surveying. Arnold 2007.
6. Singh & Karanjta - Map work and Practical Geography Central Book Dept Allahabad 2009.
7. Singh, R.L. and Dutt, P.K. Elements of Practical Geography, Students Friends, Allahabad. 2003.

### Web reference

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<https://www.esri.com/en-us/home>  
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[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)  
<https://glovis.usgs.gov/>  
[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)  
[https://www.nrsc.gov.in/aboutus/campus\\_nrscrc/risc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus/campus_nrscrc/risc_east?language_content_entity=en)  
<https://www.iirs.gov.in/>

## Semester - II

**Course Title: PROGRAMING & CUSTOMIZATION**

**Course code: PGMP-GIS-DSE-403**

**Credits: 4**

**Marks: 100**

**Duration 90 Hours**

**Prerequisite courses: NIL**

### Course objective

1. The course is designed to develop programming skills using a spatial data to automate the analysis process.
2. This includes the programming workflow in spatial domain, python for application and various scripting languages.

### Course Learning Outcome

After successful completion of a course in student will be able

- CLO1:** Student will develop new tools and software also customizes open source software.
- CLO2:** They design and built web base platform for geospatial database.
- CLO3:** Be able to demonstrate proficiency in quantitative reasoning and analytical skills
- CLO4:** Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

### Course content

Mod ule	Topics	Hours	
		T	P
		30	60
<b>I</b>	<b>Using raster data</b>	<b>10</b>	<b>20</b>
	Generating cell size obtaining with width and height of raster		
	Counting raster band and swapping raster bands querying ,creating ,raster based analysis		

<b>II</b>	<b>Dynamic maps</b>	<b>10</b>	<b>20</b>
	Map canvas, map Modules, iterating over layers, graduated layer symbol renderer, map, book mark SVG for layer symbol, map layer transparency, mouse coordinate tracking tool, composing static map analysis data using algorithm		
<b>III</b>	<b>Introduction to Google Earth Engine</b>	<b>10</b>	<b>20</b>

### Reference books:

#### Mandatory Reading

- 1 Kang-Tsung Chang, Programming ArcObjects with VBA: a task-oriented approach, 2, illustrated, CRC Press, 2007, ISBN 0849392837, 9780849392832
- 2 Robert Burke (2003) ,Getting to know ArcObjects, programming ArcGIS with VBA,Esri Pr,ISBN-10: 158960018X,ISBN-13: 9781589600186
- 3 Michael Dawson (2010), Python Programming for the Absolute Beginner, 3rd Edition

#### Supplementary Reading

1. Rick Leinecker, Vanessa L. Williams,Visual Studio 2008 All-In-One Desk ,For Dummies 2008, ISBN0 470191082, 9780470191088
2. Bruce Ralston,Developing GIS Solutions With MapObjects and Visual Basic,OnWord Press; 1 edition (October 31, 2001),ISBN-10: 0766854388 ,ISBN-13: 978-766854383
3. Swaroop CH, A Byte of Python
4. John Walkenbach, Excel VBA Programming or Dummies
5. John Zelle (2010), Python Programming
6. Michael Dawson (2010), Python Programming for the Absolute Beginner, 3rd Edition
7. Zhi Jun Lio, David Percy, Larry V Stanislawski. GIS Programming: Concepts and Applications

#### Online resources

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>  
<https://www.esri.com/en-us/home>  
<https://www.intergraph.com/>  
<https://www.sac.gov.in/Vyom/index.jsp>  
[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)  
<https://ploviz.usgs.gov/>  
[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)  
[https://www.nrsc.gov.in/aboutus/campus\\_nrsrc/rrsc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus/campus_nrsrc/rrsc_east?language_content_entity=en)  
<https://www.iirs.gov.in/>

## **Semester - II**

**Course Title:** GIS for Business and Service Planning

**Course code:** PGMP-GIS-DSE-404

**Credits:** 4

**Marks:** 100

**Duration** 90 Hours

**Prerequisite courses:** NIL

### **Course objective**

1. The course is designed to develop programming skills using a spatial data to automate the analysis process.
2. This includes the programming workflow in spatial domain, python for application and various scripting languages.

### **Course Learning Outcome**

After successful completion of a course in student will be able

- CLO5:** Student will develop new tools and software also customizes open source software.
- CLO6:** They design and built web base platform for geospatial database.
- CLO7:** Be able to demonstrate proficiency in quantitative reasoning and analytical skills
- CLO8:** Be equipped with practical skills and the ability to apply their theoretical concept to design, perform experiments, analyze and interpret data and thus develop proficiency in lab management

## Course content

Module	Topics	Hours	
		T	P
		30	60
<b>I</b>	<p>Geography ad business link, GIS for Business Services, Planning and management, Developments and prospects</p> <p>Micro and macroeconomics Organizational structures, Human resources management</p> <p>Geodemographics and lifestyle approaches, Geolifestyles</p> <p>Marketing spatial analysis, spatial decision support systems</p> <p>'business geographics'</p> <p>Business censuses and the modeling of customer targeting, Manipulation and merging business application databases</p>	<b>10</b>	<b>20</b>
<b>II</b>	<p>Customized versus proprietary solutions to business application</p> <p>Databases consultancy applications of GIS, Enterprise resource planning</p>	<b>10</b>	<b>20</b>
<b>III</b>	<p>Internet platform for GIS Customer facing GIS: web, eCommerce and mobile solutions, Online mapping</p> <p>Applications Supporting business decision, Enterprise applications, Customized spatial decision support systems</p> <p>Ethical Legal and Security issues of spatial technology</p>	<b>10</b>	<b>20</b>

### Reference books:

#### Mandatory Reading

- 1 Kang-Tsung Chang, Programming ArcObjects with VBA: a task-oriented approach, 2, illustrated, CRC Press, 2007, ISBN 0849392837, 9780849392832

- 2 Robert Burke (2003) ,Getting to know ArcObjects, programming ArcGIS with VBA,Esri Pr,ISBN-10: 158960018X,ISBN-13: 9781589600186
- 3 Michael Dawson (2010), Python Programming for the Absolute Beginner, 3rd Edition

### **Supplementary Reading**

1. Rick Leinecker, Vanessa L. Williams,Visual Studio 2008 All-In-One Desk ,For Dummies 2008, ISBN0 470191082, 9780470191088
1. Bruce Ralston,Developing GIS Solutions With MapObjects and Visual Basic,OnWord Press; 1 edition (October 31, 2001),ISBN-10: 0766854388 ,ISBN-13: 978-766854383
2. Swaroop CH, A Byte of Python
3. John Walkenbach, Excel VBA Programming or Dummies
4. John Zelle (2010), Python Programming
5. Michael Dawson (2010), Python Programming for the Absolute Beginner, 3rd Edition
6. Zhi Jun Lio, David Percy, Larry V Stanislawski. GIS Programming: Concepts and Applications

### **Online resources**

<https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>

<https://www.esri.com/en-us/home>

<https://www.intergraph.com/>

<https://www.sac.gov.in/Vvom/index.jsp>

[https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)

<https://glovis.usgs.gov/>

[https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)

[https://www.nrsc.gov.in/aboutus/campus\\_nrsrc/rsrc\\_east?language\\_content\\_entity=en](https://www.nrsc.gov.in/aboutus/campus_nrsrc/rsrc_east?language_content_entity=en)

<https://www.iirs.gov.in/>



