

**PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE**  
**MARGAO – GOA 403601**  
**Affiliated to Goa University**  
**Accredited by NAAC at A Grade**

**POST GRADUATE DEPARTMENT OF GEOGRAPHY**

**MASTER OF SCIENCE**  
**In**  
**GEOINFORMATICS**

**2020-21**

**Onwards**

**The objective of this degree course is to impart instruction and training to candidates in specialized field of techniques and resources and also intended to develop capacity building for employment, teaching and research.**

**PARVATIBAI CHOWGULE COLLEGE OF ARTS AND SCIENCE**  
**MARGAO – GOA 403601**  
**POST GRADUATE DEPARTMENT OF GEOGRAPHY**  
**MASTER OF SCIENCE IN GEOINFORMATICS**

<b>Course Code</b>	<b>Course Title</b>	<b>Marks Theory and Practical 50+50</b>	<b>Credits (2+2=4)</b>
<b>SEMESTER I</b>			
PGM-GIS-C1	Basics of GIS and GPS	<b>100</b>	<b>4</b>
PGM-GIS-C2	Basic of RS and Photogrammetry	<b>100</b>	<b>4</b>
PGM-GIS-E1		<b>100</b>	<b>4</b>
PGM-GIS-E2		<b>100</b>	<b>4</b>
<b>SEMESTER II</b>			
PGM-GIS-C3	Spatial Analysis & Modeling	<b>100</b>	<b>4</b>
		<b>100</b>	<b>4</b>
		<b>100</b>	<b>4</b>
		<b>100</b>	<b>4</b>
<b>SEMESTER III</b>			
PGM-GIS-C4	Application of GIS in Urban and Regional Planning	<b>100</b>	<b>4</b>
		<b>100</b>	<b>4</b>
		<b>100</b>	<b>4</b>
		<b>100</b>	<b>4</b>
<b>SEMESTER IV</b>			
<b>PGM-GIS-C5</b>	<b>Project Work</b>	<b>400</b>	<b>16</b>
<b>Elective subject</b>			
PGM-GIS-E1	Geostatistics	<b>100</b>	<b>4</b>
PGM-GIS-E2	Principles of Computer and Programming	<b>100</b>	<b>4</b>
PGM-GIS-E3	Digital Cartography	<b>100</b>	<b>4</b>
PGM-GIS-E4	Advanced Remote Sensing and GIS	<b>100</b>	<b>4</b>
PGM-GIS-E5	Digital Image Processing	<b>100</b>	<b>4</b>
PGM-GIS-E6	Programming & Customization	<b>100</b>	<b>4</b>
PGM-GIS-E7	Field techniques Report writing	<b>100</b>	<b>4</b>
PGM-GIS-E8	Application of GIS in Disaster Management	<b>100</b>	<b>4</b>
PGM-GIS-E9	WEB GIS and development of web Application	<b>100</b>	<b>4</b>
PGM-GIS-E10	Research and methodology	<b>100</b>	<b>4</b>
PGM-GIS-E11	Application of GIS in Resource Management	<b>100</b>	<b>4</b>
PGM-GIS-E12	Application of GIS in Agriculture and Soil	<b>100</b>	<b>4</b>

**Note:**

- 1) Each course will have six instructional contact hours consisting of two hours of theory and four hours of practical
- 2) Total Marks: 1600 (entire course is divided into 15 papers consisting 100 marks each for first 3 semester and a 400 marks project work in 4<sup>th</sup> semester. Each semester will consist of 16 credits (1 credit = 25 marks) 2 credits for theory and 2credits for practical.

4) Project is the part of paper PGM-GIS-C5. Fourth semester is fully devoted to project work.

- C 1, C2, C3, C4, C5 - Core Subject Compulsory
- E 1, E2, E3, E4, E5, E6, E7, E8, E9, E10, E11, E12 - Elective Subject Optional

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

**SEMESTER I**

Course Code	Course Title	Marks	
		Theory	Practical
<b>SEMESTER I</b>			
PGM-GIS-C1	Basics of GIS and GPS	<b>100</b>	<b>4</b>
PGM-GIS-C2	Basic of RS and Photogrammetry	<b>100</b>	<b>4</b>
PGM-GIS-E1		<b>100</b>	<b>4</b>
PGM-GIS-E2		<b>100</b>	<b>4</b>
Total		<b>400</b>	<b>16</b>

**Semester - I**

**Core**

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

**Course code: PGM-GIS-C1**

**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

No	Topic	Credits	
		L	P
		<b>24</b>	<b>48</b>
<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>1</b>	<b>1</b>
<b>II</b>	<b>Spatial data inputs</b> <ul style="list-style-type: none"> <li>• Digitization</li> <li>• Error identification</li> <li>• Types and sources of error</li> <li>• Correction editing and topology building</li> </ul>	<b>1</b>	<b>1</b>
<b>III</b>	<b>Introduction to GPS</b> <ul style="list-style-type: none"> <li>• History of Positioning System GPS System Description, Error Sources &amp; Receiver</li> <li>• Introduction to DGPS and Total Station, GPS Performance and Policy Applications</li> <li>• Introduction to open source GIS</li> </ul>		

### Reference book

#### Mandatory

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

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 0-13-489733-1.
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.

### Web references

- 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>

### Semester - I

#### Core

**Course Title: BASIC OF REMOTE SENSING AND PHOTOGRAMMERY**

**Course code: PGM-GIS-C2**

**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.

#### Details of course contents and allotted credits

No	Topic	credits	
		T	P
		<b>24</b>	<b>48</b>
<b>I</b>	<b>Fundamental of Remote Sensing</b> <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>1</b>	<b>1</b>
<b>II</b>	<b>Platform, Orbit and sensor</b> <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> <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>	<b>1</b>	<b>1</b>
<b>IV</b>	<b>Aerial photography</b> <ul style="list-style-type: none"> <li>• Types, Geometry, Scale, Height and Process of Aerial Photograph,</li> <li>• basic requirement of Aerial Photograph, planning &amp; execution of photographic flight, aerial cameras, relief displacement,</li> <li>• stereo vision, stereo model &amp; stereoscope, parallax &amp; parallax measurement</li> </ul>		

#### References books

#### Mandatory

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**

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.

### **Web references**

- 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>

**Semester - I****Elective****Course Title: GEOSTATISTICS****Course code: PGM-GIS-E1****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

**Details of course contents and allotted credits**

No	Topic	Credits	
		T	P
		<b>24</b>	<b>48</b>
<b>I</b>	<b>Introduction to Statistics</b> <ul style="list-style-type: none"> <li>• Statistical and Graphical foundation, data classification</li> <li>• Integrated approach, advantages and disadvantages.</li> <li>• Data type and structure.</li> <li>• 3D grid data geometry and association</li> </ul>	<b>1</b>	<b>1</b>
<b>II</b>	<b>Basic statistics</b> <ul style="list-style-type: none"> <li>• Measurement and summary, distribution, covariance and correlation, transformations, data analysis, display and sampling.</li> <li>• Prediction and interpolation : spatial interpolation,</li> <li>• Spectral analysis: linear sequences, Gilgai transect, power spectra and Caragabaltransact(bandwidth and confidence interval)</li> </ul>	<b>1</b>	<b>1</b>
<b>III</b>	<b>Geostatistical uncertainty, probability and reliability</b> <ul style="list-style-type: none"> <li>• Data management for Geostatistics</li> </ul>		



## Reference Books:

### Compulsory

1. Simon W. Houlding, (2000) Practical Geostatistics: Modeling and Spatial Analysis, Springer, Berlin

### supplementary

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

### Web references

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vyom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>

**Semester - I**

**Elective**

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

**Course code: PGM-GIS-E2**

**Credits: 4**

**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

**Details of course contents and allotted time**

No	Topic	Credits	
		T	P
		<b>24</b>	<b>48</b>
<b>I</b>	<b>Introduction to Computers</b> <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>1</b>	<b>1</b>
<b>II</b>	<b>Introduction to simple programming in C</b> <ul style="list-style-type: none"><li>• Developing programming techniques and solutions for spatial algorithms and problem-solving using VB</li><li>• Getting started with HTML, flash</li></ul>	<b>1</b>	<b>1</b>
<b>III</b>	<b>Introduction to Python</b>		

## Reference Books:

### Mandatory

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.

### Supplementary

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

### Web references

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vvom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>

**Semester - I****Elective****Course Title: DIGITAL CARTOGRAPHY****Course code: PGM-GIS-E3****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.

**Details of course contents and allotted credits**

No	Topic	Credits	
		T	P
		24	48
<b>I</b>	<b>Introduction to Cartography</b> <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>1</b>	<b>1</b>

<b>II</b>	<b>Thematic Cartography Characteristics of geographical phenomena</b> <ul style="list-style-type: none"> <li>• Principles of colour perception</li> <li>• Colour scheme for Univariate choropleth and Isarithmic maps, proportional symbol mapping</li> <li>• Interpolation methods for smooth continuous phenomena symbolizing smooth continuous phenomena. Dot and asymmetric mapping</li> </ul>		
<b>III</b>	<b>Geographic representation</b> <ul style="list-style-type: none"> <li>• Map and mapping, map design, symbolization, conventional signs</li> <li>• map layout, map referencing and indexing, scale of maps and map contents</li> <li>• Field work techniques, socio – economic survey and attribute data.</li> </ul>	<b>1</b>	<b>1</b>

### Reference Books:

#### Mandatory

1. ESRI. 2004. ESRI Cartography: Capabilities and Trends. Redlands, CA. White Paper supplementary

1. Kraak, Menno-Jan and Allan Brown (2001): Web Cartography – Developments and prospects, Taylor & Francis, New York, ISBN 0-7484-0869-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.

#### Web references

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vyom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>

**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 Theory and Practical 50+50</b>	
<b>SEMESTER II</b>			
PGM-GIS-C3	Spatial Analysis & Modeling	100	4
PGM-GIS-E4	Advanced Remote Sensing and GIS	100	4
PGM-GIS-E5	Digital Image Processing	100	4
PGM-GIS-E6	Programming & Customization	100	4
		400	16

**Semester - II**

**Core**

**Course Title: SPATIAL ANALYSIS AND MODELING**

**Course code: PGM-GIS-C3**

**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.

### Details of course contents and allotted credits

No	Topic	Credits	
		T 24	P 48
<b>I</b>	<p><b>Introduction to analysis.</b></p> <ul style="list-style-type: none"> <li>• Significance of spatial analysis, overview of tools for analysis</li> </ul> <p><b>Spatial analysis of Vector Base</b></p> <ul style="list-style-type: none"> <li>• Overlay operations: point in polygon, line polygon, polygon in polygon, Single layer operations, features identification, extraction, classification and manipulation, Multilayer operations: union, Intersection, difference</li> </ul> <p><b>Spatial analysis of raster base</b></p> <ul style="list-style-type: none"> <li>• Map algebra, grid based operations, local, focal, zonal and global functions, cost surface analysis, optimal path and proximity search.</li> </ul>	<b>1</b>	<b>1</b>
<b>II</b>	<p><b>Analysis</b></p> <ul style="list-style-type: none"> <li>• Network Analysis- Concept of network analysis, Types of network analysis, Evaluation of network complexity using Alpha, Gama indices, Network data model</li> <li>• Point pattern- Method for evaluating point patterns, Clustered and random distribution</li> <li>• Surface analysis- Interpolation method, DEM, TIN, variance filter, slope and aspect, relief and hill shading</li> </ul>	<b>1</b>	<b>1</b>
<b>III</b>	<p><b>Spatial modeling</b></p> <ul style="list-style-type: none"> <li>• Role of spatial model, explanative, predictive and normative models, handling complex spatial query, case studies.</li> </ul>		

## Reference Books:

### Mandatory

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.

### Supplementary

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. Principles 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

### Web references

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vyom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>



## Semester - II

### Elective

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

**Course code: PGM-GIS-E4**

**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 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.

### Details of course contents and allotted credits

No	Topic	Credits	
		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>	1	1
		1	1
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>	1	1
III	<b>Multi-criteria decision making analysis –</b> <ul style="list-style-type: none"><li>• Ranking</li></ul>		

	<ul style="list-style-type: none"> <li>• Rating</li> <li>• Pair wise comparison</li> </ul> <p><b>Fuzzy logic</b></p>		
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## Reference Books:

### Mandatory

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

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.

### Web references

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vvom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>

**Semester - II****Elective****Course Title: DIGITAL IMAGE PROCESSING****Course code: PGM-GIS-E5****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

**Details of course contents and allotted credits**

No	Topic	Credits	
		T	P
I	<b>Introduction to Digital Image Processing</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>	1	1
		24	48
II	<b>Image Rectification</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>	1	1

	<ul style="list-style-type: none"> <li>Image enhancement in spatial domain and frequency domain, Filtering, Fourier Transform, Noise removal</li> </ul>		
<b>III</b>	<b>Multispectral Image Processing</b> <ul style="list-style-type: none"> <li>Colour Image processing, slicing, Image compression, dilation, Segmentation, Spectral rationing, density slicing and image fusion</li> <li>Object recognition, classification, object recognition, feature extraction, accuracy, assessment, change detection Accuracy Assessment and integration with GIS</li> </ul>		

## Reference Books:

### Mandatory

- Burger, Wilhelm; Mark J. Burge (2007). Digital Image Processing: An Algorithmic Approach Using Java. Springer. ISBN 1846283795.
- Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.

### Supplementary

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

**Elective**

**Course Title: PROGRAMING & CUSTOMIZATION**

**Course code: PGM-GIS-E6**

**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

No	Topic	Credits	
		T	P
		24	48
<b>I</b>	<b>Using raster data</b> Generating cell size obtaining with width and height of raster Counting raster band and swapping raster bands querying ,creating ,raster based analysis	1	1
<b>II</b>	<b>Dynamic maps</b> Map canvas, map units, 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	1	1

## Reference books:

### Mandatory

- 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: 158948018X,ISBN-13: 9781589480186

### Supplementary

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

### Web References

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vyom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>

**Semester - II****Elective****Course Title: FIELD TECHNIQUES AND REPORT WRITING****Course code: PGM-GIS-E7****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 summarize 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.

**Details of course contents and allotted time**

No.	Topic	Credits	
		L 24	P 48
I	<b>Introduction to Field Survey</b> <ul style="list-style-type: none"><li>• Importance of field instrument survey - scope and purpose, principles and application of selected survey instruments.</li></ul>	1	1
II	<b>Chain and Plane Table Survey</b> <ul style="list-style-type: none"><li>• Chain survey: use of tapes-open traverse, triangulation survey; Plane table; plan preparation,</li><li>• resection -one point and two point problem; three</li><li>• point problem; tracing paper method.</li></ul>		

III	<b>Dumpy level, Auto level and Theodolite Survey</b> <ul style="list-style-type: none"> <li>Dumpy level: traverse survey, contour plan preparation.</li> <li>Theodolite - horizontal, land vertical (height) measures, accessible and inaccessible method.</li> </ul>	1	1
IV	<b>Village Survey and Report writing</b> <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

1. Clendening, J. Principles and use of Surveying Instruments. 2nd edition, Blockie. A 2000.

### Supplementary

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

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vvom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)
9. <https://www.iirs.gov.in/>



### Semester -III

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

<b>SEMESTER III</b>			
PGM-GIS-C4	Application of GIS in Urban and Regional Planning	<b>100</b>	<b>4</b>
PGM-GIS-E8	Application of GIS in Disaster Management	<b>100</b>	<b>4</b>
PGM-GIS-E9	WEB GIS and development of web Application	<b>100</b>	<b>4</b>
PGM-GIS-E10	Research and methodology	<b>100</b>	<b>4</b>
PGM-GIS-E11	Application of GIS in Resource Management	<b>100</b>	<b>4</b>
PGM-GIS-E12	Application of GIS in Agriculture and Soil	<b>100</b>	<b>4</b>
<b>SEMESTER IV</b>			
<b>PGM-GIS-C5</b>	<b>Project Work</b>	<b>500</b>	<b>20</b>

### SEMESTER III

#### CORE

**Course Title: APPLICATION OF GIS IN URBAN AND REGIONAL PLANNING**

**Course Code:PGM-GIS-C4**

**Credits: 04**

**Marks: 100**

**Duration 90 hours**

**Prerequisite course: NIL**

#### Course objective

- The course is aimed to introduce the concept of urban and regional planning and applications of GIS in it. It consists of collection, processing, analysis and development of solution from urban and regional problems.

#### Course Learning Outcome

**CLO1:** Students will describe a remote sensing application and assemble and summarize relevant literature in a written assignment, case study and development of models in various urban environmental activities.

**CLO2:** 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.

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

#### Details of course contents and allotted time

No.	Topic	Credits	
		T 24	P 48
1	<ul style="list-style-type: none"><li>• Define urban, Urban area in India, purpose of urban planning, classification of urban settlement, geospatial application urban planning and innovative technology urban planning, National urban information system</li><li>• Urban land use inventory, urban sprawl growth and trends, network analysis, urban environment analysis and suitability analysis</li></ul>	1	1

2	<ul style="list-style-type: none"> <li>Data visualization and mapping design, Visualization for displaying and accessing urban information Groupware in urban planning, web sites for urban planning</li> </ul>		
3	<ul style="list-style-type: none"> <li>Region, characterization of region, Need for region planning dataset of region planning</li> <li>Urban landscape changing model</li> </ul>	1	1
4	<ul style="list-style-type: none"> <li>Real time information systems for urban environment and risk monitoring</li> </ul>		
	Total	2	2

## Reference Book

### Mandatory

1. Ayse Pamuk (2008) Mapping Global Cities, GIS Methods In Urban Analysis. ESRI Press. New York

### Supplementary

1. Bhat, L.S. et al: Micro-Level Planning: A Case Study of Karnal Area, Haryana, K. B. Publications, New Delhi, 2001
2. Bhat, L.S.: Regional Planning in India, Statistical Publishing Society, Calcutta, 2000
3. Chorley, R.J. and Haggett, P. (ed): Network Analysis in Geography, Arnold, 2001
4. Edward J Kaiser, David R. Godschalk,(2007)
5. hypothetical City Workbook, Exercise, Spreadsheets, and GIS Data to Accompany Urban Land Use Planning (4<sup>th</sup> ed) Board of Trustees of University of Illinois, USA
6. Frederick R Steiner and Kent Butter (ed) (2007) Planning and Urban Design Standards, John Wiley and Sons New Jersey, Canada.
7. Juliana Maantay and John Ziegler ( 2001 ) GIS for Urban Environment
8. Kuklinski, A.R. (ed.): Growth Poles and Growth Centres in Regional Planning, Mouton, The Hague. 19

### Web references

1. ISO TC 211 (2003) ISO TC 211 homepage. <http://www.isotc211.org>
2. OGC (2003) The Open Geospatial Consortium Homepage, <http://www.opengeospatial.org>
3. Open Geospatial Consortium Inc. <http://www.opengeospatial.org/docs/02-058.pdf>
4. ISO/IEC DIS 14772, 2000, The Virtual Reality Modeling Language: (VRML 97), <http://www.vrml.org/technicalinfo/specifications/vrml97/index.htm>
5. VRML-Streaming Working group, <http://www.web3d.org/WorkingGroups/vrml-streams/>

**Elective**

**Course Title: APPLICATION OF GIS IN DISASTER MANAGEMENT**

**Course Code:PGM-GIS-E8**

**Credits: 04**

**Marks: 100**

**Duration 90 hours**

**Prerequisite course: NIL**

**Course objective –**

1. Provide students with the state-of-art technical skills to build disaster and hazard applications.
2. This course helpful in mitigation strategies and preparedness plans. Real time geographic data can improve the allocation of resources for response. A GIS technology is much useful in modeling of disaster risks and human adaptations to hazards.

**Course Learning Outcome-**

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

**CLO1:** 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.

**CLO2:** It is provides decision support system in disaster management and making model reduce risk and Hazard. Students will handle different disaster project like Flood, landslide, fire and drought.

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

**Details of course contents and allotted time**

No.	Topic	Credits	
		T	P
I	<ul style="list-style-type: none"><li>• Disaster management, types of hazard and disaster, risk and vulnerability assessment</li></ul>	1	1
II	<ul style="list-style-type: none"><li>• Disaster management measures –Structural and Non-structuraldisaster,prevention,mitigation,preparedness,respon se,recovery and rehabilitation</li></ul>		

III	<ul style="list-style-type: none"> <li>Disaster zonation of world –climatic, geological &amp; Geomorphologic hazard</li> </ul>	1	1
IV	<ul style="list-style-type: none"> <li>Strategies of risk reduction –disaster preparedness, support system, organization ,awareness programs, disaster policy and planning in India</li> <li>Case study –landslide, flood, cyclone and drought</li> </ul>		
		2	2

## Reference Book

### Mandatory

- Alexander, D. (2005). Natural disasters. UCL Press Ltd., University College London. 632.

### Supplementary

- Adler, R.F. and A.J. Negri, 2000. A satellite infrared technique to estimate tropical convective and stratiform rainfall. J. Appl. Meteorol., 27: 30-51.
- Anagnostou, E.N., A.J. Negri and R.F. Adler, 2000. A satellite infrared technique for diurnal rainfall variability studies. J. Geophys. Res., 104: 31477-31488.
- Barrett, E.C., (2005) The storm project: using remote sensing for improved monitoring and prediction of heavy rainfall and related events. Remote Sensing Reviews, vol 14, 282 pp.
- Van Westen, C.J. (2000) Application of Geographic Information Systems to Landslide Hazard Zonation. ITC-Publication Number 15, ITC, Enschede, The Netherlands, 245 pp.
- Ouma G.O. (2006) Disaster Risk Management: Early Warning Systems, Response, and Reduction
- Pelling, M. (2003). The Vulnerability of Cities: Natural Disaster and Social Resilience, Earthscan, London.
- Pike, R.J., (2000). Geomorphometry - diversity in quantitative surface analysis. Progress in Physical Geography 24 (1), 1-20.

### Web references

- School of Government, Harvard University. Available at <http://ksgnotes1.harvard.edu/BCSIA/sust.nsf/pubs/pub1>.
- Congressional Research Service. 2006. FEMA Reorganization Legislation in the 109th Congress. Available at <http://www.openers.com/document/RL33522>.
- Edson, E. 2001. Bibliographic Essay: History of Cartography 38(11/12):1899-1909; available at <http://www.maphistory.info/edson.html>.
- Los Angeles Almanac. 2004. Available at [www.losangelesalmanac.com/topics/population/po47a.htm](http://www.losangelesalmanac.com/topics/population/po47a.htm).
- United Nations Development Programme (UNDP). 2004. Reducing Disaster Risk: A Challenge for Development. Available at <http://www.undp.org/bcrp/disred/english/publications/rdr.htm>

**Elective**

**Course Title: WEB GIS AND DEVELOPMENT OF WEB APPLICATION**

**Course Code:PGM-GIS-E9**

**Credits: 04**

**Marks: 100**

**Duration 90 hours**

**Prerequisite course: Passing of competency test is mandatory (40%)**

**Course Objective:**

1. Provide students with a comprehensive and up-to-date overview of Web GIS, including the basic concepts, principles, related fields (e.g. mobile GIS) and frontiers.
2. Provide students with the state-of-art technical skills to build Web GIS applications and the knowledge needed to choose from various Web GIS development options.

**Course Learning Outcome:**

After Successful completion of the course, students will be

**CLO1:** Critically assess the organizational benefits and challenges of developing Web GIS applications;

**CLO2:** Explain the difference between Web GIS, geospatial web services, mashups, mobile GIS solutions, geoportals, and how these are applicable to e-business and e-government;

**CLO3:** Evaluate current technologies or architectures that support Web GIS;

**CLO4:** Design and implement an independent Web GIS application.

**Details of course contents and allotted time**

No	Topic	Credits	
		T 24	P 48
1	<b>Web Based Architecture and Scripting Environments</b> Roles of Clients & Servers, Basics of web GIS, Architecture, geospatial web services, OGC, Open source and proprietary web-based scripting and mapping environments, KML, GeoJSON, and other formats for drawing vector data in the browser,	1	1
2	Application Programming Interfaces (APIs), GeoServer, NSDI, Census GIS, BHUVAN, Crowd Sourcing.		

<b>3</b>	<b>Mobile GIS and Open Data Kit</b> Architecture of Mobile GIS, Operating systems for Mobile GIS, Wireless web, customization of Mobile GIS, softwares, Libraries, SDK packages and advantages,	1	1
<b>4</b>	Introduction to Open Data Kit (ODK), Web based databases: OpenStreet Map, Overpass turbo, Kepler.gl, Mapbox.		
<b>Total</b>		<b>2</b>	<b>2</b>

### **Reference Books:**

#### **Mandatory**

1. DuVander A 2010. Map Scripting 101: An Example-Driven Guide to Building Interactive Maps with Bing, Yahoo!, and Google Maps

#### **Supplementary**

1. PindFu,(2018) Getting to Know Web GIS,(3rd Ed),Esri Press, Redlands, CA.
2. Markus Neteler And Helena Mitasova (2007): Open Source GIS: A GRASS approach, Springer-Verlag Berlin, Heidelberg
3. Andrew Cutts, Anita Graser (2018): Learn QGIS ,

#### **Web references**

1. <https://www.packtpub.com/application-development/learn-qgis-fourth-edition>
2. ArcGIS Resource Center Web APIs, <http://resources.arcgis.com/content/web/web-apis>
3. ArcGIS JavaScript APIs, <http://help.arcgis.com/en/webapi/javascript/arcgis/>
4. ArcGIS JavaScript API Samples, <https://developers.arcgis.com/en/javascript/jssamples>
5. <https://mangomap.com/web-gis>

**Elective**

**Course Title: RESEARCH AND METHODOLOGY**

**Course Code:PGM-GIS-E10**

**Credits: 04**

**Marks: 100**

**Duration 90 hours**

**Prerequisite Course: NIL**

**Course Objectives:**

1. The course aims to introduce the students to various research designs and techniques and to identify the sources of information for data collection and literature review.

**Course Learning Outcome:** After successful completion of the course, students will be able to

**CLO1:** Understand the importance of review of literature in research

**CLO2:** Develop skills of writing review of literature

**CLO3:** Understand and use different referencing skills

**CLO4:** Create hypothesis/formulate

**CLO5:** Critically assess literature review/research paper

<b>Unit</b>	<b>Topic</b>	<b>Credits</b>	
		<b>T</b>	<b>P</b>
1	<b>Introduction to Research:</b> Research and its types, Research process and steps, Essential components of Literature Review, definition of problem, Objectives & strategies of research <b>Methods of Data Collection :</b> Types of data collection and classification, designing questionnaires and schedules, digital organization of data, preprocessing	<b>1</b>	<b>1</b>



2	<p><b>Sampling Methods:</b> Probability sampling, random sampling, systematic sampling, stratified sampling and cluster sampling Non-probability sampling, quota sampling</p> <p><b>Data Analysis:</b> Statistical measures and their significance: Central tendencies, variation, skewness, Kurtosis, time series analysis, correlation and regression, Testing of Hypotheses: Chi Square, ANOVA</p>		
3	<b>Multivariate Analysis:</b> Multiple Regression, Factor Analysis, Multi-Criteria Analysis	1	1
4	<b>Report writing:</b> Pre writing considerations, Format of report writing, Abstract Writing, Synopsis Writing, Thesis writing, Chapterization, Format of publications in research journals.		
	<b>Total</b>	<b>22</b>	

## References book

### Mandatory

1. Kothari C.K. (2004), 2/e, Research Methodology- Methods and Techniques (New Age International, New Delhi)

### Supplementary

- 1 Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, (Wiley India)
- 2 Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley India)
- 3 Krishnaswamy, K.N., Sivakumar, AppaIyer and Mathiranjana M. (2006), Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
- 4 Hira, D.S. System Simulation, S. Chand & Co., New Delh.
- 5 B.E. Vieux (2005). Distributed Hydrologic Modeling Using GIS, ISBN-13: 978-0792370024
- 6 Proctor, T. (2003) "Essentials of Marketing Research", 3rd edition, Prentice Hall

### Web reference

1. <https://www.scribbr.com/dissertation/methodology/>
2. [https://www.researchgate.net/publication/270956555 CHAPTER 3 - RESEARCH METHODOLOGY Data collection method and Research tools](https://www.researchgate.net/publication/270956555_CHAPTER_3_-_RESEARCH_METHODODOLOGY_Data_collection_method_and_Research_tools)
3. <https://research-methodology.net/research-methodology/>
4. Adapted from: Miles & Huberman (1994, p. 40). Qualitative Data Analysis, available at <http://wilderdom.com/research/QualitativeVersusQuantitativeResearch.html>
5. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
6. <https://www.esri.com/en-us/home>
7. <https://www.intergraph.com/>
8. <https://www.sac.gov.in/Vyom/index.jsp>

**Elective**

**Course Title: APPLICATION OF GIS IN RESOURCE MANAGEMENT**

**Course Code:PGM-GIS-E11**

**Credits: 04**

**Marks: 100**

**Duration 90 hours**

**Prerequisite course: NIL**

**Course objective**

1. The course is aimed to introduce the concept of land, water and coastal management. Taxation and to learn how GIS can be applied in resource management sector.

**Course Learning Outcome:** After successfully completion of the course, students will be able to

**CLO1:** Understanding importance of nature resources and its categorizes

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

**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.

**Details of course contents and allotted time**

No.	Topic	Credits	
		T	P
		24	48

1	<ul style="list-style-type: none"> <li>• Spatial approach in forest resource Management</li> <li>• Cadastral Mapping, Land Registration Workflow, Parcel management, Land Parcel Data Model, data capture, data management and processing</li> </ul>	1	1
2	<ul style="list-style-type: none"> <li>• Land Capability Mapping and Limitations, Public Access, Land classifications, Land use planning, Taxation</li> </ul>		
3	<ul style="list-style-type: none"> <li>• Water Resources- Watershed Management, Flood management and Damage Assessment, Zone Mapping, Groundwater recharge mapping, Water Quality, Watershed Erosion Modeling</li> </ul>	1	1
4	<ul style="list-style-type: none"> <li>• Coastal Zone management, Fisheries, Coral Reefs, Navigation, data storage and access, analysis</li> </ul>		
	Total	2	2

## Reference Books:

### Mandatory

1. Michael G. Wing, Pete Bettinger (2008), Geographic Information Systems: Applications in Natural Resource Management, Oxford University Press, USA

### Supplementary

1. Ali S.A. Resources for Future Economic Growth, Vikas Publications House, New Delhi, 2004.
2. Ress J. Natural Resources, Allocation, Economics & Policy, Rout Ledge, London, 2000.
3. Turner R.K. Sustainable Environmental Management, Belhaven Press, London, 2006.
4. Nancy von Meyer (2004), GIS and Land Records, ESRI press
5. Laura Lang (2004), Managing Natural Resources with GIS, ESRI Press, ISBN 1-879102-53-6
6. Roger Tomlinson (2007), Thinking about GIS, ESRI Press
7. John G. Lyon (2002). GIS for Water Resource and Watershed Management, Taylor & Francis

### Web reference

1. ISO TC 211 (2003) ISO TC 211 homepage. <http://www.isotc211.org>
2. OGC (2003) The Open Geospatial Consortium Homepage, <http://www.opengeospatial.org>
3. Open Geospatial Consortium Inc. <http://www.opengeospatial.org/docs/02-058.pdf>
4. ISO/IEC DIS 14772, 1997, The Virtual Reality Modeling Language: (VRML 97), <http://www.vrml.org/technicalinfo/specifications/vrml97/index.htm>
5. VRML-Streaming Working group, <http://www.web3d.org/WorkingGroups/vrml-streams/>

**Elective**

**Course Title: APPLICATION OF GIS IN AGRICULTURE &SOIL**

**Course Code:PGM-GIS-E12**

**Credits: 04**

**Marks: 100**

**Duration 90 hours**

**Prerequisite NIL**

**Course objective**

1. The course is aimed to introduce the concept of Agriculture, Soil and land management. Develop model and decision support system for different Agriculture system.

**Course Learning Outcome:** After successfully completion of the course, students will be able to

- CLO1:** Understanding importance of Agriculture resources and its categories.
- CLO2:** To be able use these skills to identify land use and land cover problem.
- CLO3:** Develop and built application in agriculture sector.
- CLO4:** Critically think geospatial technology aspect.

**Details of course contents and allotted time**

No.	Topic	Credits	
		T	P
		24	48

1	<b>Agriculture</b> -Spectral characteristic of crop, crop inventory ,crop yield modeling , crop water mangment,agro ecological zoning	1	1
2	<b>Soil</b> – crop acreage and production estimation model, ground water potential zone ,recharge and identification		
3	<b>Land</b> -Land evaluation, physiographic soil mapping , soil type identification, soil moisture mapping	1	1
4	<b>Case study-</b> Review case studies in Geosciences, Water Recourse, Agriculture, Soil		
	Total	2	2

## Reference Books:

### Mandatory

1. Vincent RK (2000) Fundamentals of Geological and Environmental Remote Sensing  
New Jersey: Prentice Hall

### Supplementary

1. Cracknell A P(ed) (2000) Remote Sensing in Meteorology, Oceanography and Hydrology. Chichester: Ellis Horwood Limited
2. Damen MCJ, Sicco Smith G and Kerstappen(Ed) (2004) Remote Sensing for Resources Development and Environmental Management 3rd.volume Set Netherlands: Balkema
3. *Jensen, J.R. (2000). Remote sensing of the environment: an Earth resource perspective. Prentice Hall. ISBN 0-13-489733-1.*
4. Kondratyev K Ya, Buznitov AA and Pokrovoky OM (2000). Global Change and Remote Sensing: John Wiley and Sons.
5. Roy, P.S. Geoinformatics for Tropical Ecosystems Bishen Singh Mahendra Pal Singh, Dehradun
6. Skidmore Andrew (2000) Environmental Modeling with GIS and Remote Sensing Taylor and Francis
7. Steven MD and Clark JA (2001). Applications of Remote Sensing in Agriculture London Butterworths.

### Web reference

1. <https://elearning.iirs.gov.in/https://elearning.iirs.gov.in/>
2. <https://www.esri.com/en-us/home>
3. <https://www.intergraph.com/>
4. <https://www.sac.gov.in/Vyom/index.jsp>
5. [https://bhuvan.nrsc.gov.in/bhuvan\\_links.php](https://bhuvan.nrsc.gov.in/bhuvan_links.php)
6. <https://glovis.usgs.gov/>
7. [https://www.nrsc.gov.in/EO\\_Agr\\_Objective](https://www.nrsc.gov.in/EO_Agr_Objective)
8. [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)

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

**Semester IV**

<b>PGM-GIS-C5</b>	<b>Project Work</b>	<b>400</b>	<b>16</b>
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**Guideline**

1	Problem identification and literature review	Credits 3
2	Data acquisition and collection	Credits 2
3	Field work	Credits 3
4	Data processing	Credits 2
5	Result and interpretation	Credits 2
6	Report writing	Credits 2
7	Presentation	Credits 2

- 1) Project is the part of paper **PGM-GIS-C5** Fourth semester is fully devoted to project work.
- 2) Project will cover 300 hours and 4month durations
- 3) The student for the fulfillment of M.Sc- Geoinformatics must carry out Individual dissertation work.
- 4) Comprehensive Viva Voce
- 5) Viva Voce will be conducted to the student by Department on the topic of the dissertation carried out by the student.