



## CENTRAL UNIVERSITY OF JHARKHAND

(भारतीय संसद के अधिनियम 2009 द्वारा स्थापित)  
(Established by an Act of Parliament of India in 2009)  
Homepage: <http://www.cuj.ac.in>

Name of the Department: Geoinformatics

Name of the School: SNRM

Programme Name: Ph.D Geoinformatics

### Course Structure Details

<b>Programme Name</b>	:	Ph.D. Geoinformatics
<b>Programme Objective (POs)</b>	:	<p>The programme aims to help students to demonstrate proficiency and conceptual understanding in using software or manual techniques to carry out satellite image processing and analysis through a series of laboratory exercises, field studies and dissertations. Students will be able to recognize and explain basic computational properties of remote sensing data acquisition, storage, and processing for various applications.</p> <ol style="list-style-type: none"> <li>1. Students with Ph.D. degrees in Geoinformatics become assets to research organizations working on specific projects as well as fit well in all Geoinformatics industries.</li> <li>2. These students also fit in ISRO and associated organizations as a Scientists/ Engineer as well as in Research Institutes and Private Organizations in India and abroad for pursuing a career in Geoinformatics.</li> <li>3. Ph.D. holders have vast opportunities in Academic Institutes, Scientific organizations, Government Departments, as well as Geoinformatics companies.</li> </ol>
<b>Programme outcome</b>	:	<p><b>Skill:</b> Enabling students to identify key applications of land, water and atmospheric remote sensing and relate them to the properties of historical, current, and planned remote sensing instruments, approaches, and datasets to address and manage the natural resource, disaster-risk for societal welfare through effective decision support.</p> <p><b>Attitudes:</b> effective management of natural resources (forest, water, soil etc.) and hazards-risk implications in changing climatic conditions and its mitigation through sustainable solutions.</p>
<b>Programme Specific Outcome (SPOs)</b>	:	<p><b>Decision making:</b> Empowering students with spatial knowledge with research skills that contribute efficiently to decision support for natural resource management and climate-disaster-risk management.</p> <p><b>Environment and Sustainability:</b> Students will be able to understand the impact of geospatial solutions in societal and environmental contexts and demonstrate knowledge of and need</p>



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	<p>for sustainable development.</p> <p><b>GIS Tool Usage:</b> Students will be able to create, select and apply appropriate GIS techniques, resources and modern Geo-ICT tools, including prediction and modelling, to complex scenarios, with an understanding of the limitations.</p> <p><b>Project Management:</b> Students will be able to demonstrate management skills and apply professional knowledge to their work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.</p>
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### Semester-I

Course Code	Title of the Course	Course Type	Credit
PGI 911010	Fundamentals of Geospatial Technology and its Applications	THEORY	4
PGI 911020	Research Methodology & Project Formulation	THEORY	4
PGI 911030	Computer Programming & Statistics	THEORY	4
PGI 911140	Research & Publication Ethics	THEORY	2
PGI ***	Elective paper	THEORY	4
PGI 911040	Geoinformatics in Ecology & Forestry	THEORY	4
PGI 911050	Forest biomass & Ecological Modelling	THEORY	4
PGI 911060	Water resources, Groundwater Assessment and Contamination	THEORY	4
PGI 911070	Cryospheric Studies	THEORY	4
PGI 911080	Natural Hazard Assessment	THEORY	4
PGI 911090	Advances in Geoinformatics	THEORY	4
PGI 911100	Geoenvironmental Modelling	THEORY	4
PGI 911110	Land Degradation and Sustainable Development	THEORY	4
PGI 911120	Urban Planning	THEORY	4
PGI 911130	Climatology and Satellite Meteorology	THEORY	4



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## Details of Course Syllabi Mapped with COs (For PG Programme Semester I)

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
PGI 911010	Fundamentals of Geospatial Technology and its Applications	THEORY	3	1	0		04
Pre-requisite		: PG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		00					
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Remote Sensing &amp; Photogrammetry”.</p> <ul style="list-style-type: none"> <li>• Understanding Basics of Remote Sensing and Photogrammetry</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and Photogrammetry Techniques</li> </ul>							
<p>Course Outcomes (COs): After completion of this course, the students shall be able to:</p> <ol style="list-style-type: none"> <li>1. Understand concepts, methods and types of Remote Sensing &amp; Photogrammetry.</li> <li>2. Have clear understanding about GIS &amp; GPS.</li> <li>3. Understand the concept of Remote Sensing &amp; Photogrammetry Techniques.</li> <li>4. Know Remote Sensing &amp; Photogrammetry analysis using satellite data.</li> </ol>							
Unit – 1	<b>UNIT I: BASIC PRINCIPLES AND SATELLITE SYSTEMS</b> Electromagnetic Radiation (EMR): Wavelength regions and their applications Atmospheric windows, Interaction of EMR with atmosphere & Earth’s Surface, Spectral response pattern, Geostationary & Sun Synchronous Satellites, Resolutions- Spectral, Spatial, Temporal and Radiometric, Earth Resource Satellite Sensors, Advances in remote sensing technologies: Thermal, RADAR, Microwave, Hyperspectral, Lidar etc.						
Unit – 2	<b>UNIT II: GEOGRAPHIC INFORMATION SYSTEM</b> Basic concepts about spatial information, Spatial vs. non-spatial data, Components of GIS, Spatial data models – Raster and Vector, Data base design - editing and topology creation in GIS, Linkage between spatial and non-spatial data, Integration of Raster & Vector Data, Feature Based Topological functions, Interactive Data Exploration, Vector Data Query, Attribute Data Query						
Unit – 3	<b>UNIT III: CARTOGRAPHY &amp; GLOBAL POSITIONING SYSTEM</b> Introduction to cartography, Map and Scale, Important Map Projections, Generalization- Elements , Control & Classification ( Semantic & Geometric), Introduction to Global Positioning System, GPS Segments, GPS Positioning Types- Absolute, Differential, Geopositioning, GNSS: NAVSTAR, GLONASS, GALILEO etc.						
Unit – 4	<b>UNIT IV: REMOTE SENSING APPLICATIONS</b> Brief introduction to Remote Sensing (RS) Applications: Agriculture, Forestry, Land cover/ Land use, Water resources, disaster management- floods, landslide, cyclone, forest fire, drought & Environmental Impact Assessment (EIA)						
<b>Text Books</b> <ul style="list-style-type: none"> <li>• Jensen, (2006) “Remote Sensing of the Environment- An Earth Resources Perspective”, Pearson Education, Inc. (Singapore) Pvt. Ltd., Indian edition, Delhi.</li> </ul>							
<b>Reference Books:</b> <ul style="list-style-type: none"> <li>• George Joseph, (2004) “Fundamentals of remote sensing”, Universities press (India) Pte Ltd.,</li> </ul>							



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Hyderabad.

- C.P.Lo and Albert K.W. Yeung (2006) “Concepts and Techniques of Geographic Information Systems” Prentice Hall of India, New Delhi.
- Burrough, Peter A. and Rachael McDonnell, (1998), ‘Principles of Geographical Information Systems’ Oxford University Press, New York.
- Ramesh, P. A., (2000): Fundamentals of Cartography, Concept Publishing Co., New Delhi.
- SathishGopi, (2000), GPS and Surveying using GPS
- Leica. A., (2003), GPS Satellite Surveying, John Wiley & Sons, use. New York

Course Code	Course Title	Course Type	Contact Hours				Credit
PGI 911020	Research Methodology & Project Formulation	THEORY	L 3	T 1	P 0		04
Pre-requisite		: PG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		00					
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Research Methodology”.							
<ul style="list-style-type: none"> <li>• Understanding Basics of Research Methodology Techniques</li> <li>• Solving real-world problems using the Research Methodology Techniques</li> </ul>							
Course Outcomes (COs): After completion of this course, the students shall be able to:							
<ol style="list-style-type: none"> <li>1. Understand concepts, methods and types of research.</li> <li>2. Have clear understanding about geographical data, its representation and methods to measure simple statistical descriptive.</li> <li>3. Know sampling and its methods and have understanding of simple correlation and regression and its applications.</li> <li>4. Understand the concept of probability and different probability distributions.</li> <li>5. Know simple matrix operations, principal component analysis, spatial interpolations, etc.</li> </ol>							
Unit – 1	UNIT I: FUNDAMENTALS OF RESEARCH Research and types of research, Concept of region and research of local, regional, global significance, Concept of hypotheses, models, theory and system, Formulation of research schemes, literature review, style of referencing and professional ethical issues						
Unit – 2	UNIT II: DATA COLLECTION AND FIELD INVESTIGATION Geographical data, its sources, nature and classification, Sampling: importance, types, size, area and sampling errors, Field investigation, significance and field reports						
Unit – 3	UNIT III: PROJECT PLANNING & METHODS Project formulation: Scope, Objectives, Feasibility, Budget estimate and Time scheduling, Qualitative and Quantitative Methods, Software and Hardware components, Laboratory and Field Investigation, Accuracy Assessment						
Unit – 4	UNIT IV: PROJECT EVALUATION AND REPORT WRITING Project evaluation, Review Techniques, QC and Quality Assessment and Standardization, Project Report writing: Format, representation of project outcomes, Dissemination of project outcomes: report, research papers, internet, seminar etc., Project Case Studies						



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Text Books
<ul style="list-style-type: none"> <li>Huxoldand W.E., Lerinsons A.G., Aronoft.S.,(1995) Managing Geographic Information Projects.</li> </ul>
Reference Books:
<ul style="list-style-type: none"> <li>Earickson, R. and Harlin, J., (1994) Geographic Measurement &amp; Quantitative Analysis</li> <li>Macmillan, N.York</li> <li>Bennet P. Lientzand Kathryn P., (2001) Project Management for the 21st Century Academic Press, California</li> <li>Kothari, C.R. (2004) Research Methodology Methods and Techniques, New Age International Publishers, New Delhi.</li> <li>Meredith, J.R. and Mantel (Jr.), S.J. (2011), Project Management: A Managerial Approach, John Wiley &amp; Sons, New York. 8th International student edition</li> <li>Dikshit, R.D., 1994. The art and science of geography, prentice hall of India.</li> <li>Gopalakrishnan P and Moorthy VER, 1993, Textbook of Project Management, McMillan Publication India.</li> </ul>

Course Code	Course Title	Course Type	Contact Hours				Credit
PGI 911030	Computer Programming & Statistics	THEORY	L 3	T 1	P 0		04
Pre-requisite	: PG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :	00						
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with programming for handling satellite image”.							
<ul style="list-style-type: none"> <li>Understanding Basics of programming language</li> <li>Solving real-world problems using the programming skill and Techniques</li> </ul>							
Course Outcomes (COs): After completion of this course, the students shall be able to:							
<ol style="list-style-type: none"> <li>Understand programming language for accessing digital image</li> <li>Enhance skill in reading and manipulating digital data using programming language</li> <li>Apply skill of programming language for image analysis</li> </ol>							
Unit – 1	UNIT I: COMPUTER PROGRAMMING: Introduction to Computer Programming; Development of algorithms and flow chart, C++ language - Introduction, Objects, Decisions, Loops, Functions, References, Classes, Pointers						
Unit – 2	UNIT II: WEBGIS APPLICATION DEVELOPMENT Web page design principles, HTML, XML, Data formats, helper applications, Java, databases and the Web, Internet Map Servers, Web GIS Architectures, Web GIS Development Cycle, Web GIS System Integration, Application Development, Use and Maintenance						
Unit – 3	UNIT III: SAMPLING CORRELATION AND REGRESSION Sampling: techniques, types, applications and errors, Correlation: Simple, Rank and partial, Curve Fitting: Simple linear regression, multiple regressions, non-linear regression						
Unit – 4	UNIT IV: STATISTICAL INFERENCE AND PROBABILITY						



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	Statistical Hypothesis and testing, Testing of population means, T test, F-test and Chi-Square. Analysis of variance: One way and two way analysis of variance test, Concept of Probability, Probability distribution, Binomial, Poisson and Normal distribution with Application
Text Books	<ul style="list-style-type: none"><li>Alvi, Z 1995, Statistical Geography-methods and applications, Rawat Publications, New Delhi.</li></ul>
Reference Books:	<ul style="list-style-type: none"><li>King, L.J., Statistical Analysis in Geography, Prentice –Hall, 1969</li><li>Lecture Notes, PRS Division, IIRS Dehradun, 2007.</li><li>Lafore, Robert. Object-Oriented Programming in C++ Dorling Kindersley (India) Pvt. Ltd., 2002.</li><li>Mahmood, A. Statistical Methods in Geographical Studies, Rajesh Publications, 1977.</li></ul>

*Banida*

**HEAD**

Department of Geoinformatics  
Central University of Jharkhand  
Ranchi-835222, Jharkhand

Dated: 5 June 2024

Signature of the Head of Department with seal