



## 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: M.Sc Geoinformatics

### Course Structure Details

<b>Programme Name</b>	:	M.Sc. 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 M.Sc. 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> </ol>
<b>Programme outcome</b>	:	<p><b>Skill:</b> About fifteen practical labs for M.Sc. along with internships, exclusive dissertation and extensive field tours 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</p>



## 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>

		environmental contexts and demonstrate knowledge of and need for sustainable development.	
		<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.	
		<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.	
Semester-I			
Course Code	Title of the Course	Course Type	Credit
MGI 611011	Remote Sensing & Photogrammetry	THEORY	3
MGI611013	Geographic Information Systems & Spatial Modeling	THEORY	3
MGI 611031	Geosciences & Image Interpretation	THEORY	3
MGI 611042	Research Methodology & Geostatistics	THEORY	3
MGI 612052	Remote Sensing & Photogrammetry Lab	LAB	2
MGI 612063	Geographic Information Systems & Spatial Modeling Lab	LAB	2
MGI 612072	Geosciences & Image Interpretation Lab	LAB	2
		<b>Total</b>	<b>18</b>
Semester-II			
Course Code	Title of the Course	Course Type	Credit
MGI 621024	Digital Cartography, GPS & Surveying	THEORY	3
MGI 621021	Applications of Geoinformatics in Natural Resource Management	THEORY	3
MGI 621031	Geoinformatics in Disaster Management	THEORY	3
MGI 621041	Digital Image Processing	THEORY	3
MGI 621054	Geoprocessing and Computer Programming	THEORY	3



## 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>

MGI 622063	Digital Cartography & Surveying Lab	LAB	2
MGI 622073	Applications of Geoinformatics in Natural Resource Management Lab	LAB	2
MGI 622083	Geoinformatics in Disaster Management Lab	LAB	2
MGI 622093	Digital Image Processing Lab	LAB	2
		<b>Total</b>	<b>23</b>

Semester-III			
Course Code	Title of the Course	Course Type	Credit
MGI 711011	Geoinformatics applications in Coastal Studies	THEORY	3
MGI 711021	Geoinformatics in Hydrology & Water Resources	THEORY	3
MGI 711030	Geoinformatics in Climatology & Satellite Meteorology	THEORY	3
MGI 714041	Field Tour	THEORY	3
MGI 716052	***Geoinformatics in Ecology & Forestry	THEORY	3
MGI 716062	***Geoinformatics in Soil, Agriculture & Land Evaluation	THEORY	3
MGI 716072	***Geoinformatics in Regional & Urban Planning	THEORY	3
MGI 716081	***Geoinformatics applications in Cryospheric Studies	THEORY	3
MGI 712091	Geoinformatics applications in Coastal Studies Lab	LAB	2
MGI 712101	Geoinformatics in Hydrology & Water Resources Lab	LAB	2



## 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>

MGI 712110	Geoinformatics in Climatology & Satellite Meteorology Lab	LAB	2
MGI 712121	***Geoinformatics in Ecology & Forestry Lab	LAB	2
MGI 712131	***Geoinformatics in Soil, Agriculture & Land Evaluation Lab	LAB	2
MGI 712141	***Geoinformatics in Regional & Urban Planning Lab	LAB	2
MGI 712151	***Geoinformatics applications in Cryospheric Studies Lab	LAB	2
		<b>Total</b>	<b>23</b>

Semester-IV			
Course Code	Title of the Course	Course Type	Credit
MGI 727011	DISSERTATION	PROJECT	21

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

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 611011	Remote Sensing & Photogrammetry	THEORY	2	1	0		03
Pre-requisite		: UG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		01					
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Remote Sensing & Photogrammetry”.							
<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>							
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 Remote Sensing &amp; Photogrammetry.</li> <li>2. Have clear understanding about Remote Sensing &amp; Photogrammetry.</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>							



## 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>

Unit – 1	BASIC PRINCIPLES
Remote Sensing Concept & Principles, History, Development, Advantages and Limitations, Electromagnetic Radiation (EMR): Spectrum and its properties, wavelength regions and their applications, Atmospheric windows, Interaction of EMR with atmosphere & Earth's Surface, Spectral response pattern of earth materials and measuring instruments Resolutions: Spectral, Spatial, Temporal, and Radiometric.	
Unit – 2	SENSORS, SCANNERS AND DETECTORS
Photographic System: Cameras, filters & Films Remote Sensing Systems: Platform, types of platforms & its characteristics. Sensor classification: Active and Passive, Optical-Mechanical Scanners & Push-broom scanners	
Unit – 3	REMOTE SENSING SATELLITES
Satellites & their characteristics – Geostationary & Sun Synchronous Earth Resource Satellite & sensors: LANDSAT, SPOT, IRS Series of Satellites, MODIS, Microwave (RADARSAT, ALOS), HYPERSPECTRAL (IMS, HYPERION), HRS (Quickbird, IKONOS, Worldview, Rapideye), LIDAR etc. Weather & Communication Satellites: NOAA, TERRA, INSAT, GOES, KALPANA, etc.	
Unit – 4	THERMAL & MICROWAVE REMOTE SENSING
Thermal radiation Properties, Kinetic Heat & temperature, Radiant Energy and Flux, Thermal Capacity and conductivity, Thermal Inertia of earth's materials Microwave: Passive & Active Microwave Sensors, Side looking Airborne/ Space borne RADAR.	
Unit – 5	AERIAL PHOTOGRAPHY
Aerial photography, History of aerial photography; Aerial cameras, lens, optical axis, focal length, focal plane and fiducial marks; Principal Point; Types of photographs, Geometry of vertical & oblique photographs, Aerial photography planning & execution, overlap & side lap,	
Unit – 6	DIGITAL PHOTOGRAMMETRY
Concepts of Photogrammetry, scale, measurements of object height and length, Stereovision & Stereoscopes, Stereoscopic Parallax, Relief displacement, Vertical exaggeration Generation of Digital Photogrammetric Images, Interior Orientation, Exterior Orientation Data acquisition methods (aerial, satellite, UAV) Digital Elevation Models creation & Orthorectification	
Text Books P. Wolf, B. DeWitt, B. Wilkinson (2014) Elements of Photogrammetry with Application in GIS, Fourth Edition, McGraw-Hill Professional.	
Reference Books: PANDEY, SN, (1984) Principles and Applications of Photogeology, John Wiley & Sons Inc. Paul R. Wolf (1983) Elements of Photogrammetry, McGraw-Hill Professional. Jensen, J.R., (2006) "Remote Sensing of the Environment- An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pte. Ltd., Indian edition, Delhi. Sabins, F.F. Jr., (2007) Edition. "Remote Sensing – Principles and Interpretation", W.H. Freeman & Co.	



## 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>

Lillesand, Thomas M. and Kiefer, Ralph, W., (2007) "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York  
Gottfried Konecny(2002) Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI61101 3	Geographic Information Systems & Spatial Modeling	THEORY	2	1	0		03
Pre-requisite		: UG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40%					
		Final Semester Exam: 60%					
Syllabus Version :		03					
Course Objectives: Upon successfully completing this course, students will be able to "do enhance skill with GIS and spatial Modeling".							
<ul style="list-style-type: none"> <li>• Understanding Basics of GIS and geospatial Modeling</li> <li>• Solving real-world problems using the Geospatial Modeling 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>1. Understand concepts, methods and types of GIS.</li> <li>2. Have clear understanding about GIS &amp; Spatial Sciences.</li> <li>3. Understand the concept of Geospatial modelling Techniques.</li> <li>4. Apply Geospatial modelling Techniques for solving real world challenges.</li> </ol>							
Unit – 1	GIS FUNDAMENTALS						
Basic concepts about spatial information (continuous and discrete), Applications potential of GIS, Component of GIS, GIS operations Geospatial data structure & format Spatial (point, line polygon) & non-spatial (tables), Linkage of spatial and non-spatial data Spatial data models: Raster and Vector, Comparison and Representation of Raster & Vector. Data type (.img, .tiff), Data Conversions- raster to vector, DATA compression techniques							
Unit – 2	RASTER DATA ANALYSIS						
Sources of raster data (satellite, AERIAL, TOPO etc.), Raster data structure: Cell by Cell, Run length encoding, Quart tree, Advantages & Limitations of Raster Based GIS Raster Data Analysis: Overlay Operations, Statistical Analysis (Map Algebra) 3D models: DEM, DSM, DTM, TIN, Contours, spot heights, slope and aspect							
Unit – 3	VECTOR DATA ANALYSIS						





## 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>

Digitization, type (hands on, online), projection and transformation, RMS Error Database: designing, editing and manipulation; Topology: contiguity, connectivity, containment Vector Data Analysis (Basic Concepts), errors (slivers, overshoot, undershoot, mismatch of two adjacent layers) Feature Based Topological functions: Overlay Analysis, Buffering, Distance Measurements Layer Based Topological Functions	
Unit – 4	DATA EXPLORATION & WEB GIS
Interactive Data Exploration, Attribute Data Query, Spatial Data Query, Raster Data Query Need of data integration, Integration of RS & GIS, Web GIS concepts and its application GIS project planning	
Unit – 5	DATABASE SYSTEM
Database concepts, (data, information, database, DBMS, meta data) Components of DBMS (Data, Hardware, Software, Users/ Clients) and Advantages of DBMS GIS and Remote Sensing data, data conversion, reduction and enlargement Types & Classification of attribute data (Nominal, Ordinal, Ratio and Interval)	
Unit – 6	DATABASE MODELS & REQUIREMENTS
Types of Model in DBMS (Relational, Hierarchical, Network, Object oriented) DBMS Architecture, DBMS Function, People around DBs/ DBMSs Database Administrator, instances, schema, DDL, DML. Spatial Modelling, overlay analysis, raster overlay tools, reclassification Spatial Interpolation methods, Trend surface analysis, AHP, Fuzzy AHP, ANN,	
Text Books Burrough, Peter A. and Rachael McDonnell, (1998), 'Principles of Geographical Information Systems' Oxford University Press, New York.	
Reference Books:	
Kang-tsung Chang (2007), 'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi. C.P.Lo and Albert K.W.Yeung (2006) "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India, New Delhi. Magwire, D. J., Goodchild, M.F. and Rhind, D. M., (2005), 'Geographical Information Systems: Principles and Applications', Longman Group, U.K. S. Shekhar & S. Chawla, 2002 Spatial Databases: A Tour, Prentice Hall; P. Rigaux, M. Scholl, & A. Voisard 2001, Spatial Databases: With Application to GIS, Morgan Kaufmann; 2nd ed. Andrienko & Andrienko, 2005, Exploratory Analysis of Spatial and Temporal Data: Systematic Approach, Springer.	

Course Code	Course Title	Course Type	Contact Hours				Credit	
MGI 611031	Geosciences & Image Interpretation	THEORY	L 2		T 1		P 0	03
Pre-requisite		: UG Degree as per the admission advertisement						
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%						



## 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>

Syllabus Version :	01
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with image interpretation using satellite and topographical dataset”.</p> <ul style="list-style-type: none"> <li>• Understanding Basics of Remote Sensing and image interpretation keys using satellite data</li> <li>• Solving real-world problems using the Remote Sensing and Visualization Keys</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 Image Visualization Elements using Remote Sensing derived satellite data.</li> <li>2. Have clear understanding about Topographical Features.</li> <li>3. Understand the concept of Visualization Elements and Techniques.</li> <li>4. Know Remote Sensing &amp; Photogrammetry analysis using Visualization Elements.</li> </ol>	
Unit – 1	THE EARTH SYSTEM
<p>Concept of Earth System Lithosphere, Biosphere, Hydrosphere &amp; Atmosphere Continental Drift, Plate Tectonics Theory and its relationship to earthquakes and volcanic activity.</p>	
Unit – 2	IMAGE INTERPRETATION FOR EARTH SURFACE MAPPING
<p>Visual and digital image interpretation techniques Elements of image interpretation Development of interpretation keys</p>	
Unit – 3	ROCK TYPES
<p>Igneous, Sedimentary and Metamorphic Rocks: Types, Forms Field characteristics and rock type delineation on satellite Images Mineral deposits &amp; their types</p>	
Unit – 4	ROCK STRUCTURES
<p>Folds, Faults and Joints Field characteristics of rock structures and delineation on satellite images Lineaments mapping</p>	
Unit – 5	GEOMORPHOLOGY AND LANDFORMS INTERPRETATION
<p>Fundamental concepts, geomorphic agents Classification of fluvial, aeolian, glacial and marine landforms Drainage patterns and significance, Image characteristics of landforms.</p>	
Unit – 6	OPERATIONAL APPLICATIONS
<p>Geoinformatics in mineral exploration Engineering geological investigation: Tunnel, dam &amp; reservoir Groundwater exploration</p>	
<p>Text Books Lillisand, T. M. and Keifer, R. W., (2007). Remote Sensing and Image Interpretation', John Willey and Sons, New York, Fourth Edition</p>	
<p>Reference Books:</p>	
<p>Parbin Singh(2013) Engineering and General Geology, S.K. Kataria&amp; Sons Murk &amp; Skinner, (1999). Geology Today - Understanding Our Planet, John Wiley And Sons Inc, New York Pandey, S. N., (1987). Principles and Applications of Photogeology. New Delhi: Eastern Wiley.</p>	





## 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>

<p>Jenson, J.R., (2006). Remote Sensing of the Environment – An Earth Resource Perspective, Prentice Hall Inc.          Drury, S.A., (2004). Image Interpretation in Geology, Chapman &amp; Hall, India.          Thornbury, W. D., (1969): Principles of Geomorphology, John Wiley and Sons, New York          Sabins, Floyd F., (2007). Remote Sensing: Principles and Interpretation, 2nd Ed., Freeman, New York.</p>								
Course Code	Course Title	Course Type	Contact Hours					Credit
MGI 611042	Research Methodology & Geostatistics	THEORY	L 2		T 1		P 0	03
Pre-requisite		: UG Degree as per the admission advertisement						
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :		02						
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Research Methodology”.</p> <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>								
<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 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	RESEARCH METHODOLOGY							
<p>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</p>								
Unit – 2	DATA AND REPRESENTATION							
<p>Geographic Data, data types, sources, Scale of Measurements,          Frequency distribution, diagrams and time series graph.          Measure of central tendency, location, dispersion, skewness, kurtosis &amp; Moments.</p>								
Unit – 3	SAMPLING, CORRELATION, AND REGRESSION							
<p>Sampling: techniques, types, applications, and errors.          Correlation: Simple, Rank and partial.          Curve Fitting: Simple linear regression, multiple regressions, non-linear regression.</p>								
Unit – 4	FUNDAMENTALS OF PROBABILITY							
<p>Concept of Probability, Laws of probability          Probability distribution, Binomial, Poisson and Normal distribution with Application.</p>								
Unit – 5	STATISTICAL INFERENCE							



## 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>

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.	
Unit – 6	MATRIX & MULTIVARIATE ANALYSIS
Matrix, Inverse matrix, Correlation matrix, variance and covariance matrix. Eigen values and Eigen Vectors, Mean vector Multivariate techniques, Principle component analysis. Spatial interpolation techniques, spatial variogram and applications	
Text Books Earickson, R. and Harlin, J., (1994) Geographic Measurement & Quantitative Analysis Macmillan, N. York	
Reference Books:	
<p>Srivastava PK, 2014. Computational intelligence Technique in Earth and Environmental Sciences. Huxoldand W.E., Lerinsons A.G., Aronoft.S, (1995) Managing Geographic Information Projects. Bennet P. Lientzand Kathryn P., (2001) Project Management for the 21st Century Academic Press, California Kothari, C.R. (2004) Research Methodology Methods and Techniques, New Age International Publishers, New Delhi. Meredith, J.R. and Mantel (Jr.), S.J. (2011), Project Management: A Managerial Approach, John Wiley &amp; Sons, New York. 8th International student edition Dikshit, R.D., 1994. The art and science of geography, prentice hall of India. Gopalakrishnan P and Moorthy VER, 1993, Textbook of Project Management, McMillan Publication India. Arora, P. N., Arora, Sumeet and Arora, S. Comprehensive Statistical Methods. S. Chand Pub. Sharma, D.D. (2002). Geostatistics with application in earth science, Capital Pub. Chiles, J.P., (1999). Geo-statistics: Modeling spatial uncertainty, Wiley Interscience Pub. Gupta, S.C. and Kapoor, V. K. (2004). Fundamentals of Mathematical Statistics. Sultan Chand Pub. Gupta, C. B. and Gupta, Vijay. Introduction to Statistical Methods, 23rd revised edition. Vikas Pub. Issac, E.H. and Srivastava, R.M.:1989, 'Applied Geostatistics', Oxford University Press, UK.</p>	

### Semester-II

Course Code	Course Title	Course Type	Contact Hours				Credit
MGI 621024	Digital Cartography, GPS & Surveying	THEORY	L 2		T 1	P 0	03
Pre-requisite	: UG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :	04						
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with surveying & Photogrammetry”.							
<ul style="list-style-type: none"> <li>• Understanding Basics of Surveying and Photogrammetry</li> <li>• Solving real-world problems using the Surveying, GPS and Photogrammetry 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 Surveying.</li> <li>2. Have clear understanding about Surveying, Cartography and GPS.</li> <li>3. Know Surveying, Cartography and GPS application for geospatial analysis.</li> </ol>							



## 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>

Unit – 1	BASIC CONCEPT OF CARTOGRAPHY
Introduction to cartography, evolution and scope Map elements, Classification of maps Topographical maps, Survey of India National Series maps, indexing and map interpretation. Reference and Coordinate System	
Unit – 2	MAP PROJECTIONS
Classification of Map Projections: Method of construction (conformal, equivalent and azimuthal), Perspective (Conical, Cylindrical, Zenithal), Conventional map Projections Comparison among projections (UTM, Polyconic, LCC) Transformation, visualization of distortions	
Unit – 3	CARTOGRAPHIC MAP GENERALIZATION AND DESIGN
Generalization- Elements, Control & Classification (Semantic & Geometric) Symbolization for different feature attributes, Pattern used by SOI ,Mapping the statistical surface with dot, isopleth and choropleth mapping Map Design (manual vs. digital), compilation & printing	
Unit – 4	FUNDAMENTALS OF GLOBAL POSITIONING SYSTEM
Global Positioning System, GPS Segments, Satellite constellation, GPS signals, GPS antenna, Type of GPS receivers, Geopositioning, Pseudo Range Measurement, Phase Difference Measurement, Geoid, Ellipsoid, Datum. GPS Positioning Types: Absolute & Differential, Real Time Kinematic, GPS Survey Planning, GPS & DGPS Data Processing and Accuracy GNSS: NAVSTAR, GLONASS, GALILEO, COMPASS, Indian Navigation Satellite Missions. GNSS - Principle used, Components of GNSS, Data collection methods, DGPS, Errors in observations and corrections. WAAS and GPS Applications	
Unit – 5	SURVEYING
Chain Survey, Compass Survey, Plane Table Surveying, Tacheometry, Levelling (Auto level/Digital level), Contouring, and Area and Volume Computation	
Unit – 6	MODERN SURVEYING
Modern surveying: Electronic Distance Measurement (EDM) Instruments (Tellurometer, Geodimeter, Distomats), Electronic Theodolite and Total Station and their usages	
Text Books Keates, J.S., (2008): Cartographic Design and production, London, Longman Ramesh, P. A., (2000): Fundamentals of Cartography, Concept Publishing Co., New Delhi.	
Reference Books:	
Elliott D. Kaplan (Author, Editor), Christopher Hegarty(2005) Understanding GPS: Principles and Applications, Second Edition, Artech House Rampal, K.K., (2004): Mapping and Compilation, Concept Publishing Co. New Delhi. Anson, R.W.&Ormeling, F.J., (2008), Basic Cartography, Vol. 1, 2nd ed., Elsevier Applied Science Publishers, London. Robinson A.H. & Morrison J.L, (1995) Elements of Cartography, John Wiley & Sons Singh, R.L &Dutt. P.K,(2008), “Elements of Practical geography”, Students Friends Allahabad Peterson, M.P., (1995) “Interactive and Animated Cartography” Upper Sadde River, NJ: Prentice Hall N.K.Agrawal ,(2004) ,Essentials of GPS, Spatial Network Pvt. Ltd SathishGopi (2000), GPS and Surveying using GPS	
Semester - I	



## 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>

Semester - II

Page 9 of 21

Leica. A., (2003), GPS Satellite Surveying, John Wiley & Sons, use. New York  
Terry-Karen Steede, (2002), Integrating GIS and the Global Positioning System, ESRI Press  
Surveying and Leveling, T. P. Kanetkar and S.V.Kulkarni Vol.1 & 2, Vidhyarthi Griha, Prakashan, Pune.  
Surveying, B. C. Punmia and Jain Vol.1 , 2 & 3 Laxmi Publications, New Delhi  
Surveying-Bannister, Raymond and Baker, Pearson Education  
Surveying, S. K. Duggal Vol 1&2, Tata Mcgraw Hill Publications, New Delhi.  
Advanced Surveying, S. Gopi, R.Satikumar and N.Madhu, Pearson Education  
Higher Surveying, A. M. Chandra, New Age International Publication.

Course Code	Course Title	Course Type	Contact Hours				Credit	
MGI 621021	Applications of Geoinformatics in Natural Resource Management	THEORY	L 2		T 1		P 0	03
Pre-requisite	: UG Degree as per the admission advertisement							
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%							
Syllabus Version :	01							
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Natural Resources Management”.								
<ul style="list-style-type: none"> <li>• Understanding Basics Natural Resources Management</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and Photogrammetry Techniques for Natural Resources Management</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 classification of natural resources and application of geoinformatics in its management.</li> <li>2. Understand what land resources are and geoinformatics applications are in its management.</li> <li>3. Understand various applications of geoinformatics mapping, modelling and management of water resources.</li> <li>4. Know geoinformatics applications in forest resources management and aspects of geotechnical mapping and modelling.</li> <li>5. Have deep insight into some operational applications like forest fire, ground water, etc.</li> </ol>								
Unit – 1	APPLICATION POTENTIAL OF GEOINFORMATICS TECHNIQUES							
Emergence & potentials of Geoinformatics, Advantage over conventional techniques. Classification & types of resources, sustainable development of resources. Uses of alternate energy sources, Recent trends in Geoinformatics applications in NRM								
Unit – 2	APPLICATION IN LAND RESOURCE							



## 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>

Land use classification, land degradation, waterlogging and soil salinity Soil & their types, soil erosion and desertification, Geoinformatics in soil degradation assessment & mapping, Mineral resources, mining impact on land resources, Impact assessment of surface mining on land resources, Environment and Sustainable Development goals (SDGs)	
Unit – 3	APPLICATION IN WATER RESOURCES
Sustainable water resources management, Concept of water harvesting Geoinformatics in surface & groundwater exploration, water resource prospect mapping Water quality monitoring, river pollution & river interlinking Snow covers mapping and modeling approaches.	
Unit – 4	APPLICATION IN FOREST RESOURCES
Forest vegetation, status and distribution, major forest types and their Characteristics in India. Forest degradation, deforestation & climate change: mining Impact, construction & growth activities. Forest fire and wildlife issues, Remote sensing for forest resources management.	
Unit – 5	APPLICATION IN GEO-TECHNICAL ENGINEERING
Reservoir & dam site selection, Reservoir sedimentation, Digital Terrain Modeling for Highways, Tunnel Alignment. High resolution sensors for slope stability and drainage network analysis Geotechnical softwares (Rockware)	
Unit – 6	OPERATIONAL APPLICATIONS
Forest fire & wild life habitat analysis, Groundwater exploration in hard rock and alluvial terrain, Desertification severity assessment, Site suitability for reservoir & dam site selection	
Text Books Lillisand, T. M. and Keifer, R. W. 1994. Remote Sensing and Image interpretation', John Willey and Sons, New York, Third Edition Page 10 of 21 Jenson, J.R. 2009. Remote Sensing of the environment – An Earth Resource Perspective, Prentice Hall Inc.	
Reference Books:	
Srivastava, PK et al. 20 14. Remote Sensing Applications in environmental research, Springer, Netherlands Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany. P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing Francois Ramade 1984. Ecology of Natural Resources. John Wiley & Sons Ltd. Susan Ustin. 2004. Manual of Remote Sensing, Volume 4, Remote Sensing for Natural Resource Management and Environmental Monitoring, 3rd Edition, 768 pages. Guangxing Wang. 2013. Remote Sensing Applications Series, CRC Press.	

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 621031	Geoinformatics in Disaster Management	THEORY	2	1	0		03
Pre-requisite	: UG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40%						



## 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>

	Final Semester Exam: 60%
Syllabus Version :	01
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Disaster Management”.</p> <ul style="list-style-type: none"> <li>• Understanding Basics of Disaster Management</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and Photogrammetry Techniques for Disaster Management</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 Disaster Management.</li> <li>2. Have clear understanding about role of Geospatial modeling for Disaster Management.</li> <li>3. Know Remote Sensing &amp; Photogrammetry analysis for assessing damage due to Disaster Management.</li> </ol>	
Unit – 1	INTRODUCTION
<p>Fundamental concepts of hazards, risk, vulnerability and capacity Gender, Human Values and Health Risk in Disaster Disaster: types and characterization Zonation of hazards, Disasters in context of climate change Disaster and National losses, historical perspective of disasters in India</p>	
Unit – 2	DISASTER MANAGEMENT
<p>Fundamental concept, Disaster management cycle Existing organizational structure for managing disasters in India Disaster management act, policy and guidelines, Geoinformatics in hazard prediction and disaster management</p>	
Unit – 3	GEOINFORMATICS IN GEOLOGICAL HAZARDS
<p>Earthquake, Landslide, Glacial hazards, Volcanic hazards, Mining hazards: land subsidence, mine flooding, coal mine fire.</p>	
Unit – 4	GEOINFORMATICS IN HYDROMETEOROLOGICAL HAZARDS
<p>Flash floods, river floods, urban floods Coastal hazards, Cyclones, tsunami, sea level rise Drought, Lightning hazards</p>	
Unit – 5	GEOINFORMATICS IN ENVIRONMENTAL HAZARDS
<p>Forest hazards: deforestation, degradation and forest fire Land &amp; soil degradation, Desertification Pollution: water, air, soil, solid waste dumping and oil spills</p>	
Unit – 6	EARLY WARNING SYSTEM & MODELS
<p>Early warning system: forest fires, floods, landslides, cyclone and earthquake, Multiple hazard mapping</p>	
<p>Text Books Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000</p>	
<p>Reference Books:</p>	





## 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>

P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS).  
Sdidmore A (2002) Environmental Modeling with GIS & Remote Sensing, Taylor & Francis.  
Anji Reddy. M. (2004) Geoinformatics for environmental Management. B. S. Publication.

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 621041	Digital Image Processing	THEORY	2	1	0	03	
Pre-requisite	: UG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :	01						
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Digital Image Processing”.							
<ul style="list-style-type: none"> <li>• Understanding Basics of Image Processing and their Techniques</li> <li>• Solving real-world problems using the Geospatial Data and Image Processing 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 digital image and how to visualize image</li> <li>2. Enhance skill in reading and manipulating digital data</li> <li>3. Apply skill for image transformation and classification</li> </ol>							
Unit – 1	FUNDAMENTAL CONCEPTS						
Digital image, histogram, image resolutions, Image data formats and retrieval, advantages of digital image processing Sources of digital image degradation, Pre-processing: Atmospheric, Radiometric and Geometric corrections							
Unit – 2	RADIOMETRIC ENHANCEMENT						
Look-up Tables (LUT), Radiometric enhancement techniques, Contrast stretching: Linear and non-linear methods							
Unit – 3	SPATIAL ENHANCEMENT						
Spatial enhancement techniques Low Pass Filtering: Image smoothing High Pass Filtering: Edge enhancement and Edge detection Gradient filters, Directional and non-directional filtering							
Unit – 4	SPECTRAL ENHANCEMENT						
Band ratio, Vegetation indices Principal Component Analysis, texture transformation, RGB, IHS, Image Transformation techniques, Image fusion							
Unit – 5	IMAGE CLASSIFICATION						



## 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>

Classification, feature space, hard classification techniques: Unsupervised & Supervised, Accuracy assessment Soft classification techniques: Fuzzy, NN, ANN, Sub pixel classification. Image segmentation, object oriented classification	
Unit – 6	IMAGE PROCESSING FOR ADVANCE SENSORS
RADAR image processing, Hyperspectral image processing, LiDAR image processing, Image processing for extra-terrestrial materials	
Text Books Jensen, JR. (2004), Introductory Digital Image Processing (3rd Edition), Prentice Hall	
Reference Books:	
Drury, S.A. (2001) Image Interpretation in Geology, Blackwell Science Inc Gonzalez R. C. (Author), Woods Richard E., 2007. Digital Image Processing (3rd Edition), Prentice Hall Rencz, A. N., (1999), Remote Sensing for the Earth Sciences: Manual of Remote Sensing, 3rd ed., John Wiley & Sons, Inc., New York. Curran, P., (1985), Principles of Remote Sensing, Longman, London. Campbell, J. B., (2006), Introductory Remote Sensing: Principles and Concepts, Routledge. Gibson, P.J., (2000), Introduction to Remote Sensing, 2nd ed., Taylor & Francis, London. Cracknell, A.P. & Hayes, L.W.B., (2007), Introduction to Remote Sensing, Taylor & Francis, London.	

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 621054	Geoprocessing and Computer Programming	THEORY	2	1	0		03
Pre-requisite		: UG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		04					
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: 1. Understand programming language for accessing digital image 2. Enhance skill in reading and manipulating digital data using programming language 3. Apply skill of programming language for image analysis							
Unit – 1	PROGRAMMING USING R-CRAN and Matlab						
Introduction, overview and development of R. R objects, Data types, Conditional Statements and Functions Descriptive, Inferential Statistics and visualizations Spatial Data reading, writing and analysis using R and Matlab							



# 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>

Raster data (tiff, netcdf, HDF formats) handing (basic mathematical operation) Vector data (shapefile, kml, kmp, json formats) Unsupervised (K-means clustering) and Supervised (DT, SVM, RF, XGB, Naive Bayes) classifications	
Unit – 2	PROGRAMMING USING GEE
Introduction and overview of GEE API GEE Intermediate (Regional to global data handling) Map/Reduce Programming Concepts Indices, Cloud Masking, Statistics and Charts Advance GEE learning: Change Detection, Spectral Distance Change, Unsupervised and Supervised ML (RF, SVM, CART, and NB) based Classifications.	
Unit – 3	PROGRAMMING USING PYTHON
Fundamental of Python: Modules in Python and get familiar with a script editor IDLE (Jupyter notebook), Python libraries for Geospatial data handling and analysis. Python in geospatial computation: raster and vector data computation using gdal, rasterio, geopandas, shapely libraries. visualization using Matplotlib, Seaborn and plotly libraries Advance geospatial computation using python	
Unit – 4	INTERNET CONCEPTS & WEBGIS APPLICATION DEVELOPMENT
Principles of computer networks, protocols, TCP/IP Internet services, WWW, Web servers, Web clients. Web page design principles, HTML, XML, Php, Syntax, WebGIS Architectures, Web GIS System Integration, Application Development	
Unit – 5	INTERNET GIS
Internet GIS software & Open source, Internet services to GIS, Major WebGIS applications: ArcGIS IMS, ArcGIS Server, Erdas Titan, MangoMap, CartoDB, GeoCommons, CloudGIS, MapBox Interoperability issues & OpenGIS.	
Unit – 6	MAJOR WEBGIS SERVICES & APPLICATIONS
WebGIS services: USGS, Bhuwan 2D & 3D, Google Earth, E-Governance, Potential of Geoportals & NSDI, Crowd Mapping Participatory GIS	
Text Books Michael J Crawley (2007). The R Book. John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.	
Reference Books:	
Aniruddah Ghosh and Robert J. Hijmans (2019). Remote Sensing Image Analysis with R. Erik Westra (2016). Python Geospatial Development - Third Edition 3rd Revised edition by Packt Publishing. Semester - II Page 13 of 21 Joel Lawhead (2019). Learning Geospatial Analysis with Python: Understand GIS fundamentals and perform remote sensing data analysis using Python 3.7, 3rd Edition by Packt Publishing. Pinde Fu, Jiulin Sun (2011), Web GIS: Principles and Applications, ESRI Press Songnian Li, Suzana Dragicevic, Bert Veenendaal (2011) Advances in Web-based GIS, Mapping Services and Applications (ISPRS Book Series). CRC Press GE Sherman (2008), Desktop GIS - Mapping the planet with Open Source, O'Reilly Fatimah Abdullahi (2012) Design and Implementation of a Web-Based GIS, LAP Lambert Academic Publishing Davis, S. (2007) GIS for Web Developers - Adding 'Where' to Your Web Applications, O'Reilly Bill Kropla (2006) Beginning MapServer: Open Source GIS Development (Expert's Voice in Open Source)Apress	



## 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>

ErwanBocher (Editor), Markus Neteler (2012) Geospatial Free and Open Source Software in the 21st Century (Lecture Notes in Geoinformation and Cartography), Springer Rene Rubalcava (2014) ArcGIS Web Development, Manning Publications  
Hussein Nasser (2014) Administering ArcGIS for Server, Packt Publishing Limited  
Regina O. Obe, Leo S. Hsu (2015) PostGIS in Action, Manning Publications; 2ndedition

### Semester-III

Course Code	Course Title	Course Type	Contact Hours						Credit
			L	T	P				
MGI 711011	Geoinformatics applications in Coastal Studies	THEORY	2	1	0				03
Pre-requisite		: UG Degree as per the admission advertisement							
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%							
Syllabus Version :		01							
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Coastal Studies”.</p> <ul style="list-style-type: none"> <li>• Understanding Basics of Coastal Studies</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and GIS Techniques for Coastal Studies</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 concept of coastal studies.</li> <li>2. Have clear understanding about coastal studies and shoreline changes.</li> <li>3. Understand the concept of shoreline changes and its Techniques.</li> <li>4. Know Remote Sensing analysis for coastal zone management</li> </ol>									
Unit – 1	COASTAL ZONES								
Definitions and Scope, Coastal Zone Processes – Waves, Tides and Currents, Coastal Classification Coastal Landforms, Morphology of Indian coasts, Coral reefs River Deltas: Types of Deltas and Dynamics									
Unit – 2	COASTAL WETLANDS								
Mangrove swamps, marshes, lagoons, tidal channels/creeks Continental margins – forms and processes Sea level changes – factors involved and effects of sea level rise									
Unit – 3	COASTAL HAZARDS								



## 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>

Storm surges and Tsunamis - Origin and impacts Satellite sensors for coastal hazard studies Coastal hazards risk management	
Unit – 4	COASTAL ENVIRONMENT
Deforestation, Agriculture, Aquaculture, Pollution, Offshore Mining, Oil Spills, Waste dumping Coastal aquifers; Freshwater-Seawater interface, Satellite based observation: Bathymetric studies, Sea Surface Temperature, Ocean Color Monitoring	
Unit – 5	COASTAL ZONE MANAGEMENT
Landuse pattern, Coastal vegetation, Shelter belts Management Issues, Sea level rise and Shore line erosion Geospatial Information Systems for Coastal Zone Management, Coastal Environment, Sustainable Development goals (SDGs) and Risks to Coastal Communities	
Text Books Geomorphology by A.L. Bloom, Waveland Pr.Inc. 2004	
Reference Books:	
Deltas, Coleman, J.M., Continuing education Publication Co.Inc. 1976 Coastal Sedimentary Environments, Davis, A.R. (Jr.), Springer-Verlag, 1985. Beaches and Coasts, King, C.A.M., Edward Arnold, 1972 Introduction to Marine Geology and Geomorphology, King, C.A.M., Edward Arnold, 1974 Applications in Coastal Zone Research Management, Martin, K.St. (ed), U.N. Institute for Training and Research, 1993. Semester -	

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 711021	Geoinformatics in Hydrology & Water Resources	THEORY	2	1	0		03
Pre-requisite		: UG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		01					
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Hydrology & Water Resources”.							
<ul style="list-style-type: none"> <li>• Understanding Basics of Hydrology &amp; Water Resources</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and Photogrammetry Techniques for Hydrology &amp; Water Resources</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 of Hydrology &amp; Water Resources.</li> <li>2. Have clear understanding about Hydrology &amp; Water Resources.</li> <li>3. Understand the concept of Hydrology &amp; Water Resources and Techniques.</li> </ol>							



## 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>

Unit – 1	BASIC CONCEPTS
Hydrologic cycle, hydrological parameters Groundwater flows hydraulics, Darcy law, Base Flows, Loosing and gaining stream Water table and Water Level, Vertical Profile of Ground Water	
Unit – 2	AQUIFERS
Type of aquifers, quality constraint Geological formations as aquifers Groundwater mining and aquifer stress Ground water budgeting Ground water models	
Unit – 3	WATERSHED MANAGEMENT
Watershed and its characteristics, delineation and codification Drainage Morphometric Analysis Watershed problems and management, Water logging issues Geoinformatics in watershed prioritization Water balance, Water budgeting, Interlinking of rivers and basin management	
Unit – 4	REMOTE SENSING IN SURFACE-SUBSURFACE WATER EXPLORATION
Hydrogeomorphological mapping for ground water exploration Geophysical Methods for Groundwater Exploration Water pollution, Water quality parameters, monitoring, DRASTIC model Arsenic and Fluoride contamination and impacts	
Unit – 5	GEOINFORMATICS BASED OPERATIONAL APPLICATIONS
Flood Inundation Mapping and Modelling, Snow Cover Mapping, Snowmelt Runoff Modelling Reservoir Sedimentation Assessment Runoff & Hydrological Modelling, Hydrological Drought Assessment	
Unit – 6	WATER CONSERVATIONS & MANAGEMENT
Water crisis, Methods of water harvesting Impact of climate change on water resources Water policy and issues Hydrological Software: Mudflow, Mike SHE, SWAT etc	
Text Books Schultz, G. A. and Engman, E. T. , (2000), Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.	
Reference Books:	
Murthy, J. V. S. (1994). Watershed Management in India. Wiley Eastern Ltd., New Delhi. Todd David Keith., (2005), Groundwater Hydrology, John Wiley & Sons, New York, Second Edition Srivastava et.al., 2015. Geospatial techniques in water resources applications. Taylor & Francis, UK	





## 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>

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 711030	Geoinformatics in Climatology & Satellite Meteorology	THEORY	2	1	0		03
Pre-requisite		: UG 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 climatology and satellite meteorology”.							
<ul style="list-style-type: none"> <li>• Understanding Basics of climatology and satellite used in meteorology</li> <li>• Solving real-world problems using the climatology and satellite meteorological data</li> </ul>							
Course Outcomes (COs): After completion of this course, the students shall be able to:							
<ol style="list-style-type: none"> <li>1. Enhance knowledge in climatology and satellite meteorology</li> <li>2. Apply skill of climatology and satellite meteorology for solving real world applications</li> </ol>							
Unit – 1	FUNDAMENTALS OF CLIMATOLOGY						
Atmospheric Composition & Structure, Insolation & Heat budget, Horizontal & Vertical distribution of temperature, temperature inversion, pressure belts and gradients, Coriolis force, geostrophic wind, gradient wind, Ekman Spiral Atmospheric circulation: Zonal atmospheric circulation, Tricellular Meridional Circulation, Seasonal shifting of pressure & wind belts and their climatic significance, Jet Stream, El Nino-La Nina. Atmospheric humidity, condensation, stability & instability of atmosphere, cloud, fogs & precipitation							
Unit – 2	AIR MASSES, FRONTS, CYCLONE & ANTICYCLONE						
Air mass, source region & modification Fronts & Frontogenesis, Classification of fronts and associated weather Cyclones, types, formation and associated weather condition, Anticyclones Extreme Weather Events: Tropical Cyclones, Thunderstorms, Tornado, Cloud burst, Duststorms.							
Unit – 3	MONSOON, CLIMATE CHANGE & GLOBAL WARMING						
Fundamental concepts, distribution of monsoonal circulation around the world, Origin, advancement and retreat of Indian Monsoon Monsoon depressions, tropical easterly jet stream, low level jets, Somali jet, waves in easterlies, western disturbances Climate change, theories and indicators of climate change Global Warming, causes and consequences Geoinformatics in monitoring climate change & global warming							
Unit – 4	FUNDAMENTALS OF METEOROLOGY						
Weather Forecasting; Short, medium and long range weather prediction; Observations and transmission of meteorological information; synoptic charts and its analysis. Synoptic features associated with onset, withdrawal, break active and weak monsoons and prediction.							



## 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>

Unit – 5	SATELLITE METEOROLOGY
<p>Meteorological satellite: TRMM, TIROS, NIMBUS, NOAA, SEASAT, GOES, METEOSAT and INSAT. Satellite based atmospheric temperature, surface radiation, wind and aerosols measurement and analysis. Rainfall Monitoring: Cloud indexing method, Life-history method and Bio-spectral methods, Microwave data for clouds, precipitation and lightning assessment. Interpretation of meteorological Satellite images for weather systems and cyclones.</p>	
<p>Text Books Lal. D.S.: Climatology, Chaitanya Publications, Allahabad, 1986.</p>	
<p>Reference Books:</p>	
<p>Kidder &amp; Haar, 1995, Satellite Meteorology: An Introduction, Academic Press Inc Conway, 1997, An Introduction to Satellite Image Interpretation, Johns Hopkins University Press Ray, 1986, Mesoscale Meteorology and Forecasting, University of Chicago Press Barry, and Chorley, 1998, Atmosphere, Weather and Climate, Routledge, London and New York. Tan, 2013, Meteorological Satellite Systems, Springer Critchfield, J.H.: General Climatology, Prentice Hall, India, New Delhi, 1993. Das, P.K.: Monsoons, National Book Trust, New Delhi, 1987. India Met, Deptt.: Climatological Tables of Observatories in India, govt. of India, 1968. Lydolph, P.E.: The Climate of the Earth, Rowman, 1985. Oliver, J.E. and John J. Hidore. 2002. Climatology- An Atmospheric Science (2ndEd.) Pearson. Peterson, S.: Introduction to Meteorology, McGraw Hill Book, London, 1969. Robinson, P.J. and Henderson S.: Contemporary Climatology, Henow, 1999.</p>	

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 714041	Field Tour	THEORY	2	1	0		03
Pre-requisite	: UG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :	01						
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Field Skills”.</p> <ul style="list-style-type: none"> <li>• Understanding how to work in Field conditions</li> <li>• Solving real-world problems using the collected data from Field</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. Enhance knowledge in Field Data Collections and methods</li> <li>2. Apply skill of field for solving real world applications</li> </ol>							
<p>The Centre will organize a Field Tour of not less than two weeks to provide sufficient field exposure in areas relevant to applied aspects of the course.</p> <p>The study tour will be organized after the end semester examination of 2ndsemester, to give field exposure and workings of organizations in the field of Geoinformatics such as SoI, IIRS, FRI, RRSSC, ISRO, and in the areas with proper relevance with geoinformatics applications viz., geology or geomorphology significance, disaster, coastal etc. Students are encouraged to take field observations and related it with the satellite images in order to enhance their skills in image interpretation and field data collection.</p>							



## 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>

The field tour activity will be a compulsory task, in which each student will have to participate it. Students are required to submit a study tour report before the start of 4th Semester in consultation with the Faculty in-charge in proper format with proper observations & making charts/ maps of different earth objects.

All students has to prepare a report based on the field visit and it will be evaluated by an external expert.  
Semester

Text Books

Reference Books:

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 716052	Geoinformatics in Ecology & Forestry	THEORY, ELECTIVE	2	1	0		03
Pre-requisite		: UG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		02					
<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Ecology &amp; Forestry”.</p> <ul style="list-style-type: none"> <li>• Understanding Basics of Ecology &amp; Forestry</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and GIS Techniques for Ecology &amp; Forestry</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 the concepts associated with forest ecology and its importance.</li> <li>2. Know forest classification and how forest surveys are being performed.</li> <li>3. Have a methodological understanding of forest stand and yield estimation and geoinformatics applications to it.</li> <li>4. To know the importance of forest protection and the role of remote sensing and GIS in its sustainable management.</li> <li>5. Understand various aspects of forest damage and how geoinformatics helps to contain it efficiently.</li> </ol>							
Unit – 1		FOREST ECOLOGY					
<p>Forest eco-systems; Biotic and abiotic components; forest community concepts Ecological succession and climax, primary productivity, nutrient cycling and water relations Physiology in stress environments (drought, water logging and salinity), Conservation of forest ecosystems.</p>							



## 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>

Unit – 2	FOREST CLASSIFICATION & SURVEYING
Forest types in India, identification of species, composition and associations; Conventional Survey, different methods of surveying, maps and map reading, Remote sensing based classification of forests, Spectral properties of vegetation	
Unit – 3	FOREST MENSURATION AND REMOTE SENSING
Sampling methods and sample plots. Yield calculation; yield and stand tables, Forest Applications: Sensor Requirements, forest cover monitoring through remote sensing; Geographic Information Systems for management and modelling.	
Unit – 4	FOREST PROTECTION
General forest protection against fire, Fire Identification and Control through RS & GIS, Role of afforestation and forest regeneration. Human impacts; encroachment, poaching, grazing, shifting cultivation and control.	
Unit – 5	DAMAGE ASSESSMENT
Injuries to forest – abiotic and biotic, insect-pests and disease, Disease and Stress Detection, Susceptibility of forests to damage, nature of damage, cause, prevention, protective measures and role of RS & GIS in benefits.	
Unit – 6	FOREST CONSERVATION&MANAGEMENT
Principles of conservation, needs for forest conservation, RS & GIS techniques for forest conservation&managementviz.Microwave&LiDAR, Working plans-preparation and control.	
Text Books Adrian Newton. 2007. Forest Ecology and Conservation: A Handbook of Techniques (Techniques in Ecology & Conservation).	
Reference Books:	
Kimmings JP. 2003. Forest Ecology. MacMillan. Steven E. Franklin. 2001. Remote Sensing for Sustainable Forest Management.CRC Press. Köhl, Michael, Magnussen, Steen S., Marchetti, Marco.2006,.Sampling Methods, Remote Sensing and GIS Multiresource Forest Inventory,XIX, 373 p.	

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 716062	Geoinformatics in Soil, Agriculture & Land Evaluation	THEORY	2	1	0		03
Pre-requisite		: UG Degree as per the admission advertisement					
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%					
Syllabus Version :		02					



## 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>

<p>Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Soil, Agriculture &amp; Land”.</p> <ul style="list-style-type: none"> <li>• Understanding Basics of Soil, Agriculture &amp; Land</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and GIS Techniques for Soil, Agriculture &amp; Land</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. To know concepts of soil, factors of soil formation, and physical basis of spectral signature of various soils.</li> <li>2. To understand peculiarities associated with crop identifications, its acreage mapping and yield estimations using geoinformatics.</li> <li>3. To know various applications of geoinformatics in crop damage assessments.</li> <li>4. Understand the concept of land, land uses and various aspects of land evaluation and management.</li> <li>5. Focus on application of geoinformatics in agroclimatic-regional planning, watershed managements, etc.</li> </ol>	
Unit – 1	SOIL FUNDAMENTALS & MAPPING
<p>Soil, factors of soil formation, soil forming processes (podzolisation, laterisation, salinisation and gleying) Physical and chemical characteristics, soil quality, soil problems (salinity, erosion) Soil survey: conventional and non-conventional approach Factors affecting spectral characteristics of soil, optical, microwave and hyperspectral remote sensing of soil Soil Classification: zonal, intrazonal and azonal, major soil types and their distribution in India.</p>	
Unit – 2	GEOINFORMATICS IN AGRICULTURE MANAGEMENT
<p>Spectral characteristics of leaves and crops Crop identification and acreage estimation. Crop yield parameters, crop condition monitoring &amp; crop production forecasting using remote sensing and GIS. Role of Geoinformatics in irrigation management</p>	
Unit – 3	GEOINFORMATICS IN CROP DAMAGE ASSESSMENT
<p>Crop damage assessment due to pests and diseases. Crop damage assessment due to water-logging and salinity. Crop damage assessment due to drought and flood</p>	
Unit – 4	LAND COVER AND LAND USE ASSESSMENT
<p>Concept of land cover and land use, their interrelation and importance Role of Geoinformatics in land cover and land use study, Land use/land cover matrix Classification of land cover and land use at different levels.</p>	
Unit – 5	LAND EVALUATION AND ASSESSMENT
<p>Concept of land and land evaluation, land characteristics, land quality and diagnostic criteria, multiple and compound land utilization. Principles and methodology for land evaluation Role of Geoinformatics in soil conservation and management. Land Capability Classification.</p>	
Unit – 6	CASE STUDIES
<p>Concept of Agro-Climatic Regional Planning. Command area development and watershed planning for agriculture and soil development. Geoinformatics in Agro-Climatic Modeling</p>	
<p>Text Books Srivastava et al. 2016. Satellite Soil moisture retrieval: techniques and application, Elsevier Press, US</p>	



## 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>

### Reference Books:

Steven, M.D. and Clark, J.A.:1991, 'Application of Remote Sensing in Agriculture', Butterworths, UK.  
Asrar, G.:1989, 'Theory and application of optical remote sensing', John Wiley & Sons, USA.  
Space Applications Centre,1990,Manual of procedure for Forest, Mapping and Damage Detection, India.  
Brockington, N.R.:1979, 'Computer Modelling in Agriculture', Oxford University Press, UK.  
Siva, V.:2002, 'Sustainable agriculture and food security', Sage Publications, India.  
Narayan, L.R.A.:2001, 'Remote Sensing and its application', University Press, India.  
Courtney, F.M. and Trudgill, S.T.:1976, 'The Soil', Edward Arnold, UK.  
Brady, N.C. and Weil, R.R.:2002, 'The nature and properties of soil', Pearson Prentice Hall, India.  
Costantini, E.A.C.:2009'Manual of methods for soil and land evaluation', Science Publishers, USA.  
Ghosh, S.P.:1991, 'Agro-climatic zone specific research: Indian perspective under N.A.R.P.', Publications and Information Division, Indian Council of Agricultural Research, India.  
Basu, D.N. and Guha, G.S.:1996, 'Agro-Climatic Regional Planning in India', APRU, India.  
Sivakumar, M.V.K., Roy, P.S., Harmsen, K. and Saha, S.K.:2003, 'Satellite remote sensing and GIS applications in agriculture meteorology', Proceeding of Training Workshop, Dehradun, India.

Course Code	Course Title	Course Type	Contact Hours				Credit
			L	T	P		
MGI 716072	Geoinformatics in Regional & Urban Planning	THEORY	2	1	0		03
Pre-requisite	: UG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :	02						
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with Regional & Urban Planning”.							
<ul style="list-style-type: none"> <li>• Understanding Basics of Regional &amp; Urban Planning</li> <li>• Solving real-world problems using the Geospatial Remote Sensing and GIS Techniques for Regional &amp; Urban Planning</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 of Regional &amp; Urban Planning.</li> <li>2. Have clear understanding about Regional &amp; Urban Planning.</li> <li>3. Know Remote Sensing &amp; Photogrammetry analysis for Regional &amp; Urban Planning.</li> </ol>							
Unit – 1	URBANIZATION AND URBAN GROWTH						
Concept of urbanisation and impacts, Urbanization pattern in India Urban growth: stages & models, Urban problems: housing, slums, traffic, pollution, health, environment. Geoinformatics in urban and regional planning							
Unit – 2	URBAN PLANNING						





## 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>

Planning: urban and regional, Master Plan and development plan, Planning laws and bylaws, zoning, Urban utility/ services planning, Urban green space Urban development in India, Sustainable Development goals (SDGs)	
Unit – 3	URBAN MAPPING
Urban area interpretation, Urban land use/ land cover, Space use mapping, traffic and parking survey Slum, renovation & rehabilitation High resolution and hyperspectral imaging for urban/ regional mapping	
Unit – 4	URBAN ANALYSIS
Urban growth and sprawl: monitoring & Management, Shannon entropy Density Analysis, Urban heat island, Urban Analysis and Modelling with GIS	
Unit – 5	URBAN MODELLING
Urban feature extraction, SAVI, NDBI, Site suitability built-up development, Urban risk assessment, geospatial modelling	
Unit – 6	MANAGEMENT
Decision Support System for urban and regional management. Government initiatives in urban & regional planning, Transportation Network Analysis National Urban Information System, Case Studies.	
Text Books Ramachandran, 1999. Urbanization and Urban systems in India, Oxford Publications: New Delhi	
Reference Books:	
Rangwala, 203. Urban Planning, Charotar Publishing House Pvt. Ltd.; 26th Edition P. Rao, 2009. Urban Planning: Theory and Practice, CBS Pub. Prakash M Apte, 2013. Urban Planning and Development: An Indian Perspective, Zorba Publishers Das, 2007. Urban Planning in India, Rawat Pub. Kulshrestha, 2012, Urban and Regional Planning in India: A Handbook for Professional Practice, SAGE Publications India Private Limited Peter Hall & Mark Tewdwr-Jones, 2010, Urban and Regional Planning, Routledge; 5 edition Mandal S. & Ray R., 2014. Application of Remote Sensing in Urban Area, Lambert Academic Publishing Kalpana Markandey & S. Simhadri, 2009, Urban Environment and Geoinformatics, Rawat Pub Xiaojun Yang, 2011. Urban remote sensing: monitoring, synthesis and modeling in the urban environment Verma, LN, 2008. Urban Geography, Rawat Publications Tarek Rashed and Carsten Jürgens, 2010, Remote sensing of urban and suburban areas Brench M.C., (1972), City Planning and Aerial Information, Harvard University, Cambridge, Weng, Qihao and Quattrochi, Dale A, 2013, Urban remote sensing, CRC press Maantay & Ziegler, 2006, GIS for the Urban Environment, Environmental Systems Research Institute Inc. Netzband, Stefanov, Redman, 2007, Applied remote sensing for urban planning, governance and sustainability. Springer Semester - III	

Course Code	Course Title	Course Type	Contact Hours	Credit
-------------	--------------	-------------	---------------	--------



## 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>

MGI 716081	Geoinformatics applications in Cryospheric Studies	THEORY	L 2		T 1		P 0		03
Pre-requisite		: UG Degree as per the admission advertisement							
Course Assessment Methods :		Sessional exams (I, II, III): 40% Final Semester Exam: 60%							
Syllabus Version :		01							
Course Objectives: Upon successfully completing this course, students will be able to “do enhance skill with snow cover and glacier”.									
<ul style="list-style-type: none"> <li>• Understanding Basics of cryosphere and related disaster</li> <li>• Solving real-world problems of cryosphere and related disaster using the Geospatial 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. Enhance knowledge in cryosphere and related disaster under climate change</li> <li>2. Apply skill of handling cryosphere induced disaster for solving real world applications</li> </ol>									
Unit – 1	PROPERTIES OF SNOW/ ICE AND GLACIER DISTRIBUTION								
Mineralogy of ice, Metamorphism, Effects on albedo Reflectance characteristics of Snow and Ice in optical regions Effect of mineral dust and black carbon on reflectance of snow and ice Glacier, classification and geographical distribution									
Unit – 2	GLACIER LANDFORM AND SNOW COVER MAPPING								
Depositional and erosional landforms of glacier, Snow cover mapping and controlling factors Crevasses and icefall, moraines, dead ice Glacier morphological parameters, measurement and accuracy estimation Satellite sensors for glacier and snow cover monitoring and mapping									
Unit – 3	GLACIER MASS BALANCE AND CLIMATE CHANGE								
Glacier deformation, Steady and non-steady Glacier motion/flow, Principle of mass balance, Techniques for Glacier Mass Balance Estimation Ice core and Paleo climatic studies, Response of Glaciers to climate change									
Unit – 4	SNOW AND GLACIER MELT AND RUN-OFF MODELLING								
Glacier Hydrology, Heat budget and Radiation, Thermal parameters of snow/ice, Glacier temperature profiles Physics of snow melt, Glacier melt run-off generation, hydrograph separation for melt water contribution, snow melt run off modelling									
Unit – 5	SNOW AND GLACIER HAZARDS								
Glacial lake outburst flood, Glacier retreat and surging of glacier Avalanche mapping and predictive modelling Glacier expedition, hazards and preparedness									
Text Books W. Gareth Rees, 2005, Remote Sensing of Snow and Ice, CRC Press									
Reference Books: Barry & Gan, 2011, The Global Cryosphere: Past, Present and Future, Cambridge University Press Laybourn-Parry, M. Tranter & A. J. Hodson, 2012, The Ecology of Snow and Ice Environments, Oxford Uni. Press									



## 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>

Laybourn-Parry, M. Tranter & A. J. Hodson, 2012, The Ecology of Snow and Ice Environments, Oxford Uni. Press  
Knight, 2006, Glacier Science and Environmental Change, Wiley-Blackwell  
Frederic P. Miller, Agnes F. Vandome and John McBrewster, 2010, Glaciology, Alphascript Publishing Shi  
Tafeng, 2008, Collectanea of the Studies on Glaciology, Climate and Environmental Changes in China, China Press  
Bryn Hubbard, Neil F. Glasser, 2005, Field Techniques in Glaciology and Glacial Geomorphology, Wiley Pub.  
J. S. Aber, David G. Croot and Mark M. Fenton, 1989, Glaciotectonic Landforms and Structures, Springer  
Matthew M. Bennett, Neil F. Glasser, 2009, Glacial geology: Ice Sheets and Landforms, John Wiley & sons

### Semester-IV

Course Code	Course Title	Course Type	Contact Hours				Credit
MGI 727011	DISSERTATION	THEORY	L 0	T 0	P 21	21	
Pre-requisite	: UG Degree as per the admission advertisement						
Course Assessment Methods :	Sessional exams (I, II, III): 40% Final Semester Exam: 60%						
Syllabus Version :	NA						
Course Objectives:	Upon successfully completing this course, students will be able to “do enhance skill with Thesis”. <ul style="list-style-type: none"><li>• Understanding Basics of Research Skills</li><li>• Solving real-world problems using the Geospatial 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. Apply project skill for executing research in the domain of Geospatial Techniques</li><li>2. Enhance skill on executing real world applications in the field of Geospatial Techniques</li></ol>						
	<p>One Semester dissertation work in potential application areas of Geoinformatics will be taken up by each students. Dissertation will consist of relevance of following: Need for study, research objectives, study area, methodology (lab/ field studies), result &amp; discussion, conclusion and future scope of work, references and annexures.</p> <p>M.Sc. Dissertation must be completed by the end of Fourth Semester. This should be a substantial piece of research work, which both reinforces the skills learned in the taught component of the course and provides a genuine opportunity to undertake valuable research.</p> <p>Each student is required to defend his/ her thesis through a presentation in front of an external expert, faculty and students.</p> <p>Semester</p>						

*Banida*

**HEAD**

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

Dated: 5 June 2024

Signature of the Head of Department with seal