Semester-II (PCC)

Photogrammetry and Urban Mapping

Course Code	**MCGI201**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:2:0	SEE Marks	50
Total Hours of Pedagogy	50 Hours of teaching	Total Marks	100
Credits	04	Exam Hours	03

Course Learning objectives:

i. To understand the basic concepts of remote sensing, systems & techniques of data acquisition.
ii. To acquire skills in image processing techniques and interpretation of remotely sensed data.
iii. To impart skills for extraction of information from aerial/satellite stereo-data.
iv. To use the tools and techniques of geo-informatics for efficient planning and management of urban area.
v. To get knowledge about application of urban areas.

Module-1

Introduction: Definition of photogrammetry, Types of photographs, Aerial camera, Geometry of aerial photograph; scale, relief displacement, scale of tilted photograph; Basics of Terrestrial and Close-range photogrammetry, photo interpretation.

Stereoscopic viewing: Principles of stereoscopic vision, types of stereoscopes, stereoscopic parallax, causes of Y-parallax, Elevation from parallax difference.

Module-2

Analytical and Digital Photogrammetry: Image coordinate system and Object space coordinate system; Minor Control Points (MCPs), collinearity equations of vertical and tilted photograph, Epipolar geometry co-planarity equations, Relationship between image and object space. Basic photogrammetric operation in digital environment; Inner Orientation, Exterior Orientation procedures in digital photogrammetry.

Flight Planning and Block Control: Flight planning, choice of photo scale, photographic end lap and side lap, purpose of photography, ground coverage, weather conditions, season of the year, flight map, specifications, General requirements of ground control points; planning Block Control Points (BCP), pre-pointing and post-pointing.

Module-3

Aero Triangulation (AT): Definition, Classification of AT, GPS supported AT, geometric relationship between a camera and GPS antenna with respect to its position and attitude, synchronization of GPS coordinates with camera exposures, and INS parameters in bundle block adjustments for each exposure stations.

Concept of Block/Bundle/Strip Adjustments: definition of block, types of block adjustments, development of block adjustment; bundle block adjustment, accuracy of block adjustment, space resection, space intersection, Artificial Intelligence (AI) in depth perception.

Module-4

Soft copy Photogrammetry: Digital photogrammetric system, Configuration of Digital photogrammetric work station, photogrammetric scanners, softcopy photogrammetry, 3D visualization in digital environment (stereoviewing), Quad buffer, characteristics of digital image data, image enhancement, image matching, feature extractionby 2D and 3D mode, Advantages of digital photogrammetry. Digital surface modelling by DTM/DEM, Interpolation techniques, GRID and TIN, break lines, profiles, mass points / random points, DTM generation process, differential rectification, mosaic, Seamless data generation.

Module-5

Urban Area Definition and Characterization–Base Map Preparation – Urban Land use Classification – Visual and Digital Techniques for Land use Mapping - Urban Structure and Patterns– Urban Land Cover Classification – Feature Extraction techniques –Change Detection – Sprawl Detection and Characterization - Mapping of Urban

Morphology - Urban Heat Island –Building Topology.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. . Fundamentals of Remote Sensing by George Joseph 1st edition 2003
2. . Remote Sensing and Image Interpretation by by Lillesand Kiefer Chipman 6th edition 2014
3. . Remote Sensing and GIS by Basudeb Bhatta 2nd edition 2011
4. . Elements of Photogrammetry by Paul R Wolf Indian edition 2014.
5. . Introduction to Modern Photogrammetry by E M Mikhail, James S Bethel and J C McGlone 2001.

Web links and Video Lectures (e-Resources):

- . Students are encouraged to visit SWAYAM web site where there are several Massive Open Online Courses (MOOC), **http://swayam.gov.in** Students are encouraged to take the benefits of SWAYAM PRABHA- the direct to home (DTH) 34 channels telecasting educational programmes on 24x7 basis using GSAT-15 satellite. The channels are up-linked from BISAG-N, Gandhinagar.

Skill Development Activities Suggested

- To learn skill in image interpretation techniques in practical class.
- To get familiarized with filed instruments.
- To get knowledge about photogrammetry software.
- To learn Mirror Stereoscope for height of tree or building.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Introduction to Photogrammetry	I, II
CO2	Analytical and Digital Photogrammetry, Flight Planning and Block Control	II, III
CO3	Aero Triangulation, Concept of Block/Bundle/Strip Adjustments	II,III
CO4	Soft copy Photogrammetry	III, IV
CO5	To get familiarise latest technology for data capturing in urban area and creating LIS.	II, II

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X											
CO2		X						X			X	
CO3						X						
CO4		X						X				
CO5						X					X	

Semester-II PCC

Geospatial Data Analytics

Course Code	**MCGI202**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	45 Hours of teaching+5 Session for SDA	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To understand the basic concepts of raster formats using statistical equation. To acquire skills in image enhancement and transformation techniques
- To impart skills for classification techniques raster data merging and advanced computer based algorithms.

Module-1(Geospatial Statistics)

Basic Statistics and Probability Theory: Central tendency and dispersion, Skewness, Kurtosis: Mean mode, median, standard deviation, variance, and covariance. Introduction to probability theory, kinds of probability, probability models. **Sampling and Testing of Hypothesis:** Introduction, sampling, sample mean, sampling from normal distribution, stratification and sampling, simple hypothesis testing, composite hypothesis, tests of hypotheses – sampling from normal distribution, chi-square tests, tests of hypotheses and confidence intervals. **Simple Regression and Correlation:** Estimation using regression line, correlation analysis, making inferences, limitations and errors.

Module-2

Time Series and Forecasting: Introduction, variation in time series, trend analysis, cyclical variation, seasonal variation, irregular variation, time series analysis in forecasting. **Introduction to Spatial data analysis in R:** Basic data types and data structures in R Looping, functions, Linear, Multi regression, Analysis of Covariance, Time series analysis in R, Visualising Spatial Data using R, working with vector data and raster data in R.

Module-3 (Vector Data Analytics)

Advanced Spatial Data Modelling and Visualization: Spatial Measurements, Queries, Terrain analysis, spatial analysis of 3-Dimentional data, Data integration and map overlay. GIS and Maps, Visualization process and strategies, mapping qualitative and quantitative data, map / information dissemination. Trend surface analysis, fuzzy analysis, GIS analytical models: Digital Terrain Models, Hydrologic modelling, Spatial Multi Criteria Analysis and engineering GIS applications, recent advances in GIS & Spatial Data Analytics (SDA), Career opportunities in GIS and SDA.

Module-4 (Raster Data Analytics)

Digital Data: Introduction- Satellite data acquisition –Storage and retrieval – Data Formats – Compression – Digital Image processing hardware and software. Image Quality Assessment and Statistical Evaluation. Intensity – Hue – Saturation – Colour Space Transformation, Texture transformation.

Information Extraction from Images: Hybrid –Classification – Classification of Mixed Pixels. Post Classification Smoothing, Fuzzy Classification, Object Based Image Analysis (OBIA) classification,

Module-5

Data Merging and Change Detection: Multi-temporal Data merging, Multi-sensor image merging – Merging of image data with Ancillary data- Incorporating GIS Data into automated land cover classification, Binary change detection, and spectral change vector analysis.**Advanced Imaging Sensors and Analysis:** Hyper spectral data analysis: Spectral angle mapper**,** Derivative spectroscopy, Expert systems, Decision Tree classification, Machine learning, Artificial Neural Network concepts, genetic algorithms, etc.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

3. Two Unit Tests each of **25 Marks**
4. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

6. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
7. The question paper will have ten full questions carrying equal marks.
8. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
9. Each full question will have a sub-question covering all the topics under a module.
10. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Statistics for Management Richard I.Levin, David S. Rubin, Sanjay Rastogi, Masood Hussain Siddiqui

2. Applied Spatial Data Analysis with R Roger S. Bivand, Edzer J. Pebesma Virgilio Gómez-Rubio

3. An Introduction to Spatial Data Analysis and Visualisation in R Guy Lansley and James Cheshire

4. An Introduction to R Spatial Analysis and Mapping Chris Brunsdon and Lex Comber

5. Introductory Digital Image Processing A Remote Sensing Perspective by John R. Jensen 4th edition 2014

6. Remote Sensing and Image Interpretation by by Lillesand Kiefer Chipman 6th edition 2014

Web links and Video Lectures (e-Resources):

- . https://github.com/topics/r-programming-projects
- https://www.coursera.org/learn/r-programming
- Students are encouraged to visit SWAYAM web site where there are several Massive Open Online Courses (MOOC), **http://swayam.gov.in**
- Students are encouraged to take the benefits of SWAYAM PRABHA- the direct to home (DTH) 34 channels telecasting educational programmes on 24x7 basis using GSAT-15 satellite. The channels are up-linked from BISAG-N, Gandhinagar.
- https://1lib.in/book/5243197/3b23f7?dsource=recommend

Skill Development Activities Suggested

- To develop the skills on R statistical programming.
- To learn skill on image processing techniques and classification algorithm.
- To develop skill on ML and AI programming
- To get knowledge about different indices using different software.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Basic Statistics, Probability Theory, Stratification and Sampling, Testing of Hypothesis	I,II, III
CO2	Simple Regression and Correlation, Time Series and Forecasting, Introduction to Spatial data analysis in R	IV,V
CO3	To understand the concepts of data formats and hardware and software, To Acquire skills on enhancement and manipulation of satellite images	I,II,III
CO4	To acquire skills on image classification statistical calculation, To understand the concepts of image fusion techniques and change of detection.	III, IV,V
CO5	To acquire skills on advance remote sensing and Artificial Intelligence technology	V,VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	X						X					
CO2	X	X										
CO3		X						X				
CO4		X				X						
CO5						X	X	X		X		

Semester- II (PCC)

Cartography, Geodesy and Global Navigation Satellite Systems

Course Code	**MCGI203**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	45 Hours of teaching + 5 sessions of SDA	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- Upon completion of this subject students should have gained the knowledge of Cartography, Geodesy, and Global Positioning System and also they become familiar with the basic principles and their applications in Geoinformatics Projects.

Module-1

Introduction to Cartography and Map: Cartographic concepts, science and art in cartography, essential cartographic process. Types of map, map scale, map composition, conventional signs; plan and profile, representation of relief, Map Numbering Systems, Map Legend, Symbols & Border Information, Layout of Maps, Base map and Thematic map. **Digital Cartography:** Digital cartography, cartographic generalization, hyper maps; web cartography.

Module-2

Introduction to Geodesy: Definitions, classification, shape and size of the earth, applications. Earth, Geoid and Reference Ellipsoid; Everest Spheroid, WGS 84, Vertical datum, Mean Sea Level, level surfaces, plumb line and deflection of the vertical, coordinate system in geodesy; Datum transformation. **Projections:** Classification of map projections, Scale factor, LCC, Polyconic and UTM.

Module-3

Satellite Geodesy: Introduction, Fundamentals of celestial mechanics, Normal orbits, Equation of motion and laws and elements of Kepler, geometry of elliptic orbit, perturbed satellite motion, Doppler surveying, Advantages of satellite geodesy.

Module-4

Introduction to satellite-based Positioning systems: Concept of GNSS, GLONASS, GALILEO, GAGAN, India's NavIC. Components of GPS, principle of ranging, types of receivers; GPS satellite signals, Precise Point Positioning (PPP); satellite geometry and accuracy measure, signal propagation error, International GPS Geodynamic Services (IGS)

Module-5

Differential GPS – DGPS, concepts and principles, differential corrections, local area DGPS, wide area DGPS, LAAS, WAAS; Measurement with GPS – rapid static method, semi kinematic method, Real time kinematic method. GPS pseudolites. **Planning and Field Observations:** Ground control points, field observations, criteria for selecting reference station, post processing, Receiver Independent Exchange Format (RINEX). Geo-referencing of satellite

imagery / photograph. **Applications:** Continuously Operating Reference Station (CORS) system, applications of Location Based Services, Geo-fencing.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

1. Two Unit Tests each of **25 Marks**
2. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

1. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
2. The question paper will have ten full questions carrying equal marks.
3. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
4. Each full question will have a sub-question covering all the topics under a module.
5. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Satellite Geodesy: Gunter Seebar,
2. GPS satellite surveying: Alfred leick
3. Essentials of GPS, N K Agrawal
4. Fundamentals of Cartography by R P Misra, 2nd edition
5. Handbook of GNSS Teunissen Montenbruck Editors by Springer

Web links and Video Lectures (e-Resources):

- https://1lib.in/

Skill Development Activities Suggested

- Map reading
- Field observation using DGPS

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understand the concept of cartography and production of map on various scales using latest digital technology.	I,II
CO2	Understand the analytical and equipotential surface of Earth, its gravity field and projection system.	II,III
CO3	Acquire knowledge about satellite orbits, perturbation and application of force factor.	III,IV
CO4	Understand the concept of constellation in Global Navigation Satellite System and its usage in position determination.	II.III
CO5	Acquire knowledge about the usage of Differential GPS, create field planning and carry out data processing.	IV,V

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**X**										
CO2		**X**									
CO3							**X**				
CO4		**X**									
CO5								**X**			

Semester- II (PCC)

GEOSPATIAL DATABASE MANAGEMENT SYSTEMS AND PROGRAMMING SKILLS			
Course Code	**MCGI204**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	45 Hours of teaching + 5 sessions of SDA	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To understand the basic concepts of Database management system, creation of GIS database.
- To understanding the advanced concepts of Hadoop, MongoDB, Hive.
- To acquire programming skills in python using different libraries.

Module-1

Databases and Users: Introduction, characteristics of database approach, intended uses of a DBMS, implications ofdatabase approach.

Database System Concepts and Architecture: Data models, schemas and instances, DBMS architecture and data independence, database languages and interfaces, database system environment, classification of database management systems.

Data Modelling: Conceptual data models for database design, ER model- concepts, schema constructs and simple applications.

Module-2

Relational Data Model: Concepts and constraints, update operations on relations, relational algebra, simple examples.

Structured Query Language: Data definition in SQL, queries, update statements, views in SQL, DDL, and DML. Relation Database Management System, querying operation.

Database design: Functional dependencies and normalization for relational databases, Normal forms based on primary keys, gene general definition of second and third normal forms, Boyce-Codd normal form.

Module-3

Introduction to Hadoop: Distributed Computing Challenges, Hadoop Distributed File System, Processing Data with Hadoop Managing Resources and applications, interactive with Hadoop Ecosystem.

Introduction to MongoDB: Data types in MongoDB, MongoDB Query Language.

Module-4

Python Scripting: Introduction, Environment setup, Debugging, Syntax, Variable Types, Operators, Decision statements, Loops, Numbers, Strings, Lists, Tuples, Dictionary, Modules, File I/O, Exceptions & Exception Handling, Arrays-2D.

Python OOPs and SQLITE in Python: OOPs concepts -Encapsulation, Inheritance, Polymorphism, Abstraction., SQILTE- Create , Insert, Update and Delete

Python Pandas: Introduction to Pandas and Data Frames, Understanding the Usage of Data Frames, Various Data Frame methods and Operations, Selecting and Indexing Operations, Pandas Aggregation Operations. Outlier Treatment.

Module-5

Python for Spatial Analysis: Introduction to Geopandas, geopy, rasterio & Fiona. Reading and writing files, Installing and using libraries, Building scripts and automating workflows.

Introduction to Python Data Visualization: Tabular and Vector Data Visualization, Creating charts and plots using Pandas, Creating maps with GeoPandas Raster and Gridded Data Visualization, Raster Data Visualization using Xarray and rioxarray, Interactive Mapping, Creating Interactive Maps with Folium, Creating Multi-Layer Interactive Maps with GeoPandas.

Introduction to PySpark: Spatial Data Formats & Storage, Geospatail Data Processing with PySpark, Distributed Spatial Analytics, Machine Learning in PySpark for Geospatial Data, Integration of PySpark with Web GIS platforms, Visualization and Dashboards use cases and Applications.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

3. Two Unit Tests each of **25 Marks**
4. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

6. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
7. The question paper will have ten full questions carrying equal marks.
8. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
9. Each full question will have a sub-question covering all the topics under a module.
10. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Fundamentals of Database Systems by Elmasri and Navathe 5th and 6th edition
2. Big Data and Analytics by Seema Acharya and Subhashini Chellappan
3. Python Geospatial Analysis Cookbook by Michael Diener
4. Arcpy and ArcGIS by Jerry Davis second edition

Web links and Video Lectures (e-Resources):

- Web Tutorial in python programming
- https://github.com/

Skill Development Activities Suggested

- To learn the programming skill with different libraries.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understanding the concepts of DB system architecture and modelling.	I,II
CO2	Acquiring the skills for write the query and designing the DB and model.	II,III
CO3	Understanding the advance concepts of Hadoop, MongoDB and Hive	IV,V
CO4	Understanding the concepts of Python programming skills	II,III
CO5	Acquiring the skills for different libraries of python programming.	V,VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**X**										
CO2							**X**				
CO3		**X**									
CO4								**X**			
CO5											**X**

Semester-II (PCC)

Web Applications in Geoinformatics			
Course Code	**MCGI205**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	45 Hours of teaching +5 sessions of SDA	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To understand the basic concepts, computing map, their functionalities and applications in WebGIS.
- To understanding the advanced concepts of spatial data analysis using python programming.
- To acquire skills on Cloud based platform.

Module-1

Introduction to Web GIS: Definition, concept of Web GIS, History of web GIS, components of web GIS, internet, web GIS v/s Internet GIS, Fundamentals of computer networking – network environment – network communication models –protocols – TCP/IP. Applications of web GIS, users and stake holders of web GIS, advantages and limitations of web GIS, overview of Web GIS.

Client/server Computing: Client – server Concepts, client/server system partition– layered architecture – advantages and disadvantages of client server architecture. Distributed component framework – web mapping – static and interactive web mapping – open GIS web map server.

Distributed geographic information services: Principle – components – logic and data components.

Module-2

Geographic Markup Language: Principles – characteristics – commercial web mapping programs - mobile GIS. Distributed GIS in data warehousing and data sharing.

Functions of Web GIS: Display of general information for the public, display of planning information, interactive display of spatial information sharing and distribution of spatial data as well as management of spatial data.

Design of User Graphic Interface: User friendly interface, characteristics, menus and icons, common terms. Graphic Appearance - colours, sizes, fonts, scales and arrangement.

Module-3

Software.:Proprietary and Open Source for developing server and client applications. Evaluation of different software - ArcIMS, Map Objects, Mapguide, Map Server, Geomedia web map, Openlayers, Geoserver etc.

Applications of WEB GIS: Participatory GIS -Web-based GIS For Collaborative Planning And Public Participation, Digital Democracy for planning, Local Environmental Decision-making, regional and local level planning. Community GIS, Intelligent transportation systems, planning and resource management. E-Governance.

Module-4

Python Scripting in Spatial data analysis: Graphs, Graphs algorithm, Networking programming, GML processing, GUI programming Database Access, Geoprocessing using python, python in GIS.
Introduction to Leaflet API, Map box, cloud based and server less approaches.

Module-5

Geo-data processing in Cloud computation platform: Google Earth Engine and Planetary Computing. Fundamentals of JavaScript programming, Working with Image Collections, Creating Mosaics and Composites, Working with Feature Collections, Map/Reduce Programming Concepts, Calculating Indices, Cloud Masking, Calculating Area and Statistics, Time-series Charts.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

5. Two Unit Tests each of **25 Marks**
6. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

11. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
12. The question paper will have ten full questions carrying equal marks.
13. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
14. Each full question will have a sub-question covering all the topics under a module.
15. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

1. Concepts and Techniques of Geographic Information Systems, CP Lo Albert K W Yeung, 2005 Prantice Hall of India.
2. Principles of GIS for Land Resources Assessment by P.A.Burrough, Oxford: Science publications, 1986.\.
3. An Introduction to Geographical Information Systems by Ian Heywood, S Cornelius, Second edition
4. Introduction to GIS by Kang-tsung Change, Third edition

Web links and Video Lectures (e-Resources):

- Students are encouraged to visit SWAYAM web site where there are several Massive Open Online Courses (MOOC), **http://swayam.gov.in**
- SWAYAM PRABHA web site

Skill Development Activities Suggested

- Visualization maps using different software
- Integrated the ancillary data with satellite images using softwares.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Basic concepts of GIS and understanding raster and vector formats.	I, II
CO2	Concepts spatial and non-spatial Data Sources and Data Entry.	II, III
CO3	Acquiring spatial data processing techniques and quality /assurance	III, IV
CO4	Acquiring knowledge Spatial Data Analysis and Visualization	IV, V
CO5	Knowledge about advanced Spatial Data Modelling for output product	V, VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		X										
CO2	X											
CO3							X					
CO4						X						
CO5								X				

Semester- II (PCC)

Geoinformatics in Natural Resource and Environmental Management			
Course Code	**MCGI206**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	2:0:2	SEE Marks	50
Total Hours of Pedagogy	45 Hours of teaching + 5-7sessions of SDA	Total Marks	100
Credits	03	Exam Hours	03

Course Learning objectives:

- To understand the concepts of natural resources management, linkages with economy, Earth system functioning.
- To impart the basics of sustainable development and prepare suitable action plans for sustaining the ecosystem services through geospatial technologies, and
- To explore the use of geoinformatics in assessing the natural resources and monitoring the changes in the environment.
- To introduce various types of natural disasters and application of Geoinformatics inputs for disaster management.

Module-1

Introduction to Land Resources Management: Types of natural resources, Linkages of natural resources with the economy, impact of natural resources utilization on Earth system functioning, Geomorphological Mapping, geological structures and lithological mapping, earth quakes and micro-seismic zonation. Mineral resources mapping, classification of soils and soil mapping, Land Use Land Cover Mapping, role of land and soil in the climate system.

Module-2

Agro-ecosystem and Forest Resources Management: Forecasting Agriculture output through Satellite and Landbased observations (FASAL), agricultural drought, crop stress detection and crop insurance programmes, Space inputs for precision agriculture, Site suitability studies for agricultural and horticultural crops, Web-GIS applications in agriculture. Mapping of forest types, Forest biomass estimation, Inputs for preparation of working plans / schemes, Thermal and microwave remote sensing applications in agriculture and forest fire management.

Module-3

Water Resources Management: Surface water resources mapping and management; Estimation and monitoring of precipitation (rainfall and snow cover), Integrated river basin management, Site suitability for hydro-electric power plants, Digital Terrain Models and their applications, flood early warning, preparation of ground water prospecting and recharging maps, Cyclone early warning.

Module-4

Environment and Sustainable Development: Components of environment, concepts of ecosystem, energy flow and ecosystem functioning and services, Applications in EIA and EMP, quantifying impacts of developmental projects. Concepts of sustainable development, Watershed-based Acton Plans for Sustainable development, Disaster management and Sustainable development.

Module-5

Environmental Pollution Applications: Point and non-point source pollution, methane production area mapping and modelling, oil slicks tracing and monitoring, turbidity and sedimentation mapping, Groundwater-pollution hazard assessment, Aerosol remote sensing, air quality indexing and mapping, Use of RS+GIS in studying ecology of vector-borne diseases, public health administration.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

7. Two Unit Tests each of **25 Marks**
8. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

16. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
17. The question paper will have ten full questions carrying equal marks.
18. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
19. Each full question will have a sub-question covering all the topics under a module.
20. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

- Introduction to Environmental Remote Sensing by Barrett E.C., Curtis, I.F., Chapman and Hall, New York, 1982

- Remote Sensing principles and Interpretations- Sabins, F.F., (Ed) W.H. Freeman and Co., New York, 1986
- Remote sensing and Image interpretation - Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc., New York, 1994.
- Remote Sensing in Geology by Ravi P Gupta second edition.
- Geoinformatics in Environmental Management by M Anji Reddy
- Global Changes and Natural Disaster Management: Geo-information Technologies by Saied Pirasteh, Jonathan Li (eds.) Springer International Publishing 1st edition 2017.
- Natural Disaster Management by Jon Ingleton (Editor), Leigh Trowbridge (Illustrator) Tudor RoseHoldings1999.
- Disaster Management Handbook by Jack Pinkowski CRCPress1stedition2008
- Disasters in India can Remote Sensing Dosomething by VR Rao,L Lalitha, PP NageswaraRao1983.

Web links and Video Lectures (e-Resources):

- https://1lib.in/book/3574775/66d182?dsource=recommend
- Remote Sensing Application by NRSC
- Indian Society of Remote Sensing Journal https://www.isrs-india.org/
- https://isgindia.org/journal-of-geomatics/

Skill Development Activities Suggested

- Field data collation for Geological features and water sample for test the concentrations of chemical elements.
- Collection air pollution data using instruments.
- To get familiarized in applications on disaster management.
- To do projects on disaster management

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understanding concepts natural resources, Geological features, Land and soil resources mapping, geological disaster in GIS platform	I,II
CO2	Acquiring the knowledge about Agro-ecosystems and Forest Resources Management using RS and GIS, concepts of drought and forest fire using RS technology.	II, III
CO3	To Understanding concepts of Water Resources Management cyclones and floods using RS and GIS.	II, III
CO4	Acquiring the concepts of Environment and Sustainable Development.	IV, V
CO5	Assessing Environmental Pollution using Geoinformatics	V,VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		X						X				
CO2				X	X							
CO3					X							
CO4				X							X	
CO5		X				X	X					

Semester –II (PCCL)

Geoinformatics Laboratory			
Course Code	**MCGIL207**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:2:0	SEE Marks	50
Credits	02	Total Marks	100
		Exam Hours	03

Course objectives:

- Students would be able to generate the thematic map using different techniques**.**
- Understand how to use a wide range of vector-based GIS tools to address quarries relevant to natural resource management.

Sl.NO	Experiments
1	Calculation of scale of a satellite image using a SOI toposheet, Identification of Land Use Land Cover types at Level-II (1:50,000 scale) using interpretation keys. Image rectification and image registration using ERDAS Imagine software and QGIS Open Source Software. Downloading Satellite images from different websites NRSC, USGS etc., Mosaicking and Subsetting Radiometric Correction of Satellite Images.
2	Features extraction (Polygon, Line, Point) ERDAS imagine and ArcMap Creation Geodatabase using ArcGIS, Joining the non-spatial with spatial data, editing the vector layers. Mirror stereoscope- computation of base line and orientation of aerial photographs and 3-D photo interpretation. To find the height of a point using Parallax bar.
3	Familiarization in open sources like Q- GIS, Vector based and Raster based analysis, Network Analysis and creation of DEM and TIN. Interpolation Techniques, Delineation of Watershed
4	Generate the indices (viz., NDVI, NDMI, etc) map using Model maker in ERDAS IMAGINE ,Perform the Unsupervised Classification using ISODATA algorithm in ERDAS IMAGINE Perform the supervised classification of given data using different algorithms. Calculate the accuracy assessment for classification satellite image.
5	Using ERDAS IMAGINE generate the Principle Component Analysis, Filtering Techniques, Change Detection of satellite images, Delineation of Lithological/geomorphic units Identification of forest types and area estimation, Semi Automation algorithm using QGIS.
6	Data types or Data Objects in R, Linear, Multi regression analysis covariance and time series analysis using R software, Spatial and non-spatial data visualization using R statistical software
7	Basic query using MYSQL, MongoDB, Postgres SQ, .Practical using Google Earth Engine
8	Vector analysis using python programming , Raster data processing using python,
	Demonstration Experiments (For CIE) if any
9	Familiarization in open sources like Q- GIS, Vector based and Raster based analysis, Network Analysis and creation of DEM and TIN. Interpolation Techniques, Delineation of Watershed
10	Generate the indices (viz., NDVI, NDMI, etc) map using Model maker in ERDAS IMAGINE ,Perform the Unsupervised Classification using ISODATA algorithm in ERDAS IMAGINE Perform the supervised classification of given data using different algorithms. Calculate the accuracy assessment for classification satellite image.
11	Using ERDAS IMAGINE generate the Principle Component Analysis, Filtering Techniques, Change Detection of satellite images, Delineation of Lithological/geomorphic units Identification of forest types and area estimation, Semi Automation algorithm using QGIS.
12	Data types or Data Objects in R, Linear, Multi regression analysis covariance and time series analysis using R software, Spatial and non-spatial data visualization using R statistical software

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Students will be equipped with modern tools, software of GIS and be confident to implement a GIS project independently or as a team effort.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 40% of maximum marks in the semester-end examination(SEE). In total of CIE and SEE student has to secure 50% maximum marks of the course.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8^{th} week of the semester and the second test shall be conducted after the 14^{th} week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of **scaled-down** marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University.

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer

script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 10% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours

Suggested Learning Resources:

- Web Tutorial and ESRI guide books.

Ability/Skill Enhancement Course (Offline/Online)

Semester- II (AEC/SEC)

Advanced Earth Observation Systems and Applications **Ability / Skill Enhancement Courses**			
Course Code	**MCGI258A**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	0:2:0	SEE Marks	50
Total Hours of Pedagogy	15 hours of Teaching	Total Marks	100
Credits	1	Exam Hours	02

Course Learning objectives:

i. To understand the physical basis of advanced Earth observations.
ii. To learn interpretation and analysis of Hyper spectral and Hyper spatial resolution data.
iii. To use the advance EO systems in understanding Earth system functioning and climate change.

Module-1

Introduction to Earth Observation system: Definition of Earth Observation System, Sensing Platforms, Airborne Platforms, Spaceborne Platforms, Near-Polar Orbits, Geosynchronous Orbits, Sensors, Optical Sensors, Photographic Cameras, Digital Aerial Cameras, Video Cameras, Radiometers, Electro-Optical Scanners, Microwave Sensors, LiDAR ,The Ground Segment ,Earth-Observing Systems.

Module-2

International Earth Observation Systems: The Earth Observing System (EOS) program of NASA, Japan (NASDA), Satellite Pour l' observation De La Terre (SPOT), Pleiades Systems, The Earth Observing System Mission, Terra (EoS-Am), Aqua (EoS Pm), Earth Observing-1 (EO-1) Mission, Rapid eye, Sentinel series of satellites under Copernicus programme. Intergovernmental Agencies and Partnerships.

Module-3

Hyperspectral and Hyper Resolution Data Systems: IRS IA/IB, IRS IC/ID, Resourcesat series, Cartosat series, OCM series, Megha-Tropiques, RISAT series, HySiS, SCATSAT, SARAL, EOS-04, INSAT-series having EO payloads. High Spatial Resolution Remote Sensing Systems, Early bird & Quick bird, IKONOS, Orbview-3, Geoeye-1, Worldview Missions, Hyperspectral resolution sensors of India and world-wide systems.

Module-4

Microwave Missions: European Remote Sensing Satellite (ERS-1 and -2, ENVISAT), Sentinel-1, Japanese Earth Resources Satellite (JERS-1), Advanced Land Observation Satellite (Alos-1), Canada's RADARSAT Missions, India's Radar Imaging Satellite (RISAT) Missions, Soil Moisture And Ocean Salinity Mission (SMOS)., Soil Moisture Active Passive Mission (SMAP).

Module-5

Applications of EOSs: Natural resources management, Forest and environmental applications, Cartography and land survey applications, Disaster management, LULC and climate change studies, Meteorological and oceanographic applications, Integrated Water resources conservation and development, River basin management, etc.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

The duration of the examinations shall be defined by the concerned board of studies

Suggested Learning Resources:

Books

1. Internet GIS by Zhong-Ren Peng
2. Python Geospatial Analysis Cookbook by Michael Diener
3. Arcpy and ArcGIS by Jerry Davis second edition
4. Python Scripting for ArcGIS by Paul A. Zandbergen

Web links and Video Lectures (e-Resources):

- Web Tutorial in python programming
- https://github.com/
- https://mapserver.org/

Skill Development Activities Suggested

- Working on Cloud based platform.
- Publishing the maps in Web GIS.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understanding the WebGIS, Client/Server and Distributed GI servers	I,II
CO2	Acquiring knowledge about GML, Functions of Web GIS and GUI.	II, III
CO3	Acquiring knowledge about WebGIS software and application of webGIS.	III,IV
CO4	Acquiring the skills about spatial data analysis using python programming.	IV,V
CO5	Acquiring the skills for geo-data processing tools and assessing the cloud computing platform for generates the maps.	V,VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	X										
CO2		X									
CO3										X	
CO4							X				
CO5								X			

Semester- II (AEC/SEC)

Programming in .Net, JavaScript and HTML, Cloud Computing

Ability / Skill Enhancement Courses

Course Code	MCGI258B	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	0:2:0	SEE Marks	50
Total Hours of Pedagogy	15 Hours of teaching	Total Marks	100
Credits	1	Exam Hours	02

Course Learning objectives:

i. To understand the concepts of Java and HTML programming.
ii. To acquiring advance programming skill on JavaScript working with objects.
iii. To acquire advanced skills to develop Angular JS Modules and Forms.

Module-1

Introduction to Java: Classes: Classes in Java; Declaring a class; Class name; Super classes; Constructors; Creating instances of class; Inner classes. Inheritance: Simple, multiple, and multilevel inheritance; Overriding, overloading. Exception handling: Exception handling in Java.
Module-2
Introduction to HTM: HTML Basics, Elements, Attributes, Styles, Forms, Form Elements, Input Element Types, Input Attributes, File Paths, Script tag, HTML &XHTML. **Introduction to CSS:** CSS Introduction, Syntax, Selectors, Styling, Pseudo class, Pseudo Elements, CSS Tables, CSS Box Models, CSS Opacity, CSS Navigation Bar, Dropdowns.
Module-3
Introduction to JavaScript: JavaScript Statements, Keywords, Functions, JavaScript Programs, Operators, Functions Function Parameters, Function Return Types, Data Types, Primitive Types working with Objects Object Oriented Programming, Object Creation, Adding Methods of Objects, JavaScript Loops & Iteration, Adding Properties of Objects, JavaScript Conditional Statements, Enumerating Properties, Callbacks, JSON **Angular JS Basics:** What is Angular JS? Why Angular JS? Why MVC matters, MVC-The Angular JS way, Features of Angular JS, Model-View-Controller, My First Angular JS app.
Module-4
Angular Expressions: All about Angular Expressions, How to use expressions, Angular vs JavaScript **Filters:** Built-In Filters, Using Angular JS Filters, Creating Custom Filters **Directives:** Introduction to Directives, Directive Lifecycle, Binding controls to data, Matching directives, Using Angular JS built-in directives, Creating a custom directive
Module-5
Controllers: Role of a Controller, Controllers & Modules, Attaching Properties and functions to scope, Nested Controllers, Using Filters in Controllers, Controllers in External Files **Angular JS Modules**: Introduction to Angular JS Modules, Bootstrapping Angular JS **Angular JS Forms:** Working with Angular Forms, Model Binding, Forms Events, Updating Models with a Twist, Form Controller, Validating Angular Forms, $error object **Scope:** What is scope, Scope Lifecycle, Scope Inheritance, Scope & Controllers, Root scope, Scope Broadcasting, Two-way data binding, Scope Inheritance Scope & Directives, $apply and $watch, Scope Events

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

The duration of the examinations shall be defined by the concerned board of studies

Suggested Learning Resources:

Books

1. JavaScript: The Definitive Guide - David Flanagan, 6th Edition
2. The Complete Reference Java Seventh Edition –Herbert Schildt
3. Programming Language Pragmatics - Michael L. Scott, 2nd Edition, Elsevier,2006
4. Operating System Concepts – Avil Sillberschatz, Peter Baer Galvin, Greg Gayne
5. Programming Languages Concepts and Constructs - Ravi Sethi, 2nd Edition, Pearson Education, 1996.

Web links and Video Lectures (e-Resources):

- Tutorial on Java and JavaScript and HTML
- https://github.com/
- https://1lib.in/book/499542/d6f577

Skill Development Activities Suggested

- To learn the skills on web development using JavaScript and HTML programming.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	Understanding the concepts of Java programming skills.	I,II
CO2	Acquire programming skills on HTML and CSS.	II,III
CO3	Get familiarised the JavaScript working with objects and Angular JS Modules.	III,IV
CO4	Develop skills on Angular Expression, Filters and Directives.	IV,V
CO5	Develop skills on Controllers, Angular JS Modules, Angular JS Forms and scope	V,VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**X**										
CO2	**X**							**X**			
CO3							**X**				
CO4								**X**			
CO5						**X**					

Semester- II (AEC/SEC)

Geoinformatics in Weather and Climate Studies

Ability / Skill Enhancement Courses

Course Code	**MCGI258C**	CIE Marks	50
Teaching Hours/Week (L:P:SDA)	1:2:0	SEE Marks	50
Total Hours of Pedagogy	15 Hours of teaching	Total Marks	100
Credits	1	Exam Hours	02

Course Learning objectives:

- To understand concepts of weather and climate studies.
- They have been exposed to geo-informatics in crop production, soil and water conservation techniques.
- To learn the management skill on climate change and integrated pest and meteorology applications.

Module-1

Elements of weather and Climate: Global and regional variations in the temperature, pressure, wind, humidity, precipitation, the modifying factors like latitude, altitude, distance to the ocean and/ or sea, orientation of mountain ranges toward prevailing winds and ocean currents. Atmospheric circulations and Oceanic circulations, interdisciplinary nature of climate system.

Module-2

Basics of agro-meteorology, Weather-borne Disasters and their Impacts: Identification of critical weather variables affecting crop production, Vegetation indices for crop stress detection, Characteristics of agro-climatic zones of India and Karnataka. Weather in relationship to crop growth, productivity, crop water requirements, irrigation scheduling, soil and water conservation techniques.

Module-3

Integrated Pest management: The biotic and abiotic components of an ecosystem. Spatial distribution and spread of Crop Pests / diseases, Identification of endemic zones of crop pests and diseases, the role of geoinformatics in integrated pest management, Spatial information kiosks in the rural development. etc.

Module-4

Satellite Meteorology: Principles of meteorological remote sensing, characteristics of satellite sensors, Indian satellites/sensors for meteorology, weather systems observed in satellite imagery, Monitoring the progress of monsoons, tropical weather systems, extra- tropical weather systems, Interaction between tropical and mid-latitude systems.

Module-5
Climate Change Management: Causes of climate change, Indicators of climate change, Basics of climate change adaptations, Global regulations, International Geosphere Biosphere programmes, Indian National Programmes, role of Geoinformatics in climate change studies, geoinformatics inputs for climate change management.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 50% of the maximum marks. Minimum passing marks in SEE is 40% of the maximum marks of SEE. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 50% (50 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

9. Two Unit Tests each of **25 Marks**
10. Two assignments each of **25 Marks** or **one Skill Development Activity of 50 marks** to attain the COs and POs

The sum of three tests, two assignments/skill Development Activities, will be **scaled down to 50 marks**

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

21. The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
22. The question paper will have ten full questions carrying equal marks.
23. Each full question is for 20 marks. There will be two full questions (with a maximum of four sub-questions) from each module.
24. Each full question will have a sub-question covering all the topics under a module.
25. The students will have to answer five full questions, selecting one full question from each module

Suggested Learning Resources:

Books

- SatelliteMeteorologybyRRKelkarBSpublicationsSecondedition2017
- MonsoonPredictionbyRRKelakar,2008,B.S.Publications,Hyderabad
- Climate Change–A Holistic View, by RR Kelakar, 2010. B.S. Publications, Hyderabad
- Global Change studies ScientificresultsfromIGBPin1994
- Managing Weather and Climate Risks in Agriculture by Mannava V.K. Sivakumar, Raymond P.Motha Springer 1st edition 2007
- Weather and Climate by Encyclopaedia Britannica 2008

Web links and Video Lectures (e-Resources):

- https://1lib.in/s/Weather%20and%20Climate%20Studies%20in%20geoinformatics

Skill Development Activities Suggested

- To learn the skills on weather and climate application.

Course outcome (Course Skill Set)

At the end of the course the student will be able to :

Sl. No.	Description	Blooms Level
CO1	To understand concepts of Weather and Climate studies	I,II
CO2	To acquire knowledge about agro-meteorology, Weather borne disasters and their impacts.	II,III
CO3	To get knowledge on creating spatial database for pest and diseases.	IV,V
CO4	To acquire knowledge about satellite meteorology	III,IV
CO5	To Create and develop the programs for climate change management.	V,VI

Mapping of COS and POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1				**X**							
CO2					**X**						
CO3		**X**			**X**						
CO4											**X**
CO5				**X**		**X**					**X**

Semester-II (AEC/SEC)

Climate Resilient Disaster Management **Ability / Skill Enhancement Courses**		Semester	II
Course Code	**MCGI258D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:1:0	SEE Marks	50
Total Hours of Pedagogy	25 Hours of teaching + 5-7sessions of Practicals	Total Marks	100
Credits	01	Exam Hours	02
Examination type (SEE)	Theory		

Course objectives:

- To introduce various types of natural disasters and application of Geoinformatics inputs for disaster management,
- To explain climate Resilient adaptations and
- To explain the use of geospatial technologies in developing disaster risk reduction strategies. Including mapping the disaster vulnerability, forewarning, impact assessment, preparedness and mitigation of adverse effects.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Structured lectures prepared from standard books written by eminent authors through audio-visual technologies, disaster management.

Module-1

Introduction: Definition, classification of disasters, Institutional frame work for disaster management in India, importance of Geoinformatics in Disaster Management, Satellites and sensors for disaster management. Role of satellite-based communication systems in disaster management.

Module-2

Drought and Forest Fires: Drought types and causes, delineation of drought vulnerable areas mapping, Use of RS and GIS in Meteorological, hydrological and agricultural drought severity mapping and monitoring. Forest fire causes, forest fire management using geospatial information system, climate change impact on droughts, disaster risk reduction strategies.

Module-3

Cyclones and Floods: Causes for cyclone formation, Life cycle of a cyclone, Cyclone tracking, Cyclone early warning, impact assessment and management. Types of floods, causes and mitigation measures, flood early warning, flood affected area mapping and damage assessment, flood risk analysis using RS and GIS, climate change impact on cyclones and flood severity, disaster risk reduction strategies.

Module-4

Geological Disasters Management: Causes of earthquake, RS and GIS application for post-quake rehabilitation, microlevel seismic zonation, space technology applications for Tsunami disaster management, types of volcanoes, role of remote sensing in mapping and hazard assessment, landslide vulnerability mapping.

Module-5

Climate Resilient Disaster Management: Geo-informatics in climate change adaptations, disaster risk reduction strategies, crisis management, multi-hazard risk assessment and early warning systems, risk communication including through citizen science and crowd sourcing, Sustainable recovery through build back better.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

- Interactive/participative methods, through lectures, discussion, remedial instruction, study assignment.
- Demonstration method where the faculty member / instructor himself performs risk assessment.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- The question paper will have ten questions. Each question is set for 10 marks.
- There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- The students have to answer 5 full questions, selecting one full question from each module.

The duration of the examinations shall be 02 hours however it will defined by the concerned board of studies

Suggested Learning Resources:

Books

- Proceedings of International Conference on Remote Sensing for Disaster Management by Peddada Jagadeeswara Rao, Kakani Nageswara Rao, Sumiko Kubo Springer International Publishing 1stedition2019
- Global Changes and Natural Disaster Management: Geo-information Technologies by Saied Pirasteh, Jonathan Li (eds.) Springer International Publishing 1st edition 2017.
- Natural Disaster Management by Jon Ingleton (Editor), Leigh Trowbridge (Illustrator) Tudor RoseHoldings1999
- Disaster Management Handbook by Jack Pinkowski CRCPress1stedition2008
- Disasters in India can Remote Sensing Dosomething by VR Rao,L Lalitha, PP NageswaraRao1983.

Web links and Video Lectures (e-Resources):

- https://1lib.in/book/3574775/66d182?dsource=recommend

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- To get familiarized in applications on disaster management.
- To do projects on disaster management