SYLLABUS

For

M.Sc. IN GEOSPATIAL SCIENCE

Choice Based Credit System (CBCS)

Revised in PGBS Meeting held on 16.10.2020

To be effective from Academic Session 2020-22

THE UNIVERSITY OF BURDWAN
RAJBATI, BURDWAN – 713104
WEST BENGAL, INDIA
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Contents

DEPARTMENT OF GEOGRAPHY

MSc in Geospatial Science

Division of Courses and Credits

SEMESTER I

Course				Lect. Hr /week	Dur. of Exam. (in H)	Marks			Credit
Course code	**Type**	**T/P**	**Name**			**Internal Assessment**	**End Term Assessment**	**Total**	
MSGS 101	Core	T	Generic Concepts in Geography	4	2	10	40	50	4
MSGS 102	Core	T	Fundamentals of Map making & Data Representation	4	2	10	40	50	4
MSGS 103	Core	T	Geodesy and Map Projection	4	2	10	40	50	4
MSGS 104	Core	T	Fundamentals of Remote Sensing, GIS and GNSS	4	2	10	40	50	4
MSGS 105	Core	P	Probability and Statistics	8	4	10	40	50	4
MSGS 106	Core	P	Cartography and Surveying	8	4	10	40	50	4
								Total credit	**24**

SEMESTER II

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	**Type**	**T/P**	**Name**			**Internal Assessment**	**End Term Assessment**	**Total**	
MSGS 201	Core	T	Principles of Photogrammetry	4	2	10	40	50	4
MSGS 202	Core	T	Digital Image Processing (DIP)	4	2	10	40	50	4
MSGS 203	Core	T	Microwave, Thermal and Hyperspectral Remote Sensing	4	2	10	40	50	4
MSGS 204	Core	P	Digital Image Processing (DIP): Practical	8	4	10	40	50	4
MSGS 205	Core	P	Practical in GIS and Change Detection	8	4	10	40	50	4
MSGS 206	Core	P	Multivariate Statistics in Geospatial Science	8	4	10	40	50	4
								Total credit	**24**

SEMESTER III

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	**Type**	**T/P**	**Name**			**Internal Assessment**	**End Term Assessment**	**Total**	
MSGS 301	Core	T	Techniques of Geospatial Analysis	4	2	10	40	50	4
MSGS 302	Core	T	Spatial Decision Support Systems and Modelling	4	2	10	40	50	4
MSGS 303	Core	P	Elementary Mathematics and Programming	8	4	10	40	50	4
MSGS 304	GE	T	Geospatial Science	2	1	5	20	25	2
MSGS 305	DE	T	Discipline centric Elective Theory	4	2	10	40	50	4
MSGS 306	DE	P	Discipline centric Elective Practical	4	8	10	40	50	4
MSGS 307	CE	N.A	N.A.	N.A.	N.A.	5	20	25	2
								Total credit	**24**

SEMESTER IV

Course				Lect. Hr /week	Dur. of Exam (in H)	Marks			Credit
Course code	Type	T/P	Name			I.A.	E.T	Total	
MSGS 401	Core	T	Web GIS	4	2	10	40	50	4
MSGS 402	Core	T	Database Management System (DBMS)	4	2	10	40	50	4
MSGS 403	Review of Literature on a topic based on DE	P	Literature Review	4	4	10	40	50	4
MSGS 404	DE	T	Discipline centric Elective Theory	4	2	10	40	50	4
MSGS 405	DE	P	Discipline centric Elective Practical	8	4	10	40	50	4
MSGS 406	Dissertation/ Project	N.A.	N.A.	4	4	10	40	50	4
								Total credit	**24**

Notes:

- **Core Course**: Every student will take only core courses in the Semester I and II. In the Semester III and IV students will take core courses along with the other courses.

- **Generic Elective Course:** It is to be chosen from a pool of courses. Each Department is to offer at least one generic elective course. These courses should be designed to add generic proficiency to the students. Students are not allowed to choose a course offered by his/her own Department.

- **Community Engagement Activities:** Community Engagement Activities is compulsory. Department is to decide about its successful implementation and execution.

- **Discipline centric Elective Course (Optional)**: Student will opt one of the following Discipline centric Elective course in Semester III and IV.

A. GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT

B. GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT

- *Student may opt one Discipline-centric Elective course in Semester III from SWAYAM.*

- **Review of Literature on a topic based on DE:** This course is a Review of Literature of a topic of current research interests based on Discipline-centric Elective course.

- **Dissertation/Project**: Students will submit one Dissertation/Project work based on Discipline centric Elective Course in the Semester IV. They can start the work from the Semester III.

SEMESTER - I

SEMESTER-I

MSGS-101

(Core Course)

GENERIC CONCEPTS IN GEOGRAPHY

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT-I

1. Introduction: Definition of Geography, Nature and Scope of Geography, Circumference of Geography (Nevin Fenneman), Tobler's Laws of Geography

2. Major Approaches in Geographical Research post Second World War: Quantitative Revolution, Geography as a Spatial Science, Radical Geography, Behavioral and Post-Positivist Geography

3. The Question of Space in Geography: Definition of Space, Components of Space (Pattern, Distance, Buffer, Proximity, Nearness, Containment and Surroundedness), Space and Place

4. Spatial Data: Definition, Forms (Points, Lines, Polygons, Surfaces), Geographic Patterns (Uniform, Random, Clustered)

UNIT-II

5. Human-Environment Relationship Approaches (Determinism, Possibilism, Neo-determinism, Ecological Approach), Region: Concept, Characteristics, Regional Differentiation

6. Landscape Ecology: Concepts, Pattern of Landscape Change and Landscape Dynamics, Landscape Connectivity and Heterogeneity, Concepts of Hazards and Disasters

7. Resources: Definition, Functional Theory, Natural Resources (Biotic, Abiotic) and Human Resources, Resource Conservation and Sustainable Development

8. Human Modification of Landscape: Urbanization and Climate Variability, Patch, Size Reduction, Species-Area Relationship, Deforestation,

SEMESTER-I

MSGS-102

(Core Course)

FUNDAMENTALS OF MAP MAKING AND DATA REPRESENTATION

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT-I

1. Map: Definition, History, Types, Map Scale: Types, Representation and Conversion, Scale Enlargement and Reduction

2. Interpretation of Maps: Survey of India (SOI) Topographical Maps, USGS Maps, Cadastral and Thematic Maps

3. Map Generalization: Recent developments in Map Visualization, Multimedia, Interactive and Mental Maps, Contour Mapping

4. Digital Mapping: Cartographic Design, Concept of Visual Variables (Shape, Size, Hue, Value, Chroma, Pattern, RGB Colour Model, Symbols, Map Lettering), Map Layout

UNIT-II

5. Data and Data Types (Primary, Secondary, Continuous, Discrete), Data Levels (Nominal, Ordinal Ratio, Interval), Concept of Data Normalization

6. Representation of Geographical Data (Choropleth, Isopleth, Dots, Spheres, 2D & 3D Diagrams, Box Plots)

7. Measures of Interaction, Inequality and Spatial Distribution (Gravity Potential, Nearest Neighbour Analysis, Lorenz Curve and Location Quotient)

8. Concept of Geospatial Data: Data Types and Models, Database Concepts (Relational and Object-Oriented), Data Coding and Strings, Meta data

SEMESTER-I

MSGS-103

(Core Course)

GEODESY AND MAP PROJECTION

Credit: 4	Marks: 50

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks).End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT-I

1. Introduction to Geodesy: History, Principles, Classification (Ellipsoidal, Marine, Engineering), Geodetic Control Survey, Geodetic System, Applications of Geodesy

2. Ellipse: Basic and Mathematical Properties of Ellipse, Flattening, Eccentricity, Ellipsoid, Use of Ellipsoid as Regional Datum, Conversion of Latitudes and longitudes to linear distances

3. Geodetic Datum: Horizontal and Vertical, 3D Datum, Gravity Datum, Indian Geodetic Datum, Indian Mean Sea Level Datum

4. Geoid: Concept and Spherical Geometry, Reference Spheroid and Mean Sea Level, Introduction to Different Spheroids, Ellipsoidal Systems with Special Reference to Everest and WGS 84

UNIT-II

5. Cartography: Definition, Scope and Content, Recent Trends in Cartography

6. Basic Concepts: Parallels, Meridians, Great Circles, Scale Factor (Radial and Tangential), Orthodrome, Loxodrome

7. Map Projection: Definition, Characteristics, Selected Groups of Projections: Polar Case (Polar Zenithal Gnomonic), Cylindrical (Mercator's), Conical (Bonne's), Universal Transverse Mercator, Coordinate, Distance, Bearing, Azimuth and Scale Variations in different projections

8. Coordinate Systems: Projection and Reprojection, Geographic and Projected Coordinate Systems

SEMESTER-I

MSGS-104

(Core Course)

FUNDAMENTALS OF REMOTE SENSING, GIS AND GNSS

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks).End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT-I

1. Remote Sensing: Definition, Evolution, Principles, Advantages, Limitations, Types (Active and Passive), Applications

2. Physics of Remote Sensing: Electromagnetic Spectrum, Energy Source and Characteristics, Nature of EMR, Black Body Radiation Principles, Laws of Radiation (Kirchoff, Wein's Displacement, Stephan-Boltzmann), Atmospheric Windows

3. Energy Interactions with Atmosphere (Scattering, Absorption, Transmission) and Earth (Spectral Reflectance and Signatures)

4. Components of Remote Sensing: Platforms and Sensors, Resolution Types (Spectral, Radiometric, Spatial, Temporal), Satellite Orbits, Bands and Band Characteristics of LANDSAT, IRS and SPOT), Concepts of Thermal Imaging and Multispectral Scanners

UNIT-II

5. GIS: Definition, History, Components, Data Structure (Raster and Vector), Types of Data (Spatial and Aspatial), Limitations of GIS, Applications of GIS

6. Vector Data Model: Geometric Objects (Points, Lines, Polygons), Topology, Storage (Shape File, Geodatabase, Feature Class), Composite Features (TIN, Region, Route), Vectorization

7. Raster Data Model: Elements (Cell Value, Cell Depth, Cell Size, Raster Bands, Spatial Reference), Raster Data Structure (Cell by Cell Encoding, Run Length Encoding, Quadtree). Rasterization

8. GNSS: Introduction, History, Satellite Constellation, Signals and Data, Segments (Control, Space, User), Accuracy, Reference Stations, Basic Ideas of GPS, NAVSTAR, GLONASS, NAVIK

SEMESTER-I

MSGS-105

(Core Course)

PROBABILITY AND STATISTICS

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

UNIT-I

1. Data: Frequency Distribution, Relative Frequency, Cumulative Frequency, Graphical Representation

2. Descriptive Statistics: Central Tendency (Arithmetic Mean, Geometric Mean, Harmonic Mean, Median, Mode), Partition Values (Quartiles, Deciles, Percentiles), Dispersion Measures (Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation, Variance), Shape (Skewness, Kurtosis, Moments)

3. Bivariate Relationships: Covariance, Correlation, Regression (Linear, Logarithmic, Exponential, Power), Curve Fitting and Residual Mapping

4. Hypothesis Testing: t-Test, Z-Test, ANOVA Test, Chi Square Test

UNIT-II

5. Probability: Random Experiment, Outcomes, Sample Space and Events, Addition and Multiplication Theorem of Probability, Conditional Probability, Baye's Theorem

6. Sampling: Sample and Population, Types of Sampling, Confidence Intervals for Mean

7. Probability Distribution: Normal, Binomial, Poisson, Exponential, Geometric, Hypergeometric; Basic Concepts of Probability Density Function & Probability Mass Function

8. Statistical Analysis Using Excel/R

SEMESTER-I

MSGS-106

(Core Course)

CARTOGRAPHY AND SURVEYING

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

UNIT - I

1. Principles and Methods of Surveys: Principles, Historical Overview (Great Trigonometrical Survey, British India), Methods and Types of Surveys, Independent Checks, Direct Methods of Locating Points, Conventional Surveys, Planimetric and Height Control by Triangulation, Traverse and Tacheometric Survey

2. Conventional Surveying Methods: Prismatic Compass, Abney Level, Clinometer

3. Contour Mapping (Dumpy Level), Height Measurement (Theodolite)

4. Total Station (TS) Survey: TS Survey, TS in field, Downloading, Processing, and generation of survey plots using software

UNIT-II

5. DGPS Survey (DGPS and its accessories), Surveying and Data Capture using DGPS, Data Downloading

6. Preparation of Thematic Maps: Selection of features, Calculation of Area and Perimeter, Legend Creation and Editing, Creation of Layout

7. Introduction to mapping with handheld GPS including the concepts of Waypoints and tracks, Data downloading and visualization

8. Introduction to Unmanned Aerial System (UAS) and Unmanned Aerial Vehicle (UAV)

SEMESTER - II

SEMESTER – II

MSGS-201

(Core Course)

PRICNIPLES OF PHOTOGRAMMETRY

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT - I

1. Geometry and Flight Planning of Aerial Photographs: Principles and Discipline of Photogrammetry, Geometry and Scale of Aerial Photographs, Planning and Execution of Photographic Flights and Flight Planning

2. Aerial Cameras: Introduction, Types, Components and Optical Aspects of Aerial Cameras, Lens Formula, Camera Mounts, Controls and Calibration, Aerial Film, Automatic Data Recording

3. Stereo Photogrammetry and Parallax: Introduction and Principles of Stereo Photogrammetry, Ortho Rectification, Parallax Equations and Measurement of Parallax Differences, Parallax Corrections, Error Evaluations

4. Aerial Triangulation: Principle and Purpose of Aerial Triangulation, Classification of Aerial Triangulation based on Methods, Preparation of Aerial Triangulation, Independent Model Triangulation (IMT), Blocks of Photos, Bundles Adjustment

UNIT - II

5. Application of GPS in Photogrammetry: Integrated GPS Flight Management System, Navigation, Determination and Prospective Centers of Aerial Triangulation, Airplane Altitude Measurement, Aerial Triangulation Using GPS Data

6. Non-Topographic Photogrammetry: Definition, Potential of Close-Range Photogrammetry, Instrumentation for Photo Acquisition and Data Analysis, Under Water & X-Ray Photogrammetry

7. Air Photo and Image Interpretation: Single, Vertical Stereo Pairs, Geometry and Scale of Aerial Photographs, Ortho Rectification, Determination of Height from Aerial Photographs, Visual Interpretation of Satellite Imageries derived from PAN, LISS, WiFS

8. Coordinate Systems Used in Photogrammetry: Relief Distortion and Tilt Distortion

SEMESTER – II

MSGS-202

(Core Course)

DIGITAL IMAGE PROCESSING (DIP): THEORETICAL

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT – I

1. Introduction: Definition of Digital Image, Sources of Data, Satellite Data Encoding and Decoding, Acquisition, Digital Data Formats (BSQ, BIL, BIP)

2. Elements of Visual Interpretation of Images: Tone, Shape, Size, Pattern, Shadow, Association

3. Preprocessing of Digital Images: Cosmetic Operations, Noise Removal, Atmospheric Correction, Illumination and View Angle Effects, Sensor Calibration, Terrain Effects, Image Registration

4. Radiometric Correction: Missing Scan Lines, Destripping, Line Dropout, Gain Bios Error, Methods of Radiometric Correction: Nearest Neighbour, Bilinear Interpolation, Cubic Convolution

UNIT - II

5. Geometric Correction: Ground Control Points, Image to Map Registration, Resampling Techniques (Nearest Neighbour, Bilinear Interpolation, Cubic Convolution), Geometric Distortions: Systematic, Random, Subsetting, Layer Stacking, Mosaicking

6. Image Enhancement Techniques: Linear, Non-Linear, Contrast Manipulation, Density, RGB Transformation, Spatial Texture Manipulation: Spatial Filtering: Linear, High Boost, Directional and Gradient Filters, Edge Enhancement

7. Image Classification: Unsupervised (Isodata and K-Mean), Supervised (Minimum Distance to Mean, Parallelopiped, Maximum Likelihood), Training and Validating Site Selection, Classification Accuracy

8. Multi-Image Manipulation: Band Ratioing and Differencing, Principal and Canonical Components, Vegetation Components, Image Fusion, Initial Statistics Extraction, Band Correlation, Statistical Analysis of Image Quality Parameters

SEMESTER – II

MSGS-203

(Core Course)

MICROWAVE, THERMAL AND HYPERSPECTRAL REMOTE SENSING

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

Unit-I

1. Basic Concepts: Microwave, Thermal and Hyperspectral Remote Sensing, Definition, Comparison and Review of Previously Acquired Knowledge

2. RADAR: Working Principle of RADAR, Measurement and Discrimination, System Parameters: Wavelength, Polarization, Resolution, Look Angle, Target Parameters: Back Scattering, Point Target, Volume Scattering, Penetration, Reflection, Physics of RADAR Remote Sensing, Factors affecting Microwave Measurement

3. Real and Synthetic Aperture Radar (SAR): Principles, Platforms and Sensors, Airborne Data Products and Selection Procedures, Different Passive Microwave Radiometers

4. RADAR Interferometry: Radiometers and RADAR-Grammetry: Fundamentals and Data Processing Techniques

Unit-II

5. Thermal Remote Sensing: Thermal Imaging Techniques, Thermal Properties of Terrain, Thermal Inertia of Earth Surface Features, IR-Radiometers, Airborne and Satellite TTR Scanner Systems, Thermal Scanners, Radiometric Calibrations, Interpretation of Thermal Images

6. Hyperspectral Remote Sensing Techniques and Analysis: Multispectral and Hyperspectral Data Comparison, Hyperspectral Sensors and Satellite Systems

7. Hyperspectral Data Analysis Techniques, Spectral Reflectance Libraries, Absorption Processes, Theoretical Basis and Relevance

8. Applications of Multispectral and Hyperspectral Remote Sensing

SEMESTER – II

MSGS-204

(Core Course)

DIGITAL IMAGE PROCESSING (DIP): PRACTICAL

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

1. Downloading of Satellite Images from USGS, BHUVAN, and Copernicus, Import and Export of Digital Data to GIS/RS Environment, Band Composites, Preparation of Natural Colour, False Colour and Colour Infrared Images, Extraction of Area of Interest (AOI), Generation of Spectral Signature Library, Analysis of Spectral Signature Curves

2. Image Enhancement Techniques: Resampling, Merge, Mosaicking, Contrast Enhancement, Band Ratioing (NDVI, NDWI, NDBI, TVI), Density Slicing, Histogram Stretching and Equalization, Spatial Filtering

3. Georeferencing: Satellite Imageries and Other Raster Data (Using Manual entry of Coordinates, Map to Image and Image to Image), Reprojection, Creating, Subset, Clip and Mosaicking of Digital Data

4. Image Classification: Supervised, Unsupervised and Hybrid, Accuracy Assessment, Creation of Lookup Table, Classification Report Generation, Class Editing and Merge Classes, Mask Creation, Signature Separability

5. Interpretation of Microwave and Thermal Images: Collection of Radiant Temperatures, LST Algorithm and Plotting of Diurnal Values

6. Image Statistics: Image Histogram, Histogram Stretch, Maximum, Minimum, Range, Mean, Standard Deviation and Shape of the Digital Number Distribution

7. Accuracy Analysis: Producer, User Accuracy, Kappa Coefficient

8. Preparation of Thematic Maps: Selection of Features and Calculation of Area/Perimeter, Generation of Vector Layers, Legend Creation and Editing, Creation of Layout

SEMESTER – II

MSGS-205

(Core Course)

PRACTICALS IN GIS AND CHANGE DETECTION

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

UNIT-I

1. Preliminary GIS Operations: Map Georeferencing (Part or whole of a topographic map/administrative map), Creation of Vector Layers (Point, Line, Polygon) with associated tables and digitization, Extraction of Location Coordinates of Point Features, Distance between Point Features, Length of a Line Feature, Area, Perimeter and Centroid of a Polygon Features

2. Database Manipulation: Attaching Attribute Data for Point, Line and Polygon, Attribute Table Maintenance (Editing, Updating, Adding and Deleting Data Fields), Importing and incorporating external datasets into existent databases (Census Data, Surveyed Data, GPS Data), Exporting geodatabases, Integrating datasets with Google earth

3. Thematic Map Generation: Query Building and Information Extraction, Buffer Demarcation of Point, Line and Polygon Features, Map Overlays and Layer Combinations, Map Output and Layout

4. Generation of TIN and DEM from digitized contour sets, Creating 3-D views with draped overlays, Extraction of Surface cross-sections

UNIT – II

5. Introduction to Change Detection and Geosimulation, Basic Ideas on different approaches of geosimulation (Agent-based, Cellular Automata, Decision Tree)

6. Image Overlay and Image Subtraction and Spectral Temporal Classification of Multi-temporal Images

7. Image Indexing (Ratioing) of Multitemporal Images, Change Vector Analysis of Multitemporal Images

8. Principal Component Transformation of Multitemporal Images, Post Classification Comparison of Multitemporal Images

SEMESTER – II

MSGS-206

(Core Course)

MULTIVARIATE STATISTICS IN GEOSPATIAL SCIENCE

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

Topics
1. Geospatial Data and the need of Multivariate Analysis, Determinants and Matrices, Matrix Algebraic Operations, Rank of a Matrix, Adjoint and Inverse of Matrices, Cramer's Rule
2. Dependence Techniques: Non-linear Bivariate Relationships (2^{nd} Order), Multivariate Analysis: Multiple Regression and Correlation
3. Spatial Statistics: Trend Surface Analysis
4. Exploratory Factor Analysis: Definition, Principal Component Analysis, Factor Analysis, Cluster Analysis
5. Logistic Regression Model
6. Canonical Correlation Analysis, Discriminant Analysis
7. Introduction: Big Data Analysis, Multivariate Analysis Assumptions (Normality, Homoscedascity, Heteroscedascity, Multicollinearity)
8. Use of Statistical Softwares (MS Excel/R/PAST)

SEMESTER – III

SEMESTER – III

MSGS-301

(Core Course)

TECHNIQUES OF GEOSPATIAL ANALYSIS

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

Topics

1. Geospatial Analysis: Introduction, Basic Concepts, Significance, Overview of Tools in Geospatial Analysis

2. Spatial Analysis Raster-Based: Map Algebra, Grid-based Operations, Local, Focal, Zonal and Global Functions

3. Spatial Analysis Vector-based: Overlay Operations: Point in Polygon, Line in Polygon, Polygon in Polygon, Single and Multi-Layer Operations: Extraction, Union, Intersection, Symmetrical Difference, Merge, Clip, Append and Dissolve

4. Proximity and Extraction: Proximity Analysis, Buffer, Multiple Ring Buffer, Near and Thiessen Polygon, GIS Layer Extraction, Comparison of Vector-based and Raster-based Analysis

5. Vector Overlay Processing: Boolean Algebra, Introduction of Overlay in GIS, Topological and Graphical Overlay, Dissolve Analysis

6. Network Analysis: Concepts and Evaluation of Network Complexity using Alpha-Gamma Indices, C-Matrix for Evaluating the Connectivity of the Network, Applications of Path and Network Analysis, Geocoding and Dynamic Segmentation

7. Surface Analysis: Interpolation Methods: IDW, Kriging, Measures of Arrangement and Dispersion, Autocorrelation, Semi-Variogram, DEM, TIN, Slope, Aspect, Hill Shade and ViewShed

8. Point Pattern Analysis: Methods of Evaluating Point Patterns: Clustered and Random Distribution

SEMESTER – III

MSGS - 302

(Core Course)

SPATIAL DECISION SUPPORT SYSTEMS AND MODELLING

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this paper is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

Topics

1. Decision Problems: Objectives and Types, Decision Support Systems (DSS): Concept and Characteristics, Spatial Decision Support Systems (SDSS) and GIS

2. Multi-Criteria Decision Analysis (MCDA): Elements and Structure, Overview and Working of Spatial Multi-Criteria Decision Analysis (SMCDA)

3. Selection of Attributes and Multi-collinearity of Attributes, Variance Inflation Factor, Attribute Reduction Techniques

4. Standardization of Criteria: Concept of beneficial and non-beneficial factors, Data Standardization Techniques (Linear Normalization, Linear Normalization Sum, Linear Normalization Max-Min, Vector Normalization, Enhanced Accuracy Normalization and Logarithmic Normalization)

5. Criteria Weighting and Decision Matrix: Ranking Rating, Pairwise Comparison, PCA

6. Popular MCDA Techniques: Weighted Sum, Weighted Product, WASPAS, TOPSIS

7. Analytical Hierarchy Process (AHP) and Fuzzy AHP

8. MCDA Applications in the field of Geospatial Science: Case-studies from Groundwater and Site Suitability

SEMESTER – III

MSGS-303

(Core Course)

ELEMENTARY MATHEMATICS AND PROGRAMMING FUNDAMENTALS

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

UNIT – I

1. Set Theory: Sets and their representation, Subsets, Family of Sets, Venn Diagrams, Algebraic Operations on Sets, Cartesian Products of Sets, Relations and Mappings on a Set, Concept of Fuzzy Sets

2. Real and Complex Numbers: Natural Numbers, Integers, Rational and Real Numbers, Concept of Complex Numbers, Algebraic Properties of Complex Numbers, Argand Diagram and Polar Representation, Fundamental Theorem of Algebra, Solution of Quadratic Equations with Complex Coefficients, De Moivre's Theorem, Concept of Fourier Series and Transformation

3. Calculus and Differential Equations: Limit and Continuity, Real Functions, Composite Functions (Monotone, Odd, Even, Polynomial, Exponential, Logarithmic), Differentiation and its Geometric Interpretation, Maxima and Minima, Concept of Partial and Total Derivative, Integration, Definite Integral as a limit of sum with basic properties, Fundamental Theorem of Calculus, Differential Equations, Solution of the 1^{st} and 2^{nd} Order Differential Equations, Applications

4. Binary Number System and Boolean Algebra: Introduction to Binary Number System, Conversion of Binary Number System to Decimal System and vice-versa, Introduction to Boolean Algebra and different LOGIC gates (AND, OR, NOT, NAND, XOR, NOR, XNOR), Introduction to Fuzzy Logic

UNIT II

5. Introduction to Programming Language: Machine Language, Assembly Language, High Level Language, Compilers and Interpreters, Algorithms and Flow charts

6. Data Type Operators: Data Types, Basic Sample Programming Control Flow, Arrays, List and strings. Classes Modules: Creating Modules and Classes, Implementing OOP

7. Use of Programming Languages (R/PYTHON)

8. Spatial Data Analysis in Machine Languages (RSpatial/PYTHON)

SEMESTER – III

MSGS - 304

(Generic Elective)

GEOSPATIAL SCIENCE AND APPLICATIONS

Credit: 2	**Marks: 25**

Minimum number of lectures to be delivered for this course is 20.

Method of Evaluation:

Continuous/ Internal Assessment: 5 Marks. It shall be considered based on the % of attendance in the class; and; There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. End-term written test 20 Marks. Four questions to be set. Candidates are required to answer any Two questions (10 Marks each), and each question should have at least two parts.

Topic
1. Concept and Scope of Geospatial Science, Concepts of Map and Map Projection, Applications and Limitations of Geospatial Science
2. Different and Components of GIS, Different Applications of GIS and Limitations
3. Major Tools and Data: Conventional and Contemporary, Applications
4. Sources of Data and their Procurement: Google Earth PRO, BHUVAN, USGS
5. Use of Geospatial Science in Health Mapping

SEMESTER - III

MSGS – 305A

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (THEORETICAL)

Credit: 4	Marks: 50

Minimum number of lectures to be delivered for this paper is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

1. Fundamentals of Forest Resources: Introduction and Concept of forestry, Significance and Uses of Forestry, Forest Conservation

2. Forest Mapping: Spectral Properties of Vegetation Indices, Forest Mapping Using Satellite Imageries

3. Forest Density, Change Detection and Mapping of Stressed Vegetation, Association between Rock and Forest Types

4. Forest Inventory: Principles and Planning of Forest Inventory, Forest Sampling Technique, Growing Stock Estimation, Biomass Estimation Using Microwave Assessment

5. Forest Management and Wildlife Ecology: Deforestation, Afforestation, Encroachment Mapping, Forest Information System

6. Forest Management Plans: Joint Forest Management, Agro-forestry, Social Forestry, Forest Fire Surveillance and Forecasting,

7. Forest Burnt Area Mapping and Spread Modelling, Impact Assessment of Mining in Forest, Vegetation Indices Using Remote Sensing, Forest Fire Surveillance

8. Habitat Management: Wildlife Habitat Selection, Habitat Fragmentation, Protected Areas, Inputs for Perception of Working Plan/Management Plan

SEMESTER - III

MSGS – 305B

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT (THEORETICAL)

Credit: 4	Marks: 50

Minimum number of lectures to be delivered for this paper is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

1. Concept of Urbanization: Urban Growth Model, Urban Morphology, Urbanization and its Impact, Urban Sprawl

2. Need and Objectives of Planning: Regional Plan, Perspective Plan, Master Plan, Development Plan, Project (Scheme Plan)

3. Town Planning in India: Role of Geospatial Technology in Urban Planning

4. Urban Landuse Land Cover, Land Suitability Analysis, Site Suitability Analysis, Landuse Planning

5. Urban Housing Demand: Slums and Squatters, Housing Problem in India, National Housing Policy, Urban Renewal Projects, Urban Infrastructure and Planning

6. Classification of Urban Roads, Traffic Surveys, Speed, Time, Delay Surveys, Use of Speed, Journey Time and Delay Studies, Traffic Volume, Origin Destination Surveys, Parking Surveys, Utility of Geospatial Science in Traffic and Transportation Studies

7. Urban Information System: Land, Housing, Transportation, Infrastructure

8. Urban Hazards and Risk Management: Application of Database Creation and Management for Infrastructure Development Decision Support System for Urban and Regional Management

SEMESTER - III

MSGS – 306A

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (PRACTICAL)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

Unit I (Credits: 3)

1. Measurement and Interception of Spectral Signatures of Vegetation Cover, Use of different bands and their spectral characteristics for vegetation
2. Estimation of Vegetation Indices (NDVI, TVI, LAI)
3. Forest Change Detection from Multi-temporal Images
4. NDVI-LST Correlation
5. Forest Fragmentation and Forest Perforation: Landscape Matrices
6. Sampling and Analysis of Field Data, Growing Stock Estimation and Forest Biomass Assessment
7. Site Suitability Analysis for Forestry, Revision and Updating of Stock Maps
8. GIS Database Creation for Forest Management

Unit II (Credit 1)

9. Field Report

SEMESTER - III

MSGS – 306B

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT (PRACTICAL)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

Unit I (Credits: 3)

1. Analysis and Identification of Settlement Features from Satellite Imageries
2. Google Earth PRO in Urban Infrastructure Planning and Utility Areas, Power and Drainage, Transport Network Analysis, Updating – Traffic/Transport Planning, Route Alignment
3. Visual and Digital Data Analysis Techniques: Landuse/Land Cover/Landscape Mapping. Classification System, Urban Mapping
4. Types of Data for Urban Study: Urban Morphology, Zoning Systems, Urban Landuse Zoning, Slums, Commercial and Residential Zones
5. Urban Sprawl: Urban Area Delineation and Change Detection of Urban Expansion using Multitemporal Satellite Imageries
6. Land Suitability/Identification for new Township Using Geospatial Technology
7. Information System Generation: Database Organization
8. Geographical Information System on a Large Scale, Data Entry Manipulation Retrieval, Suitable Package, Use of Information for Urban Planning

Unit II (Credit 1)

9. Field Report

Guidelines for DISCPLINE CENTRIC ELECTIVE(s)Field Report

(Unit – 2 of Course MSGS -306A, 306B)

- The work is to be based mainly on processing of primary data collected from field with the help of appropriate schedules, stressing on any local problem or any contemporary issue.
- The area and supervisor (s) of the Report are to be determined by the Departmental Committee.
- Interrelations between different aspects of the study should be the focus of the Report.
- Text of the Report should not exceed 6,000 words and should ideally be divided into the following sections: Introduction, Statement of Problem(s) and Objectives, Materials and Methods, Results and Discussions,Conclusion, References / Bibliography and Appendices (if any).
- Maps, diagrams and sketches, excluding photographs, should not exceed 15 pages of A4 size paper.

Report duly endorsed by the Supervisor(s) is to be produced individually by the students

MSGS 307

COMMUNITY ENGAGEMENT ACTIVITY

Credit: 2	Marks: 25

Minimum number of lectures to be delivered for this course is 25.

Method of Evaluation:

Continuous/ Internal Assessment: 5 Marks. It shall be considered based on the % of attendance in the class (5 Marks); End-term test: 20 Marks.

The student will actively participate in Community Engagement Activities and prepare a report based on Discipline-Centric Elective Courses.

Students will interact in field with the local community and provide them help, which needs to be documented for evaluation during the main examination.

SEMESTER – IV

SEMESTER-IV

MSGS-401

(Core Course)

WEB GIS

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10. It shall be considered based on the % of attendance in the class; and There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT-I

1. Internet Technology: Internet & World Wide Web, Brief History of Internet, Intranets, Controlling Traffic on the Internet (TCP/IP), Fundamentals of Computer Networking, Network Environment, Network Communication Models, IP Addresses, Routers and Packets

2. Controlling Text Markup: Default Settings: HR Element and HTML Attributes, HTML Attributes in General, Paragraph Alignment, Attributes, Image Markup

3. Databases, XML, ASP: SQL: Organizing data in Tables, Designing a database Using Entity Relationship Diagram, Identifying Keys in Tables, Querying Databases, XML: Extensive Markup Language, Introduction to XML, ASP (Active Server Pages) : Introduction and Scripting

4. Server-Side and Client-Side Strategies: Web-Servers: Microsoft IIS, Apache, Proxy Service, Open Source: About OGC-WMS, WFS, WRS, GML, CGI, PERL, PHP, DHTML

UNIT - II

5. Web GIS Applications: Fundamentals of Mobile Mapping, Vehicle Tracking System, Location-based Services, Intelligent Transportation Systems

6. GIS Customization Concepts: Role of Programming Language in GIS Customization, Overview of Internet GIS, Client/Server Architecture Application

7. Webpage Design: Java Script Programming, Research in Programming on the Web

8. Web-GIS databases: Introduction, Open Street Maps.

SEMESTER-IV

MSGS-402

(Core Course)

DATABASE MANAGEMENT (DBMS)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 36.

Method of Evaluation:

Continuous/ Internal Assessment: 10. It shall be considered based on the % of attendance in the class; and There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. End-term test: 40 Marks. The end-term test shall be conducted based on written test. Candidates are required to answer any Four questions, selecting two from each unit. Four questions to be set from each unit. Each question should have at least two parts.

UNIT-I

1. DBMS: Introduction, Purpose of Database, Database System Architecture – Levels, Mappings, Database, Users and DBA

2. Entity Relationship Model: Basic Concepts, Design Process, Constraints, Keys, Design Issues, E-R Diagram, Weak Entity Sets, Extended E-R Features – Generalization Specialization, Aggregation, Reduction to E-R Database Schema

3. Relational Model: Structure of Relational Databases, Domains, Relations, Relational Algebra – Fundamental Operations and Syntax, Relational Algebra Queries, Tuple Relational Calculus

4. SQL Concepts: Basics of SQL, DDL, DML, DCL, Structure – Creation Alteration, Defining Constraints – Primary Key, Foreign Key, Unique, Not Null, Check, IN Operator

5. Functions, Agreeable Functions, Built-in Functions: Numeric, Date, String, Set Operations, Queries, Sub-Queries, Correlated Sub-Queries, use of group by, having, order by, join and its types, Exist, Any, All, view and its types. Transaction control commands – Commit, Rollback, save point

6. Relational Database Design: Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes

7. Transaction Management: Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery

8. DBMS: Applications and Limitations

SEMESTER-IV

MSGS 403

(Core Course)

Review of Literature based on Discipline Centric Elective Course

Credit: 4	Marks: 50

Minimum number of lectures to be delivered for this course is 35.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); and There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test: 40 Marks (Written Report: 20; Power Point Presentation: 20).

The End-term test shall be conducted based on the following:

- The student will prepare a report on **Review of Literature and Research Methods** of an individual research topic related to his/her Discipline centric Elective Course. The written Report shall be submitted by each individual students with a signature of authentication by the Supervisor. The Report will be evaluated in the Examination Centre.
- The student will present that on a Power Point Presentation (PPT) mode in the Examination centre.

SEMESTER - IV

MSGS – 404A

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (THEORETICAL)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

1. Earth System: Planet Earth as a System, Concepts of Lithosphere, Hydrosphere, Atmosphere and Biosphere

2. Rock types and structure, Delineation and Identification from Satellite Imageries, Identification and mapping of folds, faults and lineaments from satellite imageries

3. Geomorphic Processes and Landforms; Image Characteristics of Major Landforms on the Earth Surface

4. Digital Elevation Model (DEM): Concept, Production, Sources of Acquisition and Applications, DEM Processing: Filling of Pits, Flow Direction Algorithms (D8, Rho8, DInfinity, Rho Infinity), Flow Accumulation, DEM Manipulation

5. Geomorphometry: Drainage Basin as a System, Properties of Drainage Basin: Catchment Size, Relief, Surface, Drainage Textural, Shape and Hydrologic Parameters for a basin

6. Integrated Watershed Management: Sub-basin Prioritization

SEMESTER - IV

MSGS – 404B

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN URBAN PLANNING AND RESOURCE MANAGEMENT (THEORETICAL)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

1. Concept of Resources: Definition, Components (Nature, Man, Culture), Classification, Operational Theory of Resources, Resource Conservation

2. Sustainable Development: Definition, History, UN Decade for Sustainable Development, Sustainable Development Goals (SDG)

3. Land Resources: Introduction to Soil and Mineral Resources, Digital Soil Mapping and Soil Degradation, Soil Erosion

4. Water Resources: Issue in Water Resource Management, Water Quality and Pollution, Water Scarcity

5. Energy Resources: Coal, Oil and Nuclear Energy, Non-conventional Energy Resources, Future Potential and Usage of Energy Resources, Oil Spill Mapping

6. Agricultural Resources: Introduction Yield Parameters, Crop Inventory, Crop Yield Modelling, Spectral Signatures of Major Crops, Land Suitability for Agriculture

SEMESTER - IV

MSGS – 405A

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE IN FORESTRY AND WATERSHED MANAGEMENT (PRACTICAL)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks);There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

Units

1. Digital Elevation Model (DEM): Generation of DEM from Spot Heights and Contours, Downloading of open source DEMs (SRTM 30m and 90m resolution) and CARTOSAT DEM

2. DEM Hydro processing: Flow Determination: Pit Removal and Filling, Flow Direction, Flow Accumulation, Making Conditional DEMs, Extracting Drainage Network and Basin Delineation in GIS

3. Digital Geomorphometry: Morphometric Properties of a Basin (Linear, Areal, Surface, Relief, Drainage Textural)

4. Land Use Land Cover (LULC) Characterization of a Watershed, Change Detection, Extraction of Impervious Area

5. Estimation of Surface Runoff in a Drainage Basin (SCS Curve Number Method) and its trend from multi-temporal satellite imageries

6. Sub-Basin Prioritization on the basis of MCDM (AHP and TOPSIS)

SEMESTER - IV

MSGS – 405B

(Discipline-Centric Elective)

GEOSPATIAL SCIENCE in URBAN PLANNING AND RESOURCE MANAGEMENT (PRACTICAL)

Credit: 4	**Marks: 50**

Minimum number of lectures to be delivered for this course is 48.

Method of Evaluation:

Continuous/ Internal Assessment: 10 (5+5) Marks. It shall be considered based on the % of attendance in the class (5 Marks); There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. (5 Marks). End-term test 40 Marks. Written Test: Three questions to be set. Candidates are required to answer all the questions (30 Marks). Practical Note Book and Viva Voce 10 (5+5) Marks

1. Water Resources: Information System for Rivers based on location, discharge and water quality, Drought and Flood Assessment Using geospatial technology

2. Agricultural Resources: Spectral Curves of Selected Crops, Land Suitability Classification for Agriculture Using Geospatial Technology, Agricultural Stress Detection, Crop Pest Damage

3. Soil resources: Soil Mapping and Generation of Rasters for Individual Soil Properties, Estimation of Soil Erosion Status of a District/C.D. Block/River Basin Using USLE

4. Biotic Resources: Remote Sensing Applications in Agriculture, Forest Resources and Wildlife Habitat Assessment, Forest Fire Monitoring

5. Groundwater Resources: Groundwater Potential and Recharge, Factors Affecting Groundwater Potential, Mapping, Identification of Groundwater Potential Using MCDM

6. Human Resources: Downloading of Data from the Census of India at the village/block level, Generation of Thematic Maps on Demographic and Infra-Structural Data, Development Status and Mapping Using MCDM

SEMESTER - IV

MSGS -406

DISSERTATION/ TERM PAPER

Credit: 4	Marks: 50

Method of Evaluation:
Continuous/ Internal Assessment: 10 Marks. It shall be considered based on the % of attendance in the class; and There shall be test(s) of knowledge and understanding through written test/ Presentation /Paper review/ Book review etc. End-term test: 40 (30+10) Marks. Evaluation of written Report: 30 Marks; Viva Voce: 10 Marks.

Topic

Dissertation/ Term Paper

The Dissertation / Term Paper on respective Discipline-Centric Elective Courses will be a comprehensive work based on conceptual aspects, fieldwork analysis of primary and secondary data. It should mention the objectives, sources of information, methods and approaches. Interrelations between different aspects of the study should be the focus of the work.

Text of the work should not exceed 10,000 words and should ideally be divided into the following sections: •

Introduction, • Literature Review, • Statement of the Problem (s) and Objectives • Results and Discussions • Conclusions • References and • Appendices (if any).

Maps, diagrams and sketches, excluding photographs, should not exceed 30 pages of A4 size paper. Each of the study work is to be produced individually by the students and this must be stated clearly in a certificate from the supervisor(s). Photocopying and/or bulk computer typing are not to be allowed in any form.

SUGGESTED REFERENCES

MSGS 101

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2. Dikshit, R.D. (2004): Geographical Thought: A Critical History of Ideas, Prentice Hall of India, New Delhi.

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Delhi.

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Paul, London.

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3. Anson, R. W. and Ormerling, F. J. 1993: Basic Cartography, Elsevier Applied Science Publishers. London.

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6. Map Projections, Kellaway, G. P. 1970: Methun and Co. Ltd., London.

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2. Maceachren, A. M. and Taylor, D. R. F. 1994: Visualization in Modern Cartography, Permamon. UK.

3. Principles of Remote Sensing, Paul Curran , English Language Book Society, London, 1988.

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