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No.AC.2(S)/384/14-15

Dated: 28.05.2016

01-6

**NOTIFICATION**

Sub: Introduction the New PG Diploma course in GIS from the academic year 2016-17.

Ref: 1. Decision of the Faculty of Science & Technology Meeting held on 16.02.2016.

2. Decision of the Academic Council meeting held on 29-03-2016.

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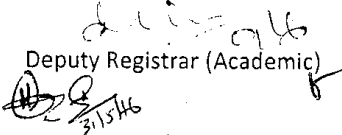
The Board of Studies in Geographical Information System (PG) which met on 19-11-2015 has resolved to introduce the syllabus for a Diploma course in GIS for the academic year 2016-17.

The Faculty of Science and Technology and the Academic Council at their Meetings held on 16.02.2016 and 29.03.2016 respectively have also approved the above said proposal and the same is hereby notified.

The PG Diploma course revised syllabus in GIS is annexed.

The concerned may download the modified contents in the University Website i.e., [www.uni-mysore.ac.in](http://www.uni-mysore.ac.in)

Draft approved by the Registrar

  
Deputy Registrar (Academic)

To:

1. The Principal Secretary to the Government, Higher Education Department (Universities), Dr.B.R.Ambedkar Veedhi, M.S.Building, Bangalore-1.
2. The Executive Director, Karnataka State Higher Education Council, Bangalore-1.
3. The Dean, Faculty of Science & Technology, DOS in Earth Science, MGM.
4. The Registrar (Evaluation), University of Mysore, Mysore.
5. The Chairperson/Chairman, BOS in Geographical Information System, DOS in Geography, Manasagangotri, Mysore.
6. The Chairman, DOS in Geography, Manasagangotri, Mysore.
7. The Director, College Development Council, Maharaja's College Centenary Building, University of Mysore, Mysore.
8. The Co-ordinator, Geographical Information System, DOS in Geography, MGM.
9. The Deputy/Assistant Registrar/Superintendent, Academic Section, UOM, Mysore.
10. The Deputy/Assistant Registrar/Superintendent (Evaluation), UOM, Mysore.
11. The P.A. to the Vice-Chancellor/Registrar/Registrar (Evaluation): UOM, Mysore.

**SYLLABUS AND REGULATIONS FOR  
POST GRADUATE DIPLOMA IN GEOGRAPHICAL INFORMATION SYSTEM  
(PGDGIS) - CHOICE BASED CREDIT SCHEME  
(For students admitted in 2016-17)**

**Aim of the Course:**

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

The program shall be called Post Graduate Diploma in Geographical Information System (PGDGIS). It is a one-year program consisting of two semesters. The course shall be governed by the following regulations:

**ELIGIBILITY FOR ADMISSION:**

Candidates applying for admission to Post Graduate Diploma in Geographical Information System (PGDGIS) must have obtained a minimum of 45% (40% in case of SC/ST and category-I candidates) of total marks in put together from all the years of the examination of the course from a recognized University. Admission procedure shall be governed by the regulations stated by the University of Mysore.

**INTAKE:**

The maximum intake for this course would be limited to 15+5=20 seats (including 5 Government Agency sponsored candidate). A maximum of 5 sponsored candidates from any of the organizations will be given admission: City/Municipal Corporations, Metropolitan Development Authorities, Urban Development Authorities, Rural Development Agencies, Slum Clearance and Pollution Control Boards, Water and Drainage Boards, Survey and Land Records and Non-Governmental Organizations.

**COURSE OF STUDY:**

- The course of study for the Post Graduate Diploma in Geographical Information System (PGDGIS) shall extend over a period of one year consisting of two semesters. Each semester shall be of sixteen weeks duration.
- The academic calendar shall be as notified by the University from time to time. However, a candidate can take a maximum of two years for completion as per the double norms of the University of Mysore.
- The medium of instructions shall be in English.
- First Semester will consist of 3 Hard Core Papers (including one Practical) and 2 Soft Core Papers (to be chosen among 4 soft core papers) having 4 credits each. Second Semester will consist of 3 Hard Core Papers (including one Practical and one minor research project) and 2 Soft Core Papers (to be chosen among 4 soft core papers) having 4 credits each.
- Conduct of the classes will be based on the CBCS regulation of the University of Mysore.

**ATTENDANCE:**

In case a candidate's class attendance in a course is less than 75% or as stipulated by the University, the candidate is said to have DROPPED that course, and such a candidate is not allowed to appear for C3 in that course. Further criteria related to the attendance are as governed by the CBCS regulation of the University of Mysore.

**SCHEME OF EXAMINATION:**

There shall be a University examination at the end of each semester. As per the CBCS regulations, a candidate has to earn a minimum of 40 credits, for successful completion of PGDGIS. The evaluation of the candidate shall be based on continuous assessment. The structure for evaluation is as follows:

- Assessment and evaluation processes happen in a continuous mode. However, for reporting purposes, a semester is divided into 3 discrete components identified as C1, C2, and C3.
- The performance of a candidate in a course will be assessed for a maximum of 100 marks as explained below.
  - a. The first component (C1), of assessment is for 15 marks. This will be based on test, assignment and seminar. During the first half of the semester, the first 50% of the syllabus will be completed.
  - b. The second component (C2), of assessment is for 15 marks. This will be based on test, assignment, seminar. During the second half of the semester the remaining units in the course will be completed.
  - c. During the 18<sup>th</sup>-20<sup>th</sup> week of the semester, a semester-end examination of 3 hours duration shall be conducted for each course. This forms the third/final component of assessment (C3) and the maximum marks for the final component will be 70.
  - d. A candidate's performance from all 3 components will be in terms of scores, and the sum of all three scores will be for a maximum of 100 marks (15 + 15 + 70). The details of continuous assessment are summarized in the following Table.

<b>Component</b>	<b>Syllabus in a course</b>	<b>Weightage</b>	<b>Period of Continuous assessment</b>
C1	First 50% (2 units of total units)	15%	First half of the semester To be consolidated by 8 <sup>th</sup> week
C2	Remaining 50% (Remaining units of the course)	15%	Second half of the semester To be consolidated by 16 <sup>th</sup> week
C3	Semester-end examination (All units of the course)	70%	To be completed during 18 <sup>th</sup> - 20 <sup>th</sup> Week.
<b>Final grades to be announced latest by 24<sup>th</sup> week</b>			

- If the conduct/behavior of the student is not found to be satisfactory, action will be initiated as per the University regulations.

### **Minor Research Project Evaluation**

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the guide. Components of evaluation are as follows.

Component – I (C1) : Periodic Progress and Progress Reports (15%)

Component – II (C2) : Results of Work and Draft Report (15%)

Component– III (C3) : Final Viva-voce and evaluation (70%). The report evaluation is for 40% and the Viva-voce examination is for 30%

Other criteria regarding the scheme of examination and valuation will be governed by the CBCS regulations of the University.

**CHOICE BASED CREDIT SCHEME**  
**CENTRE FOR GEOINFORMATICS TECHNOLOGY**  
 DOS in Geography, Manasagangothri, University of Mysore, Mysuru - 570006

**SCHEME BY SEMESTERS**  
**POST GRADUATE DIPLOMA IN GEOGRAPHICAL INFORMATION SYSTEMS (PGDGIS)**  
**For students admitted in 2016-17**

**I Semester (Credits: 28)**

SL. No.	Code	Title of Course	Types HC/SC/OE	Number of Credits			
				L	T	P	Total
1		Fundamentals of Remote Sensing	HC I	3	1	0	4
2		Fundamentals of Cartography	HC II	3	1	0	4
3	Practical	Advanced Remote Sensing Analysis	HC III	0	1	3	4
4		Computer Applications in GIS	SC I	3	1	0	4
5		Geography of Network Analysis	SC II	3	1	0	4
6		Land Use Planning and Land Evaluation	SC III	3	1	0	4
7		Remote Sensing for Coastal Management	SC IV	3	1	0	4
Note: All three Hard Core Courses are compulsory. Among the Four Soft Core courses, students have the option to choose any two Soft Core Courses.							

**II Semester (Credits: 28)**

SL. No.	Codes	Title of Course	Types HC/SC/OE	Number of Credits			
				L	T	P	Total
1		Fundamentals of GIS and GPS	HC IV	3	1	0	4
2	Practical	Advanced GIS and GPS Techniques	HC V	0	1	3	4
3	Project	Major Research Project	HC VI	0	1	3	4
4		Application of GIS in Climate Change	SC V	3	1	0	4
5		GIS for Urban Planning and Management	SC VI	3	1	0	4
6		Application of GIS in Geomorphology	SC VII	3	1	0	4
7		GIS for Natural Resource Management	SC VIII	3	1	0	4
Note: All three hard cores are compulsory. Among the Four soft cores, students have the option to choose any two Soft Core Courses.							

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**SCHEME BY SEMESTERS**  
**POST GRADUATE DIPLOMA IN GEOGRAPHICAL INFORMATION SYSTEMS**

**For students admitted in 2016-17**  
**(Hard Core and Soft Core Papers by Semester)**

**FIRST SEMESTER**

**HARD CORE**

**PAPER: FUNDAMENTALS OF REMOTE SENSING**

**Objective:** *The objective of this paper is to understand the basic concepts of Remote Sensing and to impart to students the skills necessary for remote sensing analysis and interpretation.*

**Introduction:** Definitions, concepts and types of remote sensing, evolution and stages of remote sensing, advantages of remote sensing, spatial data acquisition, Electromagnetic spectrum, types and platforms of sensors.

**Digital Image Processing:** digital image, data formats of digital image, pre-processing, image classification, elements of visual interpretation, interpretation keys, generating thematic maps.

**Remote Sensing Technologies:** Thermal Remote Sensing, spatial, Passive and Active Microwave Remote Sensing; RADAR – definition, development, components; LiDAR – principles, components, accuracy.

**Applications of Remote Sensing:** Applications of remote sensing in agriculture, forestry, oceans and coastal monitoring, geology, hydrogeology and urban heat budgeting.

**Reference:**

1. **Remote Sensing and GIS** - Bhatta, B.
2. **Introduction to Remote Sensing and Image Interpretation;** Lillesand T.M.
3. **Introductory Remote Sensing** - Gibson, Paul. J.
4. **Digital Image Processing: A Remote Sensing Perspective** - Jensen, John R.
5. **Microwave Remote Sensing: active and passive** – Fawas T Ulaby, Richard K Moore
6. **Imaging Radar for resources surveys** – Travett J W

## **HARD CORE**

### **PAPER: FUNDAMENTALS OF CARTOGRAPHY**

**Objective:** *This course enables the students to learn the fundamental techniques and skills in Cartography and the new theoretical approach that is part of the innovative evolution of cartography.*

**Introduction:** Definition, concepts, types, history, applications, conventional cartography and digital cartography, cartographic communication process, cartographical cube, types of map and functions, map scale, map numbering system.

**Cartographic abstraction and symbolization:** Cartographical data models, classification, simplification, Base maps, thematic maps, choropleth map, Socioeconomic map, Water resources map, Geologic map, Forest map, Agriculture map, Water resource map, Water quality map, Soil survey map; cartographic elements, symbolization of features – point, line and area.

**Map perceptions and design:** Objectives, functions, scope of design, perceptual consideration, graphic communications, design planning, principles of cartographic designs, cartographic generalization, atlases and hypermaps; Mapping Algorithms - Contouring algorithms; 3D Visualization with stereo anaglyph images.

**Projections:** Classification of map projections, datum surfaces and coordinate system, Transformation, Azimuthal, Conical and Cylindrical projections with emphasis on LCC, Polyconic and UTM.

### **References**

1. **Elements of Cartography** - Robinson, A.H., et. al.
2. **Fundamentals of Cartography** - Misra, R.P. and Ramesh A.
3. **Cartography: Visualisation of Spatial data** - Kraak, M.J. and F.J.Ormeling
4. **Introduction to Thematic Cartography** - Tyner, J.
5. **Satellite Geodesy** – Gunter Seebar

## **HARD CORE**

### **PAPER: ADVANCED REMOTE SENSING ANALYSIS**

**Objective:** *Remote Sensing Technology is applied to problems and issues in sustainable development. Remotely sensed data are manipulated for feature extraction, spatial analysis and raster based GIS modeling.*

**Data Acquisition:** Obtaining multi-spectral data from Landsat, IRS, SPOT, MODIS Terra/Aqua, NOAA; obtaining elevation data from Cartosat - I, SRTM, ASTER, Topographical Maps and GEBCO.

**Data Preprocessing:** Image enhancement - contrast manipulation, density slicing, and colour coding, image rectification: noise removal, radiometric correction, spatial correction, spectral correction, pan sharpening; geometric correction; image registration, subset, mosaic.

**Image Classification:** Determination of classes and various classification scheme; Unsupervised – K Means, Isodata; Supervised classification – training sets, Parametric and Non-Parametric rules; Object based classification; Visual Image Interpretation; Accuracy assessment – Confusion matrix, Kappa – coefficient.

**Modelling** – indices modelling - DVI, NDVI, SAVI, MSI, NDBI, NDWI; building of model using model maker – Tasseled Cap Transformation (Brightness, Wetness and Greenness), land surface temperature, study of histograms and layer information.

### **References**

1. **Introduction to Remote sensing and Image interpretation-** Lillesand and Keifer
2. **Introductory Remote Sensing-** Paul. J. Gibson
3. **Fundamentals of Remote Sensing and Air Photo Interpretation** -Avery, T.E.
4. **Introduction to Remote Sensing** -James B. Campbell
5. **Remote Sensing and Image Interpretation** -Lillesand, T.M. & R.W.Kiefer

## **SOFT CORE**

### **PAPER: COMPUTER APPLICATIONS IN GIS**

**Objective:** *This course teaches skills such as basic computer skills, computer cartography, and spatial analysis tools to query databases and manage relational databases, identifying appropriate data sources via the Internet and offline and presentation skills related to maps and GIS data.*

**Introduction:** Computers and its generations, Hardware Components of a Computer – Processor, Main memory, Secondary Memory, Input Devices, Output devices, Storage Devices; Software Component – Software/Program, Application Software; Operating System - OS Functions, Types of OS – Windows, Unix/Linux, Solaris.

**DBMS:** Introduction; databases, database management system - structure, types of DBMS; application of DBMS in GIS; data management using MS-Excel, SQL.

**Computer Applications in Geography:** Colour schemes Versus Black and White / Grayscale; graduated symbols; dot density; symbolizing types of features; Linking data to geography; extracting data from the map.

**Web Mapping:** Static and interactive web mapping, collaborative web mapping, Web Mapping Services, OpenLayers, Goggle maps, yahoo maps and Microsoft map services, Mashups, GeoRSS, applications of internet in GIS, Mobile GIS.

### **References**

1. **Computer Applications in Geography-** Mather, P.M.
2. **Elements of Cartography-** Robinson
3. **GIS: A Short Introduction-** Schuurman, N.
4. **The Power of Maps -** Routledge
5. **Geographical Information System Concepts and Business opportunities-** Prithvish Nag



## **SOFT CORE**

### **PAPER: GEOGRAPHY OF NETWORK ANALYSIS**

***Objective:** The paper introduces network theory, applications of network theory in analyzing social and urban networks, especially transport networks. Lectures introduce network data structures and other analytic tools. GIS-T helps students gain knowledge and skills in input, management analysis and reporting on transportation issues.*

**Network Theory:** Definition, importance and applications of network theory, web applications of social networks, graphs – socio-grams, connections, distances and measures of power and prestige, applications of social networks in GIS applications.

**Network data models:** Nature and utility of network data models, basic representations of node and link tables, layer-based and object-oriented approaches to network analysis.

**Graph Theory:** Basic graph definitions, links and their structures, basic structural properties, measures and indices (detour, network intensity, PI, Eta, Theta, Beta, Alpha and Gamma indices), connectivity and total accessibility.

**GIS for Transportation (GIS-T):** Data representation, analysis and modeling (multi-dimensional GIS-T models), Applications and problems – travelling salesman problem, vehicle routing problem, facility location problems and spatial interaction models.

### **References**

1. **The Geography of Transport Systems** - Rodrigue, Jean-Paul
2. **Social Network Analysis: A Handbook** - Scott, John.
3. **Transportation Network Analysis** - Bell, M.G.H. and Iida, Y.
4. **Network Analysis in Geography** - Haggett, P. and Chorley, R.

## **SOFT CORE**

### **PAPER: LAND USE PLANNING AND LAND EVALUATION**

**Objective:** *This course is to motivate the students to study land use systems, land uses, land utilization types, land evaluation and land use planning. Essentially, the course places the above aspects in the context of natural resources systems analysis so that students could gain insights on the land use and land evaluation perspectives.*

**Land Use:** Land use systems, land utilization types; land use classifications – rural and urban land uses and land use patterns, Municipal Lands and Open Spaces in Cities and Town, Agriculture and Forest Land Management, Recreational Lands, Wetland Management.

**Data Sources for Land Evaluation:** Land-soil-water resources surveys; remote sensing and GPS surveys of land uses; land use and land cover classification from remotely sensed data; vegetation indices, supervised and unsupervised classification.

**Land Evaluation:** The logical basis of land evaluation; land evaluation for land use planning; Biophysical models of land evaluation, the FAO two-stage approach to land evaluation; other approaches to land capability and suitability classifications.

**Land Use Planning:** The importance and difficulty of land use planning, Urban Land Use Planning Strategies, land use policies, principles of land use planning and land use management; urban land use planning, critical issues of land use planning in India.

#### **References:**

1. **Modeling in Resource Management and Environment: through Geoinformatics** - Sharma H.S. and Binda P.R
2. **Guidelines for land use planning**, UNFAO- FAO
3. **Agricultural land use planning** - Vink, A.P.A.

## **SOFT CORE**

### **PAPER: REMOTE SENSING FOR COASTAL MANAGEMENT**

**Objective:** *This course is to familiarize the students about the fundamentals of coastal process and the remote sensing applications in the field of Coastal Management.*

**Coastal processes:** definition, importance of coast, Oceanic circulation, Upwelling and sinking, Waves, Wave Characteristics, Wave generated currents, Catastrophic waves, Tides, Tidal forces, Littoral drift, Bathymetry, Navigational Charts

**Coastal Zone Management:** Introduction, major issues/ problems, Thematic maps on coastal resources, mapping of shore line changes, coastal regulation zone mapping, resolving conflict on resources utilization, coastal aquifer modeling.

**Coastal Dynamics:** Coastal Hydrodynamics, Estuarian dynamics, Hydrodynamics of pollution dispersion, Modeling of suspended sediments, Coastal erosion, Shore line change dynamics, Coastal protection works, Design of Breakwater.

**Remote Sensing Application:** Use of Microwave data, chlorophyll production index, various sensors used for coastal application, sea surface temperature, significant wave height, wind speed and directions, coastal bathymetry and sea level rise.

#### **Reference:**

1. **GIS in oceanography & Fisheries** - Vasilis D. Valavanis
2. **Remote Sensing Handbook for Tropical Coastal Management** - Alasdair J. Edward
3. **Oceanography** - Grant Gross M.
4. **Shoreline Management Guidelines** - Karsten Manager
5. **Beach process and sedimentation** - Paul D. Kumar
6. **Introduction to Coastal Engineering and Management** – J. William Kamphuis
7. **Integrated Coastal and Ocean Management** – Biliiana Cicin-Sain Gunnar Kullenburg

**CHOICE BASED CREDIT SCHEME**  
**CENTRE FOR GEOINFORMATICS TECHNOLOGY**  
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**SCHEME BY SEMESTERS**  
**POST GRADUATE DIPLOMA IN GEOGRAPHICAL INFORMATION SYSTEMS**

**For students admitted in 2016-17**  
**(Hard Core and Soft Core Papers by Semester)**

**SECOND SEMESTER**

**HARD CORE**

**PAPER: FUNDAMENTALS OF GIS AND GPS**

**Objective:** *The concepts of GIS, components of GIS and application areas of GIS are comprehensively understood. Students will go beyond the conventional fundamentals in GIS and GPS and move forward into modeling and applications, including specialized GPS surveys for planning studies.*

**Introduction:** Definitions, History and development of GIS, components of GIS, applications of GIS; Coordinate Systems - Geographical Coordinate Systems, Projected Coordinate System, attribute data query, spatial data query, raster data query.

**Data Models and Management:** Data format: Raster and Vector data formats; Spatial Data Models –Vector and Raster data models, Non- Spatial Data Models, TIN model, input methods, editing, map scale, precision and accuracy.

**GIS Modelling and analysis:** Basic elements of GIS modeling; terrain mapping and analysis- DEM and TIN, contour, hill shading, slope and aspect, Spatial interpolation: kriging method, IDW, spline, trend, natural neighbor, Vector data analysis: buffering and overlay.

**GPS and GNSS:** definition, history, components; types and application of GPS, GLONASS, GALILEO, COMPASS; system segmentation – control segment, user segment, space segment, types of receivers; DGPS; GNSS: different GNSS, IRNSS - advantages and disadvantages.

**References:**

- 1 **An Introduction to Geographical Information Systems** - Ian Heywood
- 2 **Geographic Information Systems: A Management Perspective** - Aronoff, S.
- 3 **GIS - Fundamentals, Applications and Implementations** - Elangovan, K.
- 4 **Introduction to Geographical Information Systems** - Chang, Kang-Tsung
- 5 **Remote Sensing and GIS** - Bhatta, B.
- 6 **Geographical Information Systems** - Maguire, David J.
- 7 **Mathematical Modeling in Geographical Information System, Global Positioning System and Digital Cartography** - Sharma, H.S.

## **HARD CORE**

### **PAPER: ADVANCED GIS AND GPS TECHNIQUES**

**Objective:** *This is a practical course offering theme based, problem solving techniques of GIS methodology from data creation to advanced GIS and GPS analysis for student's analytical skill development.*

**Data capture and Management:** Scanning, registration and projection, data encoding feature and geodatabase creation (point, line and area), digitization, coverage editing, topology; attribute data – joining, editing and integration, field calculation, query by attribute, query by spatial relationship and query by graphics, class interval selection, thematic mapping and output.

**Spatial Analysis Modeling:** Proximity – Buffer; Topography - Digital Elevation Model, Slope, Aspect, Hillshade, and View shed; Watershed and Morphometric – Stream order, Flow Direction, Flow Accumulation, Watershed delineation, bifurcation ratio; Network analysis – shortest path, service area, closest facility, location and allocation; Interpolation and Extrapolation – Kriging, IDW, Spline, Trend, Natural neighbor, Thiessen polygon, topo to raster.

**Spatial Statistical Modeling:** Identification of Central feature, directional distribution, mean center, median center, linear directional mean, standard distance, hot-spot analysis, correlation, raster calculator and Boolean operation.

**GNSS/GPS Survey:** Collection of Ground Control Points (GCP), Way Points, and transformation of GNSS/GPS data into GIS; Ground Truth Verification of GIS data; Precision, Vertical and Horizontal Accuracy, inputting GPS data into computer.

### **References:**

1. **An Introduction to Geographical Information Systems** – Ian Heywood
2. **Spatial analysis and Location-Allocation Models** - Ghosh, A. and G. Rushton
3. **Geographic Information Systems and Cartographic Modelling** - Tomlin, C.D.
4. **Geographic Information Systems and Science** - Paul A. Longley, et. al.
5. **Geographic Information Systems and Environmental Modeling** - Clarke, C., K.
6. **Introduction to Geographic Information Systems** - Tsung Chang Kang

## **HARD CORE**

### **PAPER: MINOR RESEARCH PROJECT**

One term minor project requires students to select a simple, manageable project idea and work on it with a view to researching a minor problem of analysis and submit a report for valuation at the end of the semester.

For the purpose of evaluation, the students are expected to make a power point presentation at a class seminar on the term work. The report should be minimum 50 pages, including maps and diagrams and tables and text. The students are expected to submit a neat, bound report for evaluation by an external expert along with an internal examiner.

## **SOFT CORE**

### **PAPER: APPLICATION OF GIS IN CLIMATE CHANGE**

**Objective:** *Climate change and its corollary global warming are the much talked-about these days for there is an impending danger to the earth we live in by the climate change caused primarily by the human activities on the earth. Climate change has already brought untold sufferings to the world that the world countries met several times to work towards a strategy for reducing global warming and the consequent climate change. This paper offers deep insights into the working of climate change and how to overcome it.*

**Earth System Dynamics:** Introduction to atmosphere, hydrosphere, biosphere, lithosphere, and human interventions in earth system dynamics and operations, anthropogenic activities and global warming.

**Climate Change, the Process:** Introduction, Concept, causes, effects, measures, importance of climate change, climate change and energy, climate change and emerging diseases, climate and change and community.

**Issues in Climate Change:** Global warming, green house effect, carbon cycle, nitrogen cycle, water cycle, ozone depletion, floods, droughts and weather variations, El-NINO and La-NINA, changing ecosystems, snow / glaciers melting.

**Geoinformatics Applications:** Hazards, risks and vulnerability analysis relating to global warming, floods and droughts, and weather variations, ecosystems changes, and snow/glaciers melting, energy studies, health and diseases studies and other case studies (at least 5).

### **References**

- 1 **Climate Change: A Multidisciplinary Approach-** Burroughs, W.J.
- 2 **The Suicidal Planet: How to Prevent Global Climate Change-** Mayer Hillman,
- 3 **Field Notes from a Catastrophe: Man, Nature, and Climate Change-** Kolbert, Elizabeth.
- 4 **Cradle to Cradle: Remaking the way we make things** William McDonough,
- 5 **Integration of GIS, remote sensing, Photogrammetry and cartography: the Geoinformatics approach** -Ehlers, M.

## **SOFT CORE**

### **PAPER: GIS FOR URBAN PLANNING AND MANAGEMENT**

**Objective:** *To understand the concepts and principles and use the tools and techniques of GIS for efficient planning and management of urban area.*

**Urban Planning and Mapping:** Plans, planning needs, types of plans, LU/LC mapping, urban infrastructure, site suitability analysis for utilities and civic amenities; Urban mapping: physical structure and composition of urban areas, growth trend, problems of urbanization, urban sprawl and associated problems.

**AM/FM applications:** GIS applications in Automated Mapping (AM) and Facility Management (FM), water and sewage related – GIS based urban water demand analysis, pipeline planning and alignment, electric and power supply related, telecom applications, radio coverage prediction, signal strength mapping.

**Demography and Urban Governance:** Population distribution map by age, gender, education, occupation, socio-economic grouping, health criteria index, crime rates and types; Urban governance: mapping administrative boundaries, property GIS, tax revenue.

**Urban Ecology Applications:** Air quality indexing and mapping, monitoring atmospheric haze, smoke, toxic gas movement and prediction of vulnerable zones, noise pollution zonation, conservation of water bodies, vegetation, soil and groundwater conservation, site suitability for groundwater recharging and rain water harvesting.

### **References**

1. **Action Planning for Cities: A Guide to Community Practice** - Hamdi, Nabeel
2. **Applied Remote Sensing for Urban Planning, Governance and Sustainability** - Netzband Maik
3. **Remote Sensing of Urban and Suburban Areas** - Tarek Rashed, Carsten Jürgens
4. **Remote sensing and urban analysis** - Jean-Paul Donnay, Michael John Barnsley
5. **Urban Remote Sensing** - Qihao Weng, Dale A. Quattrochi
6. **Radar Remote Sensing of Urban Areas, Remote Sensing and Digital Image Processing** - Soergel Uwe
7. **Analysis of Urban Growth and Sprawl from Remote Sensing Data** - Basudeb Bhatta



## **SOFT CORE**

### **PAPER: APPLICATION OF GIS IN GEOMORPHOLOGY**

***Objective:** This course offers a detailed application of GIS in geomorphology. Landforms evolve in response to a combination of natural and anthropogenic processes. Mapping these changes in landforms, mining and groundwater resources has a vast scope in RS and GIS.*

**Introduction:** Disciplines of geomorphology, role of geomorphology in identification of natural hazards - Soil erosion by water and wind, river floods, Slope instability, ground surface subsidence, volcanoes and earthquakes, management of landslides, coastal management.

**Geomorphological Mapping:** Geological survey, geologic mapping, mapping geological structures – fold, faults, joints and lineaments, lithological mapping, fracture analysis, Landforms – Deltaic, fluvial, coastal, glacial, tectonic, volcanic, karst/lakes.

**Geological Resources Exploration:** Mineral resources exploration, mineral mapping and mineral resources information system, mineral prospect zonation, mapping mining area, encroachment mapping, oil and gas exploration.

**Ground Water Resources:** Groundwater potential assessment, groundwater prospect zones mapping, groundwater modeling, planning and management of groundwater, groundwater forecasting, selecting the appropriate site for artificial recharge of groundwater by using RS and GIS, groundwater quality mapping.

#### **Reference:**

1. **Introduction to Environmental Remote Sensing** – Barrett E C
2. **Geomorphology and Engineering** - Coates, D.R.
3. **Geomorphology in Environmental Management** - Cooke, R.U. and J.C. Doorn Kamp.
4. **Geomorphology and Environment Sustainability** - S C. Kalwar et.al.
5. **Indian Geomorphology** - Sharma, H.S.
6. **Geomorphology** - Savindra Singh.

## **SOFT CORE**

### **PAPER: GIS FOR NATURAL RESOURCE MANAGEMENT**

*Objective: To develop the skills in utilization of technologies of remote sensing, GIS, GPS, etc. in Land Resource Analysis and planning for sustainable development, soil, forest, ecology and agricultural resources management and studies.*

**Land resource:** Soil classification, soil erosion mapping, soil salinity, soil alkalinity, surface soil moisture estimation, runoff and sediment yield estimation, desertification mapping, soil fertility mapping, soil capability and loss assessment, site suitability for agricultural and horticulture crops, crop acreage estimation, RS based yield model.

**Forest and Ecology:** RS and GIS for forest cover mapping and monitoring, estimation of biomass, wildlife tracking, protected areas, wildlife habitat selection, rangeland applications, forest fire surveillance and forecasting, forest burnt area mapping, revegetation, deforestation/ afforestation/encroachment mapping and monitoring.

**Water Resource:** Definition and its importance, hydrological cycle, water budgeting, water demand estimation, surface water bodies, water content in ocean, sea, ice, lakes, dams, tanks, rivers and ground, RS and GIS applications in water resources development and management, ocean resources, sea surface temperature, salinity, phytoplankton mapping, potential fishing zones.

**Mineral resources:** Mineral mapping and mineral resources information system, mapping mining area, encroachment mapping, GIS in mine remediation and mine reclamation, oil and gas exploration, site suitability for dams, atomic power plants.

#### **Reference:**

- 1 **Introduction to Environmental Remote Sensing** – Barrett E. C.
- 2 **Remote Sensing Principles and Interpretations** – Sabins F. F.
- 3 **Remote Sensing and Image Interpretation** – Thomas M. Lillesand
- 4 **Modeling in Resource Management and Environment** - Sharma H.S. and Binda P.R.
- 5 **Genesis, Termination and succession in the life cycle of organizations** - Paul Brown M.