

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

Syllabus for Pre-Ph. D Examination

SPATIAL INFORMATION TECHNOLOGY

PAPER-I		
S.No	SUBJECT	SUBJECT CODE
1	Digital Image Processing	1415101
2	Geographic Information System Applications	1415102
3	Advanced Soft Computing	1415103
4	Decision Support System	1415104
5	Microwave Remote Sensing	1415105

PAPER-II		
S.No	SUBJECT	SUBJECT CODE
1	Digital Cadastral and Land Management System	1415201
2	Remote Sensing and Gis for Hydrology and Water Resources	1415202
3	Remote Sensing and Gis for Earth Sciences	1415203
4	Remote Sensing and Gis for Agriculture & Forestry	1415204
5	Remote Sensing and Gis for Environmental Engineering	1415205
6	Remote Sensing and Gis for Ocean Engineering and Coastal Zone Management	1415206
7	Remote Sensing and Gis for Urban Planning and Management	1415207
8	Remote Sensing and Gis for Disaster Mitigation Management	1415208
9	Flood Modelling and Drought Assessment	1415209

1. DIGITAL IMAGE PROCESSING

Subject Code : 1415101

OBJECTIVE:

The objective of the course is to describe the procedure of satellite data acquisition and analysis.

UNIT I: SATELLITE SYSTEMS AND DATA

Satellite Systems And Data –Acquisition - Storage - Orbits – Data Formats –Data Products – Image Display System- Current Missions.

UNIT II: SENSOR AND DATA MODEL

Sensor Model –Resolutions- Pixel Characters- Image Formation –Univariate & Multi Variable Image Statistics –Spatial Statistics –Geometric And Radiometric Correction- Noise Models.

UNIT III: IMAGE ENHANCEMENTS

Spectral Signatures –Image Characteristics, Feature Space Scatterogram- Point, Local And Regional Operation –Fourier Transform, Scale- Space Transform, Wavelet Transform – Principle Component Analysis- Orthogonal Rotation Transformation

UNIT IV: INFORMATION EXTRACTION

Image Registration And Ortho Rectification, Resampling, Multi-Image Fusion, Classification – Feature Extraction, Training –Supervised, Unsupervised And Hybrid Training, Nonparametric, And Sub-Pixel Classification, Hyper – Spectral Image Analysis.

UNIT V: IMAGE ANALYSIS AND UNDERSTANDING

Pattern Recognition, Boundary Detection And Representation, Textural And Contextual Analysis, Decision Concepts- Fuzzy Sets, Evidential Reasoning, Expert System, Artificial Neural Network, Integration Of Data.

REFERENCES:

1. W.G. Rees - Physical Principles of Remote Sensing, Cambridge University Press, 2nd edition, 2001.
2. Robert Shcwebgerdt , Remote sensing models & methods for image processing, III edition, 2004.
3. Digital Image Processing (3rd Edition) Rafael C. Gonzalez , Richard E. Woods Prentice Hall, 2007.
4. John A.Richards, Springer –Verlag, Remote Sensing Digital Image Analysis 1999.
5. John R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, 2nd Edition, 1995.

Pre PhD Course Paper I

2. GEOGRAPHIC INFORMATION SYSTEM APPLICATIONS

Subject Code : 1415102

OBJECTIVE:

To provide exposure to applications of GIS in various application domains through case studies.

UNIT I: NATURAL RESOURCE MANAGEMENT APPLICATIONS

Forestry: Resource inventory, Forest fire growth modeling – Land: Land use planning, watershed management studies – Water – Identification of ground water recharge – Resource information system – Wetlands Management, Wildlife habitat analysis.

UNIT II: DISASTER MANAGEMENT & FACILITY MANAGEMENT APPLICATIONS

Disaster management: Use of GIS in Risk assessment, mitigation, preparedness, Response and recovery phases of Disaster management – Utilities – Water utility applications – Electric utility Application – Telecommunication: Tower spotting, route optimization for meter reading for utilities – Other utilities.

UNIT III: LOCATION BASED SERVICES APPLICATION

Vehicle Tracking: Automatic vehicle location (AVL), Components of AVL: Invehicle equipment, Various communication channels, Web server, Client – Vehicle tracking alarms used in Vehicle tracking, Fleet management – Vehicle navigation – Emergency call: Address geocoding, Distress call application.

UNIT IV: LAND INFORMATION SYSTEM & WEB GIS APPLICATIONS

Land information system (LIS) – Tax mapping – Mobile mapping - Other LIS applications – Web GIS: Architecture of Web GIS, Map server, Web GIS applications.

UNIT V: BUSINESS, HEALTH AND OTHER APPLICATIONS

Business applications: Sitting a new facility, Customer Loyalty studies, Market penetration studies – Health application: Disaster Surveillance, Health information system – Crime Mapping: Mapping Crime data, Hot Spot Analysis – 3D GIS.

REFERENCES:

1. Paul Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind, Geographic Information Systems and Science, John Wiley and Sons, 2005.
2. Uzair M. Shamsi GIS Tools for Water, Wastewater, and Stormwater Systems, ASCE Press, 2002.
3. Alan L. M. Melnick, Introduction to Geographic Information Systems for Public Health, Aspen Publishers, first edition, 2002.
4. Amin Hammad, Hassan Karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 2004.
5. Allan Brimicombe, GIS Environmental Modeling and Engineering, Taylor & Francis, 2003.

6. Van Dijk, M.G. Bos, GIS and Remote Sensing Techniques in Land-And-Water-Management, Kluwer Academic Publishers, 2001.

Pre PhD Course Paper I

3. ADVANCED SOFT COMPUTING

Subject Code : 1415103

OBJECTIVE:

- To impart the concepts of the ANN network with the fuzzy logic in the geomatics system.

UNIT I: INTRODUCTION

Artificial Neural Systems – Perceptron – Representation – Linear separability – Learning – Training algorithm – The back propagation network – The generalized delta rule – Practical considerations – BPN Geomatic applications.

UNIT II: STATISTICAL METHODS

Hopfield nets – Cauchy training – Simulated annealing – The Boltzmann machine. Associative memory – Bidirectional Associative Memory Network – Geomatic Applications.

UNIT III: COUNTER PROPAGATION NETWORK AND SELF ORGANIZING MAPS

CPN building blocks – CPN data processing. SOM data processing - Adaptive Resonance Theory network - Geomatic Applications

UNIT IV: FUZZY LOGIC

Fuzzy sets and Fuzzy reasoning – Fuzzy matrices – Fuzzy membership functions – Operators Decomposition – Fuzzy automata and languages – Fuzzy control methods – Fuzzy decision making

UNIT V: NEURO – FUZZY MODELING

Adaptive networks based Fuzzy interface systems – Classification and Regression Trees – Data clustering algorithms – Rule based structure identification – Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation - Geomatic Applications.

REFERENCES:

1. James Freeman A. and David Skapura M. Neural Networks – Algorithms, Applications & Programming Techniques Addison Wesley, 1999.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill, 1997.
3. Yegnanarayana B., Artificial Neural Networks, Prentice Hall of India Private Ltd., New Delhi, 1999.
4. L. Quere Fausett, “Fundamentals of Neural Networks”, Prentice Hall, 1994.
5. Jang J.S.R., Sun C.T. and Mizutani E, “Neuro-Fuzzy and soft computing”, Prentice Hall 1998.

Pre PhD Course Paper I

4. DECISION SUPPORT SYSTEM

Subject Code : 1415104

OBJECTIVE :

- To impart the knowledge of Expert Systems for Geomatics and its Applications.

UNIT I: STRUCTURE

Definition – Features, needs, components – characteristics – players - Structure and phases of building ES – Types – Rule based, Frame based & Hybrid – Design, Planning, monitoring.

UNIT II : KNOWLEDGE ACQUISITION

Knowledge Acquisition stages – Representation schemes, Rule, Semantic network, frames and logic – Inference Techniques – Types of Reasoning deductive, inductive, adductive, analogical and non-monotonic – conflict resolution - types of inference: forward and backward chaining - search techniques

UNIT III: RULE BASED EXPERT SYSTEMS

Evolution – Architecture – Examples – backward and forward chaining - rules and meta rules – rule based systems – Case studies: MYCIN, PROSPECTOR

UNIT IV: INEXACT REASONING

Bayesian theory, examples – Certainty theory: overview, uncertain evidence, rule inferencing - certainty factors – Fuzzy sets – Representation, hedges inference & fuzzy logic – Rule base for interpretation of RS data.

UNIT V: OBJECT BASED EXPERT SYSTEM

Overview, anatomy of class, sub class, instance, properties, inheritance, Facets methods, encapsulation, rules interaction with object, design methodology for frame based system – domain, classes, instances, rule – communications, design interface.

REFERENCES:

1. Peter Jackson, “Introduction to Expert systems”, Pearson Education, 2004.
2. Turban E., “Expert Systems and Applied Artificial Intelligence”, Macmillan, 2004.
3. Donald A. Waterman., “A Guide to Expert systems”, Pearson Education, 2001.
4. Durkin.J., “Expert Systems Design and Development”, Prentice Hall, 1994
5. Dan.W.Patterson, “Introduction to Artificial Intelligence and Expert systems”, Prentice Hall, 2003.
6. Ermine.J.I, “Expert Systems: Theory and Practice”, Prentice Hall, 2003.

Pre PhD Course Paper I

5. MICROWAVE REMOTE SENSING

Subject Code : 1415105

OBJECTIVE:

To impart the knowledge of Microwave Remote sensing and its applications.

UNIT I: FUNDAMENTALS AND RADIOMETRY

Introduction and early history, Basic concepts, plane waves, antenna systems, radiometry, microwave interactions with atmospheric constituents, Earth's surface and vegetation, Radiometric systems, Sensors, Data products and its applications.

UNIT II: RADAR REMOTE SENSING

Radar Basics, Radar interaction with Earth surface and vegetation, Surface scattering theory. Radar equation, fading concept, Measurement and discrimination, Physical mechanisms and empirical models for scattering and emission, Geometry of Radar images, Radar return and image signature, Resolution concepts, SAR, Speckle in radar imagery, concept of roughness, geometry of targets, resonance, dielectric constant, surface and volume scattering, signal penetration and enhancement.

UNIT III: AIRBORNE AND SPACEBORNE RADAR SYSTEMS

Airborne, Spaceborne, different platforms and sensors, Data products and selection procedure, SEASAT, SIRAS, SIRB, ERS, JERS, RADARSAT missions, Doppler radar, JASON, TOPEX/POSEIDON, Aircraft: AirSAR, C/X SAR, E-SAR, STAR-1.

UNIT IV: APPLICATION OF RADAR REMOTE SENSING

Applications in Agriculture, Forestry, Geology, Hydrology, ice studies, landuse mapping and ocean related studies, military and surveillance applications, search and rescue operations, ground and air target detection and tracking.

UNIT V: SPECIAL TOPICS IN RADAR REMOTE SENSING

SAR interferometry-Basics- differential SAR interferometry, Radar polarimetry- Radargrammetry and applications- Altimeter and its applications, scatterometer and its applications.

REFERENCES:

1. Ulaby, F.T., Moore, K.R. and Fung, Microwave remote sensing vol-1, vol-2 and vol- Addison-Wesley Publishing Company, London, 1986.
2. Floyd, M. Handerson and Anthony, J. Lewis "Principles and applications of Imaging RADAR", Manual of Remote sensing, Third edition, vol.2, ASPRS, Jhumurley and sons, Inc, 1998.
3. Philippe Lacomme, Jean Claude Marchais, Jean-Philippe Hardarge and Eric

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Normant, Air and spaceborne radar systems-An introduction, Elsevier publications 2001.

4. Iain H.woodhouse, Introduction to microwave remote sensing, 2004.

5. Roger J Sullivan, Knovel, Radar foundations for Imaging and Advanced Concepts, SciTech Pub, 2004.

6. Ian Faulconbridge, Radar Fundamentals, Published by Argos Press, 2002.

7. Eugene A. Sharkov,Passive Microwave Remote Sensing of the Earth: Physical Foundations, Published by Springer, 2003.

Pre PhD Course Paper II

1. DIGITAL CADASTRAL AND LAND MANAGEMENT SYSTEM

Subject Code : 1415201

OBJECTIVE:

To understand the concepts of coordinate- based digital form of parcel and related Land records, complexities of urban Land records, continuous updating of Cadastre and Land rights; future Land management in general and Urban Land in particular using high resolution current data in 3D environment for efficient functioning of administration, for Disaster management, utility management, coastal zone land management as examples.

UNIT I: INTRODUCTION TO CADASTRAL PRACTICES IN INDIA

Definition of Cadastral, Historical background, Graphic and Numeric Cadastral, Legal aspects, Land Records and Title Registration, Mutation, Boundary demarcation and Dispute Redressal System, Municipal Cadastral Systems.

UNIT II: CONCEPT OF CO-ORDINATE BASED DIGITAL CADASTRAL

2D Cadastre from Revenue records (review of NIC projects in India); 3D Cadastre-Data generation through Re-survey and Settlement, Use Of Soft Copy Photogrammetry, High Resolution Satellite Imagery and ALTM, Use of GPS and Electronic Total Station; Case Studies of A-N project of Orissa , Bhu-Bharati project of Andhra Pradesh and C-STAR programme of Tamil Nadu.

UNIT III: MULTI-DIMENSIONAL CADASTRAL SYSTEM FOR THE CITIES

3D and 4D Cadastral Systems, Modernization programs in INDIA - Case Studies of Delhi, Chennai, Mumbai & Ahmedabad; Systems in USA, CANADA, SWEDAN, U.K. & GERMANY.

UNIT VI: LAND MANAGEMENT

Concepts of Land Reforms, Land Consolidation, Guarantee of Land Title and Automated Title Registration, e-Governance, Disaster Management, Coastal Zone Land Management Systems, Emerging systems and future trends.

UNIT V: STUDY OF AVAILABLE SOFTWARE PACKAGES

ENVI, ILWIS , ArcGIS, Quantum-Gis, Map-Info software, And various commercially available GIS packages.

REFERENCES:

1. Nancy von Meyer, GIS and Land Records: The Parcel Data Model 2004.
2. Peter F.Dale & John D.Melaugliu; Land information management, Oxford press,

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2000.

3. Gerhard Larsson, Land Registration and Cadastral Systems: Tools for Land Information and Management, 1991.
4. A. Rajabifard, I. Williamson, D. Steudler, and Binns; Assessing the worldwide comparison of cadastral systems [An article from: Land Use Policy], 2007.
5. S.M. Cashin and G. McGrath; Establishing a modern cadastral system within a transition country: [An article from: Land Use Policy], 2006.
6. Peter F. Dale and John D. Melaughlin I, Land Administration(spatial information system), Oxford Press, 2000.
7. Proceedings of FIG Congress 2002. (USA) Commission 7 – Cadastral Innovation I (TS7.1), Cadastral Innovation II (TS 7.2), Global Survey of Cadastral Experiences (TS 7.3), Land Consolidation (TS 7.4), GPS for Cadastral Application (JS 2)
8. ESRI Data manuals:

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Pre PhD Course Paper II

**2. REMOTE SENSING AND GIS FOR HYDROLOGY AND WATER
RESOURCES**

Subject Code : 1415202

OBJECTIVE:

This Subject Deals With The Basics Of Hydrology And Also Various Remote Sensing And GIS Applications In The Field Of Hydrology And Water Resources.

UNIT I: BASICS OF HYDROLOGY

Hydrological Cycle – Estimation Of Various Components Of Hydrology Cycle – Clouds – Rainfall – Runoff – Evaporation – Transpiration – Evapo–Transpiration – Interception – Depression Storage – Spectral Properties Of Water – Gis Application In Surface Water Modeling – Case Studies.

UNIT II: DRAINAGE BASIN

Watershed Divide – Stream Networks – Delineation And Codification Of Watersheds Morphometric Analysis – Linear – Areal –Relief Aspects – Rainfall- Runoff Modeling – Urban Hydrology – Case Studies.

UNIT III: AREAL ASSESSMENT

Mapping Of Snow Covered Area – Snow Melt Runoff – Flood Forecasting, Risk Mapping And Flood Damage Assessment Soil Moisture Area – Drought Forecasting And Damage Assessment – GIS Application In Aerial Assessment – Case Studies

UNIT IV: GROUND WATER AND WATER QUALITY

Ground Water Prospects – Surface Water Indicators – Vegetation , Geology, Soil Aquifer – Aquifer Parameters – Well Hydraulics – Estimation Of Ground Water Potential – Hydrologic Budgeting – Mathematical Models – GIS Application In Ground Water Modeling – Study On Sea Water Intrusion – Modeling Of Sea Water Intrusion – Water Quality Parameters – Physical, Chemical, Biological Properties. Water Quality Mapping And Monitoring – Correlation Model For Pollution Detection And Suspended Sediment Concentration– Case Studies

UNIT V IRRIGATION AND WATERSHED MANAGEMENT

Project Investigation, Implementation, Maintenance Stage- Location Of Storage/ Diversion Works – Canal Alignment –Depth-Area Capacity Curve Generation, - Conjunctive Use Of Surface And Ground Water – Mapping And Monitoring The Catchment Command Area – Artificial Recharge Of Groundwater – Water Harvesting Structures – Sediment Yield – Modeling Of Reservoir Siltation – Prioritization Of Watershed –Modeling Of Sustainable

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Development – Development Of Information System For Natural Resource Management –
Case Studies.

REFERENCES:

1. Eric C. Barrett, Clare H. Power, Satellite Remote Sensing for Hydrology and Water Management, Gordon & Breach Science Publications - New York 1990,
2. Dr. David Maidment, Dr. Dean Djokic, Hydrologic and Hydraulic Modeling Support with Geographic Information Systems, Esri Press 2000,
3. Wilfried Brutsaert, Hydrology: An Introduction Cambridge University Press, 2005,
4. Andy D. Ward and Stanley W. Trimble, Environmental Hydrology, second edition, Lewis Publishers, 2004,
5. U.M. Shamsi, GIS Applications for Water, Wastewater, and Stormwater Systems, CRC; first edition 2005,
6. Remote Sensing and its application by IRA Narayana, University Press
7. Geoinformation for development by Zeil Kickberg, University Science Press

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Pre PhD Course Paper II

3. REMOTE SENSING AND GIS FOR EARTH SCIENCES

Subject Code : 1415203

OBJECTIVE:

The objective of the course is to impart knowledge about the various geological structures and Geomorphic Landforms. The students will be exposed to various Remote Sensing Applications to earth Sciences.

UNIT I: LITHOLOGY AND STRUCTURE

Introduction – Rocks And Minerals, Image Characters Of Igneous, Sedimentary And Metamorphic Rocks - Lithological Mapping Using Aerial And Satellite Data- Structural Geology, Introduction, Mapping Structural Feature Such As Folds, Lineaments / Faults, Fractures Image Characters Of Folds, Faults, Lineaments Etc., - Digital Techniques For Lithological And Structural Analysis – Case Studies.

UNIT II: SPECTRAL OF ROCKS AND MINERALS

Spectral properties of geologic features in different regions of Electromagnetic Spectrum, Elemental composition and nature of the spectra of rocks and minerals, Optimal spectral windows – Geologic Remote sensing and its significance in Geologic mapping - case studies.

UNIT - III GEOMORPHOLOGY

Geomorphic Landforms, Drainage network and patterns classification and implications of drainage patterns, geomorphic mapping using aerial and satellite data - Landform analysis in natural resources and management case studies.

UNIT IV SUBSURFACE EXPLORATIONS

Different types of Geophysical Surveys - Electrical resistivity surveys - aeromagnetic surveys - Electromagnetic surveys - Seismic surveys - Planning Geophysical surveys using satellite data - Applications of different types of geophysical surveys in resource mapping - case studies.

UNIT V REMOTE SENSING AND GIS APPLICATIONS

Introduction - Applications of Remote Sensing and GIS for Resource mapping, monitoring and management - Preparation of thematic layers - Integration of all relevant primary and secondary data using GIS in Surface and groundwater studies - Engineering Geology, Mineral exploration and Petroleum exploration - Disaster Management studies like Droughts, Floods-Case studies.

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REFERENCES:

1. Frederic k. lutgens, kennth G.pinzke and Edward j. tarbuck Applications and Investigation in Earth science 2008.
2. Glencoe science, Physical science with earth science, 2005.
3. Sebins, F.Remote Sensing principles and interpretation' W.H.Freeman and company Newyork 1987.
4. Parbin Singh 'Engineering and General Geology' Ketson Publication House 1987
5. Drury, S.A. image interpretation in Geology, Chapman and Hall London 1993
6. Michael N.Demers Fundamentals of GIS, John Wiley & sons, inc 1999.
7. C.P.L.O and Albert KW Yeung Prentice- Hall of India Pvt. Ltd., New Delhi, 2002
8. Remote sensing in Geology—A. K.Gupta
9. Remote Sensing in Geomorphology by SM Rama Samy,New India Publishers

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Pre PhD Course Paper II

4. REMOTE SENSING AND GIS FOR AGRICULTURE & FORESTRY

Subject Code : 1415204

OBJECTIVE:

The content of this course enable the students to understand the application potentialities of remote sensing data separately and in combination with GIS techniques for Agriculture and Forestry.

UNIT I: CROPS ACREAGE AND YIELD ESTIMATION

Introduction – Spectral properties of crops in optical & TIR region, Microwave backscattering behavior of crop canopy – crops identification and crop inventory – crop acreage estimation – vegetation indices – Yield modeling – crop production forecasting through digital analysis – crop condition assessment – command area monitoring – land use and land cover analysis – Microwave RS for crop inventory – Case studies

UNIT II: SOIL MAPPING AND CONSERVATION

Introduction – soil genesis, Soil morphological characters, Soil pedology – Soil survey, Types and methods of soil surveys – Soil classifications – Hydrological Soil grouping – Characteristics of saline & alkaline Soils – Factors influencing soil reflectance properties – principle component analysis and orthogonal rotation transformation-Soils mapping using RS data - Problem soil identification and mapping – land evaluation – Soil sedimentation & erosion – Soil loss assessment – Soil conservation – Case studies.

UNIT III: DAMAGE ASSESSMENT

Detection of pest & diseases – Flood mapping and Assessments of crop loss – Remote sensing capabilities & contribution for drought management – Land degradation due to water logging & Salinity – crop stresses reflectance properties of stressed plants and stress detection.

UNIT IV FORESTRY

Introduction – Forest taxonomy – inventory of forestlands – forest types and density mapping using RS techniques – Forest stock mapping – factors for degradation of forest – Delineation of degraded forest - Forest change detection and monitoring – Forest fire mapping & damage assessment – LiDAR remote sensing for Forest studies.

SPATIAL INFORMATION TECHNOLOGY

UNIT V INTEGRATED SURVEYS

Introduction – Integrated surveys for agriculture & forest development – RS & GIS for drawing out action plans – water shed approach – Rule of RS & GIS for watershed management – Land use planning for sustainable development – Precision farming - Case studies.

REFERENCES:

1. John G. Lyon, Jack McCarthy, Wetland & Environmental application of GIS, 1995.
2. Margareb Kalacska, G. Arturosanchez, Hyper spectral RS of tropical and sub tropical forest, 2005.
3. Shunlin liang , Advances in land RS: System, modeling invention and applications, 2001.
4. Joe Boris dixon, Soil mineralogy with environmental application, Library of congress catalog, 2004.
5. James B, Introduction of Remote sensing, Third edition Campbell, third edition Guilford Press, 2002.
6. NRSC : Applications of Remote sensing

Pre PhD Course Paper II

**5. REMOTE SENSING AND GIS FOR ENVIRONMENTAL
ENGINEERING**

Subject Code : 1415205

OBJECTIVE:

To understand the various remote sensing and GIS technological applications in the field of Environmental Engineering.

UNIT I: REMOTE SENSING APPLICATIONS TO ENVIRONMENTAL STUDIES

Introduction ,Environmental satellites GEOS, NOAA, AVHRR, CZCR Monitoring land, water, atmosphere and ocean using Remote Sensing Data, case studies.

UNIT II: SOIL DEGRADATION STUDY

Taxonomical classification of soils, soil survey interpretation and mapping, impact of agricultural and industrial activity on soil properties. soil salinity/alkalinity, erosion studies, Applications of GIS in assessing soil salinity, erosion productivity etc.

UNIT III: WATER QUALITY AND GROUND WATER POLLUTION

Classification of water quality for various purposes. Data base creation and quality modeling using GIS. Database Creation and maintaining water supply network, sewerage network using GIS. Case studies. Aquifer Vulnerability Intrinsic and specific vulnerability, DRASTIC, SINTACS MODELS MODFLOW, MT3D, contaminant transport model. Case studies using AHP techniques.

UNIT IV: AIR QUALITY MODELLING

Atmosphere: Chemicals, Particulate matters present in the atmosphere, allowable limits, Remote Sensing technique to monitor atmosphere constituents, air pollution due to industrial activity, modeling using GIS. Case Studies.

UNIT V: ENVIRONMENTAL MANAGEMENT

Revenue management-environment and ecological concerns- Resource development in remote areas-Impacts of anthropogenic activity- Solid Waste management- Carbon footprints and sinks, carbon trading, carbon credits and marketing, Indian and international status

REFERENCES:

1. Ian L. Pepper, Charles P. Gerba and Mark L. Brusseau, Environmental and pollution science 2006.
2. Savigny, D. De and Wijeyaratne, P. GIS for Health and Environment, Stylus publication, 1994.
3. Reger, D. Griffin, Air Quality Assessment and Management (second edition), 2006.
4. Donald L. Wise, Remediation for Hazardous waste contaminated soils 1994.
5. Integrated Solid Waste Management Technology George, Hilary Theisen, Samuel Vigi, McGraw – Hill Inc, Singapore. 1993.
6. Michele Campagna, GIS for sustainable development, 2005.

Pre PhD Course Paper II

6. REMOTE SENSING AND GIS FOR OCEAN ENGINEERING AND COASTAL ZONE MANAGEMENT

Subject Code : 1415206

OBJECTIVE:

This Course deals with the fundamental of physical, chemical and Biological oceanography and the various RS applications to coastal zone management.

UNIT I: OCEAN ENGINEERING

Coastal processes – Oceanic circulation – Upwelling and sinking - current Measurement – Waves – surface waves - Water motion in waves – reflection, diffraction and refraction – wave generated currents – catastrophic waves – Tides – Tidal forces – sediment drift – salinity intrusion.

UNIT II: OCEAN GENERAL STUDIES

Study of physical properties of sea water and parameters – chemistry of sea water – Biological parameters – Oceanographic instruments – collection of water samples – current measuring devices – deep sea coring devices – dredges.

UNIT III: COASTAL ENGINEERING

Coastal Hydrodynamic – Coastal erosion and protection – different Coastal protection works – design of Breakwaters – Estuaries and their impact on coastal process – Hydrodynamics of pollution dispersion.

UNIT IV: REMOTE SENSING APPLICATION

Use of Microwave data – CZCS studies – chlorophyll production index – various sensors used for coastal application – physical oceanographic parameter estimation – sea surface temperature – significant wave height – wind speed and direction – coastal Bathymetry – sea level rise.

UNIT V COASTAL ZONE MANAGEMENT

Introduction – Major issues/problem – Thematic maps on coastal resources, - wetland classification – creation of CZIS – Coastal Regulation zone – Coastal aquifer modelling

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using GIS – Integrated coastal Management using GIS.

REFERENCES:

1. Johnb.Herbich, Handbook of Costal Engineering, McGraw-Hill Professional; 1 edition 2000.
2. D. J. Tritton , Physical Fluid Dynamics,Publisher: Oxford University Press, USA; edition 1988.
3. Robert G. Dean, Robert A. Dalrymple , Water Wave Mechanics for Engineers & Scientists, Publisher: World Scientific Publishing Company 1990.
4. J. William Kamphuis , Introduction To Coastal Engineering And Management , World Scientific Publishing Company, 2000.
5. Biliانا Cicin-Sain Gunnar Kullenberg, Integrated Coastal and Oce

Pre PhD Course Paper II

**7. REMOTE SENSING AND GIS FOR URBAN PLANNING AND
MANAGEMENT**

Subject Code : 1415207

OBJECTIVE:

- This course describes the various mapping techniques used for urban mapping including transportation planning.

UNIT I: INTRODUCTION

Remote sensing for detection of urban features – Scale and resolution – Scope and limitations – Interpretation from Aerial and satellite images – Digital image processing techniques – Image fusion – Case studies.

UNIT II: SETTLEMENT MAPPING

Classification and settlement – settlement structure – Segmentation of Built-up areas – Classification algorithms – Land use/ Land cover mapping – change detection – high resolution remote sensing – case studies.

UNIT III : ANALYSIS AND PLANNING

Urban morphology – Housing topology – Population estimation from remote sensing – Infrastructure demand analysis – Urban renewal Land suitability analysis – Plan formulation – Regional, Master and detailed development – Use of remote sensing and GIS in plan preparation – Urban information system – Web GIS – case studies.

UNIT IV: TRANSPORTATION PLANNING

Mapping transportation network – Classification – Optimum route/ shortest route – Alignment planning – Traffic and parking studies – Accident analysis – case studies.

UNIT V: CURRENT TRENDS

Urban growth modeling – Expert systems in planning – 3D city models – ALTM – Land use Transportation interaction models – Intelligent transportation systems – case studies

REFERENCES:

1. Juliana Maantay, John Ziegler, John Pickles, GIS for the Urban Environment,

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Esri Press 2006.

2. Allan Brimicombe, GIS Environmental Modeling and Engineering, CRC; 1 edition 2003.

3. Paul Longley, Michael Batty, Spatial Analysis: Modeling in a GIS Environment Wiley, 1997.

4. Michael F. Goodchild, Louis T. Steyaert, Bradley O. Parks, Carol Johnston, David Maidment, Michael Crane, Sandi Glendinning, GIS and Environmental Modeling: Progress and Research Issues (Hardcover) by, Publisher: Wiley; 1 edition, 1996.

5. Roland Fletcher, The Limits of Settlement Growth: A Theoretical Outline (New Studies in Archaeology) (First edition), Cambridge University Press; 2007.

6. Advanced Surveying by Satheesh Gopi, R. Satyakumar and N. Madhu, Pearson publishers

Pre PhD Course Paper II

8. REMOTE SENSING AND GIS FOR DISASTER MITIGATION MANAGEMENT

Subject Code : 1415208

OBJECTIVE:

To teach about the various principles involved and also the various mitigation to be adopted during the disasters.

UNIT I: DISASTER PRINCIPLES

Basic concepts and principles – Hydrological and geological disasters, characteristics crisis and consequences – Role of government administration, University research organization and NGOs-International disaster assistance – Sharing technology and technical expertise.

UNIT II: LONG TERM MITIGATION MEASURES

Needs and approach towards prevention – principles and components of mitigation Disaster legislation and policy – Insurance – Cost effective analysis – Utilisation of resource – Training – Education – Public awareness – Role of media.

UNIT III: SAFETY RATING OF STRUCTURES

Slope stability of Ghat roads – Structural safety of Dams, Bridges, Hospital, Industrial structures – Low cost housing for disaster prone areas – Cyclone shelter projects and their implications – Reconstruction after disasters: Issues of practices.

UNIT IV : SPACE SCIENCE INPUT IN DISASTER MANAGEMENT

Remote sensing in Hazard evaluation – Zonation – Risk assessment – Damage assessment – Land use planning and regulation for sustainable development – Communication satellite application – network – Use of Internet – Warning system – Post disaster review – Case studies.

UNIT V: EMERGENCY PLANNING USING SPATIAL AND NON-SPATIAL DATA

Information system management – Spatial and non-spatial data bank creation-

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SPATIAL INFORMATION TECHNOLOGY

Operational emergency management – Vulnerability analysis of infrastructure and settlements –Pre-disaster and post disaster planning for relief operations – Potential of GIS application in development planning – Disaster management plan – Case studies, REFERENCES:

1. Sisi zlatanova & Andrea Fabbri jonathanli, Geometrics solutions for Disaster management, Springer Verlag, 2007.
2. C.Emdad Haque, Mitigation of natural Hazards & disasters, Kluwer Academic publishers group, 2005.
3. Linda C. Bottersll & ponald A.wilhite, From Disaster response to Risk management. Kluwer Academic publishers group, 2005.
4. Gerard Blokdiijk, Disaster recovery planning and services, Gennaio publishers, 2008.
5. Mohamed Gad Large scale disasters:prediction, control and mitigation, Cambridge university press, 2008.

Pre PhD Course Paper II

9. FLOOD MODELLING AND DROUGHT ASSESSMENT

Subject Code : 1415209

OBJECTIVE:

This subject aims at making the students to understand the hydrologic extremes of floods and droughts, estimation of severity and extent of damages and the mitigation measures to combat them.

UNIT I: FLOOD ESTIMATION

Hydrologic extremes – Flood – Types of Flood – Effects of Flood – Design Flood - SPF/MPF - Estimation of design flood – Physical Indicators - Envelope curves - Empirical methods – Rational method - Statistical methods – Frequency analysis – Unit hydrograph method.

UNIT II: FLOOD MODELLING AND MANAGEMENT

Hydrologic and Hydraulic Routing – Reservoir and Channel Routing - Flood Inundation Modelling –

HEC HMS and HEC RAS software - Flood control methods – Structural and non structural measures -

Flood Plain Zoning – Flood forecasting – Flood Mitigation - Remote Sensing and GIS for Flood modelling and management.

UNIT III: DROUGHT AND IMPACTS

Definition – Definitions based on rainfall, stream flow, vegetation and comprehensive aspects - Characterisation of Drought/water shortage/aridity/desertification - Types of Drought – NCA classification – Impacts of Drought – Environmental, Social and Economical aspects

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UNIT IV: DROUGHT ASSESSMENT

Drought Severity Assessment – Meteorological Hydrological and Agricultural methods – Drought Indices – GIS based Drought Information system – Drought Vulnerability Assessment and Mapping Using GIS.

UNIT V: DROUGHT MONITORING AND MANAGEMENT

DPAP Programme - Drought Monitoring – Application of Remote sensing – Drought Mitigation Proactive and Reactive Approach – Supply and Demand Oriented Measures – Long term and Short term Measures – Water Scarcity Management in Urban, Industrial and Agricultural sectors

REFERENCES:

1. Chow V.T., Maidment D.R., Mays L.W., "Applied Hydrology", McGraw Hill Publications, New York, 1995.
2. Vijay P.Singh., "Elementary Hydrology", Prentice Hall of India, New Delhi, 1994.
3. Yevjevich V., Drought Research Needs, Water Resources Publications, Colorado State University, USA, 1977.
4. Rangapathy V., Karmegam M., and Sakthivadivel R., Monograph in Flood Routing Methods as Applied to Indian Rivers, Anna University Publications