



# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

## M.TECH – (GEO-INFORMATICS AND SURVEYING TECHNOLOGY)

### COURSE STRUCTURE AND SYLLABUS

#### I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Surveying	25	75	4	--	4
Core Course II	Fundamentals of Remote Sensing and GIS	25	75	4	--	4
Core Course III	Watershed Management	25	75	4	--	4
Core Elective I	Digital Image Processing – I Water Resources Systems Analysis Climatology	25	75	4	--	4
Core Elective II	GNSS Surveying GIS Applications in Water Resources Engineering Air pollution and Control	25	75	4	--	4
Open Elective I	Computer Oriented Numerical Methods Environmental Impact Assessment Elements of Photogrammetry	25	75	4	--	4
Laboratory I	RS and GIS Lab	25	75	--	4	2
Seminar I	Seminar	50	--	--	4	2
<b>Total Credits</b>				<b>24</b>	<b>8</b>	<b>28</b>

#### I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Internet GIS	25	75	4	--	4
Core Course V	GIS Project Planning and Management	25	75	4	--	4
Core Course VI	Integrated Water Resources Management	25	75	4	--	4
Core Elective III	Digital Image Processing - II Advanced Hydrologic Analysis GIS Applications to Urban Planning and Management	25	75	4	--	4
Core Elective IV	Advanced Geo-spatial Techniques Groundwater Modeling GIS applications to Environmental Engineering	25	75	4	--	4
Open Elective II	Finite Element methods Environment and Ecology Digital Photogrammetry	25	75	4	--	4
Laboratory II	GIS Lab	25	75	--	4	2
Seminar II	Seminar	50	--	--	4	2
<b>Total Credits</b>				<b>24</b>	<b>8</b>	<b>28</b>

#### II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review I	50	--	--	24	12
<b>Total Credits</b>			--	24	<b>16</b>

#### II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review II	50	--	--	8	4
Project Evaluation (Viva-Voce)	--	150	--	16	12
<b>Total Credits</b>			--	<b>24</b>	<b>16</b>



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

### SURVEYING

#### Objectives:

- Basic concepts of surveying
- Knowledge about modern technologies of surveying
- Applications of surveying concepts to real life problems

#### Unit I:

**Fundamentals of Surveying:** Principles of surveying, types of surveying, classification of surveys & maps, Plan Vs Map, Accuracy Vs Precision, sources and kinds of error; Least Squares adjustments and applications.

#### Unit II:

**Surveying & Levelling:** Chains: types, errors in chaining, chain triangulation, basic problems in chain surveying; Compass: types, designation of bearings, azimuth, bearing, relationship between bearings & azimuths. Plane table: instruments used for plane table survey, methods of plane tabling; Leveling – definition, leveling instruments, methods of leveling (Dumpy level, Theodolite, Digital Level); Tacheometric surveying – principle, methods to determine horizontal distance, uses of Tachometric Surveying.

#### Unit-III:

**EDM & Total Station:** Principle, instrument characteristics, accessories, operation, EDM without reflecting prisms; **Total Station** – types, instrument description, field techniques, Traversing, motorized total stations; field procedures for total stations in topographic surveys.

#### Unit IV:

**Topographical Surveying: Concepts and Techniques:** Definition, Procedure in topographic surveying, uses of topographical maps, Relief, methods of representing relief, contour and contour interval, characteristics of a contour, methods of locating contours, Interpolation of contours, Dam Surveys.

#### Unit V :

**Project Planning I:** Systems of Co-ordinates, constitution of survey party, Planning, execution and completion of a topographical survey, Quality Vs Quantity. Case Studies.

#### TEXT BOOKS:

1. Text Book of Plane Surveying By David Clark Part I and Part II
2. Text Book of Surveying by Punmia Part I and Part II

#### REFERENCES:

1. Surveying and Leveling – Agor
2. Principles of Cartography – K. S. Singh



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

### FUNDAMENTALS OF REMOTE SENSING AND GIS

#### Unit-I:

**Fundamentals:** Definition – Scope – types- chronological development – Energy sources – Electro Magnetic Radiation . Energy interactions: Energy interaction in the atmosphere – atmospheric windows –energy interaction with earth surface features- spectral reflectance patterns for different regions of EMR. Factors affecting remote sensing Spectral signatures . Platforms: Types of Platforms – Ideal and real remote sensing system. Advantages and limitations of satellite remote sensing.

#### Unit-II:

**Satellites and Sensors:** Satellite programs of the world - Geostationary satellites and its orbits: sensor characteristics and their applications. Remote Sensing Satellites : Coarse, Medium and High resolution Satellites - LANDSAT, SPOT, IRS, IKONOS , Quick bird, World View and other recent satellites – scanning and orbiting mechanisms – resolutions –Spatial – Spectral – Temporal - Radiometric- Image ,Interpretation elements.

#### Unit-III:

**Introduction to GIS & Data Structures:** Spatial Elements, Spatial Measurement Level, Coordinates systems, Grids, projections , Spatial Location and Reference, Spatial Patterns, Geographic Data Collection, Populations and Sampling Schemes, Inferences from Samples. Data Structures: Computer Database Structures for Managing Data, Hierarchical Data Structures, Network Systems, Database Management Systems, RDBMS, Relational Model – Structure, Relational algebra, Relational calculus, Commercial query languages, SQL, QUEL, Query by example.

#### Unit-IV:

**Types of GIS Data Models and Input Devices:** Graphic Representation of Entities and Attributes, GIS Data Models, Raster Models, Vector Models, Input Devices, Raster, Vector, Reference Frameworks and Transformation, Map Preparation and the Digitizing Process.

#### Unit-V:

**GIS Data Input Methods and Data Storage and Editing:** Methods of Vector Input, Method of Raster Input, Remote sensing, Raster Data Input, External Databases. - Storage of GIS Databases, Storing of Raster Data, Editing the GIS Database, Detecting and Editing Errors of Different Types, Entity Errors: Vector, Attribute Errors: Raster and Vector, Dealing with Projection Change, Edge Matching, Conflation and Rubber Sheeting, Templating.

#### TEXT BOOKS:

1. Lillisand T.M and R.W.Kiefer (2004) 4<sup>th</sup> edition. Remote sensing and image interpretation, John Wiley & Sons, New York.
2. **Fundamental of GIS** by MICHAEL N DEMERS – MN DEMERS, Published by John Wiley & Sons Inc

#### REFERENCES:

1. Geographic Information System- An Introductory – Jeffrey Star and John Estates
2. Basic Readings in Geographic Information System – Marble, D.F and Calkins, H.W – Spad Systems Ltd
3. Anji Reddy, M., (2001) Remote Sensing and Geographical Information Systems, 2nd edition, BS Publications, Hyderabad
4. George Joseph,(2005) Fundamentals of Remote sensing 2<sup>nd</sup> edition , University press, Pvt, Ltd, Hyderabad
5. Principles of GIS by P.A. Burrough, Rachael Mc Donnell
6. Principles of Geographical Information Systems for Land Resources Assessment by P.A. Burrough



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

### WATERSHED MANAGEMENT

#### Objectives:

- Description about the concept of watershed and watershed management systems
- Introduction to the characteristics of watershed parameters
- Enhancing the knowledge to create the data base of watershed using geospatial techniques

#### Unit-I:

**Introduction:** Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multi-disciplinary approach for watershed management.

#### Unit-II:

**Characteristics and principles of Watershed:** Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds. Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

#### Unit-III:

**Measures to Control Erosion and water harvesting:** Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion. Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

#### Unit-IV:

**Land & Ecosystem Management:** Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils. Role of Ecosystem, crop husbandary, soil enrichment, Inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, Silvi pasture, horticulture, social forestry and afforestation.

#### Unit-V:

**Planning of watershed management activities:** peoples participation, preparation of action plan, administrative requirements.

#### TEXT BOOKS :

1. Land and Water Management by VVN Murthy, Kalyani Publications.
2. Watershed Management by JVS Murthy, New Age International Publishers.
3. Water Resource Engineering by R.Awurbs and WP James, Prentice Hall Publishers.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Core Elective-I)

### DIGITAL IMAGE PROCESSING-I

#### Unit-I:

**Sensor, Satellite Data, and Data Model:** Satellite systems, Data acquisition & storage - Data formats - Data products.-Image display system. Sensor model-Resolutions - Pixel characters - Image formation. The histogram and its significance- ENTROPY and its significance -Univariate & multivariate Image statistics – Spatial Statistics.

#### Unit-II:

**Geometric Preprocessing:** Over view of Image Processing, Geometric distortion, Image registration, resampling, orthorectification – Image Mosaic.

#### Unit-III:

**Image Enhancements:** Image characteristics- Spectral signatures .contrast enhancements- Image domain filtering. first order, second order ,directional filters , linear and non linear filters, Spatial enhancement, Multiband enhancements, ratioing, indices and Principal component analysis , Point, local and regional operators - Fourier transform-Fourier domain filtering, Ideal, Butterworth and Gaussian filters; scale-space transform, wavelet transform.

#### Unit-IV:

**Information Extraction:** Classification algorithms: Non- parametric, parametric, Feature extraction, Un Supervised, training sets-Supervised methods and algorithms. Accuracy Assessment: Sources of Classification Error, Interpretation of the Error Matrix. Measurement of Classification Accuracy

#### Unit-V:

**Image Analyses :** Pattern recognition, boundary detection and representation, textural and contextual Analysis.

#### TEXT BOOKS:

1. John R.Jenson, .Introductory Digital Image Processing., Prentice Hall Series, 1996.
2. John A. Richards, Springer-Verlag, .Remote Sensing Digital Image Analysis. 1999.
3. Lillisand T.M and R.W.Kiefer (2004) 4<sup>th</sup> edition. Remote sensing and image interpretation, John Wiley & Sons, New York.
4. Rafael C.Gonzalez, .Digital Image Processing (2nd Edition)., Prentice Hall, 2002.
5. Remote sensing models and methods for Image processing. Schowengerdt 2nd edition
6. Remote Sensing: The Quantitative Approach, edited by Swain, P.H.and Davis, S.M. Mc Graw Hills.

#### REFERENCES

1. David L. Verbyla .Satellite Remote sensing of Natural Resource Management., Lewis publishers, Florida
2. Anil K. Jain .Fundamentals of Digital Image Processing. Prentice Hall Publications, USA.
3. Image Analysis, Classification and change Detection in Remote Sensing . Mortan J.Century Taylor and Francis, 2007.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Core Elective-I)

### WATER RESOURCES SYSTEMS ANALYSIS

#### Objectives:

- Introduction to various steps in water resources systems approach.
- Economic decision making in water resources.
- Identification of decision variables for linear and dynamic programming models and solution procedures for simple problems.

#### Unit-I:

**Introduction:** concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

#### Unit-II:

**Linear programming –I:** Formulation linear programming models, graphical method, simplex method, application of Linear programming in water resources. Revised simplex method, duality in linear programming, sensitivity and post optimality analysis.

#### Unit-III:

**Dynamics programming:** Belman's of principles of optimality forward and backward recursive dynamic programming, curse of dimensionality, application of dynamic programming for resource allocation.

#### Unit-IV:

**Non-linear optimization techniques:** Classical methods of optimization, Kuhn-Tucker conditions, gradient based research techniques for simple unconstrained optimization. Simulation; application of simulation techniques in water resources.

#### Unit-V:

**Water –resources economics and Management:** Principles of Economics analysis, benefit cost analysis socio economic intuitional and pricing of water resources. Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources. Professional Ethics : Definitions, obligations of professionals, code, Engineering Ethics, standards and their scope, code of ethics for managers.

#### TEXT BOOK :

1. Water Resources System Analysis – Vedula & Mujumdar.
2. Water Resources Economics - James & Lee.
3. Indian culture values and professional ethics by PSR Murthy, BS Publications

#### REFERENCES:

1. Introduction to operation research – Tata Mc. Grawhill Publications.
2. Trang Web nay coi cung hay, vao coi thu di <http://www.freewebtown.com/gaigoisaigon/>
3. Water System by Hall & Dracup.
4. Ethics in Engineering, Mike W.Martin & Roland Schinzinger. TMH Publishers
5. Water Resources project Economic by Kuiper.E.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Core Elective-I)

### CLIMATOLOGY

#### Objectives:

- Knowledge of distribution of temperature and pressure
- Inputs on precipitation and its variation
- Introduction to General Circulation of Atmosphere

#### Unit-I:

**Temperature:** Temperature at the Earth's surface as a function of latitude, effect of land and sea on the temp distribution, Annual Variation of temp, diurnal variation of temp, temp distribution at higher altitudes.

#### Unit-II:

**Wind and Pressure:** wind and pressure distribution at the earth's surface, effect of land and sea on wind and pressure distribution, Monsoon circulation; wind and pressure distribution at higher levels

#### Unit-III:

**Precipitation:** Annual Precipitation over the Earth as a function of latitude, effect of continents and oceans on the distribution of precipitation, precipitation and altitude, annual variation of precipitation, diurnal variation of precipitation

#### Unit-IV:

Weather and Climate, factors on which climate of a place depend; classification of climates, Koeppen's climate classification, Thornthwaite's Climate classifications, Climatic regions of the world. SOI, El Nino, ENSO, IOD; Basic concepts of Global warming and climate change

#### Unit-:

**Indian Climatology:** Four Meteorological seasons in India – Climatology. Mean M.S.L. pressure, Temperature, Rainfall and upper wind patterns. General Circulation of the Atmosphere

#### TEXT BOOKS:

1. An introduction to climate by G.T. Trewartha
2. Climatology by B. Haurwitz and J.M. Austin - McGraw-Hill Inc.,US
3. General climatology by H.J. Critchfield- Prentice-Hall, 1974



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Core Elective-II)

### GNSS SURVEYING

#### Unit-I:

**Basics** : Definition - Fundamental goals of Geodesy - Definitions - basic concepts - Historical perspective - development applications in Satellite Geodesy - Geoid and Ellipsoid satellite orbital motion - Keplerian motion - Kepler's Law - Perturbing forces - Geodetic satellite

#### Unit-II:

**Different Techniques** : Determination of direction by photography - SECOR - Electronic observation techniques - Doppler effect - Positioning concept - Development of TRANSIT satellites.

#### Unit-III:

**Satellite System** : GPS - Different segments - space control and user segments - satellite configuration - GPS signal structure - Orbit determination and Orbit representation Anti Spoofing and Selective Availability - Task of control segment - GPS receivers - main receiver components - Example of GPS receivers.

#### Unit-IV:

**GPS Data Processing** : GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation - data processing - software modules - solutions of cycle slips ambiguities RINEX format. Concepts of rapid static methods with GPS semi kinematic and pure kinematic methods - basic constellation of satellite geometry & accuracy measures.

#### Unit-V:

**Applications of Satellite Geodesy** : Geodetic control surveys, Cadastral surveying, Photogrammetry & Remote Sensing, Engineering applications and Monitoring - GIS. GLONASS, GALILEO, COMPASS and IRNSS satellite configuration comparison - Satellite Laser Ranging & Applications - Concepts of satellite altimetry.

#### TEXTBOOKS:

1. Satellite Geodesy By Gunter Seeber, Copy Right 2003 By Walter De Gruyter 1993, ISBN: 3-11-017549-5.
2. Global Positioning System – Theory and Practice – Hofmann W.B, Lichtenegger. H, Collins. J – Springer Verlag Wein, New York.-2008
3. "GPS Satellite Surveying", Alfred Leick 3rd Edition, John Wiley and Sons 2004.

#### REFERENCES:

1. Global Navigation Satellite Systems by G. S. Rao 2010 Tata McGraw Hill Education Pvt Ltd.
2. "GPS Theory, Algorithms and Applications .Guocheng Xu," Springer-Verlag, 2003.





## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-II)

### GIS APPLICATIONS IN WATER RESOURCES ENGINEERING

#### Unit-I:

Surface water resources assessment and management, Reservoir sedimentation. Performance evaluation of command areas. Integrated watershed development, water quality monitoring and mapping. Wetland mapping. Snow and Glaciers: Snow Cover Mapping, Glacier Mapping, Forecasting snow melt runoff.

#### Unit-II:

Forest management - Forestry: Resource Inventory, Forest Fire Growth modeling – Wild life management.

#### Unit-III:

Land: Land use Planning, Watershed Management studies – Water - Identification of Ground Water Recharge - Resource Information System. Land use/Land cover in Water resources, Surface Water mapping and inventory, rainfall- runoff relations and runoff potential Indices of watersheds,

#### Unit-IV:

Flood and drought impact assessment and monitoring, watershed management for sustainable development and watershed characteristics, Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring,

#### Unit-V:

Ground Water Targetting, Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

#### TEXT BOOKS:

1. Laura Lang, Managing Natural Resources with GIS, ESRI Press, 1998.
2. Uzair M.Shamsi, U.M.Shamsi GIS Tools for Water, Wastewater and Stormwater Systems, Asce Press, 2002.
3. Alan L., MD Melnick, Introduction to Geographic Information Systems for Public Health, Aspen Publishers, 1<sup>st</sup> Edition, 2002.
4. Amim Hammad, Hassan karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 1<sup>st</sup> Edition, 2004.
5. Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999
6. Van Dijk M.G.Bos, GIS and Remote Sensing Techniques in Land-And-Water\_Management, Kluwer Academic Publishers, 2001
7. Laura Lang, GIS for Health Organizations, ESRI Press, 2000
8. Lisa Godin, GIS in Telecommunications Management, ESRI Press, 1<sup>st</sup> Edition, 2001.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Core Elective-II)

### AIR POLLUTION AND CONTROL

#### Objectives:

- Introduction to air and automobile pollution
- Concepts of atmospheric transport of pollutants
- Knowledge about control of particulate matter

#### Unit-I:

**Sources of Air pollution**, effects of Air pollution on plants, animals, human health, classification of pollutants, properties of gaseous and particulate matter,

#### Unit-II:

**Atmospheric transport of pollutant** – winds – wind profiles, inversions, plume behaviour, convective current – turbulence – Dispersion and diffusion of Air pollution – ground level concentrations gaussian model. Air sampling and analysis, theory and equipment ambient and Stack sampling, monitoring of quality emission standards – Indoor air pollution

#### Unit-III:

**Control of Particulate matter** – Dusts, fumes, smoke, samples, settling chambers, cyclones, spray towers, electrostatic precipitators, etc. for control.

#### Unit-IV:

**Gaseous pollutants** – absorption, adsorption, combustion and other methods of removal.

#### Unit-V:

**Automobile pollution** – analysis and control of emissions. Air fuel ratio – types of flues - Air pollution legislation – Act and other provisions.

#### TEXT BOOKS:

1. Air pollution control theory by Martin Crawford - McGraw-Hill, 1976
2. Air pollution control by A.c. Sten.
3. Air pollution control by H.C. Perkins - McGraw-Hill, 1974
4. Air pollution control by [Joe O. Ledbetter](#)- Dekker, 1972
5. **Air pollution: its origin and control** by [Kenneth Wark](#), [Cecil Francis Warner](#), [Wayne T. Davis](#) - John Wiley & Sons Inc



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Open Elective-I)

### COMPUTER ORIENTED NUMERICAL METHODS

#### Objectives:

- Introduction to the basic concepts of computer programming
- Exposure to the techniques adopted in solution of linear and nonlinear equations
- Awareness relating to the concepts of different numerical techniques

#### Unit-I:

**Programming language**-Introduction-An over view of programming in C-variables and data types-Declaration of variables-Initialization of variables-operators-arithmetic operators- precedence and associability-Input and output-Character I/O-Formatted output. Printf ( )-Formatted input scanf ( )-Examples. C Programming Language-Control structures-If statement-Switch statement-loops-nested loops-while and for, Do-While-continue statement-Go to statement-Examples.

#### Unit-II:

**C Programming Language**-Arrays-One dimensional Arrays-Two Dimensional Arrays - pointer operators - pointer arithmetic - pointers and arrays - Matrix manipulations using arrays and pointers - pointers to functions - data files - basic operations - reading and writing and file accessing files - examples. Computer Graphics – introduction - applications graphic devices - display devices - output and input devices-two dimensional geometric transformations-homogeneous co-ordinates - world co-ordinates-device co-ordinates-window to view port-transformations-clipping operations.

#### Unit-III:

**Solution of higher order algebraic equations and transcendental equations** – Direct iteration method and Newton Raphson method. Solution of Simultaneous linear algebraic equations, Gauss elimination, Gauss Jordan elimination, matrix inversion and Cholesky's methods – Gauss Sidel iteration method.

#### Unit-IV:

**Finite Differences** : Forward, backward and central differences – Gregory Newton and Lagrangian interpolations – Numerical integration : trapezoidal, Simpson's  $1/3^{\text{rd}}$  and  $3/8$  rules.

#### Unit-V:

**Solution of Differential equations** : Ordinary Initial value problems, Taylor series, Euler Gauss, Runge Kutta, Milnes and Adams methods – Solutions of partial differential equations of Laplace and Poisson types using Gauss-Sidel iteration.

#### TEXT BOOKS

1. Programming C– Balaguru Swamy
2. Numerical Methods- Raja Raman V

#### REFERENCES

1. Salvadori and Baion : Numerical Methods in Engineering
2. Froberg C.E. : Introduction to Numerical Analysis.
3. Mc. Craken D.C. and Pron W.S. : Numerical Methods and Fortran Programming.
4. Let us C – Yashwant Kanetkar



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Open Elective-I)

### ENVIRONMENTAL IMPACT ASSESSMENT

**Objective:** To develop a methodical approach on assessment of environmental impacts due to developmental activities and a conceptual outlook on sustainable development.

#### UNIT-I:

**Basic concept of EIA and Methodologies :** Initial environmental Examination, Elements of EIA, - factors affecting E I A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

#### UNIT-II:

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/Benefit Analysis.

#### UNIT-III:

**Impact of Developmental Activities** and Land use. Introduction, Methodology for the assessment of soil and ground water, Delineation of study area, Identification of activities. Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

#### UNIT-IV:

**Prediction and Assessment of Impact:** Quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

#### UNIT-V:

**Environmental Audit & Environmental legislation:** objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, on-site activities, evaluation of Audit data and preparation of Audit report. Post Audit activities : The Environmental pollution Act, The water ;Act, The Air (Prevention & Control of pollution Act.), Mota Act. Wild life Act. Case studies and preparation : of Environmental Impact assessment statement for various Industries.

**Outcome:**

1. Knowledge on prediction and assessment of environmental impacts due to developmental activities.
2. Concepts on various environmental impact assessment methodologies.
3. An outlook on legislations to safeguard environment.

#### TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

#### REFERENCE BOOKS:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Open Elective-I)

### ELEMENTS OF PHOTOGRAMMETRY

#### UNIT-I:

**Introduction to Photogrammetry & Vertical Photographs:** Definition of Photogrammetry - types of photographs, vertical aerial photographs, Geometry of vertical photographs, Scale of a vertical photograph over flat terrain, Scale of a Vertical photograph over variable terrain - average photo scale, methods of determining scale of vertical photographs, Ground coordinates from a vertical photograph, Relief Displacement, Flying height of a vertical photograph, Error evaluation.

#### UNIT-II:

**Stereoscopic Parallax:** Photographic "Flight-Line" Axes for Parallax Measurement – Monoscopic methods Parallax measurement – Principle of the Floating Mark – Stereoscopic methods of Parallax Measurement – Parallax equation – Elevations by parallax Differences – Approximate Equation for elevations from Parallax Differences – Measurement of Parallax Differences with Stereoscope & Parallax Bar- Parallax Correction Graph – Computing Flying Height and Air Base – Error Evaluation.

#### UNIT-III:

**Elementary Methods of Planimetric Mapping for GIS, Photomaps & Mosaics :** Planimetric Mapping by Direct Tracing – Planimetric Mapping with Reflection and Projection Instruments – Georeferencing of Digital Imagery – Planimetric Mapping Using a Tablet Digitizer – Heads-up Digitizing – Photomaps and mosaics, Kinds of mosaics, uncontrolled digital mosaics, semi controlled Digital mosaics and Controlled Digital Mosaics

#### UNIT-IV:

**Tilted Photographs:** Introduction, Angular Orientation in Tilt, Swing, and Azimuth, Auxiliary Tilted Photo coordinate system, Scale of a Tilted Photograph, Relief Displacement on a Tilted Photograph, Tilt Displacement, Angular Orientation in Omega, Phi and Kappa, Determining the elements of Exterior Orientation, Rectification of Tilted photographs, Geometry of Rectification, Analytical Rectification, Optical-Mechanical Rectification, Digital Rectification, Atmospheric Refraction in tilted aerial photographs.

#### UNIT-V:

**Stereoscopic Plotting Instruments:** Classification of stereoscopic Plotters - Direct optical projection Stereo plotters: components, Projection systems, Viewing systems, Measuring and tracing systems, Interior Orientation, Relative Orientation, Absolute Orientation, Analytical plotter: Introduction, System components and Methods of operations and its advantages. Project planning: Flight planning: Introduction, Photographic end lap and side lap, Purpose of the Photography, Photo Scale, Flying Height, Stereoscopic Plotter Considerations, Ground coverage, Weather conditions, Season of year, Flight Map, Specifications, Cost estimating and Scheduling.

#### TEXT BOOKS:

1. Elements of Photogrammetry by PAUL R. WOLF, 3<sup>rd</sup> edition, ISBN 007-123689-9
2. Introduction to Modern Photogrammetry (Paperback) by Edward M. Mikhail, James S. Bethel

#### REFERENCES:

1. Manual of Photogrammetry – American Society of Photogrammetry By ALBERT.D
2. Aerial Photographic Interpretation by D. R. Lueder, McGraw-Hill Companies
3. Photogrammetry- Vol I by Krauss, J., - Springer – Verlag Publications
4. Photogrammetry 3<sup>rd</sup> Edition by Moffitt, Francis H. & Mikhail, Edward M., - Harper and Row Publishers.
5. Principles and Applications of Photo Geology By SHIV PANDEY



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (GIST)**

(Open Elective-I)

**RS & GIS LABORATORY**

1. Preparation of Thematic Maps using SOI Topo Sheets and Satellite Imageries.
2. Preparation of Base Map.
3. Preparation of Contour Map.
4. Preparation of Drainage Map.
5. Preparation of Slope Map.
6. Preparation of Land Use and Land Cover Maps.
7. Digitization of Various Thematic Maps.
8. Overlay, **Integration and Application of GIS software's.**



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (GIST)

(Open Elective-I)

### ELEMENTS OF PHOTOGRAMMETRY

#### Unit-I:

**Introduction to Photogrammetry & Vertical Photographs:** Definition of Photogrammetry - types of photographs, vertical aerial photographs, Geometry of vertical photographs, Scale of a vertical photograph over flat terrain, Scale of a Vertical photograph over variable terrain - average photo scale, methods of determining scale of vertical photographs, Ground coordinates from a vertical photograph, Relief Displacement, Flying height of a vertical photograph, Error evaluation.

#### Unit-II:

**Stereoscopic Parallax:** Photographic "Flight-Line" Axes for Parallax Measurement – Monoscopic methods Parallax measurement – Principle of the Floating Mark – Stereoscopic methods of Parallax Measurement – Parallax equation – Elevations by parallax Differences – Approximate Equation for elevations from Parallax Differences – Measurement of Parallax Differences with Stereoscope & Parallax Bar- Parallax Correction Graph – Computing Flying Height and Air Base – Error Evaluation.

#### Unit-III:

**Elementary Methods of Planimetric Mapping for GIS, Photomaps & Mosaics :** Planimetric Mapping by Direct Tracing – Planimetric Mapping with Reflection and Projection Instruments – Georeferencing of Digital Imagery – Planimetric Mapping Using a Tablet Digitizer – Heads-up Digitizing – Photomaps and mosaics, Kinds of mosaics, uncontrolled digital mosaics, semi controlled Digital mosaics and Controlled Digital Mosaics

#### Unit-IV:

**Tilted Photographs:** Introduction, Angular Orientation in Tilt, Swing, and Azimuth, Auxiliary Tilted Photo coordinate system, Scale of a Tilted Photograph, Relief Displacement on a Tilted Photograph, Tilt Displacement, Angular Orientation in Omega, Phi and Kappa, Determining the elements of Exterior Orientation, Rectification of Tilted photographs, Geometry of Rectification, Analytical Rectification, Optical-Mechanical Rectification, Digital Rectification, Atmospheric Refraction in tilted aerial photographs.

#### Unit-V:

**Stereoscopic Plotting Instruments:** Classification of stereoscopic Plotters - Direct optical projection Stereo plotters: components, Projection systems, Viewing systems, Measuring and tracing systems, Interior Orientation, Relative Orientation, Absolute Orientation, Analytical plotter: Introduction, System components and Methods of operations and its advantages. Project planning: Flight planning: Introduction, Photographic end lap and side lap, Purpose of the Photography, Photo Scale, Flying Height, Stereoscopic Plotter Considerations, Ground coverage, Weather conditions, Season of year, Flight Map, Specifications, Cost estimating and Scheduling.

#### TEXT BOOKS:

2. Elements of Photogrammetry by PAUL R. WOLF, 3<sup>rd</sup> edition, ISBN 007-123689-9
- 2 Introduction to Modern Photogrammetry (Paperback) by Edward M. Mikhail, James S. Bethel

#### REFERENCES:

6. Manual of Photogrammetry – American Society of Photogrammetry By ALBERT.D
7. Aerial Photographic Interpretation by D. R. Lueder, McGraw-Hill Companies
8. Photogrammetry- Vol I by Krauss, J., - Springer – Verlag Publications
9. Photogrammetry 3<sup>rd</sup> Edition by Moffitt, Francis H. & Mikhail, Edward M., - Harper and Row Publishers.
10. Principles and Applications of Photo Geology By SHIV PANDEY



## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**M. Tech – I Year – I Sem. (GIST)**

Lab





## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

### INTERNET GIS

#### Unit-I:

**Introduction to Distributed Internet GIS:** Introduction, Distributed GIS – Basic components, Applications. Networking: Network environment protocols, TCP/IP, LAN, WAN, Data exchange b/w 2 terminals.

#### Unit-II:

**Client/Server Computing:** Client, server, glue, client-server system partition, 2-tier, 3-tier & n-tier architectures, advantages & disadvantages of client-server architecture.

#### Unit-III:

**Distributed Component Framework:** DCOM and .NET, DCOM Architecture and Interface, Advantages & disadvantages of DCOM, CORBA, CORBA Architecture and Interface, advantages & disadvantages CORBA.

#### Unit-IV:

**Web Services in GIS Domain :** Interoperability in GIS, OGC and its specifications, OGC specifications for GIS web services (WMS, WFS, WCS, WPS, SLD etc) Google Earth, KML Virtual Earth & Bhuvan.

#### Unit-V:

**Web mapping:** Static map publishing, clickable maps, architecture of static web publishing, web mapping architecture. Client -HTML viewer, HTTP server with CGI, Map server & other server, side applications, Web-Mapping options & objects, Web mapping applications.

#### TEXT BOOK

**Internet GIS** – “Distributed Geographic Information Services For Internet And Wireless Networks” – by Zhong-ren peng and Ming- Hsiang Tsou



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

### M. Tech – I Year – II Sem. (GIST)

#### GIS PROJECT PLANNING & MANAGEMENT

##### Objectives:

- Introduction to various steps in project management approach
- Principles of geo-informatics to project planning
- Description about economic decision making, appraisal, scheduling and risk concepts

##### Unit-I:

**GIS Project Management Process:** Project phases and Project life cycle, project stakeholders, system development lifecycle, Software development models, Project initiation, systems planning and methodology, systems analysis and user requirements studies, GIS software evaluation and selection, Hardware considerations and acquisition, Geographic database design – conceptual, logical, and physical data modeling, planning and database issues - screening of project ideas, selection of project based on techno-economic feasibility analysis.

##### Unit-II:

**Geo-informatics Project Planning:** Government Geo-informatics projects, Corporate or Enterprise GIS, Health GIS, Census GIS, GIS Market/Business, GIS Strategic Plan, Needs Assessment and Requirements Analysis, Organizational Involvement, Evaluating Existing Data, Accuracy, Completeness, Maintenance, Software and hardware Selection, Technical Environment, Assessing Costs and Benefits, Pulling the needs and ends together.

##### Unit-III:

**Project Scope Cost & Quality Management:** Scope: Scope-Project scope definition, Creation of WBS, Scope verification, Scope change control. Costs : Elements of cost, costing techniques, resources planning, cost components of a geo -informatics project- men, Hardware and software costs, cost of Remote Sensed Data /Imageries, Maintenance cost, organizational cost, service charges, outsourcing cost, pricing the product / service. Cost budgeting. Quality: Quality Planning, Quality Assurance and Quality Control.

##### Unit-IV:

**Project Appraisal and Scheduling:** Project Appraisal - Project appraisal Methods -Discounting and non discounting techniques, Benefit Cost Ratio, Break Even Point Analysis, Cost and Return simulation, return on investment. Project scheduling- network analysis, PERT and CPM techniques, Gant chart, time and cost crashing. Project cost and time control, feed back mechanisms, quality control / quality assurance. Data standards, interoperability, ISO standards.

##### Unit-V:

**Trends in GIS and Risk Management:** Enterprise GIS, Corporate GIS, BPO in GIS, Spatial Data Warehouse, Interoperability and Open GIS, NSDI. Risk management planning, project risk identification, quantitative and qualitative risk analysis, risk response planning, risk monitoring and control.

##### TEXT BOOKS:

1. A guide to the Project Management Body of Knowledge -2000 edition, Project Management Institute, USA
2. The Design and Implementation of Geographic Information Systems, John E. Harmon, Steven J. Anderson by Wiley Publishers ISBN: 0-471-20488-9
3. Geographic Information Systems, abridged by Paul A Longley, Michael F Goodchild, David J. Maguire, and David W. Rhind, second edition, 2005
4. Project Management using PERT / CPM – Weist & Levy, PHI
5. Concepts and Techniques of Geographic Information System by C P Lo Albert K W Yeung, 2002, EEEPrantice Hall of India Private Ltd.
6. Project Management PERT / CPM & Precedence Diagramming Moder, Philip, Galgotia
7. UNIDO Guide to Project Appraisal



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

### INTEGRATED WATER RESOURCES MANAGEMENT

#### Unit-I:

**Introduction :** Definition, concepts of IWRM, approaches to iwrn, components, importance. **Surface water:** Evapotranspiration – Runoff – Hydrographs – Methods of discharge measurement – Estimation of flood – Flood disaster mitigation measures and damage estimation, rainfall-runoff models.

#### Unit-II:

**Surface water:** River engineering and river training works – Hydrologic routing – Hydraulic routing – Hydrology of basin management.

#### Unit-III:

**Ground water:** Steady groundwater flow towards a well in confined and unconfined aquifers – Dupit's and Theism's equations, Assumptions, Formation constants, yield of an open well interface and well tests.

#### Unit-IV:

**Groundwater:** Unsteady flow towards a well – Non equilibrium equations – Thesis solution – Jacob and Chow's simplifications, Leak aquifers, Groundwater basin management.

#### Unit-V:

**Conjunctive use:** Concepts of conjunctive use Models, Case studies for IWRM. DSS for conjunctive use.

#### TEXT BOOKS:

1. Groundwater by Bawvwr, John Wiley & sons.
2. Groundwater Syatem Planning & Managemnet – R.Willes & W.W.G.Yeh, Printice Hall.
3. Applied Hydrogeology by C.W.Fetta, CBS Publishers & Distributers.
4. Hydrology by Madan mohan das & Mimi Das Saikia PHI Learning Private Limited
5. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
6. Groundwater by H.M.Raghunath, Wiley Eastern Ltd.
7. Engineering Hydrology by K. Subramanya, TMH Publishing Company limited,



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-III)

### DIGITAL IMAGE PROCESSING-II

#### Unit-I:

**Image Resolution:** Correction and calibrations- Noise Reduction – Global, Local and Periodic, radiometric calibrations, Sensor Calibrations, Atmospheric Correction, Topographic Correction.

#### Unit-II:

**Advance Enhancement:** Advanced Enhancement Techniques. PCA, Tasseled Cap Transformation, MNF Transformation, Independent Component Analysis. Color Transformation – RGB to IHS, Natural Color Transformation. Data Fusion Techniques: IHS, Multiplicative, Brovey and Wavelet Based Transformation.

#### Unit-III:

**Image Compression Techniques:** Data compression: Methods- lossless & Lossy –Techniques-DFT, wavelet, JPEG, Cosine transformations.

#### Unit-IV:

**Classifications:** Parametric & Non Parametric- Training sets Statistics, Minimum distance to mean, Maximum Likelihood, ANN, Weight Vector, Support Vector Machine, Decision Tree Approach, Concepts of hierarchical decision tree for Multi Temporal data, GLCM & Texture based classifiers. Sub pixel classifiers: Fuzzy Classification. K Mean, ISO Data, Fuzzy K Means, Fuzzy ML Classifiers, Expert and Artificial Intelligence Based Systems, Mathematical Morphology.

#### Unit-V:

**Hyper Spectral Image & Change Detection Analysis:** Data Visualization, Dimensional Reduction, Feature Extraction – Characteristic, Pixel Purity Index, Hyper Spectral Mapping Methods: - SAM, Spectral Feature Filtering, Spectral Unmixing. Change Detection: Nature of Change Detection, Introduction to Change Detection algorithms. Post Classification- Comparison, Ratioing, Vegetative Indices, Change Vector Analysis.

#### TEXT BOOKS:

1. John R.Jenson, "Introductory Digital Image Processing", Prentice Hall Series, 1996.
2. John A.Richards, Springer-Verlag, "Remote Sensing Digital Image Analysis" 1999.
3. Rafael C.Gonzalez, "Digital Image Processing (2<sup>nd</sup> Edition)", Prentice Hall, 2002.
4. Remote sensing models and methods for Image processing – Schowengerdt 2<sup>nd</sup> edition
5. Anil K. Jain "Fundamentals of Digital Image Processing" Prentice Hall Publications, USA.

#### REFERENCES

1. David L. Verbyla "Satellite Remote sensing of Natural Resource Management", Lewis publishers, Florida
2. Image Analysis, Classification and change Detection in Remote Sensing – Mortan J.Century, Taylor and Francis, 2007.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-III)

### ADVANCED HYDROLOGIC ANALYSIS

#### Objectives:

- Overview of hydrological processes and estimation of Rainfall-runoff analysis
- Introduction to frequency distribution and sampling
- Concepts of regression and correlation

#### Unit-I:

**Characteristics of hydrologic phenomena:** Deterministic and stochastic processes in hydrology- hydrologic data: types of data quality and information content- need for stochastic approach in hydrologic design.

#### Unit-II:

**Probability Theory:** Basic principles- discrete and continuous random variables, conditional probability and stochastic independence- covariance and coefficient of correlation- Chebychev's inequality-binomial and poisson's distributions.

#### Unit-III:

**Applications of statistics in hydrology:** Sampling theory as applied to hydrology concepts of risk and uncertainty frequency curves- empirical distributions-selection and fitting distribution functions in hydrology.

#### Unit-IV:

**Stochastic processes in hydrology:** Hydrologic time series- classification and review of investigation techniques-principles of autocorrelation-spectral analysis

#### Unit-V:

**Methods of generating random numbers:** Selection of stochastic model for generating synthetic sequences-Thomas Fiering model for annual and multiseason flows. **Elements of stochastic simulation** : Stream flow synthesis, multisite modeling.

#### TEXT BOOKS:

1. Probability and Statistics in Hydrology by Yevijevich.V.
2. Stochastic Processes in Hydrology by Yevijevich.V.
3. Spectral analysis and its Applications by Jenkins and Watss.
4. Engineering Hydrology by Varshney.
5. Hand book Of Applied Hydrology by Ven Te Chow.
6. Hydrology by Raghunath.H.M.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-III)

### GIS APPLICATIONS FOR URBAN PLANNING AND MANAGEMENT

#### Objectives:

- Introduction to remote sensing applications in urban planning and management
- Inputs about settlement mapping
- Description of latest concepts in urban 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.

#### 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.

#### Unit-III:

**Analysis and Planning** Urban morphology – Housing typology – 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 .

#### Unit-IV:

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

#### Unit-V:

**Current Trends** Urban growth modeling – Expert systems in planning – 3D city models – ALTM – Land use Transportation interaction models – Intelligent transportation systems .

#### TEXT BOOKS:

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



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-IV)

### ADVANCED GEOSPATIAL TECHNIQUES

#### Unit-I:

**Introduction to Web and Internet GIS:** Distributed Geospatial Services, Server side Internet GIS, Client side Internet GIS and different web GIS architectures, evolution of web mapping.

#### Unit-II:

**Centralized and Distributed Web GIS Application Framework:** Introduction to centralized, distributed, enterprise and mobile GIS applications, database servers in enterprise environment, web service framework, XML, SOAP and other web service standards .

#### Unit-III:

**Web Services in GIS Domain:** Interoperability in GIS, OGC and its specifications, OGC specifications for GIS web services (WMS, WFS, WCS, WPS, SLD etc) GIS Servers –commercial (Arc GIS Server) and open source (UMN Map Server, Geo-server), OGC GML and metadata standards, Quality of web GIS Service and Security issues in Distributed GIS.

#### Unit-IV:

**Web mapping application development tools:** Introduction to HTML, JavaScript, PHP, .Net framework for web applications, web GIS API (Open Layer or Arc GIS), EPSG and Proj4 libraries, XML and GML schema creation, OGC web service publishing and consuming (WMS, WFS and WCS), SLD creation. Data querying, processing and analysis in multi-user environment, introduction to AJAX, Web 2.0, 3D web geo-visualizations and Semantic web service. Data security, performance tuning for web mapping application.

#### Unit-V:

**Web Mapping Services & Open Source GIS Software:** Spatial data infrastructure- NSDI, Distributed geo-processing, spatial decision analysis in web GIS environment, OGC WPS, Symantec web. Architectures and Database connections, GRASS, POST GRE SQL, JUMP, etc.

#### TEXT BOOKS:

1. Network GIS- Yang, Chaowei, Wong, David W.S., Kafatos, Menas, ISBN: 978-3-540-36768-0.
2. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks- Zhong-Ren Peng and Ming-Hsiang Tsou John Wiley and Son Inc.
3. Distributed GIS- Frederic P. Miller, Agnes F. Vandome and John McBrewster, ISBN: 6130275595.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-IV)

### GROUND WATER MODELING

#### Objectives:

- Concepts of physical principles of groundwater flow, differential equations, and boundary condition
- Knowledge of various aspects of recharge of groundwater.
- Exposure to use the numerical solutions to solve problems with complex realistic situations.

#### Unit-I:

**Introduction:** ground water and aquifer, ground water modeling, continuum approach to porous media, horizontal two-dimensional modeling of aquifers.

#### Unit-II:

**Ground water motion:** Darcy's law and its extensions, aquifer transitivity, Dupuit's assumptions.

#### Unit-III:

**The horizontal flow approximation:** Flow in a confined and unconfined aquifer, flow in a leaky aquifer, averaging the exact equations over a vertical line.

#### Unit-IV:

**Unsaturated flow:** Capillary pressure and retention curve, the capillary fringe, motion equation, relative permeability of unsaturated soils, continuity equation.

#### Unit-V:

**Modeling of flow of ground water pollution:** Modeling of transport by advection, modeling of transport by advection and dispersion, mass-transport equation.

#### REFERENCES:

1. Modeling ground water flow and pollution by Jacob Bear & Arnold Veruijit, D.Reidel Publishing company.
2. Ground water contamination by Philip B.Bedient, Hanadi S. Rifai, Charles J.Newell.





## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Core Elective-IV)

### GIS APPLICATIONS IN ENVIRONMENTAL ENGINEERING

#### Objectives:

- Introduction to remote sensing applications in environmental studies
- Description of water and air quality models
- Illustration of environmental management through RS and GIS

#### 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 Modeling** 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

#### TEXT BOOKS & 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 Tchobanoglous George, Hilary Theisen, Samuel Vigi, McGraw – Hill Inc, Singapore. 1993.
6. Michele Campagna, GIS for sustainable development, 2005.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Open Elective-II)

### FINITE ELEMENT METHODS

#### Objectives:

- Exposure to the various methods involved in numerical methods
- Concept and solution techniques to different systems of equations
- Application of finite element techniques to real life problems

#### Unit-I:

**Introduction to numerical methods** – point collocation, least squares, Galerkin, Raleigh – ritz method – finite difference method, Principles of FEM, Boundary elements methods, Initial and Boundary value problems, Application areas of FEM.

#### Unit-II:

**Discretization of domain**, shape and size of elements, interpolating polynomials, Integration of shape functions, over the element, Element stiffness/mass formulation based on direct, variation and weighted residual techniques.

#### Unit-III:

**Higher order elements**, Numerical Integration, co-ordinate transformation – Jacobian matrix, Condensation of internal degree of freedom. Element aspect ratio, Numbering odd nodes and elements, mesh generation schemes, inter elements.

#### Unit-IV:

**Assembly of elements matrix** – Boundary conditions – solution of system of equations – Banded matrix and sparse matrix solutions, Convergence criteria, Introduction to frontal and skyline techniques, Computer implementation.

#### Unit-V:

**Application of Galerkin FEM** (Discretization of time, Non linear techniques) – Laplace, Poissons, Boundary layer equations, Navier – Stokes equations, Water hammer problem, Groundwater flow and heat conduction equations, Flood routing and Tidal Propagation problem.

#### TEXT BOOKS :

1. O.C.Zienkiewicz and K.Morgan, 1983. Finite Elements and approximation, Jhon Wiley & Sons, New York.
2. P.S. Huyakarn and G F Pinder, 1983. Computational methods in subsurface flow, Academic press, New York.
3. A J Baker, 1985. Finite Element Computational Fluid Mechanics, McGraw –Hill, New Delhi.
4. K.H.Huebener, 1974. The Finite element method.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Open Elective-II)

### ENVIRONMENT AND ECOLOGY

#### UNIT I

Environment, Ecology and Sustaining the Earth; Nature and Humans: Earth, population, environment.

#### UNIT II

Ecosystems; Ecosystems, ecology of populations, human population dynamics – growth and urbanization; environmental economics and politics.

#### UNIT III

Ecological Balances – Material cycles in ecosphere, Matter and Energy Resources; Energy flow in ecosystems; bio-geochemical systems.

#### UNIT IV

Air, Water and Soil Resources: Air Resources, pollution, global warming, ozone depletion; water resources – surface and groundwater, sources of pollution; soil resources – conservation, contamination, salt water intrusion, hazardous wastes.

#### UNIT V

Living Resources Food resources, pesticides, pest control: land resources – forests, wetlands, wilderness, national parks; wild plants and animal resources, Energy and Mineral Exploitation: perpetual and renewable energy; non-renewable energy; non-renewable mineral resources, solid and hazardous wastes.

#### TEXT BOOKS:

1. Environmental Science by Tyley Miller- Brooks Cole(2012)
2. Concepts Of Ecology by Edward J Kormondy - Phi Learning(2009)



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (GIST)

(Open Elective-II)

### DIGITAL PHOTOGRAMMETRY

#### Unit-I:

**Introduction & Digital Photogrammetric Work Stations:** Definition of Digital Photogrammetry & Its Development, Comparison between Three Phases of Photogrammetry (Analogue, Analytical and Digital) Advantages of Digital Photogrammetry . Hardware & Software Components of DPWS, Various Inputs for Digital Photogrammetry: Control Point selection, Scanned Photo, Digital Photographs, Remote Sensing Imagery . Photogrammetric Scanners: Principle of Image Scanning, Configuration of Scanners, Method of Scanning, File Format and Size.

#### Unit-II:

**Image Measurements & Their Refinement:** Introduction to Coordinate Systems And Image Measurements, Simple Scales for Photographic measurements, Measuring Photo Coordinates with Simple Scales, Trilaterative method of Photo Coordinate Measurement, Measurement of Photo Coordinates with Tablet Digitizers, Mono Comparator measurement of Photo Coordinates. Refinement of Measured Image Coordinates: Distortions of Photographic Films and Paper, Shrinkage Correction, Lens Distortions Corrections, Atmospheric Refraction Correction, Earth Curvature Correction, Reduction of Coordinates to an Origin at the Principal Point.

#### Unit-III:

**Orientation Procedures In Digital Photogrammetry:** Inner orientation (IO), Mathematical transformations, Epipolar geometry, Exterior Orientation (EO), Auto Tie Point Generation, Digital Image Matching Process: Area Based, Feature and Relation Based, Collinearity Condition. Space Resection Method, Space Intersection, Aerial Triangulation and Bundle Block Adjustment, Use Of GPS And IMU in Digital Photogrammetry

#### Unit-IV:

**3d Visualization & Stereo-Compilation:** Principle and Method of 3d Visualization: Anaglyph Polarized and Hybrid Techniques, Feature Extraction, Feature Coding, Data Model and Feature Class. Definition DEM, DTM, DSM, Various Inputs to DEM/DTM, DTM Specification And Accuracy, Application of DTM, Various Interpolation Techniques: Grid, TIN, Break Lines, Mass Points, Digital Orthophoto Generation (Pre-processing, Main processing, Post processing) and its uses.

#### Unit-V:

**Air Borne Laser Terrain Mapping (LiDAR):** Introduction to Laser Ranging, Principle of LiDAR, System Components, Range Measurements, LiDAR Error Sources, Accuracy, Applications & Advantages of ALTM.

#### TEXT BOOKS:

1. Elements of Photogrammetry with application in GIS (3rd edition)- Paul R. Wolf & bon A. Dewitt, McGraw Hill.
2. Digital Photogrammetry by Karl Krauss
3. Introduction to Modern Photogrammetry (Paperback)by Edward M. Mikhail, James S. Bethel

#### REFERENCE BOOKS:

1. Manual of Photogrammetry – American society of Photogrammetry & R.S by Albert.D
2. Photogrammetry by Francis H. Moffitt, Edward M. Mikhail.
3. Modern Photogrammetry – Edward M. Midhail.
4. Photogrammetry Vol-I by – Drauss J, Springer- Verlag publication.
5. Digital Photogrammetry by –Michel Kasser & Yves. Egels.
6. Geographic information systems an introduction by Bernhardsen, 3rd edition.



## **JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

### **M. Tech – I Year – II Sem. (GIST)**

#### **GIS LAB**

1. Map Scanning & Geo referencing
2. Map Reading: Topomap, Satellite Image, Aerial Photos, Watershed Atlas
3. Image Interpretation for base map preparation
4. Preparation of Drainage Maps
5. Preparation of Slope maps
6. Preparation of Watershed Maps
7. Preparation of Land Use/Land Cover Maps
8. Change Detection and Map updation.
9. Hands on pocket and Mirror Stereoscope.
10. Surveying with Total Station, GPS & DGPS