ACADEMIC REGULATIONS,

PROGRAM STRUCTURE AND SYLLABUS

For

M.Tech (ENVIRONMENTAL GEOMATICS)

(Full Time PG Program)

ACADEMIC YEAR 2022-2023

CENTRE FOR ENVIRONMENT

UNIVERSITY COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY HYDERABAD

(Autonomous)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

KUKATPALLY, HYDERABAD-500 085,

TELANGANA STATE, INDIA.

CENTRE FOR ENVIRONMENT

UNIVERSITY COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY HYDERABAD
JAWAHARLALA NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY: HYDERABAD – 500 085.

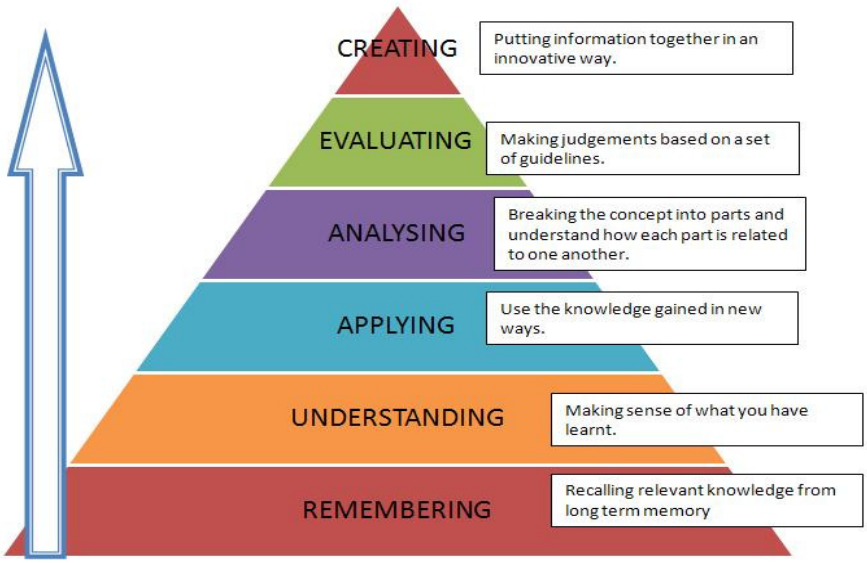
Vision:

- To disseminate advance knowledge by providing effective instruction and innovative research in environmental science and technology by promoting inter-disciplinary studies and research.
- To respond and to find technological solutions for pollution monitoring, abatement and control through innovation in environmental chemistry, environmental biotechnology and Environmental Geomatics.
- To maintain and develop liaison/collaboration with reputed universities, R&D organizations, industries and consultancy firms in India and abroad.

Mission:

- Producing highly motivated, technically competent, morally strong graduates with deep roots in our culture and with ability to respond to global challenges, thereby delighting all stakeholders namely parents, employers and humanity at large.
- To excel as a centre of Higher Education and Research in the field of Environmental Science & Technology.

Blooms Taxonomy:



ACADEMIC YEAR 2022-2023
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
CENTRE FOR ENVIRONMENT
UNIVERSITY COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY HYDERABAD
(Autonomous)

PROGRAM STRUCTURE AND SYLLABUS
M.Tech (ENVIRONMENTAL GEOMATICS)

PROGRAMME EDUCATION OBJECTIVES:

To provide the engineering graduates and science post graduates with technical expertise in Environmental Geomatics which will enable them to have a career and professional accomplishment by allowing them to work in multidisciplinary/interdisciplinary areas in the public or private sector.

The program educational objectives of the **M. Tech (Environmental Geomatics)** are:

- To provide students with fundamental knowledge and skills in the Geomatics discipline especially for Environmental protection and Management.
- To generate trained manpower in the applied areas of Environmental Geomatics, and prepare students for a profession in geospatial science and technology in concurrence with the policies of Government of India.
- To demonstrate knowledge and skills product interpretation, analysis, integration with GIS and GNSS and management of geospatial database for land parcels surveying, environmental planning and in EIA studies as per the norms of Ministry of Environment, Forest and Climate change.
- To acquire the ability to start entrepreneurship in the geospatial industry.
- To get involved with state, national, and international organizations, to place the students in their mission projects and industry employability.

PROGRAM OUTCOMES:

PO1: Ability to independently carry out research/investigation and development work to solve practical problems.

PO2: Ability to write and present a substantial technical report/document.

PO3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: To Train and make the student ready with appropriate skills and technologies with special reference to Geomatics industry and sustainable environment development.

OUTCOMES OF THE PROGRAMME:

By the time of their graduation, the students are expected to be able to:

1. An ability to independently carry out research/investigation and development work to solve practical problems.
2. An ability to write and present a substantial technical report/document.
3. Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
4. Understand the environmental, social and economic framework in which environmental management decisions are made understand the life cycle perspective, systems approach and environmental technologies for converting process, products and service related industrial environmental problems into opportunities to improve performance
5. Anticipate, recognize, evaluate, and control environmental issues in a variety of sectors and industries and liaison with federal, state, and local agencies and officials on issues pertaining to environmental protection
6. Recognize, evaluate, and control factors in the workplace and the environment that cause health and environmental hazards and utilize quantitative knowledge and skills and modern tools and technologies using Remote sensing, GIS & GPS to assess, analyze, plan, and implement environmental management systems
7. Engage in critical thinking and contribute to research in solving contemporary environmental problems with professional and ethical responsibility.
8. Pursue lifelong learning as a means of enhancing the knowledge and skills in environmental modeling.
9. Identify, formulate, analyze, and develop management systems and formulate solutions that are technically sound, economically feasible, and socially acceptable.
10. Communicate proficiently in writing and speaking for promoting and coordinating public consultations on environmental matters and for negotiating environmental service agreements and managing associated costs and revenues
11. Collaborate with environmental engineers, planners, technicians, and other specialists, and experts in to address environmental problems.
12. Find professional level employment or pursue higher studies and pursue research for contributing to the betterment of humanity and in shaping a sustainable society.

ACADEMIC YEAR 2022-2023

CENTRE FOR ENVIRONMENT

UNIVERSITY COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY HYDERABAD

(Autonomous)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. TECH. -ENVIRONMENTAL GEOMATICS
PROGRAM STRUCTRURE

M.Tech I Year I Semester

Course Number	Subject	Scheme of Studies Per Week			Credits	Int Marks	Ext Marks
		L	T	P			
1EGMC01	**Program Core -I** Surveying & Photogrammetric Engineering	3	0	0	3	40	60
1EGMC02	**Program Core- II** Remote Sensing of Environment	3	0	0	3	40	60
1EGMPE03	**Program Elective -I** 1) Digital Image Processing 2) Geodesy & GNSS 3) Smart Cities and GIS	3	0	0	3	40	60
1EGMPE04	**Program Elective -II** 1) DBMS and Programming Language 2) Geomatics for Climate Change& Sustainable Development 3) Advanced Photogrammetry	3	0	0	3	40	60
1A01	Research Methodology & Intellectual Property Rights	2	0	0	2	40	60
1A02	**Audit Course -I**	2	0	0	0	0	00
1EGML05	**Lab- I** Image Processing & Feature Extraction Lab	0	0	4	2	40	60
1EGML06	**Lab- II** Surveying & GNSS Lab	0	0	4	2	40	60
	Total Credits	**16**	**0**	**08**	**18**	**280**	**420**

M.Tech I Year - II Semester

Course Number	Subject	Scheme of Studies Per Week			Credits	Int Marks	Ext Marks
		L	T	P			
2EGMC07	**Program Core-III** Geographical Information System (GIS)	3	0	0	3	40	60
2EGMC08	**Program Core -IV** Spatial Data Analysis & Modeling	3	0	0	3	40	60
2EGMPE09	**Program Elective- III** 1) Environmental Impact Assessment (EIA) 2) Geo Visualization & Web Mapping 3) Satellites and Sensors	3	0	0	3	40	60
2EGMPE10	**Program Elective -IV** 1) Microwave Remote Sensing 2) Geo Statistics 3) Applied Geomatics	3	0	0	3	40	60
2A03	**Audit Course- II**	2	0	0	0	0	00
2EGML11	**Lab- III** GIS Lab	0	0	4	2	40	60
2EGML12	**Lab -IV** Applied Geomatics Lab	0	0	4	2	40	60
2EGM13	Mini Project with Seminar	0	0	4	2	100	00
	Total Credits	**14**	**0**	**12**	**18**	**340**	**360**

***Students are encouraged to go to Industrial Training/Internship for at least 2-3 months during semester break.**

M.Tech II Year - III Semester

Course No.	Subject	Scheme of Studies Periods Per Week			Credits	Int Marks	Ext Marks
		L	T	P			
3EGMPE14	**Program Elective- V** 1) Cadastral Land use Planning & Management 2) Programming with Open Source GIS 3) Geomatics for Disaster Risk Reduction & Management	3	0	0	3	40	60
3EGMOE15	**Open Elective- I** 1) Geomatics for Natural Resource Management 2) Remote sensing for Vegetation	3	0	0	3	40	60
	Dissertation / Project work						
	Project work Review - I	0	0	0	0	0	0
3EGM16	**Project work Review - II**	0	0	20	10	100	00
	Total Credits	**06**	**0**	**20**	**16**	**180**	**120**

M.Tech II Year – IV Semester

	Subject	Scheme of Studies Per Week			Credits	Int Marks	Ext Marks
		L	T	P			
4EGM 17	**Project work Review – III**	0	0	32	8	100	00
4EGM 18	**Project work Evaluation (Viva-Voce)**	0	0	0	8	00	100
	Total Credits	**0**	**0**	**32**	**16**	**100**	**100**

(**L**: Lecture Periods **T:** Tutorial periods **L**: Practical Periods)

TOTAL MARKS = 700+700+300+200 = 1900

TOTAL CREDITS OF THE PROGRAM = 68

- **Students going for Industrial Projects / Thesis will complete these courses through MOOCs**

LIST OF AUDIT COURSES

1A02 / 2A03: English for Research Paper Writing
1A02 / 2A03: Disaster Management
1A02 / 2A03: Sanskrit for Technical Knowledge
1A02 / 2A03: Value Education
1A02 / 2A03: Constitution of India
1A02 / 2A03: Pedagogy Studies
1A02 / 2A03: Stress Management by Yoga
1A02 / 2A03: Personality Development through Life Enlightenment Skills

M. TECH. -ENVIRONMENTAL GEOMATICS
PROGRAM SYLLUBUS

I YEAR - I SEMESTER

Course Title	**SURVEYING, PHOTOGRAMMETRIC ENGINEERING**		
Course code	1EGMC01	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Core I**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Discuss photogrammetric surveys related to hydrographic, mining and cadastral surveys. **CO2:** Demonstrate various surveying and mapping technologies connected with elevation, contour survey, trigonometric leveling. **CO3:** Focus on Modern surveying trends using GPS, ETS and digital cartography. **CO4:** Tabulate various types of aerial cameras in flight planning **CO5:** Evaluate parallax equations and height determinations.		
UNIT I: INTRODUCTION TO SURVEYING AND CARTOGRAPHY			
i. Datum and Reference System, horizontal datum and Vertical data ii. Topographical surveys, Photogrammetric surveys iii. Engineering surveys:- Hydrographic surveys, Mine surveys, Cadastral surveys			
UNIT II: SURVEYING AND MAPPING:			
i. Conventional mapping versus Digital mapping, list of mapping organizations, Classification of maps. ii. Control Survey: Horizontal, vertical and both, Contour survey and Depiction of heights. iii. Introduction to Elevation Determination, Systematic Errors in Differential Levelling iv. Random Errors In Differential Levelling, Error Propagation in Trigonometric Levelling v. Conversion of ellipsoidal heights to MSL.			
UNIT III: MODERN TRENDS IN SURVEYING AND MAPPING:			
i. Global Positioning System for ground control and extension, ii. Total station system for detail surveying			
UNIT IV: BASICS OF PHOTOGRAMMETRY:			
i. History of Photogrammetry, Definition and terminology, ii. Geometry and Types of photographs, Photographic scale, relief displacement, photographic overlaps, iii. Types of aerial cameras, Ground control, Photo mosaics. iv. Flight planning – Crab and drift – Computations for flight planning, v. Specification for Aerial Photography.			

UNIT V: STEREO PHOTOGRAMMETRY

i. Stereo photogrammetry introduction,
ii. Parallax equations and height determination
iii. Workflows in photogrammetry: Block adjustment, orthorectification.
iv. Overview on applications of Photogrammetry

Books Recommended

1. Geo-informatics for Environmental Management by M. Anji Reddy, BS Publications, 2nd edition, 2004.
2. Text book of Photogrammetry by P.R. Wolf, 2nd edition.
3. Surveying and Mapping, Volume I and II by David Clarke, 1996.
4. Manual of Photogrammetry – American society of Photogrammetry & R.S by Albert.D, 1952

Course Title	REMOTE SENSING OF ENVIRONMENT		
Course code	1 EGMC 02	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Core II**		
Course outcomes (COs)	**At the end of the course, The student will be able to** **CO1:**Appreciate the interaction of electromagnetic spectrum with atmospheric interactions on earth surface materials. **CO2:**Interpret remote sensing systems, sensors and their capabilities with varied resolutions. **CO3:**Extract different features from the satellite imageries and analyze various data products **CO4:**Discriminate factors affecting microwave measurements using various space and air borne radar systems **CO5:**Integrate application of multi spectral images in analysis of LULC and agricultural/Forest applications.		

UNIT I: BASIC PRINCIPLES

i. Introduction, Electromagnetic Remote Sensing Process, Physics of Radiant Energy:
ii. Nature of Electromagnetic Radiation, Electromagnetic Spectrum. Energy Source and its Characteristics,
iii. Atmospheric Interactions with Electromagnetic Radiation: Atmospheric Properties,
iv. Absorption Ozone, Atmospheric Effects on Spectral Response Patterns.

Energy Interactions with Earth's Surface Materials: Spectral Reflectance Curves. Cosine Law

UNIT II: REMOTE SENSING SYSTEM AND SENSOR PARAMETERS

i. Introduction, Satellite System Parameters: Instrumental Parameters, Viewing Parameters. Sensor Parameters, Spatial Resolution, Spectral Resolution, Radio metric resolution.
ii. Imaging Sensor Systems: Multispectral &imaging sensor systems,
iii. Thermal sensing systems, microwave image systems.

Latest Trends in Remote Sensing Platforms and sensors: Examples of different satellites and sensors

UNIT III: VISUAL IMAGE INTERPRETATION AND FEATURE EXTRACTION

i. Introduction, Types of Pictorial Data Products, Image interpretation strategy: Levels of Interpretation Keys.
ii. Process of Image Interpretation, Interpretation of Aerial Photo, General procedure for photo interpretation, Three-dimensional interpretation Method.
iii. Basic elements of Image Interpretation, Application of Aerial Photo Interpretation.
iv. Interpretation of Satellite Imagery, Key Elements of Visual Image Interpretation, Concept of Converging Evidence

UNIT IV: MICROWAVE AND HYPERSPECTRAL REMOTE SENSING:

i. Introduction, The Radar Principle, Factors affecting Microwave measurements: Surface roughness, Radars catering mechanism.
ii. Radar Wave binds, Side looking Airborne radar (SLAR) systems, Synthetic Aperture Radar (SAR).
iii. Spectroscopy, Hyper spectral vs. Multi spectral imaging, Spectral reflectance's, Spectra

Libraries – absorption process.

UNIT V: REMOTE SENSING APPLICATIONS

i. Advantages and Disadvantages of Remote Sensing, Applications of - Multi spectral and hyper spectral imaging.
ii. Geological and soil mapping, agriculture applications, forestry applications and water resources applications.

Books Recommended

1. M.Anji Reddy, Text book of Remote sensing and GIS by, BSP Publications, Hyderabad, 2001.
2. Lillesand, T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley and Sons, Inc, New York, 1987.
3. Remote Sensing: Principles and Interpretation by Floyd F. Sabins, 1997.
4. Remote Sensing of the Environment: An Earth Resource Perspective by John R. Jensen, 2009.

Course Title	DIGITAL IMAGE PROCESSING		
Course code	1 EGMPE03	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective I**		
Course outcomes (COs)	**At the end of the course, The student will be able to** **CO1:** Illustrate satellite data acquisitions, image display subsystems and file formats **CO2:**Correlate sensor calibration and image enhancement techniques **CO3:** Compare various image filtering techniques and arithmetic operations. **CO4**: Prioritize various techniques of image classification techniques for accuracy assessment. **CO5:** Give reasons for integration of GIS in image classification and software's related to image classification.		

UNIT I : DIGITAL COMPUTERS AND IMAGE PROCESSING

i. Introduction: Information Systems – Encoding and decoding, modulation.
ii. Satellite digital data – acquisition, storage and retrieval.
iii. Computer basics: Hardware and Software, Networks, Image Display Subsystem, Color Display System, Hard copy.
iv. Data Formats for Digital Satellite Imagery, Image file Format sub-system and Data Compression

UNIT II :PROCESSING OF REMOTE SENSING DATA AND IMAGE ENHANCEMENT TECHNIQUES

i. Cosmetic Operations- Missing Scan Lines, De –striping Methods, Geometric Corrections and Registration.
ii. Coordinate Transformations, Atmospheric Correction Methods, Illuminations and View Angle Effects,
iii. Sensor Calibration and Terrain Effects and radiometric correction methods.
iv. Introduction to image enhancement, Human Visual Systems, Contrast Enhancement- Linear Contrast Stretch, Histogram Equalization, Guassian Stretch, Pseudo Color Enhancement- Density Slicing, Pseudo Color Transform.

UNIT III: IMAGE TRANSFORMS AND IMAGE FILTERING TECHNIQUES

i. Introduction, Arithmetic Operations- Image Addition, Subtraction, Multiplication and Division.
ii. Empirically Based Image Transforms- Perpendicular Vegetation Index, Tasselled Cap Transformations, NDVI.
iii. PRINCIPAL COMPONENT ANALYSIS: Standard PCA, Noise Adjusted PCA, De-correlation Stretch, Hue -Saturation and Intensity Transform, Fourier Transform
iv. Introduction to image filtering, Low Pass Filters- Moving Average Filters, Median Filters, Adaptive Filters, High Pass Filters- Image Subtraction Method, Derivative Based Method, Frequency Domain Filters, Filtering for Edge Enhancement.

UNIT IV: IMAGE CLASSIFICATION AND ACCURACY ASSESSMENT

i. Introduction, Geometrical Basis of Classification,
ii. Unsupervised classification, Supervised Classification, Training Samples, Statistical Parameters and Classifiers, Other Approaches to Image Classification, Feature Selection, Contextual Information
iii. Image classification accuracy assessment, Performance analysis, Various Band Data for Land use, Land Cover Classification System with Case Studies.

UNIT V: DIGITAL DATA & GIS

i. Image Classification and GIS,
ii. Integration and Linkage. Software:
- ERDAS,
- EASI /PACE,
- Geomatica and ENVI.

Books Recommended

1. M. Anji Reddy, Y. Harishanker - Digital Image Processing, B.S. Publications, Hyderabad, 2nd edition.
2. John, R. Jensen, Introductory Digital Image Processing – Prentice Hall, New Jersey, 1986.
3. Robert, A. Schowengergt. Techniques for image processing and classification in Remote Sensing, 1983.
4. Hord, R.M. Digital Image Processing, Academic Press Pub. 1982.
5. Paul. M. Mather & Magaly Koch - Computer Processing of RS Images- An Introduction, Wiley Blackwell publication, 4th edition, 2011

Course Title	GEODESY & GNSS		
Course code	1 EGMPE03	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective I**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Illustrate the shape of the Earth Models and coordinate systems **CO2:** Summarize the GNSS and GPS technologies **CO3:** Formulate the GPS signals and formats **CO4**: Visualize the DGPS technology and functioning system **CO5:** Discuss the various applications related to GNSS & GPS Technology		

UNIT I : OVERVIEW ON GEODESY & GNSS

Definition of Geodesy- problems of Geodesy- Ellipsoid of Revolution- coordinate system of Rotational Ellipsoid and spatial Ellipsoid- computations on the Ellipsoid- Gravity- Satellite Geodesy, reference surface, Geoid models- Indian datum- World Geodetic System.

UNIT II : GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS):

Global Positioning System (GPS), Description of the System and their orbits, GPS measurement strategies; Advantages and limitations of GPS, reference frames and other space geodetic techniques (satellite & lunar laser ranging, VLBI, Doppler orbitography, GLONASS, GALILEO).

UNIT III: GPS SIGNAL STRUCTURE:

Carriers, GPS codes: C/A, P, navigational message, GPS receiver: Types and Structure of receivers, Principles of GPS position fixing: Pseudo ranging**.** Determination of GPS satellite coordinates, Types of ephemerides, Data Pre-processing, GPS data formats.

UNIT IV: DIFFERENTIAL GPS:

Principles of DGPS, Real Time Kinematics, Various modes and applications of DGPS, Enhancement of Accuracy.

UNIT V: APPLICATIONS:

Geodetic control surveys, Cadastral surveys, Photogrammetry, Remote sensing, Engineering and monitoring. Military applications, Geographical Information System, Vehicle tracking and car navigation, LBS and special applications.

Books Recommended

1. Linear Algebra, Geodesy and GPS, Gilbert strang Kai Borre, Wellesley- Cambridge press, 1997.
2. Satellite Geodesy by Gunter Seeber, 1st eition, Walter de gruzter Gmbtl & co.KG, 10785 Berlin, 1993.
3. Essentials of GPS by N.K. Agrawal, spatial network Pvt.Ltd. Hyderabad, 2004.
4. Geo-informatics for Environmental Management by M. Anji Reddy, BS Publications, 2nd edition, 2004.

Course Title	**SMART CITIES AND GIS**		
Course code	1 EGMPE 03	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective I**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Identifying the fundamentals of GIS, structure and usage. **CO2:**Examine the Data editing, analysis and output practices in GIS. **CO3:**Establish the data modelling in environmental problem solving and data relationship. **CO4:**Summarize the need of smart cities and role of Govt. and stake holders. **CO5:**Examine the smart cities spatial planning with case studies.		

UNIT I: FUNDAMENTALS OF GIS:

i. Introduction, Roots of GIS, Overview of Information System, The Four Ms, Contribution Disciplines, GIS Definitions and Terminology, GIS Queries, GIS Architecture, Theoretical Models of GIS. Theoretical Framework for GIS, GIS Categories, Levels/Scales of Measurement.

ii. GIS data Types, Spatial data models, Comparison of Raster and Vector models, and Topology.

iii. **GIS dataInput and Storage**: Introduction, The data stream, Data input methods: Keyboard entry, Manual digitizing, Scanning and automatic digitizing; GPS for GIS data capture; Storage of GIS database.

UNIT II: GIS DATA- EDITING, QUALITY, ANALYSIS AND OUTPUT:

i. Data editing, Detecting and correcting errors, Data reduction and generalization, Edge matching and Rubber sheeting. Components of data quality, Accuracy, Precision and resolution, Consistency, Completeness, Sources of error in GIS;

ii. Data Analysis- Format and Data medium conversion, spatial measurement methods, Reclassification, buffering techniques and overlay analysis; GIS output- Maps as output and graphical outputs. RS & GIS applications for environmental management: Forestry, Agriculture, water resources, urban & Geological studies

UNIT III: DATA MODELING

i. The state of GIS for Environmental Problem Solving, A Perspective on the State of Environmental Simulation Modeling, GIS and Environmental Modeling, The Role of Software Venders in Integrating GIS and Environmental Modeling, Cartographic Modeling, Scope of GIS and relationship to environmental modeling, data models and data quality

UNIT IV: SMART CITIES I

i. Benchmarks; Smart city scheme; Infrastructure pillars—Social, Physical, Institutional and Economic; Instruments; Demand; Citizen participation; Role of Government; conditions precedent for smart city development; Financial architecture; Industrial promotion;

ii. Smart city reference frame wok and Implementation framework; smart mobility; smart environment; smart living; role of GIS and smart services.

UNIT V: SMART CITIES II

i. smart city model; principles and spatial planning; Instrumentation; Transportation ; water distribution; sewage treatment; Waste management; Smart communication; Quality assurance; Resilience-- the use of IT; Energy efficiency; Optimisation techniques; Zero emissions; sustainability;

ii. **Case studies**: Singapore; India; Songdo; Lavasa; and Vienna.

Books Recommended

1. Atmospheric Chemistry and Physics: From Air Pollution to Climate Change, 2ndEdition, John H. Seinfeld and Spyros N. Pandis, 2006, ISBN 978-0-471-72018-8
2. Fundamentals of Atmospheric Modeling, 2nd Edition, Mark Z. Jacobson, 2005, ISBN 978-0-521-54865-6
3. Air Quality Modeling, Vol. I-III. Paolo Zannetti, EnviroComp/A&WMA.
4. Atmospheric Chemistry and Physics of Air Pollution. Seinfeld, John H., John Wiley and Sons, Inc., New York, 1986.

Introduction to Boundary Layer Meteorology. Stull, Roland B., Kluwer Academic Publishers,

Course Title	**DBMS AND PROGRAMMING LANGUAGE**		
Course code	1 EGMPE04	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective II**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Elaborate the database languages, applications and data base users. **CO2:**Summarize therelational database, SQL and intermediate SQL and its types. **CO3:**Formulate the database design And storage practices**.** **CO4:**Visualize the .Net platform and applications, C#, VB.NET software's. **CO5:**Discuss about the object oriented programming concepts.		

UNIT I: INTRODUCTION:

General:-Database System Applications- Purpose of Database System, View of Data, Database Languages, Relational Database, Database design, Data storage and querying, Transaction management, Database Architecture, Data mining and information retrieval, Database Users- Data-Administrators and History of Database systems.

UNIT II: RELATIONAL DATABASES:

Structure of Relational Databases, Database Schema, keys, Schema diagrams, Relational query languages and relational operations.

SQL: SQL data definition, Basic Structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Modification of the Database.

Intermediate SQL: Join expressions, views, transactions, integrity constraints, SQL data types and schemas and authorization.

UNIT III: DATABASE DESIGN and DATABASE STORAGE:

Overview of the design process, the entity- relationship model, ER- diagrams, features of good relational design, database design process.

Storage & File Structure: Overview of Physical Storage Media- Magnetic Disks- Flash Storage RAID, tertiary storage, File Organization- Organization of records in Files- Data-Dictionary storage, database buffer.

Indexing & Hashing: Basic Concepts- Ordered Indices- B^+ -Tree Index Files- B^+ -Tree extensions- Static Hashing- Dynamic Hashing, bitmap indices and index definition in SQL.

UNIT IV: INTRODUCTION TO .NET PLATFORM AND LANGUAGE FEATURES:

Understanding the .Net platform and its layers, components of .Net platform and its functions, structure of a .Net application.

Language fundamentals in C#, Control statements.

Language fundamentals in VB.NET, Features and Control statements.

UNIT V: OBJECT ORIENTED PROGRAMMING CONCEPTS:
Concepts of procedural programming, object oriented programming, classes, encapsulation, inheritance, polymorphism, understanding Csharp and VB.NET as object oriented programming languages.
Books Recommended: 1. Database System Concepts by Silberschatz- McGraw Hill Editon. 2. Database Management Systems by Gerald V Post- Tata Mc-Graw Hill edition. 3. Database Management Systems by Ramakrishnan- Tata Mc-Graw Hill edition**.** 4. **.**NET tutorial for Beginners by Microsoft professionals.

Course Title	GEOMATICS FOR CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT		
Course code	1 EGMPE 04	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective II**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Categorise the role of aerosols and radiative effects of aerosols on global climate change. **CO2:** Elaborate changes in global climate and evaluate climate change policies **CO3:**Debate the impact of ecosystem, water resources developmental planning and their adaption on climate change. **CO4:**Infer GHG management, inorganic carbon sequestration on mitigation of climate change. **CO5:**Recommend climate modelling and early warning systems using GST towards Sustainable development in view of SDG's		

UNIT I: INTRODUCTION TO CLIMATE CHANGE

i. Introduction to atmospheres: vertical structure and residence time.
ii. overview of aerosols, radiative effects of aerosols: direct and indirect; scattering and absorbing behaviour of aerosols
iii. Energy budget - and greenhouse effect
iv. Global climate change- Evidences and Observations of climate change; Ice and climate change; Isotope evidence

UNIT II: CLIMATE CHANGE GOVERNANCE, INTERNATIONAL POLICY AND LEGAL FRAMEWORK

i. Global Climate Change Governance
ii. Climate change finance sources: Challenges and opportunities to accessing and managing climate finance
iii. Evaluate climate change policies:
- UNFCCC and other entities
- Kyoto protocol, Paris agreement
- Climate negotiations

iv. National scenario: NAPCC, India's commitments (INDCs) and National Communication (NATCOM) initiative Policies and regulation: Important agencies and organizations

UNIT III: CLIMATE CHANGE IMPACTS AND ADAPTATION

i. Climate Change Adaptation: Importance of adaptation- Adaptation options.
ii. Linkages between climate change adaptation and development planning
iii. approaches to climate change impacts and adaptation practices for:
- ecosystems,
- land use,
- water resources and
- human health

iv. Green Engineering

UNIT IV: CLIMATE CHANGE MITIGATION

i. Mitigation options :
   - technological and economic mitigation strategies:

ii. Biological and Inorganic Carbon Sequestration
iii. GHG Management
iv. energy system transformation and renewable energy technologies
v. carbon trading and carbon offsetting.
vi. Key sectors for low carbon development.
vii. The basic concepts of life cycle assessment (LCA) and Life cycle cost assessment (LCCA), common tools for performing LCA and LCCA.

UNIT V: CLIMATE CHANGE EARLY WARNING SYSTEM & SUSTAINABLE DEVELOPMENT

i. Climate Modelling: global and regional climate models, its applications and importance. climate change projections.
ii. Climate Prediction and Early Warning System: Tools and Technologies
iii. Preparedness to Climate Change: Geospatial Approach
iv. Human Behaviour and Climate Change
v. Overview on SDG 2030:
vi. Sustainability: Need and concept, understanding sustainability and threats, Different types of tools for assessing sustainability in engineering.

References • Business and Climate – UNFCCC • GHG protocol – A Corporate Accounting and Reporting Standard • Kyoto Protocol – UNFCCC • Low carbon inclusive growth – GoI • Making Paris Work (Accepted Manuscript) • Fundamentals of Climate change • IPCC – Climate change Action, Trends and Implications for Business • India-Biennial report to UNFCC – 2015 • Global Warming – Six Indias • IPCC technical guidelines for assessing Climate change impacts and adaptation

TED talks • Can clouds buy us more time to solve climate change https://www.ted.com/talks/kate_marvel_can_clouds_buy_us_more_time_to_solve_climate_change • A critical look at Geoengineering against climate change - https://www.ted.com/talks/david_keith_s_surprising_ideas_on_climate_change • Let's prepare for our new climate(Adaptation) - https://www.ted.com/playlists/78/climate_change_oh_it_s_real

Documentaries • Before the flood (2016) • An inconvenient truth (2006) • National Geographic: Six Degrees Could Change the World (2007) • An Inconvenient Sequel: Truth to Power (2017)

1. Handbook of climate change mitigation & Adaptation - Chen.Y
2. National acts for climate change – MoEF

Course Title	ADVANCED PHOTOGRAMMETRY		
Course code	1 EGMPE 04	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective II**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Summarize digital photogrammetry Vis-à-vis Analogue photogrammetry, and various camera systems and principles of image scanning methods. **CO2:** Distinguish image measurement, scales, and digitizing methods. **CO3:** Justify procedures in image transformations, image matching techniques, and use of GPS in adjustments. **CO4:** Theorize principles of visualization in DEM, DTM & DSM. **CO5:** Prove role of LiDAR in range measurements and accuracies.		

UNIT I: INTRODUCTION TO DIGITAL PHOTOGRAMMETRY (DP)

i. Definition of Digital Photogrammetry & Its Development, Digital Photogrammetry Vis-À-Vis Analogue Photogrammetry, Advantages of Digital Photogrammetry,

ii. Hardware & Software Components of DPWS, Various Inputs for Digital Photogrammetry: Scanned Photo, Digital Camera Data, Remote Sensing Data, Lidar Data, Video Camera Data, Basic Consideration of Photogrammetric Scanners: Principle of Image Scanning, Configuration of Scanners, Method of Scanning, File Format and Size.

UNIT II: IMAGE MEASUREMENTS & THEIR REFINEMENT

i. 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.

ii. 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

i. Inner orientation (IO), Transformation& Its Suitability, Exterior Orientation (EO), Auto Tie Point Generation, Digital Image Matching Process: Area Based, Feature and Relation Based, Co linearity Conditions, Block Triangulation Method and Adjustment, Simultaneous Solution for unknowns in a Block, Space Resection Method, Space Forward Intersection. Use Of GPS And IMU in Digital Photogrammetry

UNIT IV: 3D VISUALIZATION & STEREO-COMPILATION

i. Principle and Method of 3d Visualization: Anaglyph, Polarized and Hybrid Techniques, Feature Extraction, Feature Coding, Data Model and Feature Class.

ii. 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 Ortho-Photo Generation and its uses.

UNIT V: AIR BORNE LASER TERRAIN MAPPING (LiDAR):

i. Introduction to Laser, Principle of LiDAR, System Components, Range Measurements, LiDAR Error Sources, LiDAR Accuracy, Applications & Advantages.

Books Recommended

1. Elements of Photogrammetry- Paul r. wolf, 2nd edition, 1983.
2. Elements of Photogrammetry with application in GIS (3rd edition)- Paul Wolf&Bon Dewitt, Benjamin Wilkinson, McGraw-Hill companies, incorporated, 2013, 4th edition.

Reference: -

1. Manual of Photogrammetry – American society of Photogrammetry & R.S by Albert.D, 1952.
2. Digital Photogrammetry – A practical course by Wilfried Linder, 3rd edition, Springer, 2009.
3. Digital Photogrammetry by – Y. Egels & Michel Kasser, Taylor & Francis group, 2002.
4. Geographic information systems an introduction by – Tor Bernhardsen, 3rd edition, John Wiley & Sons, Newyork, 2009.

Course Title	IMAGE PROCESSING AND FEATURE EXTRACTION LAB		
Course code	1 EGML 05	No. of credits	02
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**LABORATORY I**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Isolate the various thematic layers using SoI toposheets and satellite images **CO2:**Will be exposed to various pre & post processing of satellite images. **CO3:** Determine the image processing techniques and implementation in preparation of various maps. **CO4:**Establish the error free satellite images for classification **CO5**: Evaluate the different features in the satellite image and its classification categories for preparation of LU/LC maps		

THEMATIC MAPPING:

- Study of Toposheet
- Base map preparation
- Road network
- Drainage
- Watershed
- Slope
- Land use/land cover
- Geomorphology

DIGITAL IMAGE PROCESSING on ERDAS, Arc GIS and ENVI:

- Loading of digital data and extraction of study area
- Geometric Correction
- Image rectification
- Filtering Techniques
- Image classification - Supervised and Unsupervised Classification
- Map Composition and Output Generation

Course Title	**SURVEYING AND GNSS LAB**		
Course code	1 EGML 06	No. of credits	02
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**LABORATORY II**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Illustrate the importance of GNSS technology. **CO2:** Plan and perform the survey using GPS and DGPS. **CO3:** Establish the survey information using GNSS technology and preparation of maps. **CO4:** Plan & survey using Total station **CO5:** Preparation of complete map using surveyed information/data.		
GNSS:			
• Alignment survey by handheld GPS, • Arrangement of rover and Base stations, Survey Estimation using RTK & PPK modes, Field surveying/ studies using DGPS and Recording data and plotting. • Processing of GPS&DGPS survey data with GIS software • Electronic Total Station (ETS): Survey using Total Station, Recording data and plotting			

Course Title	RESEARCH METHODOLOGY & IPR		
Course code	1A01	No. of credits	02
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**RM & IPR**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Understand research problemformulation. **CO2:** Analyze research relatedinformation, Follow researchethics **CO3:**Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, andcreativity. **CO4**: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering inparticular. **CO5:**Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and socialbenefits.		

UNIT I :

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II :

Effective literature studies approach, analysis Plagiarism, Research ethics,
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT III:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT IV:

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT V:

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Books Recommended

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineeringstudents'"

2. Wayne Goddard and Stuart Melville, “Research Methodology: AnIntroduction”
3. Ranjit Kumar, 2 nd Edition, “Research Methodology: A Step by Step Guide forbeginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall , “Industrial Design”, McGraw Hill,1992.
6. Niebel , “Product Design”, McGraw Hill,1974.
7. Asimov, “Introduction to Design”, Prentice Hall,1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”,2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand,2008

M. TECH. -ENVIRONMENTAL GEOMATICS
COURSE STRUCTRURE
I YEAR
II SEMESTER

Course Title	**GEOGRAPHICAL INFORMATION SYSTEMS (GIS)**		
Course code	2EGMC 07	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Core III**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Illustrate Fundamental operations of GIS in Mapping, Data structure, and analysis of spatial and attribute data. **CO2:** Correlate directionality and spatial arrangement of liner, Theisen polygons, in measuring distances. **CO3:**Discriminate surface mapping and digital elevation models, choropleth maps, and overlay analysis. **CO4:**Theorize role of GIS in environmental and cartographic modeling. **CO5:**Compare integrated hydrological and water quality mapping with respect to watersheds. Compare impact of industrial sites on environment and ecological modeling.		
UNIT I: FUNDAMENTALS OF GIS:			
i. Map – scale, projection and symbolism. GIS - Introduction, definition and terminology, categories, components, fundamental operations, functional elements. ii. Data structures, data models, GIS data, acquisition, input, storage, output generation. Data preprocessing, database management, integrated analysis of spatial and attribute data.			
UNIT II: GIS SPATIAL ANALYSIS, MEASUREMENT AND SPATIAL ARRANGEMENT:			
i. Introduction, defining spatial objects - point, line and area objects based on their attributes, higher level point, line and area objects. Measuring length of linear objects, measuring polygons, measuring shape, measuring distance. ii. Classification – Principles, Neighborhood functions, Polygonal neighborhoods, Buffers. Spatial Arrangement -Point patterns, Theisen Polygons, Area patterns, Linear patterns, Directionality of Linear and Areal objects, Connectivity of Linear objects, Routing and allocation.			
UNIT III: STATISTICAL SURFACES AND OVERLAYANALYSIS:			
i. Surface mapping, sampling the statistical surface, Digital Elevation Model (DEM). Interpolation- linear and non-linear, uses and problems. ii. Terrain reclassification – steepness of slope, aspect, shape or form. Discrete surfaces - dot distribution maps, choropleth maps. Cartographic overlay, point-in-polygon and line-in-polygon operations, Polygon overlay, Automating point-in-polygon and line-in-polygon procedures in Raster, Automating Polygon overlay in Raster, Automating vector overlay, types of overlay.			

UNIT IV: DATA MODELING:

i. The state of GIS for Environmental Problem Solving, A Perspective on the State of Environmental Simulation Modeling, GIS and Environmental Modeling

ii. The Role of Software Venders in Integrating GIS and Environmental Modeling, Cartographic Modeling, Scope of GIS and relationship to environmental modeling, data models and data quality.

UNIT V: INTEGRATED MODELING USING GIS:

i. Hydrological Modelling - water quality modelling, watershed management and modelling, saltwater intrusion models.

ii. Land-surface-subsurface Process Modelling- pipeline alignment studies, solid and hazardous waste disposal site selection,

iii. Zoning atlas for industrial siting, environmental information system development. Ecosystem modelling, risk and hazard modelling.

Books Recommended

1. M.Anji Reddy, Text book of Remote sensing and GIS by, BSP Publications, Hyderabad, fourth edition..
2. Fundamentals of Geographic Information Systems by Michael N DeMers. Published By john Wiley & Sons Inc., 3rd edition, 2008.
3. Environmental Modeling with GIS, Michael F. Autor Goodchild, Bradley O. Parks, Louis T. Stewart, publisher- Oxford university press, 1993.
4. Geographic Information Systems: A Management Perspective by Stan Arnoff, WDL publications, 1989.

Course Title	**SPATIAL DATA ANALYSIS & MODELLING**		
Course code	2EGMC 08	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Core IV**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Illustrate Fundamental operations of GIS in Mapping, Data structure, and analysis of spatial and attribute data. **CO2:** Correlate directionality and spatial arrangement of liner, theissen polygons, in measuring distances. **CO3:**Discriminate surface mapping and digital elevation models, choropleth maps, and overlay analysis. **CO4:**Theorize role of GIS in environmental and cartographic modeling. **CO5:**Compare integrated hydrological and water quality mapping with respect to watersheds. Compare impact of industrial sites on environment and ecological modeling.		

UNIT I: VECTOR DATA ANALYSIS AND RASTER DATA ANALYSIS:

Buffering, Overlay, Distance Measurement, Pattern Analysis, Map Manipulation.
Data Analysis Environment, Local Operations, Neighborhood Operations, Zonal Operations, Physical Distance Measure Operations, Other Raster Data Operations, Comparison of Vector- and Raster-Based Data Analysis

UNIT II: TERRAIN MAPPING AND ANALYSIS, VIEWSHEDS AND WATERSHEDS

Data for Terrain Mapping and Analysis, terrain Mapping, slope and Aspect, Surface, Curvature, Raster Versus TIN.
View shed Analysis, Parameters of View shed Analysis, Application of View shed Analysis, Watershed Analysis, Factors Influencing Watershed Analysis, Applications of Watershed Analysis

UNIT III: SPATIAL INTERPOLATION, GEOCODING AND DYNAMIC SEGMENTATION:

Elements of Spatial Interpolation, Global Methods, Local Methods, Kriging, Comparison of Spatial Interpolation.
Geocoding, Application of Geocoding, Dynamic Segmentation, Application of Dynamic Segmentation.

UNIT IV: PATH ANALYSIS AND NETWORK APPLICATIONS:

Path Analysis, Application of path Analysis, Network, Putting Together a Network, Network Application.

UNIT V: GIS MODELS AND MODELING:

Basic Elements of GIS Modeling, Binary Models, Index Models, Regression, Models, Process Models.

Books Recommended

1. Fundamentals of GIS by MICHAEL N DEMERS. Published By john Wiley & Sons Inc.
2. Environmental Modelling with GIS, Michael F. Goodchild, Bradley O. Parks, Louis T. Steyaert
3. Introduction to Geographic Information Systems by Kang-Tsung Chang (TATA McGRAW-HILL EDITION).
4. Ormsby T.E. Napoleon,R.Burke,C.groessl,L.Feaster 2004.Getting to know Arc GIS Desktop,ESRI Press
5. Burke R.T.Tilton,A.Arana 2003 Getting to Know ArcObjects.ESRI Press

Course Title	ENVIRONMENTAL IMPACT ASSESSMENT (EIA)		
Course code	2 EGM PE 09	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective III**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Direct, Indirect, cumulative and induced environmental impacts at Regional, sectoral and project level. **CO2:**Data products, thematic maps, collateral data in planning and management of baseline data acquisition. **CO3:**Screening of environmental clearance, for category B&B2 industries and feasibility studies. **CO4:**Predicting impact of Air, Water, Noise, Socio economic status on environment. **CO5:**Environmental management plans on emission controls and green belt development and hazardous wastes.		

UNIT I: CONCEPTUAL FACTS OF EIA

i. Introduction, Definition and Scope of EIA, Objectives in EIA, Basic EIA Principles, and Classification of EIA: Strategic EIA (SEIA), Regional EIA, Sectoral EIA, Project Level EIA and Life Cycle Assessment, Project Cycle, Grouping of Environmental Impacts: Direct Impacts, Indirect Impacts, Cumulative Impacts and Induced Impacts. Significance of Impacts: Criteria/Methodology to Determine the Significance of the Identified Impacts.

UNIT II: BASELINE DATA ACQUISITION, PLANNING AND MANAGEMENT OF IMPACT STUDIES

i. Environmental Inventory, Data Products and Sources: thematic data, topographical data, collateral data and field data. Environmental Baseline Monitoring (EBM), Preliminary Study to determine impact significance, Environmental Monitoring network Design, Monitoring Stations, Air quality data acquisition, Water Quality data acquisition, soil data, socioeconomic data and biological data acquisition. Impact on Environmental Components: Significance of Impacts, Criteria to determine the significance of the identified Impacts.

ii. Conceptual Approach for Environmental Impact Studies, Proposal Development, Interdisciplinary Team Formations, Team Leader Selection and Duties, General Study Management, Fiscal Control.

UNIT III: OPERATIONAL ASPECTS OF EIA AND METHODS FOR IMPACT IDENTIFICATION

i. Screening: Application for Prior Screening for Environmental Clearance, Screening Criteria Category A Projects, Category B Projects, Criteria for Classification of Category B1 and B2 Projects, Consistency with other Requirements and Siting Guidelines. Scoping: Identification of Appropriate Valued Environmental Components (VEC), Identification of Impacts Information in Form 1, Structure of a Pre-feasibility Report. Public consultation: Appraisal Decision Making, Post-clearance Monitoring Protocol.

ii. Background Information, Interaction-Matrix Methodologies: simple matrices, stepped matrices, development of a simple matrix, other types of matrices, summary observations or

matrices, Network Methodologies: Checklist methodologies, simple checklists, descriptive Checklists, summary observations on simple and descriptive Checklists.

UNIT IV: PREDICTION OF IMPACTS (AIR-WATER- NOISE- BIOLOGICAL AND SOCIO-ECONOMIC)

i. **Air Environment:** Basic information on air quality, Sources of Pollutants, effects of pollutions, Conceptual approach for addressing air environment impacts, Air quality standards, Impact Prediction, Impact significance.

ii. **Water Environment:** Basic Information on surface-Water Quantity and Quality, Conceptual Approach for Addressing Surface-Water-Environment Impacts, Identification of Surface-Water Quantity or Quality Impacts, Procurement of Relevant Surface-Water Quantity-Quality Standards, Impact Predictions, Assessment of Impact Significance.

iii. **Noise Environment:** Basic Information on Noise Key Federal Legislation and Guidelines, Conceptual Approach for Addressing Noise-Environment Impacts, Identification of Noise Impacts, Procurement of Relevant Noise Standards and/or Guidelines, Impact Prediction, Assessment of Impact Significance.

iv. **Biological Environment:** Basic Information on Biological Systems, Conceptual Approach for Addressing Biological Impacts, Identification of Biological Impacts, Description of Existing Biological Environment Conditions.

v. **Socio-Economic Environment:** Procurement of Relevant Legislation and Regulations, Impact Prediction, Assessment of Impact Significance.

UNIT V: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

i. Case Study, identification of Impacts, EMP for Air Environment: Dust Control Plan, Procedural Changes, Diesel Generator Set Emission Control Measures, Vehicle Emission Controls and Alternatives, Greenbelt Development. EMP for Noise Environment,

ii. EMP for Water Environment: Water Source Development, Minimizing Water Consumption, Domestic and Commercial Usage, Horticulture, Storm Water Management. EMP for land Environment: Construction Debris, hazardous Waste, Waste from temporary Labour settlements.

Books Recommended

i. Textbook of Environmental Science & Technology by M.Anji Reddy, BS Publications, 2010

ii. Technological guidance manuals of EIA. MoEF.

iii. Environmental Impact Assessment by Harry W. Canter, McGraw Hill, 1996, 2nd edition.

iv. Man and Environment D.H.Carson 1976 Interactions Part I and III.

v. Environmental Impact Assessment, 2003, Y.Anjaneyulu, B.S Publications

vi. Erickson, P.A.1979 Environmental Impact Assessment Principles and applications

vii. Basic Concepts in Remote Sensing & Arial Photogrammetry Lillesand & Keifer Printice Hall Intl., 1994.

viii. Renewable Energy: environment and development, Maheswar Dayal, Konark Publishers, 1989

Course Title	GEO VISUALIZATION & WEB MAPPING		
Course code	2 EGM PE 09	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective III**		
Course Program outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Understanding Spatial and Non Spatial Databaes, Architecture and Quires **CO2:**Projections, Datums, Concepts of Geo-Visualization **CO3:**Basics of web-designing software, Cartography, and spatio temporal databases. **CO4:**Vector layers, Java Script, Classification of Web Hardware **CO5:**Conceptualization of Web Mapping and 2D 3D mapping advantage, with cloud source.		

UNIT I:

Role of GIS in understanding visual communication., Spatial Databases, Attribute Databases, SQL Databases, Schema and Architecture of Databases, Understanding Spatial Quires.

UNIT II:

Transformation and Projection of Databases, Maps Design, Layout, linking nonspatial databases to maps. Concepts and Basics of Cartography. Projections, Datums, and Geoid. Geo-visualization, Spatial Query, and User Interaction, Geo-visualization and Interactive Transformation, Basic concepts of cartography and Geo-Visualization. Visualization and spatiotemporal phenomenon.

UNIT III:

Basics of Web Programming**,** System Architecture for Web Programming,Basics of Java Script in Web Programming, Spatial Data for Web Mapping, symbolize and sharing of geographic data on the Web, Classification of spatial web hardware and software architecture.

UNIT IV:

Basics of ArcGIS Online AGOL Basics,Web GIS layers, Maps, and Apps and Hosted Feature Layers.Common Web Mapping Software (Proprietary and Open Source), Considerations for Choosing Software, Basics of Data Publishing.

UNIT V:

Understanding collaborative and static web maps,Cloud sourcing, Integrating Web maps with cloud, Nature of 2D and 3D mapping procedures, Mobile mapping on Android platform, 3D modeling of satellite data.

Books Recommended

1. Kraak, M.-J. & Ormeling, F.J., Cartography: Visualization of Spatial Data. Third edition.
2. Abingdon, Oxon & New York, 2013, NY: Routledge. ISBN 9781317903116.
3. Mastering HTML, CSS & Javascript Web Publishing Paperback – 15 Jul 2016, by Laura Lemay (Author), Rafe Colburn (Author), Jennifer Kyrnin (Author).
4. Thematic Cartography and Geovisualization: International Edition Paperback– Import, 8 May 2009. by Terry A. Slocum (Author), Robert B McMaster (Author), Fritz C Kessler (Author), Hugh H Howard (Author).

5. Thematic Cartography and Geovisualization, 3rd Edition 3rd Edition, by Terry A. Slocum (Author), Robert B. McMaster (Author), Fritz C. Kessler (Author), Hugh H. Howard (Author)
6. Exploring Geovisualization (International Cartographic Association) HAR/CDR Editionby J. Dykes (Author), A.M. MacEachren (Author), M.-J. Kraak (Author).
7. Thematic Cartography and Geovisualization, 3rd Edition 3rd Edition, by Terry A. Slocum (Author), Robert B. McMaster (Author), Fritz C. Kessler (Author), Hugh H. Howard (Author).

Course Title	**SATELLITE AND SENSORS**		
Course code	2 EGM PE 09	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective III**		
Course Program outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Demonstrate the satellite orbits, sensor and its characteristics. **CO2:**Examine the types of satellites and history. Indian satellite missions. **CO3:**Estimate the satellite system parameters, platforms and sensor systems. **CO4:**Elaborate the INSAT, IRS and RADAR, GAGAn systems. **CO5:**Discuss the usage / applications of various satellites and sensors.		

UNIT I:INTRODUCTION :

An Overview of Remote Sensing from Space, Introduction to Electromagnetic Radiation, Basic Characteristics of Satellite Remote Sensing Systems - Satellite orbits- sensor attributes and observational characteristics, observational categories and corresponding Sensor.
Ocean Remote Sensing Systems-- Visible – Near Infrared Ocean Color- Thermal Infrared, Passive Microwave Radiometers, Scatterometers, Altimeters, Synthetic Aperture Radar

UNIT II:SATELLITE ORBITS AND MISSIONS :

Satellite orbits, classification of satellites, Types of satellites, satellite system infrastructure, History of Satellites, Satellite launch vehicle fleet, Indian Satellite missions namely-PSLV-C28, GSAT-16, PSLV-C27/IRNSS-1D, Mars Orbiter Mission and LVM3-X (CARE).

UNIT III:SENSORS AND PLATFORMS :

Introduction, satellite system parameters- instrumental and Viewing, Sensors- Active and passive, classification, sensor parameters- spatial, spectral and radiometric resolutions, Platforms- Airborne and Space borne, constraints of satellite geometry, effects of the local environment, common orbits and details of elevation angle and ground area, types of Scanners

UNIT IV:SATELLITE PROGRAM'S:

INSAT series, IRS series, RADAR imaging satellites, other satellites, GAGAN & IRNSS satellite navigation system, Extra terrestrial exploration- chandrayaan-1 and 2 & Mangalayaan, International cooperation of ISRO, future projects of ISRO.

UNIT V: APPLICATIONS :

Telecommunication, Resource management, Military, Academic, Telemedicine, Biodiversity Information System, Cartography, Navigation, Ocean / Marine studies and other applications.

Text books:

1. M.Anji Reddy, Text book of Remote sensing and GIS by, BSP Publications, Hyderabad, 2001.
2. Principles of Remote sensing, An introductory Text book by the international institute for Geo-Information sciences and Earth Observation (ITC).
3. Satellite Technology: Principles and Applications, 2nd Edition, Anil K. Maini, Varsha Agrawal, ISBN: 978-1-119-95727-0694 pages, June 2011.

Course Title	MICROWAVE REMOTE SENSING		
Course code	2EGM PE 10	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective IV**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Illustrate components of Radar System and factors affecting Microwave measurements. **CO2:** Interpret characteristics of Side looking Airborne Radar on relief, soil, vegetation and urban response. **CO3:** Infer Passive Microwave radiometers on various ocean bound satellites **CO4:** Categorize Hyperspectral and Microwave images and their spectral reflectance curves. **CO5:** Choose Hyperspectral images for environmental management.		

UNIT I: INTRODUCTION TO MICROWAVE REMOTE SENSING

i. Definition, Radiometric Quantities, Radar System Components, Source of Radiation, Radar Wave Bands, RADAR Equation
ii. Factors Affecting Microwave Measurement, Beam Polarization and Look Angle.

UNIT II: SLAR, CHARACTERISTICS AND INTERPRETATION OF SLAR IMAGERY

i. Definition, Radar working principle, range resolution, azimuth resolution, swath width resolution and SAR systems.
ii. Slant range scale distortion, ground range geometry, image displacement due to relief, layover, fore shorting, shadow and speckle.
iii. Geometric characteristics, Electrical characteristics, Effects of polarization, Soil response, Vegetation response, urban area response.

UNIT III: MICROWAVE SENSORS AND SATELLITES

i. Passive microwave radiometers SEASAT, SIR, ALMAZ, ERS, ENVISAT, JERS, ALOS, RADARSAT
ii. Applications of microwave remote sensing

UNIT IV: HYPER SPECTRAL REMOTE SENSING

i. Hyper spectral imaging, imaging spectrometers, principles of spectroscopy
ii. Hyper spectral vs multi spectral imaging.
iii. Spectral reflectance, spectral libraries, absorption process, analysis of spectral curve.

UNIT V: SATELLITES AND APPLICATIONS

i. Hyper spectral satellite systems viz., AVIRIS, HYMAP, HYPERION
ii. Applications of Hyper Spectral Remote Sensing in the field of Environmental management.

Books Recommended

i. Textbook of Remote Sensing and Geographical Information Systems M.Anji Reddy, BS Publication, 3rd edition, 2008.
ii. Remote sensing and Image interpretation by Thomas Lilliesand and Ralphw. Keifer Published by John Wiley &Sons.6th edition, 2007.
iii. Remote sensing-Principles and interpretation by Floyd F Sabins.Jr. Published by Freeman & Co., New York, 3rd edition, 2003.

Course Title	GEOSTATISTICS		
Course code	2EGM PE 10	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective IV**		
Course outcomes (COs)	**CO1:**Examine the statistics applications and frequency. **CO2:**Establish the measurement and its analysis process in standard deviation etc. **CO3:**Estimate the probability studies and error sources. **CO4:**Examine the correlations and regressions **CO5:**Organize the test significance and statistical process control		

UNIT I: INTRODUCTION AND FREQUENCY DISTRIBUTION:

Types of proof, Generality of Applications of statistics, Examples of statistical problems
Raw data, Arrays, Frequency Distributions, Class interval and Class limits, Class boundaries, Size, width of a class interval, class mark, general rules for forming frequency distributions,
Histograms and frequency polygons, relative frequency distributions, cumulative frequency distributions and Ogives, Relative cumulative-frequency distribution and percentage Ogives, frequency curves and smoothed Ogives, types of frequency curves

UNIT II: MEASUREMENTS AND THEIR ANALYSIS:

Introduction, Sample Versus Population, Range and Median, Graphical Representation of Data, Numerical Methods of Describing Data, Measures of Central Tendency, Standard deviation and other measures of Dispersion.

UNIT III: RANDOM ERROR THEORY AND CONFIDENCE INTERVAL:

Introduction, Theory of Probability, Properties of the Normal Distribution Function, Probability of the Standard Error, Uses of Percent Errors, Moments, Skewness and Kurtosis
Introduction, Distributions used in Sampling Theory, Confidence Interval for the Mean, Sampling, its uses, some sampling distributions, Analysis of Variance

UNIT IV: CORRELATION AND REGRESSION:

Curve fitting and the method of Least squares, Correlation theory, Multiple and partial correlations, Linear regression, Multiple regression, R^2, regression modeling.

UNIT V: STATISTICAL TESTING AND STATISTICAL ANALYSIS:

Tests of significance, Chi-square and F-test, Non parametric tests, t-tests.
Analysis of Time series, Statistical Process control and Process capability

Books Recommended

1. Theory and Problems of STATISTICS by Murray R. Spiegel and Larry J. Stephens
2. Basics Statistics by B.L.Agarwal
3. Introduction to statistical Analysis by Wilfred J. Dixon and Frank J. Massey JR

Course Title	APPLIED GEOMATICS		
Course code	2EGM PE 10	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective IV**		
Course outcomes (COs)	**At the end of the course, The student will be able to** **CO1**Validate Air and space borne sensors with respect to spectral and radiometric resolutions. Appraise satellite navigation systems, outer space explorations, Chadrayan and Mangalyan. **CO2:**Formulate spectral information in estimation of vegetative indexes, precision agriculture, and crop and forest management. **CO3:**Illustrate role of remote sensing and GIS in Geological mapping, and identification of spectral signature on mining. **CO4:**Assess crop type classification and estimates, watershed impact on soil erosion and water quality modeling. **CO5:**Analyze spectral response on upland and wetland vegetation ecosystem, urban and municipal solid waste studies.		

UNIT I: SENSORS AND SATELLITES

SENSORS AND PLATFORMS

i. Introduction, satellite system parameters- instrumental and Viewing, Sensors- Active and passive, classification, sensor parameters- spatial, spectral and radiometric resolutions
ii. Platforms- Airborne and Space borne, constraints of satellite geometry, effects of the local environment, common orbits and details of elevation angle and ground area, types of Scanners

SATELLITE PROGRAM'S

i. INSAT series, IRS series, RADAR imaging satellites, other satellites, GAGAN & IRNSS satellite navigation system
ii. Extra terrestrial exploration- chandrayaan-1 and 2 & Mangalayaan, International cooperation of ISRO, future projects of ISRO

UNIT II: SPECTRAL INFORMATION FOR SENSING VEGETATION & APPLICATIONS

SPECTRAL INFORMATION FOR SENSING VEGETATION

i. Estimation of Vegetation Cove: Spectral Indices -Vegetation indices and vegetation descriptors.
ii. Microwave vegetation indices- estimation of vegetation using Lidar.

INTEGRATED APPLICATIONS

i. Detection and diagnosis of plant stress.
ii. Precision agriculture and crop management
iii. Ecosystems and Forestry Management.

UNIT III: SOIL SCIENCES

i. Role of Remote sensing and GIS in geological studies and case studies. Evaluation of Geological Mapping
ii. Introduction to Prospection Techniques, History of Remote Sensing in Geological Exploration. Image Lineaments and structural origin, Prospecting, Applications of thermal and Radar remote sensing in structural geology.
iii. Spectral response of Minerals, Rocks, Alterites, case studies

UNIT IV: WATER RESOURCES, AGRICULTURE AND FORESTRY

i. The hydrological cycle, Hillslope hydrology, The drainage basin, Channel networks, Automatic derivation of catchment characteristics, The global cycle.Ground water exploration and targeting. Introduction, Characteristics, Watershed and people, Watershed characteristics, watershed management and Integrated approach for sustainable planning. Water quality modeling. Watershed Management in India, Case studies.
ii. Soil and altitude, Soil and aspect, Soil and slopes, Soil landscapes, Soil erosion modeling.
iii. Crop type classification, area estimates, and spectral response of different crops. Crop diseases and Assessment, Crop and Water management and monitoring. Advances in Crop monitoring.

UNIT V: RESPONSE OF ECOLOGICAL FACTORS AND IMPACT STUDIES, MODELLING

i. Spectral response of vegetation and mapping, Ecosystem Analysis, Environmental impact analysis and monitoring, Ecosystem modeling,
ii. Wetland mapping.
iii. Urban growth studies
iv. Municipal solid waste studies
v. Land use land cover change detection studies
vi. Spatial Models of Ecological Systems and Process

Books Recommended

1. M.Anji Reddy, Text book of Remote sensing and GIS by, BSP Publications, Hyderabad, 2001.
2. Principles of Remote sensing, An introductory Text book by the international institute fo Geo-Information sciences and Earth Observation (ITC).
3. Satellite Technology: Principles and Applications, 2nd Edition, Anil K. Maini, Varsha Agrawal, ISBN: 978-1-119-95727-0694 pages, June 2011.

Course Title	GIS LAB		
Course code	2 EGML 11	No. of credits	02
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**LABORATORY III**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Planning survey using total station and hand held GPS. **CO2:** Describe scale, projection, and coordinate systems and explain importance of each in GIS **CO3:** Creating Vector data and attribute linking **CO4**: Establish theMap composition and output generation **CO5:** Evaluate the spectral signatures of individual bodies.		

GIS : Arc GIS Software-

- Scanning of maps using software
- Creating GIS data using Arc Catalog
- On Screen Digitization using Arc Map
- Addition of Attribute data to a feature class
- GPS linkage and data entry
- Data editing, manipulation and analysis using ARC GIS software
- Map Composition and Output Generation using ArcGIS software.

Dealing with open source GIS : QGIS

Course Title	APPLIED GEOMATICS LAB		
Course code	2 EGML 12	No. of credits	02
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**LABORATORY IV**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Describe scale, projection, and coordinate systems and explain importance of each in GIS **CO2:**Creating Vector data and attribute linking, Map composition and output generation **CO3:**Gives better maps for easy estimation of environmental parameter changes and its consequences. **CO4:**Estimation of change detection and its factors. **CO5:**Evaluation of crop suitability, solid waste dumping site selection and lake restoration capacity.		

Exercise using Geomatica, ERDAS, ArcGIS, iGIS software and using different satellite datasets viz. High, Medium, Low… for

i. Watershed development
ii. Forest information& change
iii. Agricultural information
iv. Preparation of Village Information System
v. Irrigation system
vi. Urban Expansion studies
vii. Land use Land cover assessment studies

Site suitability studies for

i. Crop
ii. Solid waste
iii. Water harvesting
iv. Lake restoration

Course Title	MINI PROJECT WITH SEMINAR		
Course code	2EGM13	No. of credits	02
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	Mini Project with Seminar		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1**: Students will get an opportunity to work in actual industrial environment if they opt for internship. **CO2:** In case of mini project, they will solve a live problem using software/analytical/computational tools. **CO3:** Study different techniques used to analyze complex systems **CO4:** Students will learn to write technical reports. **CO5:** Students will develop skills to present and defend their work in front of technically qualified audience.		

The mini project will be based on the work done during the industrial training/internshipof two months provided during semester break.

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done

1. Along with the report on identification of topic for the workand
2. The methodology adopted involving scientific research, collection and analysis ofdata,
3. Determining solutions highlighting individuals'contribution.

Continuous assessment of Mini Project at Mid Semester and End Semester will be monitored by the departmental committee.

M. TECH. -ENVIRONMENTAL GEOMATICS
COURSE STRUCTRURE
II YEAR /
III SEMESTER

Course Title	**CADASTRAL, LAND USE PLANNING AND MANAGEMENT**		
Course code	3 EGM PE 14	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective V**		
Course Program outcomes (COs)	**At the end of the course, the student will be able to** **CO1:** Identify methods and tools for Land use, built environment, and zoning criterion. **CO2:** Classify relevance of Geomatics in evaluating Land suitability, capability in decision making system. **CO3:** Discuss sustainability of Land management, Net farm profitability, and Principles of ecology for planners. **CO4:** Assess concepts of sustainable planning towards smart cities. **CO5:** Compose Urban growth models in assessing alternative land use for environmental modeling.		

UNIT I: INTRODUCTION TO LAND USE AND LAND COVER TYPES AND DISTRIBUTION

Study of the methods and tools for managing land use and the built environment. Comprehensive Plan, Zoning Criteria and guidelines, regional, and state-level plans and socio-economic issues.

UNIT II: GEOMATICS FOR LAND USE PLANNING

i. Land use System: Environmental inputs and impacts, economic inputs and outputs. Role of Geomatics in Land Evaluation and Suitability for land use planning.
ii. Land Capability classification and preference of land use.
iii. Decision Support System for land use planning

UNIT III: ECOLOGICAL PRINCIPLES FOR PLANNERS

i. Overview of ecology and the environment. Important ecological issues in land use for environmental planners.
ii. Sustainable land management: Crop Yield, Nutrient Balance, Maintenance of Soil Cover, Soil Quality/Quantity; Water Quality/Quantity; Net Farm Profitability; Conservation Practices

UNIT IV: SUSTAINABLE URBAN PLANNING & SMART CITIES

i. Concept of Sustainability in planning practice.
ii. Objectives of (i) urban sustainability initiatives ;(ii) Transportation, solid waste reduction;(iii) Climate change initiatives; and (iv) smart cities policies.

UNIT V: LAND USE AND ENVIRONMENTAL MODELLING

i. Fundamentals of GIS and statistics.
ii. GIS-based land use and urban growth models, basins (stream and runoff water quality model)
iii. Visualization and impact assessment models for alternative land use

Books Recommended

1. Geo-Information Innovations in Land Administration.b Tahsin Yomralioglu, John McLaughlin, 2017.
2. Land Registration and Cadastral Systems: Tools for land Information and Management, Addison-Wesley , 1991.
3. Land Tenure, Boundary Surveys and cadastral systems by George M. Cole, Donald A. Wilson., 2017

Course Title	PROGRAMMING WITH OPEN SOURCE GIS		
Course code	3 EGM PE 14	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective V**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Classify GUI application, debugging and console applications **CO2:**Distinguish Console raster/vector level operations. **CO3:**Assessment of various maps building and GUI applications. **CO4:**Discuss fundamentals of Web GIS, WFS, WMTS. **CO5:**Evaluating the use of Geo server and open layers i9n creative response applications.		

UNIT I:

i. Principles of Object-Oriented Programming - C# - example programmes - console application - GUI application - debugging – deployment

UNIT II:

i. Console level Raster operations: Introducing GDAL - OSSIM, format translations, geometric corrections to imagery, reproject the raster, geo-tagging the imagery, georeferencing an image, clip images, altering the radiometric quantization, pyramid building, Kernel-based image processing (Data to be used: Resourcesat / Cartosat / MODIS / DigitalGlobe / Sentinel imagery)

ii. Console level Vector operations: Introducing OGR, Merging the features of multiple vector files, create KML files, burning vector data onto raster (Data to be used: Open Source Maps)

UNIT III:

i. Building map applications - using MAPWINGIS: create a map, adding tool bar for standard map operations, create GUI, load GIS data into application programmatically

ii. Building applications: To load vector data, create basic symbology, change the feature symbology, add labels, create ESRI Shapefile and add a feature

iii. GUI application for handling raster data: Load a DEM file with custom colour-table, getting the metadata such as cell size, corner coordinates, read and display the cursor coordinates, read the map projection

UNIT IV:

i. Web GIS - Web GIS Fundamentals, Over view and Types of OGC Web Services, Web Map Service (WMS), Web Feature Service (WFS), Web Coverage Service (WCS), Web Processing Service (WPS), Web Map Tile Service (WMTS)

UNIT V:

i. **Geo Server –**Open Source Geo Spatial Tool, Install Geo Server, Loading the data into Geo Server, OGC protocols, Sample data access using Geo Server.

ii. **Open Layers -** Introduction to Open Layers, Java Script Library for Open Layers, Creating Sample Maps using Open Layers, Sample Open Layers Map creation using data of Geo Server, Applying Custom Styles, Working with Layers, Creating Responsive Applications with Interaction and Controls**,** Controlling the Map, Open Layers for Mobile, 3D rendering with Cesium.

Books Recommended

1. Open source GIS : A GRASS GIS Approach by Helena Mitasova 2007, 3rd edition.
2. Introduction to GIS Programming and fundamentals with Pythgon and ArcGIS CRC Press.
3. Python for ArcGIS by Laura Tateosian.
4. Learning QGIS by Anita Graser, 2 nd Edition, 2014

Course Title	**GEOMATICS FOR DISASTER RISK REDUCTION & MANAGEMENT**		
Course code	3 EGM PE 14	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Program Elective V**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Relate definitions, levels of disaster risks and phenomena. **CO2:**List Disaster trends at Global and regional levels, differentiate natural and manmade disasters **CO3:**Compare disaster risk vulnerabilities, hazard mapping prevention and mitigation of disasters. **CO4:**Assess impact of climate change, Biodiversity loss on desertification and disasters. **CO5:**Evaluate Disaster Management Policy, organizational frame work in preparation of disaster management plans.		

UNIT I: UNDERSTANDING ECOSYSTEM AND DISASTER PHENOMENA

i. Concept and definitions and functions of different terms of disaster and Ecosystem, approaches to understand disaster phenomena (natural science, applied science, progressive and holistic approaches)
ii. Parameters of Disaster Risk, Levels of disaster as per national guideline.

UNIT II: OVERVIEW, CLASSIFICATION, CHARACTERISTICS, PROBLEM AREAS OF DISASTERS

i. Disaster trends (Global, national and regional), Selected models for understanding the causes of disaster and disaster risk mitigation, Classification of hazards (natural and manmade), Response time, frequency, forewarning, exposure time of different hazards.
ii. General characteristics and problem areas of different natural and man-made hazards (e.g. flood, erosion, earthquake, landslide, lightning, tropical cyclone, drought, civil unrest etc.), Common approaches to study natural and manmade hazards; vulnerability and disasters.

UNIT III: DISASTER RISK MITIGATION

i. Disaster risk assessment (Hazard-Vulnerability-Capacity analysis), Hazard mapping and forecasting; Principles and aspects of Disaster prevention, Disaster mitigation, Preparedness for damage mitigation and coping with disasters; Capacity building for disaster/damage mitigation (structural and non-structural measures);
ii. Contingency planning for damage mitigation of different hazards; Relevance of indigenous knowledge, appropriate technology and local resources in disaster risk mitigation
iii. Community based disaster risk reduction mechanism; Counter disaster resources and their roles.

UNIT IV: ENVIRONMENT AND DISASTERS

i. Environment, ecosystem and disasters. Climate change – issues and concerns. Biodiversity loss and DRR; Global water crisis and DRR

ii. Desertification, soil erosion and DRR; ecosystems for urban risk reduction; Industrial hazards and safety measures; Post disaster impact on environment; Impact of developmental projects on disaster risk; Aspects of environmental management for disaster risk reduction; Environmental Impact Assessment (EIA).

UNIT V: PLANNING FOR DISASTER MANAGEMENT

i. Concept of spatial planning for DRR; Community-hazard profile in India; Different phases of Disaster Management (DM cycle; Relief mechanism (needs assessment, relief administration and distribution, management of relief centres, external support etc.); Disaster Management Act (2005); Disaster Management Policy (2009); organizational framework for disaster management in India.

ii. **Case studies**: Hazard mapping of vulnerable areas, Vulnerability assessment (physical, social, organizational, economical, technological), Risk mitigation planning for vulnerable areas.

Books Recommended

1. Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2. Carter, W. N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3. Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
4. National Policy on Disaster Management, NDMA, New Delhi, 2009.
5. Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.
6. Parasuraman, S & Unnikrishnan, P. V. (ed.), India Disasters Repot Towards a policy initiative. Oxford, 2000

Course Title	**GEOMATICS FOR NATURAL RESOURCE MANAGEMENT**		
Course code	3 EGM OE 15	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Management		
Course type	**Open Elective I**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Illustrate the Lu/Lc map preparation for various activities **CO2: To learn geological mapping & exploration, use of different sensors for mapping** **CO3:**Inventing the water resources, crops and forest cover **CO4**: Preparation of spatial models for various environmental features **CO5:**geomatics applications on disaster studies in the environment.		

UNIT I: LAND RESOURCES AND MUNICIPAL & URBAN GIS

Appropriate methodology, Rapid land use assessment, Rapid land use information system. Land evaluation and suitability studies by Remote sensing and Techniques of land use / land cover map preparation. Land use / land cover mapping and planning. Dynamic urban land use, Semi dynamic land use.

GST for Urban Environmental Monitoring. GST for Municipal Administration. Geomatics in Solid and Hazardous waste disposal site selection, Environmental Information System Development for municipalities: Case studies GST for Traffic and Transportation planning assessment

UNIT II: GEOSCIENCES

Role of Remote sensing and GIS in geological studies and case studies. Evaluation of Geological Mapping, Introduction to Prospection Techniques, History of Remote Sensing in Geological Exploration. Image Lineaments and structural origin, Prospecting, Applications of thermal and Radar remote sensing in structural geology. Spectral response of Minerals, Rocks, Alterites, case studies

UNIT III: WATER RESOURCES, AGRICULTURE AND FORESTRY

The hydrological cycle, Hillslope hydrology, The drainage basin, Channel networks, Automatic derivation of catchment characteristics, The global cycle. Ground water exploration and targeting. Introduction, Characteristics, Watershed and people, Watershed characteristics, watershed management and Integrated approach for sustainable planning. Water quality modeling. Watershed Management in India, Case studies.

Soil and altitude, Soil and aspect, Soil and slopes, Soil landscapes, Soil erosion modeling.

Crop type classification, area estimates, and spectral response of different crops. Crop diseases

and Assessment, Crop and Water management and monitoring. Advances in Crop monitoring.

Survey and mapping of forest cover, Forest change detection, Forest damage assessment and Forests monitoring, Land evaluation for forestry.

UNIT IV: ECOSYSTEM MODELING

Spectral response of vegetation and mapping, Ecosystem Analysis, Environmental impact analysis and monitoring, Ecosystem modeling, Wetland mapping. Spatial Models of Ecological Systems and Process.

UNIT V: DISASTER MANAGEMENT

Introduction and Overview- Natural and manmade hazards – Vulnerability assessment and Mapping on Disasters- Spatial Information for natural Hazard and risk assessment -Landslides- volcanoes- floods and famines- earth quakes- Drought hazard and risk assessment-Human Induced disasters- industrial disasters- dams- constructional and others.

Books Recommended

1. Good child : Environmental Modeling With GIS
2. Manual of Geospatial Science and Technology Edited By John. D. Bossler, Taylor And Francis, London
3. Lillesand, T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley and Sons, Inc, New York, 1987.
4. Geographical Information Systems by David Martin
5. RS in Geology by Siegal
6. RS in Forest Resources by John. A. Howard, Chapman and Hall.

Course Title	**REMOTE SENSING FOR VEGETATION**		
Course code	3 EGM OE 15	No. of credits	03
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Open Elective I**		
Course outcomes (COs)	**At the end of the course, the student will be able to** **CO1:**Relate role of remote sensing in concepts of plant physiology. **CO2:**Focus on Characteristics of Electromagnetic Sources, radiation, Energy, spectrum on vegetation. **CO3:**Appraise radiative and back scatter phenomenon of soil, water, plant canopy in microwave regions **CO4:**Devise spectral and vegetative indices for microwave and LiDAR technologies. **CO5:**Integrate applications for detection and diagnosis of plant stress and crop management.		

UNIT I: INTRODUCTION

i. Introduction,History, introduction and and interpretation of Remote sensing, Concepts of Plant Physiology and Remote Sensing. Data availability

UNIT II: BASICS OF RADIATION PHYSICS FOR REMOTE SENSING OF VEGETATION

i. Introduction, Radiation characteristics, Electromagnetic Radiation, Electromagnetic Spectrum, Electromagnetic Energy, Sources and terminology.
ii. Energy Interactions with matter and surfaces. The radiation Environment. LAI.

UNIT III: RADIATIVE PROPERTIES OF VEGETATION, SOILS AND WATER

i. Optical region: Leaf radiative properties, radiative properties of soil and water, radiative properties canopies.
ii. Thermal region: Emissivity of canopy components, and canopies.
iii. Microwave region: Microwave emissivity, back scatter, and advantages. Plant and Canopy Function: water relations, evaporations and water loss.

UNIT IV: SPECTRAL INFORMATION FOR SENSING VEGETATION

iii. Estimation of Vegetation Cove: Spectral Indices -Vegetation indices and vegetation descriptors.
iv. Microwave vegetation indices- estimation of vegetation using Lidar.

UNIT V: INTEGRATED APPLICATIONS

iv. Detection and diagnosis of plant stress.
v. Precision agriculture and crop management
vi. Ecosystems and Forestry Management.

Books Recommended

1. Lillesand, T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley and Sons, Inc, New York, 1987.
2. Principles of *Geographic Information Systems* by John *Jensen* and Ryan
3. Remote Sensing: Principles and Applications - Kindle edition by Floyd F. *Sabins*.

M. TECH. -ENVIRONMENTAL GEOMATICS
COURSE STRUCTRURE
II YEAR /
III &IV SEMESTER

Course Title	**DISSERTATION - I , II & III**		
Course code	**3EGM16** **4EGM17** **4EGM18**	No. of credits	26 (10+8+8)
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Dissertation Phase I , II & III**		

Objectives: At the end of this course, students will be able to

1. Ability to synthesize knowledge and skills previously gained and a pplied to an in-depth study and execution of new technical problem.
2. Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
3. Ability to present the findings of their technical solution in a writte n report.
4. Presenting the work i n International/ National conference or repute d journals.

Syllabus Contents:

The dissertation / project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The dissertation should have the following

1. Relevance to social needs of society
2. Relevance to value addition to existing facilities in the institute
3. Relevance to industry need
4. Problems of national importance
5. Research and development in various domain

The student should complete t he following:

1. Literature survey Problem Definition
2. Motivation for study and Objectives
3. Preliminary design / feasibility / modular approaches
4. Implementation and Verification
5. Report and presentation

The dissertation stage II is based on a report prepared by the students on dissertation allotted to them.

It may be based on:

1. Experimental verification / Proof of concept.
2. Design, fabrication, testing of Communication System.

The viva-voce examination will be based on the above report and work

Guidelines for Dissertation Phase – I , II & III

As per the AICTE directives, the dissertation is a yearlong activity, to be carried out and evaluated in two phases i.e. Phase – I: July to December and Phase – II: January to June.

The dissertation may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P co-coordinator.

After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define dissertation objectives. The referred literature should preferably include Springer/Science Direct. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.

Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and phase wise work distribution, and submit the proposal within a month from the date of registration.

Phase – II deliverables: A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.

Phase – II evaluation: A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend repeating the phase-I work.

During phase – III, student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/inn ovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.

Phase – III deliverables: A dissertation report as per the specified format, developed system in the form of hardware and/or software, A record of continuous progress.

Phase – III evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q & A. In case of unsatisfactory performance, committee may recommend for extension or repeating the work

****

AUDIT COURSE'S

Course Title	**ENGLISH FOR RESEARCH PAPER WRITING**		
Course code	**1A02 / 2A03**	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Audit Course**		
Course outcomes (COs)	**At the end of the course, The student will be able to** **CO1:**Understand that how to improve writing skills and level of readability **CO2:**Learn about what to write in each section, **CO3:**Understand the skills needed when writing a Title Ensure the good quality of paper at very first-timesubmission **CO4**: establishing the skills needed for the result/ report framing. **CO5:**Visualize the research article quality.		
UNIT I :			
Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness			
UNIT II :			
Clarifying Who DidWhat, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.			
UNIT III:			
key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,			
UNIT IV:			
skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions			
UNIT V:			
useful phrases, how to ensure paper is as good as it could possibly be the first- timesubmission			
Books Recommended 1. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks) 2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge UniversityPress 3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book. 1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011			

Course Title	DISASTER MANAGEMENT		
Course code	1A02 / 2A03	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	Audit Course		
Course outcomes (COs)	**CO1:** learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response. **CO2:** critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives. **CO3:** develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations. **CO4:** critically understand the strengths and weaknesses of disaster management approaches, planning and programming. **CO5:** Estimation of Risk & mitigation measures		

UNIT I: OVERVIEW OF DISASTERS

Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

UNIT II: REPERCUSSIONS OF DISASTERS AND HAZARDS

Economic Damage, Loss of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III: DISASTER PRONE AREAS IN INDIA

Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.

UNIT IV: DISASTER PREPAREDNESS AND MANAGEMENT

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V: RISK ASSESSMENT & DISASTER MITIGATION

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation in Risk Assessment. Strategies for Survival.

Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Books Recommended

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep &Deep Publication Pvt. Ltd., New Delhi.

Course Title	VALUE EDUCATION		
Course code	1A02 / 2A03	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	Audit Course		
Course outcomes (COs)	Students will be able to 1. Knowledge of self-development 2. Learn the importance of Human values 3. Developing the overall personality		

UNIT I:

Values and self-development–Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements.

UNIT II:

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.

UNIT III:

Personality and Behavior Development-Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance.

UNIT IV:

True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

UNIT V:

Character and Competence –Holy books vs Blind faith. Self-management and good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

Books Recommended

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

Course Title	CONSTITUTION OF INDIA		
Course code	1A02 / 2A03	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	Audit Course		
Course outcomes (COs)	Students will be able to 1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics. 2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. 3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution. 4. Discuss the passage of the Hindu Code Bill of 1956.		

UNIT I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History Drafting Committee, (Composition & Working). Philosophy of the Indian Constitution: Preamble Salient Features.
UNIT II: CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES:
Fundamental Rights. Right to Equality. Right to Freedom. Right against Exploitation. Right to Freedom of Religion. Cultural and Educational Rights. Right to Constitutional Remedies. Directive Principles of State Policy. Fundamental Duties.
UNIT III: ORGANS OF GOVERNANCE
Parliament. Composition. Qualifications and Disqualifications. Powers and Functions. Executive. President. Governor. Council of Ministers. Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions.
UNIT IV: LOCAL ADMINISTRATION:
District's Administration head: Role and Importance. Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Appointed officials, Importance of grass root democracy.
UNIT V: ELECTION COMMISSION:
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Books Recommended

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Title	PEDAGOGY STUDIES		
Course code	1A02 / 2A03	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	Audit Course		
Course outcomes (COs)	Students will be able to 1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries? 2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners? 3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?		

UNIT I: INTRODUCTION AND METHODOLOGY

Aims and rationale, Policy background, Conceptual framework and terminology**.** Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and searching.

UNIT II:

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT III:

Evidence on the effectiveness of pedagogical practices. Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV:

Professional development: alignment with classroom practices and follow-up support. Peer support. Support from the head teacher and the community. Curriculum and assessment. Barriers to learning: limited resources and large class sizes.

UNIT V:

Research design Contexts. Pedagogy. Teacher education. Curriculum and assessment. Dissemination and research impact.

Books Recommended

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Title	STRESS MANAGEMENT BY YOGA		
Course code	**1A02 / 2A03**	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	**Audit Course**		
Course outcomes (COs)	Students will be able to 1. Develop healthy mind in a healthy body thus improving social health also 2. Improve efficiency		
UNIT I:			
Definitions of Eight parts of yog (Ashtanga).			
UNIT II:			
Yam and Niyam. Do`s and Don't's in life. 1. Ahinsa, satya, astheya, bramhacharya and aparigraha. 2. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.			
UNIT III:			
Asan and Pranayam 1. Various yog poses and their benefits for mind & body. 2. Regularization of breathing techniques and its effects-Types of pranayam.			
Books Recommended 1. 'Yogic Asanas for Group Tarining-Part-I":Janardan Swami Yogabhyasi Mandal, Nagpur.			

Course Title	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTMENT SKILLS		
Course code	1A02 / 2A03	No. of credits	00
Centre/ Department	Centre for Environment , IST, JNTUH		
Program	M. Tech : Environmental Geomatics		
Course type	Audit Course		
Course outcomes (COs)	Students will be able to 1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life 2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity 3. Study of Neetishatakam will help in developing versatile personality of students.		

UNIT I:

Neetisatakam-Holistic development of personality; Verses- 19,20,21,22 (wisdom). Verses- 29,31,32 (pride & heroism). Verses- 26,28,63,65 (virtue). Verses- 52,53,59 (dont's). Verses- 71,73,75,78 (do's).

UNIT II:

Approach to day to day work and duties. Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48. Chapter 3-Verses 13, 21, 27, 35. Chapter 6-Verses 5,13,17, 23, 35. Chapter 18-Verses 45, 46, 48.

UNIT III:

Statements of basic knowledge. Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68. Chapter 12 - Verses 13, 14, 15, 16,17, 18. Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17. Chapter 3-Verses 36,37,42. Chapter 4-Verses 18, 38,39. Chapter18 – Verses 37,38,63.

Books Recommended

1. Rashtriya Sanskrit Sansthanam, New Delhi.
2. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata.
3. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath