

**ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
M.TECH (SPATIAL INFORMATION TECHNOLOGY)**
(Effective for the students admitted from academic year 2019-2020 onwards)



CENTRE FOR SPATIAL INFORMATION TECHNOLOGY
JNTUH INSTITUTE OF SCIENCE AND TECHNOLOGY (AUTONOMOUS)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
Kukatpally, Hyderabad, Telangana State, INDIA-500085.

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BLOOM'S TAXONOMY



KNOWLEDGE LEVELS

Self-Assessment of a student is based on the answers given to the Blooms level of questions

The Knowledge Dimension	Remember	Understand	Apply	Analyze	Evaluate	Create
Facts	list	paraphrase	classify	outline	rank	categorize
Concepts	recall	explains	show	contrast	criticize	modify
Processes	outline	estimate	produce	diagram	defend	design
Procedures	reproduce	give an example	relate	identify	critique	plan
Principles	state	converts	solve	differentiates	conclude	revise
Meta-cognitive	proper use	interpret	discover	infer	predict	actualize

Vision of the Institution

Imparting technical education that encourages independent thinking, develops strong domain of knowledge, hones contemporary skills and positive attitudes towards holistic growth of young minds.

Mission of the Institution

- Student-centered Teaching-learning processes and a stimulating R&D environment.
 - Providing Quality Education and ethics to students.
 - State-of-art Infrastructure for professional aspirants.

Vision of the Centre for Spatial Information Technology

- To emerge as a centre of excellence in geospatial technology and allied fields to cater to the larger interest of the society and nation at large.

Mission of Centre for Spatial Information Technology

- To strive for achieving and sustaining professionalism in Geospatial Technology in collaboration with Industry and academia.
- To nurture the spirit of innovation and creativity, and
- To harness and promote geospatial technology for national development.

Program Outcomes(POs)

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

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

PO3: Students should be able to demonstrate a higher 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: Shall be able to employ necessary techniques, advanced equipment and software tools for state of the art engineering methodologies for natural resources management.

Program Educational Objectives (PEOS):

PEO1: To prepare students to develop a strong background in geo-informatics, remote sensing and navigational surveying and in software development/IT, IT related areas/IoT.

PEO2: To train the students in developing practical solutions to the problems of the society using the cutting- edge technology.

PEO3: To develop professional competence in students through life-long learning and professional experience.

PEO4: To maintain state-of the art R&D facilities for constant improvement in the quality of education research and development.

**CENTRE FOR SPATIAL INFORMATION TECHNOLOGY
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M.Tech (Spatial Information Technology), COURSE STRUCTURE AND SYLLABUS (CBCS) -2019

M. TECH SEM -I

Course Number	Subject	Scheme of Studies per Week			Credits	Int Marks	Ext Marks
		L	T	P			
SIT – 01	Programme Core-I Remote Sensing and Photogrammetry	3	0	0	3	30	70
SIT-02	Programme Core-II Geographic Information Systems	3	0	0	3	30	70
SIT-03	Programme Elective-I 1. Large Scale Topographic Mapping 2. Concepts of Big Data and its Applications 3. Terrain Modelling	3	0	0	3	30	70
SIT-04	Programme Elective –II 1. Geodesy 2. WEB GIS 3. WEB Technologies	3	0	0	3	30	70
SIT -05	GIS Laboratory	0	0	4	2	30	70
SIT-06	GNSS and In-situ Data Collection Laboratory	0	0	4	2	30	70
SIT-07	Research methodology and IPR	2	0	0	2	30	70
SIT -08	Audit Course - I	2	0	0	0	-	-
		16	0	08	18	210	490

M. TECH SEM -II

Course Number	Subject	Scheme of Studies per Week			Credits	Int Marks	Ext Marks
		L	T	P			
SIT – 09	Programme Core-III Advanced Digital Image Processing	3	0	0	3	30	70
SIT- 10	Programme Core-IV Remote Sensing Applications	3	0	0	3	30	70
SIT- 11	Programme Elective-III 1. GNSS 2. Earth Observation Systems 3. Object Oriented Programming Concepts	3	0	0	3	30	70
SIT- 12	Programme Elective –IV 1. Spatial Database Creation 2. Python Script Programming 3. Advanced Geospatial technologies	3	0	0	3	30	70
SIT –13	Digital Image Processing Laboratory	0	0	4	2	30	70
SIT- 14	Software Development Laboratory	0	0	4	2	30	70
SIT- 15	Mini-Project with Seminar	2	0	0	2	30	70
SIT - 16	Audit Course -II	2	0	0	0	-	-
	Total	16	0	08	18	210	490

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

M.TECH SEM -III

Course Number	Subject	Scheme of Studies per Week			Credits	Int Marks	Ext Marks
		L	T	P			
SIT – 17	Programme Elective-V 1. Drone Flying and Data Analysis 2. Statistics and Computation 3. WEB Development	3	0	0	3	30	70
SIT- 18	Open Elective 1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy	3	0	0	3	30	70
SIT- 19	Dissertation – I	0	0	20	10	0	0
	a) Project Review – I				0	0	0
	b) Project Review – II				0	100	0
		06	0	20	16	160	140

*Students going for Industrial project/Thesis will complete these courses through MOOCs.

M.TECH SEM -IV

	Subject	Scheme of Studies per Week			Credits	Int Marks	Ext Marks
		L	T	P			
	Dissertation –II (Project review –III 30 marks + Project Evaluation 70 Marks = 100 Marks)	0	0	32	16	0	0
	a) Project Review – III				0	30	0
	b) Project Evaluation (Viva Voce)				0	0	70
		0	0	32	16	100	100

(L: Lecture periods, T: Tutorial periods, P: Practical periods)

Total credits of the Programme = 68

List of Audit Courses 1 & 2

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga Personality Development through Life Enlightenment Skills



SEMESTER-I
PROGRAMME CORE-I / SIT- 01
REMOTE SENSING &PHOTOGRAMMETRY

OBJECTIVES:

1. To familiarize with the fundamentals of Remote sensing.
2. To provide an overview of various satellites and sensors.
3. To provide an exposure to LIDAR.
4. To familiarize with the fundamentals of photogrammetry.
5. To provide an introduction to Digital photogrammetry.

UNIT-I: Fundamentals: Introduction to remote sensing; energy sources; electromagnetic radiation laws; Energy matter interactions in atmosphere with earth surface feature, atmospheric windows spectral reflectance patterns. Resolution-spatial, spectral, temporal, radiometric and angular resolution; Platforms-types of platforms and classification of sensors; Advantages and limitations of satellite remote sensing.

UNIT-II: Satellites and Sensors: Introduction to satellites-LEO, MEO and HEO; Orbital characteristics of geostationary and polar orbiting satellites; Various types of sensors-framing systems, imaging systems-whiskbroom, push-broom; stereoscopic viewing-along-track and across-track stereo viewing. Thermal sensors: thermal properties of materials; Thermal IR detection and imaging. Concept of hyper spectral remote sensing, Hyperion /HYSI data, Image cube; Hyper spectral data analysis, spectral library, Application of hyper spectral data.

UNIT-III: Microwave Remote Sensing and LiDAR: Introduction to passive and active microwave sensors; Working principles of Real Aperture Radar and Synthetic Aperture Radar; Geometry of radar images; Factors affecting radar backscattering; corner reflection. Introduction to LiDAR; acquisition of LiDAR data, applications of LiDAR in digital terrain model and digital surface model generation.

UNIT-IV: Fundamentals of Photogrammetry: Introduction of Photogrammetry, collinearity condition, coplanarity condition, scales restraint equation. Concept of bundle block adjustment and use of navigational parameters in bundle block adjustment, Interior orientation, Exterior Orientation (relative and absolute), Physical Models, Abstract Models, generalized models, Rational Function model, terrain dependent and terrain independent model for Rational Polynomial coefficient generation.

UNIT-V: Digital Photogrammetry: Stereoscopic acquisition of area of interest, concept of overlap, side-lap, B/H ratio, epi- polar geometry, stereo viewing, vertical exaggeration, along -track and across-track stereo for space- based platforms.

Digital photogrammetric systems, concept of image resolution pyramid, interest point operators, digital image matching techniques; example of a COTS digital photogrammetric s/w tool. Definition of Ground Control Point, extraction of Digital Elevation Model, Digital Terrain Model, Digital Surface Model; break-lines, Definition and generation of ortho rectified products.

COURSE OUTCOMES:

- The student will be familiar with
- CO 1. The basic concepts of remote sensing.
 - CO 2. Satellites and sensors.
 - CO 3. Working principles of and issues related to microwave sensors LiDAR.
 - CO 4. The basics of photogrammetry, and
 - CO 5. The fundamentals and working principles of digital photogrammetry.

TEXT BOOKS:

1. Introduction to Modern Photogrammetry by Edward M Mikhail, James S Bethel
2. Elements of Photogrammetry by Paul Wolf, 3rd Edition ISBN 007-123689-9
3. Remote Sensing and Image Interpretation Lillisand TM & Kiefer (2004) 4th edition John Wiley & Sons, New York
4. Introduction to Remote Sensing Campbell J R Taylor and Francis
5. Fundamentals of Remote Sensing, 2nd edition George Joseph University Press Pvt Ltd

REFERENCE BOOKS:

1. Manual of Photogrammetry American Society of Photogrammetry by Albert D
2. Digital Photogrammetry Michel Kasser & Yves Egles, Taylor & Francis
3. Digital Photogrammetry: An addendum to Manual of Photogrammetry Edited by Cliff Greve.

PROGRAMME CORE-II/ SIT -02
GEOGRAPHIC INFORMATION SYSTEMS

OBJECTIVES:

1. To familiarize with the basics of GIS.
2. To provide an overview of various types of GIS data model including devices used to input the data into GIS.
3. To provide an exposure to various data input methods, storage and editing.
4. To introduce the concepts of DBMS and entity modeling,
5. To provide an introduction to concepts of data mining and data marts.

UNIT - I: Introduction to GIS & Data Structures: Spatial Elements/Developing spatial awareness, Spatial Measurement Levels, Spatial Location and Reference, Spatial Patterns, Geographic Data Collection, Populations and Sampling Schemes, Inferences from Samples, Map Scale and Map Characteristics, Map Projections, Grid Systems.

UNIT - II: Types of GIS Data Models: Graphic Representation of Entities and Attributes, GIS Data Raster and Vector Models, Reference Frameworks and Transformations, Map Preparation and the Digitizing Process.

UNIT - III: GIS Data Input Methods, Storage and Editing: Methods of Vector Input, Method of Raster Input, Remote sensing Data Input, GPS Data input, Secondary data, Meta data and Meta data Standards. - Storage of GIS Databases, Detecting and Editing, Entity Errors: Vector, Attribute Errors: Raster and Vector, Dealing with Projection Changes, Edge Matching, Templating.

UNIT - IV: Database Systems & Entity Relationship Model: Definition, Purpose, Data abstraction, Instances and Schema, Data independence, Introduction to DDL, DML, Database manager, Database administrator, Database users, Overall system structure. Entity Relationship Model: Entities, Entity sets, Relationships, Relationship sets, Mapping constraints, Primary keys, E-R diagrams, Reduction of E-R diagrams to tables, Generalization, Aggregation.

UNIT - V: Data Structures: Computer Database Structures for Managing Data, Hierarchical Data Structures, Network Systems, Database Management Systems, RDBMS, Relational Model – Structure, Relational algebra, Relational calculus, Commercial query languages, SQL, Query –by- example.

COURSE OUTCOMES:

The students will have sound background in the following aspects of GIS

- CO 1. Fundamentals of GIS.
- CO 2. Various types of GIS data model including devices.
- CO 3. Familiarization with various data types, editing and storage.
- CO 4. Concepts and components of DBMS and entity modeling, and
- CO 5. Exposure to data mining and data marts.

TEXT BOOKS:

1. Fundamental of GIS by MICHAEL N DEMERS – Published by John Wiley & Sons Inc
2. Principles of GIS by P.A. Burrough and Rachael Mc Donnell
3. Principles of Geographical Information Systems for Land Resources Assessment by P.A. Burrough
4. Database System concepts by HENRY F. KORTH, Abraham Siberschatz et.al., Mc Graw Hill.

REFERENCE BOOKS:

1. Database Management Systems by Raghurama Krishnan and Johannes Gehrke, TATA McGrawHill 3rd Edition.
2. Data Warehousing, Data Mining & OLAP, by Alex Berson and Stephen J.Smith, “Tata McGraw – Hill Edition.

PROGRAMME ELECTIVE-I /SIT -03
LARGE SCALE TOPOGRAPHIC MAPPING

OBJECTIVES:

1. To familiarize with Fundamentals of Mapping:
2. To provide an overview of Map Projections
3. To provide an exposure to various types of surveys
4. To introduce the concepts of mapping,
5. To provide an introduction to cartography.

UNIT-I: Fundamentals: Introduction to mapping; Mapping scale, contours, magnetic and true north, Geoid and ellipsoid/spheroid models of the earth, Datum and coordinate reference systems.

UNIT-II: Map Projections: Introduction to map projection; various types of Map projections: Cylindrical Projections, Mercator projection, Azimuthal projections, Conical projections, UTM, Non-geometric projection, designing a map projection.

UNIT-III: Surveying: Principle of Surveying, Measurement Technology, traditional Survey methods, modern Surveys using Total station/GNSS.

UNIT-IV: Mapping: Planning an aerial Photo Mission, Feature extraction and map generation, mapping standards, Various Map Accuracy Standards; Circular Error 90, Linear error 90, SOI Toposheets and map policy . Introduction to various elements of map design- Typography and lettering of maps, type size, type colors, positioning guidelines, Naming Conventions.

UNIT-V: Digital Cartography:Cartographic abstraction, selection and generalization principles, classification, simplification, exaggeration, Topfer Radical law, symbolization.

Common file formats for storing features; raster/vector and map composition, DXF, DLG, DGN, Postscript and encrypted postscript, .SHP. Tagged Image File, geo-tagged Image file and geo-pdf format.

Introduction to AutoCAD and Microstation, ArcGIS and QGIS, Grass, Quality control of vector data capturing process; and Location-Based Services.

COURSE OUTCOMES:

The student will have

- CO 1.Exposure to concept and various facets of mapping.
- CO 2.Familiarity with map projections.
- CO 3.Acquaintance with various elements of surveying.
- CO 4.Familiarity with mapping, and
- CO 5.Insight into various steps involved in map preparation including cartography.

TEXT BOOKS:

1. Elementary Cartography by Arthur Robinson et al John Wiley & Sons.
2. Datum and Map Projections for remote Sensing GIS and Surveying byJonathathan Iliffe &Roger Lott CRC Press
3. Aerial MappingMethods and Applications by Edgar Falkner, Dennis Morgan Lewis Publishers.
4. Location based Services by Jochen Schilier, Agnes Voisard Elsevier, Morgan Kaufmann Publishers.

REFERENCE BOOKS:

1. Remote Sensing and Image Interpretation by Lillisand TM & Kiefer, 4th edition John Wiley & Sons, New York.
2. Map Projections A reference Manual by Bugayevskiy & Snyder Taylor & Francis.

PROGRAMME ELECTIVE-I/ SIT -03
CONCEPTS OF BIG DATA AND ITS APPLICATIONS

OBJECTIVES:

1. To understand basic knowledge about **Big Data**
2. To learn about data sciences
3. To understand various case studies
4. To understand and solve problems using querying
5. To understand various applications of Big-data

UNIT I: Introduction to Big Data: Big data-concepts, Characteristics, V's Examples, Types and Challenges; general statistical concepts and principles; and impacts.

UNIT II: Data Science: Introduction to Data science, The Data Science Process, Sources of Data science, Adoption of data science & Skills.

UNIT III: Case studies: Case studies on Big Data Exploration, The Enhanced 360 View of a Customer, Security and Intelligence Operations and Analysis.

UNIT IV: Querying big data with Hive: Introduction to the SQL Language, Overview, Useful Functions, Advanced SQL, Useful Resources, Migration to HiveQL.

UNIT V: Applications of Big Data: Applications of Big Data in academics, Healthcare, Media and Entertainment, Weather, Transportation and Banking Sector.

COURSE OUTCOMES:

Students will be able to

CO 1: Have sound background in Big data

CO 2: Have sound background in Data science

CO3: Familiarize with the use of the Big Data-case studies

CO4: Execute the Queries, and

CO5: Comprehend Big data applications

TEXT BOOKS:

1. An Introduction to Statistical Learning, by James, Witten, Hastie, and Tibshirani.

REFERENCE BOOKS:

1. Elements of Statistical Learning by Hastie, Tibshirani, and Friedman

PROGRAMME ELECTIVE-I / SIT -03
TERRAIN MODELLING

OBJECTIVES:

1. To introduce the concepts of terrain modelling.
2. To familiarize with the data acquisition methodology.
3. To comprehend the concept of terrain surface modelling.
4. To have exposure to data quality control.
5. To familiarize with multi scale representation of DEM.

UNIT-I: Terrain Model Concepts: Digital terrain representation, Digital terrain models, Digital elevation models, Topographic Contours, Geometric characteristics of terrain surface, Complexity of terrain surface, Terrain classification.

UNIT-II: Data Acquisition Methodology

Data sources, Interferometric, Synthetic Aperture Radar Interferometry (InSAR), GPS and other ground-based measurement.

UNIT-III: Terrain Surface Modelling

Basic concepts, Approaches to surface modelling, Grid network: concepts and formation approaches, Comparison between TIN-based and grid-based modelling, **Interpolation Methods**, Classification of interpolation methods, Global interpolation, Patch-wise interpolation methods, Point-based interpolation methods, Discussion on interpolation methods.

UNIT-IV: Data Quality Control

DTM quality control: concepts and strategy, On-line quality control in photogrammetric data acquisition, **Mathematical Models for DTM Accuracy**, Problems and strategy, Accuracy of sources data, Relationship between DTM accuracy, Relationship between DTM accuracy and contour interval.

UNIT-V: Multi-Scale Representation of Digital Elevation Models

The concepts of scale and resolution, Multi-scale representation: pyramid structure versus quad tree, Multi-scale representation: surface generalisation, Multi-scale DTM at a national level, **DTM Data Management**, Concepts of data structure and databases, DTM data structure: TIN and Grid, Database organisation of DTM, Databases for DTM management, Extraction of characteristic line, Extraction of hydrological information.

COURSE OUTCOMES:

The students will have exposure to

- CO1: Basic concepts of terrain modelling.
- CO2: Methods of acquisition.
- CO3: Terrain surface modelling.
- CO4: Data quality control
- CO5: Multi Scale representation of DEM.

TEXT BOOKS:

1. Terrain Modelling (2007) by Richard Windrow, Compendium Publishing.
2. Digital Terrain Modeling: Principles and Methodology (2004) by Zhilin Li, Christopher Zhu, Chris Gold, CRC Press.

REFERENCE BOOKS:

- Annoni, A. (2005). *European Reference Grids*, volume EUR 21494 EN. European Commission, Joint Research Centre. URL <http://sdi.jrc.it/publist/annoni2005eurgrids.pdf>
- Annoni, A., Luzet, C., Gubler, E., and Ihde, J., editors (2003). *Map Projections for Europe*, volume EUR 20120 EN. European Commission, Joint Research Centre.
- Arrighi, P. and Soille, P. (1999). From scanned topographic maps to digital elevation.

GEODESY

OBJECTIVES:

1. To introduce the fundamental concepts of reference co-ordinate systems, time and signal propagation.
2. To familiarize with the satellite orbital motion.
3. To comprehend GPS fundamentals and receivers.
4. To acquire working knowledge of processing navigational data ,and the assessment error budget.
5. To have an exposure to the role of permanent reference points in the context of satellite navigation, networks and its applications.

UNIT– I: Fundamentals: Introduction to geodesy, historical perspective, Reference coordinates systems, Time system, Signal Propagation.

UNIT–II: Satellite Orbital Motion: Fundamentals of Celestial Mechanics, Orbit determination, Satellite Orbits and Constellations.

UNIT–III: GNSS Fundamentals: Space segment, Control segment, Observation principle and signal structure; Receivers, Future developments.

UNIT–IV: Data Pre Processing: Ambiguity Resolutions; adjustments, filtering and smoothing; Dilution of precision

Unit – V: GNSS errors sources & improving positional accuracy:Satellites clocks, orbit errors, Atmospheric delays ,receivers noise, multipath; multi frequency multi constellation, DGNSS, Argumentation systems.

COURSE OUTCOMES:

The students will be able

- CO1: Introduce the fundamental concepts of reference co-ordinate systems, time and signal propagation.
- CO2: Fundamentals of satellite orbital motion.
- CO3: Working principles of satellite orbital motions and GPS receivers.
- CO4: Processing navigational data and assessment of error budget, and
- CO5: Knowledge of the role of permanent reference points in the context of satellite navigation, networks and its applications.

TEXTBOOKS:

1. Satellite Geodesy by GUNTER SEEBER, Copy Right 2003 by WALTER DE GRUYTER 1993, ISBN: 3-11-017549-5.
2. Global Positioning System – Theory and Practice – Hofmann W.B, Lichtenegger. H, Collins. J – Springer Verlag Wein, New York.-2008
3. “GPS Satellite Surveying”, Alfred Leick 3rd Edition, John Wiley and Sons 2004.

PROGRAMME ELECTIVE –II/ SIT-04
WEB-GIS

OBJECTIVES:

1. To know Fundamentals of Web.
2. To know about Java Script.
3. To know about Programming in Web GIS
4. To have exposure to handling Geographical Data in Internet Environment
5. To understand about Publishing the Geo-spatial data

UNIT I: Fundamentals of Web: Introduction to web & Mark up languages, Different tags of HTML, Marquee List, frames ,I-frames and creation of form document, CSS: Block level and Inline elements, Types of style sheets, Box model, Different fonts, Animation, Static layout.

UNIT II: Java Script for Form validation: Introduction to java script: Syntax, Statements, Comments, Pop up Boxes: Alert, Confirm, Prompt, Variables, Operators, Conditional Statements, Loops, Events, Cookies. Page Printing, Page redirection, Built-in Objects, Debugging, HTML DOM.

UNIT III: Programming in Web GIS: Introduction to different 2D and 3D view, working with Map views, Constructors, Map view properties and methods.

UNIT IV: Display Geographical Data in Internet Environment: Base maps, Map Rendering ,Query task, Point graphics, Working with base map tools, Feature Layer Query, Geometric engine.

UNIT V: Publishing the Geo-spatial data: Search widget, Publishing of Geospatial data in Local server and Global server, Geo-coding, Validating and Analyzing the results.

COURSE OUTCOMES:

The student will be able to

- CO1: Comprehend basic programming including HTML & CSS to implement high quality web mapping applications.
- CO2: Familiarize with the usage of Java Script for form validation of web page
- CO3: Gain an understanding of the basic concepts of programming using web GIS
- CO4: Have the basic knowledge of techniques to distribute, process and display geographical data in the Internet environment, and
- CO5: Develop the skill for publishing the geospatial data

TEXT BOOKS:

1. An Introduction to Web design and programming, McGraw Hill, Wang, Thomson.
2. Ajax: The Complete Reference – Thomas A. Powel, McGraw Hill, 2008.
3. JavaScript 2.0 Complete Reference, 2nd Edition by Thomas A. Powel, McGraw Hill.

PROGRAMME ELECTIVE –II/ SIT -04
WEB TECHNOLOGIES

OBJECTIVES:

1. To familiarize with concepts of scripting languages.
2. To comprehend the concepts of style sheets.
3. To have and exposure to DotNET frame work.
4. To familiarize with concepts of web services
5. To introduce the concepts of servers.

UNIT - I: Introduction to Web Technologies and Web 2.0: Introduction to client server systems, HTTP protocols, Common tags in HTML: List, Tables, Forms, Frames, Images, Links and Addressing, Cascading Style Sheet (CSS), XML: Comparative study of XML and HTML, Document Type Definition, Schema, Parsers (Dom and SAX), Introduction to JavaScript, JavaScript objects, programming using java script if-else, switch, popup box, while loop, for loop, event handling, Introduction to Web 2.0, Data and Web 2.0, Convergence, Web Services: SOAP, JSON, Building Rich Internet Applications with AJAX, Servlets.

UNIT - II: HTML5&CSS3: HTML5 Document Structure Changes, Forms, Form elements, Video and Audio, Semantic elements, Structural elements, Introduction to CSS3, Style inclusion methods, selectors, properties, fonts, colors.

UNIT - III: Introduction to Microsoft .NET framework: Introduction to Microsoft .NET framework: arrays, operators, flow control statements, functions and properties, collection and generics, Getting started with ASP.NET – web forms, controls-web form validation, website navigation, enhancing websites using master pages.

UNIT - IV: .NET framework and web services: Web services and .NET framework(exposing web services, consuming web services, .NET remoting, namespace, web service architecture), ADO.NET programming objects and architecture, connected model (command objects), disconnected model (data sets), introduction to LINQ.

UNIT - V: Working with Geo Server and Open Layers: Introduction to map server and web server, map file concept and format, geographic data formats, Open Layers- Understanding Open Layers Syntax, Layers, Controls, Formats, Overlays, Styling, Geoserver- Publishing data in GeoServer, Different types of Services: WMS, WFS,WCS.

COURSE OUTCOMES:

The student will have exposure to

- CO1: Concepts of scripting languages.
- CO2: HTML 5 and CSS3.
- CO3: DotNET frame work.
- CO4: Customized wed services.
- CO5: GeoServer and Open layers.

TEXT BOOKS:

1. The Complete Reference: HTML and CSS, 2nd & 5th Editions by Thomas A. Powel, McGraw Hill.
2. JavaScript 2.0 Complete Reference, 2nd Edition by Thomas A. Powel, McGraw Hill.
3. Ajax: The Complete Reference – Thomas A. Powel, McGraw Hill, 2008.

REFERENCE BOOKS:

1. Professional AJAX – Nicholas C Zakas et al, Wrox publications, 2006.
2. Pro ASP.Net 4 in C# 2010 by Mathew MacDonald, Adan Freeman (paperback).
3. Beginning ASP.net 4: in C# & VB (Wrox programmer to programmes by Ima Spanjaars
4. An Introduction to Web design and programming, Wang, Thomson.
5. Beginning MapServer, Opensource GIS Development, by Bill Kropla.

LAB 1/ SIT -05
GIS LABORATORY

OBJECTIVES:

1. To provide hands-on experience in preparation of remote sensing data for analysis/ interpretation, and to familiarize with the topographic maps and thematic maps.
2. To provide an and exposure to various aspects of base map preparation.
3. To make the scholars develop different thematic maps like drainage map, slope map, watershed map and land use / land cover map.
4. To have an exposure to digital change detection process and map updation.
5. To collect and process the navigational data both in stand- alone mode and DGPS mode- the steps towards surveying.

List of the Practicals

1. Interaction of satellite imageries, understand of watershed Atlas.
2. Map Scanning and Geo referencing
3. Image Interpretation for base map preparation
4. Interpretation of imagery, preparation and composition of
5. Drainage Maps
6. Slope maps
7. Watershed Maps
8. Preparation of Urban road and rail network Map
9. Capture of buildings
10. Capture of Water bodies
11. Land Use/Land Cover Maps
12. Preparation of DEM/DTM

COURSE OUTCOMES:

The students will be able to

- CO1: Prepare remote sensing data for analysis/ interpretation, and will be familiar with the topographic maps and thematic maps.
- CO2: Prepare base maps.
- CO3: Develop different thematic maps like drainage map, slope map, watershed map and landuse / landcover map.
- CO4: To analyze the change in terrain features/ land use/ land cover from multi-temporal and multispectral data, and map updation.
- CO5: Carry out GPS survey.

LAB 2/ SIT -06
GNSS & IN-SITU DATA COLLECTION LABORATORY

OBJECTIVES:

1. To introduce the fundamental concepts of GNSS
2. To familiarize with concepts of DGNSS.
3. To comprehend file formats of GNSS.
4. To acquire knowledge of Integrating GNSS, GPS and RS data.
5. To comprehend different protocols.

LIST OF PRACTICALS:

1. Exploring GNSS Constellation
2. To learn the concept of navigation and positioning.
3. Familiarization with the concepts of DGNSS.
 - i. DGPS
 - ii. RTKP (Real time kinematics Positioning)
4. Precise Point Positioning Concepts
5. Familiarization with different file formats of GNSS.
6. DGNSS through NTRIP Protocol
7. Field Exercises to map a field/group of fields of campus with different positioning methods
8. Navigational Data processing from different GNSS systems.
9. Integrating GNSS , GPS and RS data
10. Institute data collection using smart phones.

COURSE OUTCOMES:

Students will be able to

- CO1: Familiarize various contents of GNSS
- CO2: Handling of the DGPS & RTK'S
- CO3: Handling of RTKP
- CO4: Able to Handle different file formats
- CO5: Integrate Remote sensing data with GNSS

CORE/ SIT-07
RESEARCH METHODOLOGY AND IPR

UNIT - 1: 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- 2: Effective literature studies approaches, analysis Plagiarism, Research ethics.

UNIT- 3: 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-4: 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-5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT-6: 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.

COURSE OUTCOMES:

Students will be able to

CO1: Understand research problem formulation.

CO2: Analyze research related information

CO3: Follow research ethics

CO4: Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

CO5: 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 in particular.

CO6: 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 social benefits.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students
2. Wayne Goddar and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

REFERENCE BOOKS:

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.
2. Mayall, "Industrial Design", McGraw Hill, 1992.
3. Niebel, "Product Design", McGraw Hill, 1974.
4. Asimov, "Introduction to Design", Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2000

AUDIT COURSE -1/ SIT -08
ENGLISH FOR RESEARCH PAPER WRITING

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 Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.

UNIT-III: Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

UNIT-IV: 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-V: 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-VI: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

COURSE OUTCOMES:

Students will be able to:

CO1: Understand that how to improve your writing skills and level of readability

CO2: Learn about what to write in each section

CO3: Understand the skills needed when writing a Title

CO4: Ensure the good quality of paper at very first-time submission

SUGGESTED STUDIES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman'sbook.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

AUDIT COURSE -1/ SIT -08
DISASTER MANAGEMENT

UNIT-1: Introduction: 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 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.

UNIT-VI: Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation, Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

COURSE OUTCOMES:

Students will be able to:

- 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 in different countries, particularly their home country or the countries they work in

SUGGESTED READINGS:

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

AUDIT COURSE -1/ SIT -08
SANSKRIT FOR TECHNICAL KNOWLEDGE

OBJECTIVES:

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
2. Learning of Sanskrit to improve brain functioning.
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

UNIT-I:

- Alphabets in Sanskrit,
- Past/Present/Future Tense,
- Simple Sentences

UNIT-II:

- Order
- Introduction of roots
- Technical information about Sanskrit Literature

UNIT-III:

- Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

COURSE OUTCOMES:

Students will be able to

CO1: Understand basic Sanskrit language.

CO2: Understand Ancient Sanskrit literature about science & technology.

CO3: Develop logic in students being a logical language.

SUGGESTED READING

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

AUDIT COURSE -1/ SIT -08
VALUE EDUCATION

OBJECTIVES:

1. Understand value of education and self- development
2. Imbibe good values in students
3. Let the should know about the importance of character

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 judgments.

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

UNIT-IV:

- 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

COURSE OUTCOMES:

Students will be able to

CO1: Gain knowledge of self-development

CO2: Learn the importance of Human values

CO3: Develop the overall personality

PROGRAMME CORE-III/ SIT -09
ADVANCED DIGITAL IMAGE PROCESSING

OBJECTIVES:

1. Familiarize with different types of distortions.
2. To learn different Image Enhancement.
3. To understand the different types of Image Interpretation/Analysis are enumerated in this unit.
4. Familiarize with Hyper Spectral Image Analysis.
5. To understand the concepts of Change Detection and Accuracy Assessment.

UNIT-I: Introduction: Sources of radiometric distortions- atmospheric effect, instrumentation errors; Correction of radiometric distortions, Sources of geometric distortions: earth rotation effects, panoramic distortions, earth curvature, scan line skew, etc. Geometric Correction: use of polynomials for image corrections, image registration, ortho-rectification.

UNIT-II: Image Enhancements: Data formats. Image processing softwares - IDRISI, ILWIS, ERDAS Imagine, ENVI, e-Cognition, etc., Radiometric enhancement techniques: Contrast modification, Histogram equalization, Histogram matching, density slicing, Geometric enhancement techniques: Neighbourhood operations, image smoothing, spatial filtering, edge detection and enhancement, Data fusion methods-IHS transformation, Brovey, Wavelet transform, principal component transform, multiplicative.

UNIT-III: Image Interpretation/Analysis: Image interpretation, Digital image analysis-unsupervised classification, supervised classification including advanced classification approaches.

UNIT-IV: Change Detection and Accuracy Assessment: Change Detection: Scope and Methods-Spectral Differencing, NDVI-based Analysis, Post-classification change detection, Principal Component Analysis, Precision versus Accuracy, types of accuracies: positional, thematic- sources of errors in thematic maps, Error matrix analysis, report of accuracy.

UNIT-V: Hyper Spectral Image Analysis: Data Visualization, Dimensionality Reduction, Feature Extraction - Pixel Purity Index, Hyper Spectral Data Analysis Methods: - SAM, Spectral Feature Filtering, Spectral Unmixing.

COURSE OUTCOMES:

The students will have

- CO1: Exposure to various image restoration techniques.
- CO2: Comprehend various image enhancement techniques.
- CO3: Thorough understanding of the procedures for image interpretation.
- CO4: Familiarity with hyperspectral data and its analysis, and
- CO5: Exposure to change detection and accuracy assessment.

TEXT BOOKS:

1. John R.Jensen, 1996.Introductory Digital Image Processing., Prentice Hall Series,.
2. John A. Richards and X. Jia, 2013.Remote Sensing Digital Image Analysis. Springer-Verlag,.
3. Lillisand T.M , R.W.Kiefer and Chipman,J.W.,2008. Remote sensing and image interpretation, John Wiley & Sons, New York.
4. Campbell J.B. and Wynne,R.H., 2012. Introduction to Remote Sensing. Fifth edition. The Guilford Press, New York.

REFERENCE BOOKS:

1. David L. Verbyla .Satellite Remote sensing of Natural Resource Management., Lewis publishers, Florida
2. Anil K. Jain .Fundamentals of Digital Image Processing. Prentice Hall Publications, USA.

PROGRAMME CORE-IV/ SIT-10
REMOTE SENSING APPLICATIONS

OBJECTIVES:

1. In this unit concepts concerned to Land Resources are studied.
2. Types of different Resources are dealt in this unit.
3. To understand the concepts of water resources are enumerated in this unit.
4. Concepts of Environmental Studies are discussed here.
5. To understand the concepts of Natural disasters

UNIT- I: Land Resources: Land use land cover- mapping and monitoring of land use including wastelands and urban land use.

Soil resources- soil resources mapping, soil resources database, generation of derivative maps (land capability, land irrigability and crop suitability maps); land degradation mapping and monitoring; and soil moisture estimation using microwave and thermal data.

Minerals and ground water- Geological and geomorphologic mapping, hyperspectral data for mineral targeting, ground water prospecting and exploration and Identification of sites for ground water recharge.

UNIT – II: Vegetal Resources: Agriculture–Crop inventory and acreage and production estimation, (Forecasting Agricultural output using Space Agrometeorology and Land based observations (FASAL); Crop condition assessment, crop intensification, precision farming, and crop insurance.

Forests–Forest cover and density mapping, forest change detection, forest fire monitoring; Biodiversity characterization.

UNIT – III: Water Resources: Water resources inventory; snow cover mapping; Flood inundation mapping; water quality monitoring; high resolution data applications- irrigation infrastructure mapping and monitoring.

UNIT - IV: Environmental Studies: Role of remote sensing in environmental studies- water and air pollution; Environmental Policy - Environmental Impact Assessment.

UNIT- V: Natural disasters: Natural disasters – floods, agricultural drought, earthquakes and tsunamis – volcanoes – landslides, Familiarization with Decision Support System and National Database for Disaster Management.

COURSE OUTCOMES:

The students will be able to know

CO1: Role of remote sensing in the management of land resources

CO2: Role of remote sensing in the management of Vegetatal Resources

CO3: Water resource management by Remote sensing techniques

CO4: Remote sensing of environment, and

CO5: Basic concept and types of natural disasters, and the role remote sensing plays in natural disaster management.

TEXT BOOKS:

1. Lillisand T.M and R.W.Kiefer (2004) 4th edition. Remote sensing and image interpretation, John Wiley & Sons, New York.
2. JOHN R.JENSEN “Remote sensing for Environment”Pearson edition Pvt Ltd, New Delhi.
3. Anji Reddy, M., (2001) Remote Sensing and Geographical Information Systems, 2nd edition, BS Publications, Hyderabad.

PROGRAMME ELECTIVE-III/ SIT -11
GLOBAL NAVIGATION SATELLITE SYSTEM

OBJECTIVES:

1. Introduction to Geodesy specially satellite geodesy.
2. To have an overview of positioning and basic physical concept.
3. To have an in depth knowledge of Navigational satellite system.
4. To have an exposure various navigational satellite **Data** Processing.
5. To familiarize with Applications of Satellite Geodesy.

UNIT-I: Basics: Definition - Fundamental goals of Geodesy - Definitions - basic concepts - Historical perspective - development applications in Satellite Geodesy - Geoid and Ellipsoid, Earth Geoid models(EGM), satellite orbital motion - Keplerian motion - Kepler's Law - Perturbing forces - Geodetic satellite

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

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

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

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

COURSE OUTCOMES:

The students will have exposure to

- CO1: Satellite geodesy.
- CO2: Overview of positioning and basic physical concept.
- CO3: In depth knowledge of navigational satellite system.
- CO4: Navigational satellite data processing and techniques.
- CO5: Applications of Satellite Geodesy

TEXT BOOKS:

1. Satellite Geodesy by GUNTER SEEBER, Copy Right 2003 by WALTER DE GRUYTER 1993, ISBN: 3-11-017549-5.
2. Global Positioning System – Theory and Practice – Hofmann W.B, Lichtenegger. H, Collins. J – Springer Verlag Wein, New York.-2008
3. “GPS Satellite Surveying”, Alfred Leick 3rd Edition, John Wiley and Sons 2004.

REFERENCE BOOKS:

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

PROGRAMME ELECTIVE-III/ SIT -11
EARTH OBSERVATION SYSTEMS

OBJECTIVES:

1. To review the emerging and federated observation system concepts
2. To identify potential benefits to be obtained in light of observation needs in different Earth Observation domains
3. To identify key required technology challenges entailed by the emerging fractionated and federated by Indian satellite system concepts.
4. To validate observation needs with the respective user communities to be fit for purpose in terms of scientific and commercial applications
5. To propose an high resolution satellite data for GEOS

UNIT-1: Introduction to Earth Observation system: Introduction Of Earth Observation System, Sensing Platforms, Airborne Platforms, Spaceborne Platforms, Near-Polar Orbits, Geosynchronous Orbits, Sensors, Optical Sensors, Photographic Cameras Digital Aerial Cameras, Video Cameras, Radiometers, Electro-Optical Scanners, Microwave Sensors, Passive Microwave Sensors, Active Microwave Sensors, LiDAR ,The Ground Segment ,Earth-Observing Systems .

UNIT-2: International Satellite Programmes: The Landsat System, Satellite Pour l' observation De La Terre (SPOT), Pleiades Systems, The Earth Observing System Mission, Terra (Eos-Am), Aqua (Eos Pm), 8 Earth Observing-1 (Eo-1) Mission, Rapideye.

UNIT-3: Indian Remote Sensing Satellites Mission: IRS IA/IB, IRS IC/ID, Resource sat series, Cartosat series, OCM series, RISAT series, HySi.

UNIT-4: High Resolution Data: High Spatial Resolution Remote Sensing Systems, Early bird & Quick bird, Ikonos, Orbview-3, Geoeye-1, Worldview Mission.

UNIT-5 : Microwave Mission: Spaceborne Imaging Microwave Systems , Seasat , European Remote Sensing Satellite (Ers-1 And -2) , Sentinel-1 Japanese Earth Resources Satellite (Jers-1), Advanced Land Observation Satellite (Alos-1), Radarsat Missions, Radarsat-1 , Radarsat-2 , Radarsat Constellation Mission (Rcm) , Envisat , Radar Imaging Satellite (Risat) Missions, Radar Imaging Satellite (Risat-2), Radar Imaging Satellite (Risat-1), Soil Moisture And Ocean Salinity Mission (Smos)., Measurement Principle , Soil Moisture Active Passive Mission (Smop).

COURSE OUTCOMES:

The students will have exposure to

- CO1: Existing and emerging earth observation system.
- CO2: Various satellite platforms
- CO3: IRNNS program and its data processing
- CO4: Satellite data structures
- CO5: Currently operating and future GEOS

TEXT BOOKS:

1. Aoki, S., 2006. Nihon no Uchu Senryaku (Japanese Space Strategy), Keio University Press, Tokyo, p. 309.
2. Richards and Jia "Global Earth Observation Systems".
3. Gaos Book " Global Earth Monitoring Systems".

PROGRAMME ELECTIVE-III/ SIT -11
OBJECT ORIENTED PROGRAMMING CONCEPTS

OBJECTIVES:

1. To familiarize with the concepts of basics of object-oriented programming and working with files.
2. To provide an overview of advanced concepts of object-oriented programming concepts.
3. In a logical sequence to familiarize the student with concepts of Java.
4. To introduce the advanced concepts of Java
5. To comprehend with the concept of Java script.

UNIT-I: Getting started with OOPs Concepts: Principles of object oriented programming, operators, Datatypes, Beginning with C++, Tokens, Expressions and control structures, Functions in C++, Classes and objects, Access Specifiers, Keywords, Constructors and Destructors, Operator Overloading, Type Conversions, Inheritance, Pointers, Virtual functions and Polymorphism.

UNIT-II: Advanced Concepts in OOPS: Managing console I/O operations, working with files, Templates, exception handling, manipulating strings.

UNIT-III: Introduction of JAVA: Principles of object oriented programming, The Genesis of Java, an overview of Java, Comparative study of C++ and JAVA: Data types variables and arrays, operators, control statements, methods and classes, inheritance, Packages and interfaces, exception handling.

UNIT-IV: Advanced Concepts of JAVA: Java Library, Multithreaded programming, I/O, Applets, string handling, input/outputs, Applet class, event handling, AWT, AWT controls, Layout managers and menus, working with images.

UNIT-V: Working with Java Script: Introduction to javascript- Syntax, Statements, Comments, Popup Boxes, Alert, Confirm, Prompt, Variables, Operators, Conditional Statements, Loops, Events, Cookies, Page Printing, Page redirection, Built-in Objects, Debugging, HTML DOM.

COURSE OUTCOMES:

The students will have exposure to

1. Concept of classes, objects and files.
2. Working with files and strings.
3. To provide an overview of Java and its packages
4. Concept of Java AWT controls, Layouts.
5. To familiarize the students working with Javascript.

TEXT BOOKS:

1. Programming in C++ by Balaguruswamy, 4th edition, Tata McGraw Hill Education Pvt. Ltd.
2. Java: The Complete Reference by Herbert Scheldt McGraw-Hill, 2011.

REFERENCE BOOKS:

1. C++ Primer plus by Stephen Prata, 6th edition, Person education.
2. Problem Solving in C++, The OOP by W.Savitch 4th edition, Pearson education.
3. Object Oriented Analysis and Design with Applications by Grady Booch, 2nd edition, Pearson education.
4. Schaum's Outline of Programming with C++ by John R. Hubbard, 2nd edition, McGraw Hill.

SPATIAL DATABASE CREATION

OBJECTIVES:

1. To introduce the fundamental concepts of thematic maps.
2. To familiarize with Map Production techniques.
3. To comprehend Concept of Database.
4. To acquire knowledge of Database System Architecture, and
5. To have an exposure to Database Creation and management.

UNIT I: Thematic maps: Introduction to different types of maps-chloropleth maps, Heat maps, proportional symbol maps, dot density maps, animated time-series maps.

UNIT II: Technology of Map Production: Standard procedure- data preparation-data model creation, cartographic design, map layout, quality control.

UNIT-III: The Concept of Database: Introduction to Database, characteristics of database, Database design, Entities and attributes, database models, Relationships, Designing for data integrity, Database normalization and Denormalization.

UNIT IV: Database System Architecture:

Database system- Architecture, Centralized and Client–Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types.

UNIT V: Database Creation and management: Conceptual Modeling and Database Design methodology, Data storage and querying- storage and file structure, indexing and hashing, query processing; transaction management- transactions, concurrency control, recovery system; Database security.

COURSE OUTCOMES:

The students will have exposure to

- CO1: Various types of thematic maps
- CO2: Production of map's
- CO3: Database creation & Redundancy
- CO4: Various types of database systems
- CO5: Creation and management of database

TEXT BOOKS:

1. Cauvin, Colette; Francisco Escobar and Aziz Serradj, Thematic Mapping and Transformations. ISTE Ltd., Willey.
2. Denegre, J. 1994. Thematic Mapping From Satellite Imagery: A Guide Book. Elsevier Science Ltd.
3. Elmasri, Ramez and Navathe, Shamkant B., 2011. Fundamentals of Database Systems. Addison-Wesley.
4. Silberschatz, Abraham; Henry F. Korth and S. Sudarshan, 2006 Database Systems Concepts. McGraw Hill.

PROGRAMME ELECTIVE-IV/ SIT -12
PYTHON SCRIPT PROGRAMMING

OBJECTIVES:

1. To introduce the fundamental concepts of scripting language.
2. To familiarize with the OOPS concepts
3. To comprehend Modules and regular expressions in scripting environment.
4. To acquire working knowledge of File and Database Connections , and
5. To have an exposure to UI programming.

UNIT 1: Fundamentals of Python: Introduction to Python; Installation of python; Code execution ways; Data types Control statements (if, if else); Iterators and generators (For , While, yield), Operators; Functions in python.

UNIT 2: Introduction to OOPS: Features of OOPS; Classes and Objects; Types of class methods; Inheritance; Encapsulation, Abstraction; Polymorphism; Exception handling.

UNIT 3: Introduction to Modules and regular expressions: Introduction to regular expression; Working strings using RE; Working with files using RE; Introduction to modules; Creating own modules; In-built modules and GIS modules; Common usage models for Excel, Database.

UNIT 4: File and Database Connections: Reading and writing data from notepad and Excel; Installation of database (MySQL for python); Database Connections (MySQL); Working with queries (Update, delete, Insert, Retrieving).

UNIT 5: Introduction to UI programming: Introduction to TKINTER module; Root window; Containers; Canvas; Frames; UI Elements (Button, Message, Text, Menu etc...).

COURSE OUTCOMES:

The student will have exposure to

- CO1: Fundamentals of PYTHON
- CO2: Familiar with various elements of Python script programming, namely OOPS
- CO3: Integration of Modules and regular expression in PYTHON.
- CO4: Data base programming
- CO5: With abovementioned background they will be able to develop small application

TEXT BOOKS:

1. Core python Programming by Dr Nageswrara rao.
2. Python Cookbook by Brian Jones
3. Dive into Python 3 Mark Pilgrim

PROGRAMME ELECTIVE-IV/ SIT -12
ADVANCED GEOSPATIAL TECHNOLOGIES

OBJECTIVES:

1. To provide exposure to Web and Internet GIS.
2. To familiarize with centralized and distributed Web GIS.
3. To comprehend the web services in GIS domain.
4. To introduce the web mapping applications.
5. To provide overview of working principles of web mapping services and open source GIS.

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

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

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

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

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

COURSE OUTCOMES:

The students will have

- CO1: Exposure to Web and internet GIS.
- CO2: Familiarization with centralized and distributed web GIS applications frame work.
- CO3: Grasp of web services in GIS domain.
- CO4: Working knowledge of web mapping application development tools.
- CO5: An idea about web mapping services and open source GIS software.

TEXT BOOKS:

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

LAB 3/ SIT-13
DIGITAL IMAGE PROCESSING LABORATORY

OBJECTIVES:

1. To introduce the fundamental concepts of Image formats.
2. To familiarize with Image processing techniques.
3. To comprehend Image fusion techniques.
4. To acquire knowledge of classifications, and
5. To have an exposure to spatial model maker.

LIST OF PRACTICALS

1. Displaying digital image data with various formats, namely BIL, BSQ and BIP, tiff, jpeg, png & Generation of Color Composite.
2. Geometric correction of satellite images.
3. Mosaic Preparation of digital images
4. Image enhancement techniques, namely
 - Contrast enhancement
 - Edge enhancement
 - Different Filtering techniques
 - Principal Component Analysis (PCA),
 - Fourier Transform Analysis
5. Image fusion techniques.
6. Digital image analysis
 - Unsupervised Classification
 - Supervised Classification
 - Accuracy assessments
7. Change detection
8. Spatial model maker
9. Contour mapping
10. DEM Generation

COURSE OUTCOMES:

The students will have hands –on experience in

CO1: Data preparation for image analysis

CO2: Various types of digital image enhancements.

CO3: Different digital image fusion techniques.

CO4: Digital image analysis- unsupervised and supervised approaches.

CO5: Change detection techniques and spatial model maker.

LAB 4/ SIT- 14
SOFTWARE DEVELOPMENT LABORATORY

OBJECTIVES:

1. To discuss different data types, conditional statements in programming language.
2. To understand the concepts of OOPS.
3. To discuss about method overloading and overriding.
4. To learn about various windows services.
5. To understand the integration of DotNet with ArcGIS environment..

LIST OF THE PRACTICALS

- 1) Introduction to the .NET platform.
- 2) Working with Data Types in C#.NET.
- 3) Implementation of Type Conversion.
- 4) Execution of Boxing & Unboxing in C#.NET.
- 5) Working with Conditional Statements, operators, Looping Arrays.
- 6) Implementation of OOPS Concepts in Dot NET.
- 7) Working with Constructors & Destructors in Dot NET.
- 8) Working with Static method and Static classes.
- 9) Implementation of Method overloading and overriding.
- 10) Working with sealed classes, Partial Classes in C#.NET.
- 11) Interaction with Windows forms and Event Controls.
- 12) Handling various File Systems with various File Streams.
- 13) Development of sample customized tools in Arc-GIS.
- 14) Working with Insert cursors of Arc-GIS environment.

COURSE OUTCOMES:

The student will be able to

- CO1: Handle the implementation of programming concepts of Dot Net.
- CO2: Learn the usage of Type conversion techniques.
- CO3: Gain an understanding of the basic concepts of OOPS.
- CO4: Have the basic knowledge of different windows services.
- CO5: Gain hands-on experience in Handling of Assemblies in DotNet.

CORE/SIT-15
MINI PROJECT

The mini project will be based on the work done during the industrial training/internship of 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

- (a) Along with the report on identification of topic for the work and
- (b) The methodology adopted involving scientific research, collection and analysis of data,
- (c) Determining solutions highlighting individuals' contribution.

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

COURSE OUTCOMES:

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.

AUDIT COURSE-2/SIT-16
CONSTITUTION OF INDIA

OBJECTIVES:

1. To understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT-I: History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working).

UNIT-II: Philosophy of the Indian Constitution: Preamble, Salient Features.

UNIT-III: 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-IV: 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-V: Local Administration:

- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.
- Panchayati raj: Introduction, PRI: Zilla Panchayat.
- Elected officials and their roles, CEO Zilla Panchayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

UNIT-VI: 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.

COURSE OUTCOMES:

Students will be able to:

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3: 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.

CO4: Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING

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

AUDIT COURSE-2/ SIT -16
PEDAGOGY STUDIES

OBJECTIVES:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

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 gaps and future directions**

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

COURSE OUTCOMES:

Students will be able to understand:

CO1: What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

CO2: What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

CO3: How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

SUGGESTED READING:

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.

AUDIT COURSE-2/ SIT -16
STRESS MANAGEMENT BY YOGA

OBJECTIVES:

1. To achieve overall health of body and mind.
2. To overcome stress.

UNIT-I: Definitions of Eight parts of yog. (Ashtanga)

UNIT-II: Yam and Niyam.

Do's and Don't's in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan.

UNIT-III: Asan and Pranayam

- i) Various yog poses and their benefits for mind & body
- ii) Regularization of breathing techniques and its effects-Types of pranayam

COURSE OUTCOMES:

Students will be able to:

CO1: Develop healthy mind in a healthy body thus improving social health also

CO2: Improve efficiency

SUGGESTED READING

1. 'Yogic Asanas for Group Training-Part-I' :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

OBJECTIVES:

1. To learn to achieve the highest goal happily.
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom in 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 (don't'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 BhagwadGeeta:
- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

COURSE OUTCOMES:

Students will be able to

CO1: Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life

CO2:The person who has studied Geeta will lead the nation and mankind to peace and prosperity

CO3:Study of Neetishatakam will help in developing versatile personality of students.

SUGGESTED READING

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

PROGRAMME ELECTIVE-IV/ SIT -17
DRONE-FLYING AND DATA ANALYSIS

OBJECTIVES:

1. To introduce the fundamental concepts of Multirotor UAV Pilot.
2. To familiarize with Surveying with Drone
3. To comprehend Image processing and Photogrammetry.
4. To acquire knowledge of Modeling, and
5. To have an exposure to Applications of drones.

UNIT 1:Introduction: Introduction to Drones, History of Drone/UAS/UAVs, payload, battery life, Specs for good results, Regulations of DGCA and Drone license, Pre, Post Flight planning- Flight execution and photography, data collection.

UNIT 2: Surveying with Drone

Consideration for hardware selections, comparison on surveying drone and its accuracy, Techniques of controlling errors, Consideration of GCP in vertical and horizontal accuracies, Planning and estimation of drone surveying jobs, Autonomous flight vs. manual and hybrid flight profiles

UNIT 3: Image processing and Photogrammetry

Aerial Triangulation, post processing software's, Analyzing Data, Contouring, DEM, DSM, Cut, Fill, and Volumetric Measurement Calculation and orthophoto generation.

UNIT 4: Modeling

Introduction to mapping and modeling concepts, Understanding RTK, PPK and GCP's, Overview of popular data processing software platforms and functions.

UNIT5: Applications

Application of drone for Surveying & Mapping like Construction, Agricultural, Engineering Land Survey and Architecture.

COURSE OUTCOMES:

The students will have exposure to various components of Drones including

- CO1: Data collection by UAV'S.
- CO2: Surveying with drones.
- CO3: Concepts of Image processing techniques.
- CO4: Modelling and mapping by drone data.
- CO5: Applications of drones.

TEXT BOOKS:

1. One Nation Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems by John E. Jackson
2. Drones and Support for the Use of Force by James Igoe Walsh.

PROGRAMME ELECTIVE –V/ SIT -17
STATISTICS AND COMPUTATION

OBJECTIVES:

1. To have an introduction to Measurements and Their Analysis
2. To comprehend Random Error Theory and Hypothesis Testing.
3. To have an exposure to Error Propagation in Traverse Surveys.
4. To comprehend with Neural Network and Fuzzy Logic.

UNIT I: Measurements and Their Analysis: Introduction, Direct and Indirect Measurement, Measurement Error Sources, Sample versus Population, Range and Median, Graphical Representation of Data.

Unit II: Random Error Theory: Introduction, Theory of Probability, Properties of the Normal Distribution Function, Probability of the Standard Error, Uses of Percent Errors.

Unit III: Hypothesis Testing: Hypothesis Testing: Test of Hypothesis for the Population Mean, Test of Hypothesis for the Population Variance: Test of Hypothesis for the Ratio of Two Population Variances.

Unit IV: Error Propagation in Traverse Surveys: Introduction, Derivation of Estimated Error in Latitude and Departure, Derivation of Estimated Standard Errors in Course Azimuth, Computing and Analyzing Polygon Traverse Misclosure Errors, Computing and Analyzing Link Traverse Misclosure Errors.

Unit V: Neural Network and Fuzzy Logic: Introduction: Basic Concepts of Neural Networks and Fuzzy Logic, Differences Between Conventional Computing and Neuro-Fuzzy Computing, Characteristics of Neuro-Fuzzy Computing. Fuzzy Set Theory: Basic Definitions and Terminology and Membership Functions – Formulation and Parameters, Neural Networks, Fuzzy Logic and Genetic Algorithm.

COURSE OUTCOMES:

The students will have exposure to

- CO1: A thorough understanding of measurements and their analysis.
- CO2: Comprehension of Random Error Theory
- CO3: Hypothesis Testing.
- CO4: To Error Propagation in Traverse Surveys.
- CO5: Comprehension of Neural Network and Fuzzy Logic.

TEXT BOOKS:

1. Adjustment Computations (Statistics and Least Squares in Surveying and GIS) - Paul R.Wolf & Charles D. Ghilani
2. Finite Element by Buchnan, TataMcgraw Hill, 2006

REFERENCE BOOKS:

1. Neural Networks by Satish Kumar, Tata Mcgraw Hill, 2004.

PROGRAMME ELECTIVE –V/ SIT -17
WEB DEVELOPMENT

OBJECTIVES:

1. To provide an exposure to concepts of HTML5
2. To provide hands on experience on working with HTML5 concepts
3. To provide an exposure to applying styles with CSS3
4. To study concepts of DotNet basics.
5. To provide a glimpse of working with windows services

UNIT-I: HTML5: HTML 5, Overview of HTML 5, HTML5 Syntax, Forms, Form Elements, New attributes for <form>, New attributes for <input>, Video and Audio, Types of Elements, HTML5 NEW ELEMENTS, Migration from HTML4 to HTML5, HTML5 DEPRECATED TAGS, HTML5 DEPRECATED ATTRIBUTES.

UNIT-II: Advanced concepts of HTML5: App Cache or Offline Applications, Web Storage, Web Workers, Server Sent Events - One Way Messaging, MathML, Geolocation, Drag and Drop API, File API, WEB SQL, Canvas Overview, SVG.

UNIT-III: CSS3: CSS 2.0 vs CSS 3.0, Introduction to css3, what's new in css3.0, border, background, Gradients, Linear Gradients, Radial Gradients, text effects, FONT Face, Google fonts, 2D Transforms, 3D Transforms, Box Resize, Box Sizing, Outline, Animations, Selectors, Multiple Columns, Converting Layout to HTML 5 & CSS 3.

UNIT-IV: WORKING With DOTNET: Introduction to Microsoft .NET framework: arrays, operators, flow control statements, functions and properties, C#.NET Language Basics-Working with Data Types -Type Conversion, Boxing & Unboxing, Conditional Statements (if, switch condition), operators, Looping Arrays, Enumerations.

UNIT-V: Creating Web Services: Windows forms and Event Controls., Understanding the services, Windows service Architecture, Windows Services- Service base class, Service Process installer, Service Installer, Creating a Windows Service, Installing and uninstalling windows services, Google Earth, KML Virtual Earth & Bhuvan.

COURSE OUTCOMES:

The students will have exposure to

- CO1: Fundamentals of HTML5.
- CO2: Various types of tags in HTML5.
- CO3: Familiarization with CSS3.
- CO4: Concepts and working knowledge in DotNet
- CO5: Concepts and creation of web services.

TEXT BOOKS:

1. The Complete Reference: HTML and CSS, 2nd & 5th Editions by Thomas A. Powell, McGraw Hill.
2. Ajax: The Complete Reference – Thomas A. Powell, McGraw Hill, 2008.
3. Web Technologies by Puntem bekhar Edition-2

REFERENCE BOOKS:

1. Professional AJAX – Nicholas C Zakas et al, Wrox publications, 2006.
2. An Introduction to Web design and programming, Wang, Thomson.
3. Visual C# .NET Programming

OPEN ELECTIVE/ SIT -18
BUSINESS ANALYTICS

OBJECTIVES:

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Manage business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

UNIT I: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT-II: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression.

Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT-III: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT-IV: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT-V: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

UNIT-VI: Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

COURSE OUTCOMES:

Students will be able to

CO1: Demonstrate knowledge of data analytics.

CO2: Think critically in making decisions based on data and deep analytics.

CO3: Use technical skills in predicative and prescriptive modeling to support business decision-making.

CO4: Translate data into clear, actionable insights.

REFERENCE BOOKS:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

INDUSTRIAL SAFETY

UNIT-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes, Fire prevention and firefighting, equipment and methods.

UNIT-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III: Wear and Corrosion and Their Prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion, Types of corrosion, corrosion prevention methods.

UNIT-IV: Fault Tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

REFERENCE BOOKS:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

OPEN ELECTIVE/ SIT -18
OPERATIONS RESEARCH

UNIT I: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

UNIT II: Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT III: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

UNIT IV: Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V: Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

COURSE OUTCOMES:

The student should be able to

CO1: Students should able to apply the dynamic programming to solve problems of discrete and continuous variables.

CO2: Students should able to apply the concept of non-linear programming

CO3: Students should able to carry out sensitivity analysis

CO4: Student should able to model the real world problem and simulate it.

REFERENCES BOOKS:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

OPEN ELECTIVE/ SIT -18
COST MANAGEMENT OF ENGINEERING PROJECTS

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

REFERENCE BOOKS:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

OPEN ELECTIVE/ SIT -18
COMPOSITE MATERIALS

UNIT-I: Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT-IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding, Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

REFERENCE BOOKS:

1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

WASTE TO ENERGY

UNIT-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

UNIT-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

REFERENCES BOOKS:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

DISSERTATION PHASE-1

The Project Work will start in semester III and should preferably be a problem with research potential and should involve scientific research, design, generation/collection and analysis of data, determining solution and must preferably bring out the individual contribution.

Seminar should be based on the area in which the candidate has undertaken the dissertation work as per the common instructions for all branches of M. Tech.

The examination shall consist of the preparation of report consisting of a detailed problem statement and a literature review.

The preliminary results (if available) of the problem may also be discussed in the report.

The work has to be presented in front of the examiners panel set by Head DRC.

The candidate has to be in regular contact with his guide and the topic of dissertation must be mutually decided by the guide and student.

COURSE OUTCOMES:

CO1: Students will be exposed to self-learning various topics.

CO2: Students will learn to survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.

CO3: Students will learn to write technical reports.

CO4: Students will develop oral and written communication skills to present and defend their work in front of technically qualified audience.

DISSERTATION PHASE- II

It is a continuation of Project work started in semester III.

He has to submit the report in prescribed format and also present a seminar.

The dissertation should be presented in standard format as provided by the department.

The candidate has to prepare a detailed project report consisting of introduction of the problem, problem statement, literature review, objectives of the work, methodology (experimental set up or numerical details as the case may be) of solution and results and discussion.

The report must bring out the conclusions of the work and future scope for the study.

The work has to be presented in front of the examiners panel consisting of an approved external examiner, an internal examiner and a guide, co-guide etc. as decided by the Head and PG coordinator.

The candidate has to be in regular contact with his guide.

COURSE OUTCOMES:

CO1: Students will be able to use different experimental techniques.

CO2: Students will be able to use different software/ computational/analytical tools.

CO3: Students will be able to design and develop an experimental set up/ equipment/test rig.

CO4: Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.

CO5: Students will be able to either work in a research environment or in an industrial environment.

CO6: Students will be conversant with technical report writing.

CO7: Students will be able to present and convince their topic of study to the engineering community.

Eligibility Criteria:

M.Tech (Spatial Information Technology)	<p>B.E/B.Tech: Civil/Environmental, Computer Science, Remote Sensing, IT, ECE, Marine, Bio-informatics, Agriculture, Geomatics, courses in planning and Architecture, and other related courses.</p> <p>M.Sc: Geoinformatics/Geomatics/Geospatial Science, Geophysics, Geology, Geography, Remote Sensing, Oceanography, Physics, Agriculture, Forestry, Horticulture, Environmental Management</p>
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Alkumari
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Shrestha
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V. Baghel
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Rajsaubh
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