GEO-ENGINEERING

SCHEME AND SYLLABI (With effect from 2020-21)

B.Tech III Year - I Semester

Course code	Category	Course Title	Hours per week L	T	Internal Marks	External Marks	Total Marks	Credits
GI 3101	PC	Geographical Information systems - I	4	0	30	70	100	3
GI 3102	PC	Database Management Systems	4	0	30	70	100	3
GI 3103	PC	Remote Sensing-II	4	0	30	70	100	3
GI 3104	PE	Professional Elective-I	4	0	30	70	100	3
GI 3105	OE	Open Elective -I	4	0	30	70	100	3
GI 3106	PC	Geographical Information systems-I Lab	0	3	50	50	100	1.5
GI 3107	PC	Database Management Systems Lab	0	3	50	50	100	1.5
GI 3108	SC	Digital Photogrammetry	1	2	50	50	100	2
GI 3109	INT	Internship-I			50	50	100	2
		Total Credits						22

B.Tech. III Year - II Semester

GI 3201	PC	Digital Image Processing	4	0	30	70	100	3
GI 3202	PC	Geographical Information Systems-II	4	0	30	70	100	3
GI 3203	PC	Geodesy & GPS	4	0	30	70	100	3
GI 3204	PE	Professional Elective-II	4	0	30	70	100	3
GI 3205	OE	Open Elective -II	4	0	30	70	100	3
GI 3206	PC	Geographical Information Systems-II Lab	0	3	50	50	100	1.5
GI 3207	PC	Digital Image Processing Lab	0	3	50	50	100	1.5
GI 3208	PC	Geospatial Analysis with Python Lab	0	3	50	50	100	1.5
GI 3209	SC	Soft Skills	1	2	50	50	100	2
		Total Credits						21.5

Internship-II

B.Tech. IV Year - I Semester

GI 4101	PE	Professional Elective-III	4	0	30	70	100	3
GI 4102	PE	Professional Elective-IV	4	0	30	70	100	3
GI 4103	PE	Professional Elective-V	4	0	30	70	100	3
GI 4104	OE	Open Elective- III	4	0	30	70	100	3
GI 4105	OE	Open Elective- IV	4	0	30	70	100	3
GI 4106	HSSE	HSS Elective	4	0	30	70	100	3
GI 4107	SC	Cloud-based Geospatial Analysis	1	2	50	50	100	2
GI 4108	INT	Internship-II			50	50	100	2
		Total Credits						22

B.Tech. IV Year - II Semester

GI 4201	PROJ	Project work	100	100	200	14
		Total Credits				14

PROFESSIONAL ELECTIVES

1. Spatial Data Mining & Neural Networks
2. Soft Computing Techniques
3. Internet of Things
4. Climate change and GIS
5. Geoinformatics for Forestry and Ecology
6. GIS for Health, Utility and Energy
7. GIS for Transportation Engineering
8. Data Science
9. Artificial Intelligence
10. Machine Learning
11. Computer Graphics
12. Web Programming & Applications
13. Open-Source GIS & Web Mapping
14. Airborne & Terrestrial LiDAR
15. Drone & UAV Remote Sensing

OPEN ELECTIVES

1. Geoinformatics for Environmental Monitoring
2. Geoinformatics for Earth Science Applications
3. Geoinformatics for Agriculture Survey
4. Geoinformatics for Resources Development and Disaster Management
5. Geoinformatics for Watershed Management
6. Hydrology and Water Resources Engineering
7. Geoinformatics for Coastal Zone Management
8. Urban Planning & Information Systems
9. Soil Surveying and Mapping
10. Geoinformatics for Water Resources Development
11. Geoinformatics for Water Resources Management
12. Geoinformatics for Water Resources Assessment

HSS ELECTIVES

1. Operations Research
2. Industrial Management and Entrepreneurship
3. Organizational Behavior

(THIRD YEAR) 1st SEMESTER

GI 3101 GEOGRAPHIC INFORMATION SYSTEMS –I

Course Objectives:

The objective of the course is to

* Familiarize with the concept of GIS, its components, along with its advantages

* Focus on different available data formats in GIS

* Impart knowledge of spatial data structures details and input, management and output processes

* Explain different possible areas of GIS applications

Course Outcomes:

After completion of the course student will be able to

* Gain knowledge in fundamental concepts of GIS

* Develop skills in collecting, editing different types of GIS data

* Demonstrate expertise in database management in GIS

* Represent and visualize DEMs in GIS

SYLLABUS

Introduction to Geographical Information Systems: Introduction maps and spatial information. Computer-assisted mapping and map analysis, Map Projections – Usage of Maps Geographic Information Systems. The components of geographical Information System; Future directions and trends in GIS Datadisplay, Data Storage, Spatial Indexes, Data analysis tool – Computer-Assisted Cartography – Advantages, Disadvantages, GIS and Computer-Assisted Cartography – History of GIS – Basic Components of GIS – Hardware, Software, Organizational Context – Comparison of GIS and Hardcopy Maps – GISSoftware available in Market.

Data Files and Databases: Data Types – Non-Spatial Data – Nominal, Ordinal, interval, ratio-Spatial Data – Points, Lines and Polygons / Area –File Types – Simple lists, Ordered Sequential Files – Indexed Files – Database – Functions, Database structures – Hierarchical, Network, Relational.

Raster Data structures: Raster Data Model – Creating a raster – Cell by cell entry, digital data, Scanner – Tessellations – Regular, Irregular –Geometry of Regular Tessellations – Shape, Adjacency, Connectivity, Orientation – Resolution of Regular Cell – Data Encoding, Rule of dominance, Rule ofimportance, Center of Cell, Space Filling Curves – Run length, Block, Row Order, Prime Row Order, Peano Order, Pi Order – Variable Resolution regular cells – Quadtree data structure – Irregular Tessellations – Theissen polygons, Triangulation, Delaunay triangles.

Vector Data Structure:Vector Data Model – Arcs, Storing area – Database Creation – Digitizer, On Screen Digitizing – Topology – EulerEquation, Topological Consistency, Topological Errors, Error identification, Topological Editing, Line weeding, Node matching, Dangle truncation, Fuzzy tolerance,Digital Line Graph, Arc Node Structure, DIME etc.

Continuous Surface Representation: Digital Elevation Models – Elevation data capture, Interpolation, DEM representation – Altitude matrix, TINstructure – DEM interpretation, Scale, Visualization, Applications.

Text Books:

* Burrough P.A., Principles of Geographical Information Systems for Land Resources Assessment, Oxford University Press.

* Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999.

Reference Books:

* Star J. Estes. J GIS – An Introduction, Prentice Hall, NJ, USA, 1990.

* Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996.

GI 3102 : DATABASE MANAGEMENT SYSTEMS

Course Objectives:

The objective of the course is to

* Summarize the role of a database management system in an organization

* Demonstrate basic database concepts, including the structure and operation of therelational data model

* Introduce simple and moderately advanced database queries using Structured Query Language (SQL)

* Explain and successfully apply logical database design principles, including E-R diagrams and database normalization

* Demonstrate the concept of a database transaction and related database facilities, including concurrency control, and data object locking and protocols

Course Outcomes:

After completion of the course student will be able to

* Understand and evaluate the role of database management system in an organization apply logical database design principles, including E-R diagrams

* Infer database queries using Structured Query Language (SQL)

* Demonstrate the concept of a database transaction and related database facilities, including concurrency control, and data object locking and protocols

* Design and develop a small database project using database software

SYLLABUS

Databases and Database User : Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS.

Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher Than Two.

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.

Relational Database Design by ER and EER - to - Relational Mapping: Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model , Constructs to Relations.

Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries INSERT, DELETE, and UPDATE Statements in SQL, Specifying Constraints as Assertions and Triggers, Views (Virtual Tables) in SQL, Additional Features of SQL.

Introduction to SQL Programming Techniques :Database Programming: Issues and Techniques, Embedded SQL, Dynamic SQL, and SQLJ Database Programming with Function Calls: SQL/CLI and JDBC, Database Stored Procedures and SQL/PSM.

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.

Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, Geographic Information Systems (GIS), Genome Data Management.

Text Books:

* Fundamentals of Database Systems, 5/E (Chap 1-3,5-11 and 30) RamezElmasri, Shamkant B. Navathe, Pearson Ed

* Database Management Systems , 3/e, Raghurama Krishnan, JohannesGehrke, TMH

* Database System Concepts, 5/E AviSilberschatz, Korth, Tata Mc Graw Hill.

Reference Books:

* Database principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning

* Introduction to database Systems, 8/e C J date, PEA

GI 3103 REMOTE SENSING – II

Course Objectives:

The objective of the course is to

* Impart knowledge on satellite data reception and processing

* To familiarize student with types of errors and correction for satellite images

* To introduce the concept of thermal remote sensing and microwave remote sensing

* To familiarize with interpretation of thermal and radar imagery.

Course Outcomes:

At the end of the course the student will be able to understand

* The types and configuration of various satellites and sensors

* Types of errors and correction of satellite images

* The concepts of thermal and hyperspectral remote sensing

* The concepts of microwave remote sensing

* Interpretation of RADAR images

SYLLABUS

Data reception, Data processing & Data generation: Ground station, Global and Indian data products Satellite Data Receiving and data generation, Data processing & correction.

Radiometric and Geometric corrections: Radiometric corrections Random noise correction Atmospheric correction, Geometric errors and corrections, Distortion evaluated from tracking data, distortion evaluated from ground control Image correction. Ground Investigation in support of Remote sensing Uses of ground data, calibration correction, Interpretation of properties, Training sets, Accuracy evaluation, test sites.

Thermal Imaging : Thermal Imaging: Introduction - IR region of the Electromagnetic spectrum, Atmospheric transmission, Kinetic and radiant temperature, Thermal properties of materials, Emissivity, Radiant temperature, Thermal conductivity, Thermal capacity, thermal inertia, Apparent thermal inertia, Thermal diffusivity IR - radiometers, Airborne and Satellite scanner system Characteristics of IR images, Scanner distortion, image irregularities, Film density and recorded Temperature ranges Effects of weather on images: Clouds, Surface winds, Penetration of smoke plumes; Interpretation of thermal imagery; Advantages of Thermal imagery.

Introduction to Microwave Remote Sensing: Introduction, Microwaves for Remote sensing, History of Microwave Remote Sensing, The E M R, radar operating principle; Radar equations, Definitions Incidence angle, Look angle, depression angle, Azimuth angle, Spatial Resolutions in Radar, Range Resolution, Azimuth Resolution. Types of Microwave sensors, Real Aperture Radar (RAR), Synthetic Aperture Radar (SAR), Geometry of Radar Imagery, Microwave Radiometers, Microwave Scatterometer, Microwave Altimeter, Airborne and Spaceborne Platforms and Sensors, SEASAT, SIR-A, SIR-B , JERS, ERS and EOS. Radar data & Data Interpretation: Spatial Resolutions in Radar: Range resolution, Azimuth Resolution, Radar return and Image signature, System properties (Wavelength, Polarization and Incidence angle) Terrain properties: Di-electric constant, Surface Roughness, Feature Orientation. Forms of Radar return: Spectral Reflection, Corner Reflection or Diffuse scattering Radar image characteristics, slant range distortion, Relief displacement, Layover, Foreshortening, Radar shadow, Parallax and Stereo capability, speckle. Interpretation of SLAR image, SAR Image, Atmospheric applications, Ocean and Land, SAR interferometry.

Text Books:

* Lillisand T.M. and Kiefer R.W. Remote Sensing and Image Interpretation (4th ed), John willey and Sons, Inc, New York, 2000

* Fundamentals of Remote sensing- George Joseph, University Press.

* Applied Remote Sensing, C.P. Lo, Longman, Scientific and Technical Publishers

Reference Books:

* Remote Sensing in hydrology, Engman, E.T. Gurney, R.J.

* Remote Sensing in water management in command areas, Govardhan.

GI 3106 GEOGRAPHIC INFORMATION SYSTEMS -I LAB

Course Objectives:

The objective of the course is to

* Familiarize yourself with different GIS software.

* Train students in creating spatial layers in GIS.

* Train students in performing basic GIS tasks.

* Teach Map analysis.

Course Outcomes:

After completion of the course the student will be able to

* Understand basic GIS data concepts.

* Perform basic GIS analysis.

* Demonstrated a practical application of GIS.

* Gain practical experience in spatial analysis in GIS.

SYLLABUS

1. Getting familiar with ArcGIS software

2. Geo-referencing & Reprojection: mage to image rectification, keyboard entry rectification - setting projections

3. Geodatabase Creation & digitizing entities like point, line and polygon data.

4. Editing and adding labels, cleaning and generating coverage topology.

5. Map Design (Layout & Composition) & Thematic Map creation

6. Attribute data addition and query generation

7. Vector Analysis- Buffer, Overlay operations (clip, union,intersect,erase)

8. Surface Analysis – Generating TIN, Hillshade, Slope, Aspect from DEM

GI 3107 : DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

The objective of the course is to

* To familiarize with features of commercial RDBMS packages such as ORACLE,MS Access and SQL

* To impart practical knowledge on design and implement a database schema.

* To demonstrate the use of basic SQL commands on DDL ML,DCL,TCL and construct queries on them.

* To train the student to develop application programs using PL/SQL.

Course Outcomes:

Upon completion of the laboratory work the student will be able to

* Apply the basic concepts of database systems and applications.

* Use the basic SQL and construct queries using SQL in database creation and interaction.

* Design a commercial relational database system by writing SQL using the system.

* Analyze and select storage and recovery techniques of the database system.

SYLLABUS

1. Study features of a commercial RDBMS package such as ORACLE, MS Access, MYSQL & Structured Query Languages (SQL) used with the RDBMS.

2. (Select two of RDMSS) Laboratory exercises should include

3. Exercise 1: Defining schemes for applications, creation of a database.

4. Exercise 2: Writing SQL Queries, to retrieve information from the database.

5. Exercise 3: Use of host Languages, interface with the embedded SQL.

6. Exercise 4: Use of forms& report writing packages available with the chosen RDBMS product.

Some sample examples, which may be programmed, are given below:

1. Accounting package for a shop, Database manager for a magazine agency or a newspaper agency.

2. Ticket booking for performances.

3. Preparing greeting cards & birthday cards.

4. Personal accounts- insurance, loans, mortgage payments, etc. Doctor's dairy & billing system.

5. Personal bank account Class marks management, hostel accounting, Video tape library, History of cricket scores, Cable TV transmission program manager, Personal library.

GI 3108 : DIGITAL PHOTOGRAMMETRY

Course Objectives:

The objective of the course is to

* Introduce the concepts of analytical and digital photogrammetry

* Impart knowledge on principles of softcopy photogrammetry and production of DEMs

* Teach traditional ground control survey methods and GPS usage.

* Impart knowledge on photogrammetry applications in various fields.

Course Outcomes:

After completion of the course student will be able to

* Explain fundamental principles of analytical photogrammetry.

* Conduct surveys to establish ground control for photogrammetric operations

* Assess the quality and accuracy of digital elevation models.

* Discuss application of photogrammetry in various fields.

SYLLABUS

Introduction to Analytical Photogrammetry: Image measurements, Control points, Collinearity condition, Coplanarity condition, Space resection by collinearity, Space intersection by collinearity, Analytical Stereo model, Analytical Interior Orientation, Analytical Relative Orientation, Analytical Absolute Orientation, Analytical Self calibration.

Principles of Softcopy Photogrammetry: System Hardware, Image measurements, Orientation procedures, Epi polar geometry, Digital image matching, Automatic production of digital elevation model and Orthophotos.

Ground Control for Aerial Photogrammetry &Aerotriangulation: Traditional field survey methods of establishing horizontal & vertical controls .Ground control surveys by GPS, Pass Points for Aero triangulation, Sequential construction of Strip model from independent models, Independent model Aerotriangulation by simultaneous Transformations, Bundled Adjustment, Bundled Adjustment by GPS control, Triangulation with Satellite images, Computational strategies for triangulation.

DEM Quality Assessment: Vertical & Horizontal Accuracy, Post Spacing, Vertical & Horizontal Datum, Projection and Coordinate system, DEM Editing,

TIN/DEM Accuracy testing, Quality Control, TIN interpolation DEM User Requirements – Accuracy and Cost Considerations – Technology-based cost comparisons, Area-based cost comparisons, and Accuracy-based cost comparisons.

Photogrammetric Applications in GIS: Hazardous Waste Management, Water Quality Management, WildLife Management, Environmental Restoration, Land Development, Transportation, Hydrography, Multipurpose Land Information System.

PRACTICALS:

1. Creation of Non-oriented Digital Stereo Models
2. Creation of Oriented Digital Stereo Models
3. Accuracy of Digital Stereo Models
4. Measurements of 3Dimensional information
5. Collecting & Editing 3D GIS data
6. Aerial Triangulation
7. Triangulation with Satellite Imagery
8. Orthorectification
9. Automatic Digital Terrain Model Extraction

Text Book:

* Paul R Wolf and Bon A. Dewitt, Elements of Photogrammetry (3 ed), McGraw Hill David F. Maune.

Reference Book:

* Digital Elevation Model Technologies and Applications: The DEM User Manual. The American Society of Photogrammetry and Remote Sensing, Bethesda, Maryland.

(THIRD YEAR) 2nd SEMESTER

GI 3201 : DIGITAL IMAGE PROCESSING

Course Objective:

To make the undergraduate Engineering Students understand the concepts, principles, processing of Satellite data in order to extract useful information from them.

Course Outcomes:

At the end of the course the student will be able to understand

* Various components and characteristics of image processing systems

* The concepts of image geometry and radiometry and corrections

* Various types of image enhancement techniques used for satellite image processing

SYLLABUS

Introduction – Image processing system considerations. Initial statistical extraction – univariate and multivariate statistics, histogram and its significance in remote sensing data. Preprocessing- Radiometric corrections and Geometric Corrections of Remote Sensing Data

Image Enhancements – Image Reduction & Magnification, Transects, contrast enhancement: linear, non-linear, Spatial Filtering: Spatial Convolution filtering, Image transform – Arithmetic operations' based image transforms, principal component analysis, Tasseled cap transformation, Fourier transforms, Fast Fourier frequency domain filters

Image segmentation: points, lines and edge detection and combined detection

Thresholding: The Basics of Intensity Thresholding, The Role of Noise, The Role of Illumination and Reflectance, Basic Global Thresholding, Split and merge Segmentation

Thematic information extraction: pattern recognition: Supervised Classification: Select the Appropriate Classification Algorithm Unsupervised Classification, Fuzzy Classification, Object-Based Image Analysis (OBIA) Classification, Classification Based on Machine Learning Decision Trees and Regression Trees, Neural Networks.

Change detection: Steps Required to Perform Change Detection, Binary Change Detection Algorithms Provide Change/No-Change Information. Interpretation of Hyperspectral Image Data – Data Characteristics, Challenges to Data Interpretation, Data Calibration Techniques, Interpretation using Spectral Information, Hyperspectral Interpretation by Statistical Methods, Feature Reduction, Regularized Covariance Estimators.

Text Books:

* John, R.Jensen, Introductory Digital Image Processing – Prentice-Hall, New Jersey, 1986

* Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, 3rd ed, Pearson Int.Ed.

Reference Book:

* John A. Richards, Xiuping Jia, Remote Sensing Digital Image Analysis: An Introduction, Published by Springer, 1999.

GI 3202 : GEOGRAPHICAL INFORMATION SYSTEMS-II

Course Objectives:

The objective of the course is to:

* Spatial data manipulation in Geographic information system

* Impart knowledge on spatial and non-spatial data analysis.

* To teach fundamentals of spatial data modeling.

* Familiarize with quality and errors in GIS data

Course Outcomes:

After completion of the course student will be able to

* Gain knowledge in manipulation and transformation of spatial data.

* Understand spatial and non-spatial data analysis.

* Define spatial modeling and explain various models

* Understand the importance of data quality in GIS.

SYLLABUS

Spatial Data Manipulation and Transformation: Line intersections – Point-in-line, Point-in-segment, Point-in-polygon, line intersection with polygons, Union and Intersections of Polygons, shape measures of polygons, buffer zones – Data Transformation – Change in Dimensionality, Change in position – Rubber Sheeting, Tin Sheeting – Vector to Raster, Raster to Vector Conversion.

Spatial and Non-spatial Data Analysis – Raster and Vector : Display of raster data–Local operators–recoding, overlaying–Local Neighborhood operators–Filtering, Slopes and Aspects – Extended Neighborhood operators–Distance, Buffer zones, Visible area or Viewshed –Zonal operations–Zone identification, Zone area, Zone Perimeter, Distance from Zone boundary – Vector data–Polygon overlay, polygon statistics, Network Analysis–Non-spatial data analysis–Structured Query Language.

Spatial Modeling: Modeling – Definition – Spatial Modeling – External Model, Conceptual Model, Logical Model, Internal Model – GIS applications in Resource Management – AM / FM studies.

Data Quality and Error Data Propagation in GIS: Data Quality–Accuracy – Spatial Accuracy, Temporal Accuracy, Thematic Accuracy– Resolution –Spatial resolution, thematic Resolution, Temporal resolution–Consistency– Completeness– Data Quality in Spatial Data Transfer Standards–Lineage, Positional, Attribute accuracy, Logical Consistency, Completeness–Error Propagation.

Miscellaneous Topics: Multi Criteria Evaluation in GIS – Data capture using GPS for GIS FM studies – Object Oriented Database Models. Recent trends in GIS.

Text Books:

* Burrough P.A., Principles of Geographical Information System for Land Resources Assessment, Oxford University Press.

* Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999.

Reference Books:

* Star J. Estees, J GIS – An Introduction, Prentice Hall, NJ, USA, 1990.

* Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996.

GI 3203 : GEODESY AND GPS

Course Objectives:

The objective of the course is to

* To introduce the concepts of Geodesy and its history

* To impart knowledge of Different coordinate systems and datums

* To introduce GPS and its segments

* To impart knowledge of GPS applications in different fields

Course Outcomes:

At the end of the course the student will be able to understand

* Fundamentals of Geodesy, Techniques involved in establishment of geodetic control

* Concepts of geoid, ellipsoid and their interrelationship

* Various types of coordinate systems and relationship between them

* GPS and its segments

* Civilian, Defense, Agricultural applications of GPS

SYLLABUS

Basic principles of Geodesy; History of Geodesy; Spherical Earth; Ellipsoidal Earth; Geoidal Earth; Geodetic Survey Systems; Horizontal Positioning –Determination of Astronomic position, Triangulation, Trilateration; Vertical Positioning.

Fundamentals of Reference Systems and Frames: Geodetic and Cartesian coordinate system; principles of coordinate transformation; Datums: Horizontal and vertical datums – national, regional and local datums; Major datums and Indian datum; World Geodetic System(WGS) WGS84; tidal datums.

Satellite Geodesy: definition; observational systems: Historical systems; Doppler; laser; radar altimetry.

Global Positioning System (GPS): Definition; GPS elements – space segment, user segment and control segment; Observation principles; phasemeasurement techniques; determining orthometric heights; GPS Error Sources and Error Handling Procedures: Atmospheric effects, clock and orbital errors,multipath, anti-spoofing and selective availability, etc; interference and jamming. Accuracy issues, GPS satellite navigation message; GPS time, fundamental andderived frequencies.

GPS receivers: Multi-Channel, sequential and multiplexing receivers; GPS applications: Defense, civilian, Navigational and Geodetic applications;GPS-GIS integration; GPS applications in surveying, mapping, GIS and land navigation and precision farming; integration with other sensors: GPS in intelligenttransportation and fleet management.

Text Books:

* Physical Geodesy by Weikko A. Heiskanen and Helmet Moritz, Freeman and Company.

* GPS: Theory and Practice, B. Hofmann-Wellenhof, H. Lichtenegger and J.Collins, 5th Revised Edition, Springer, Wien, New York, 2001.

* GPS: Theory and applications, B. Parkinson, J. Spilker, Jr. (Eds), Vol. I & II, AIAA, 370 L'Enfant Promenade SW, Washington, DC 20024, 1996

Reference Books:

* GPS for Geodesy, A. Kleusberg and P. Teunissen (Eds), Springer-Verlag, 1996.

* GPS Satellite Surveying, A. Leick, 2nd edition, John Wiley & Sons, 1995

GI 3206 : GEOGRAPHIC INFORMATION SYSTEMS - II LAB

Course Objectives:

The objective of the course is to

* Train the student to identify problems and apply GIS technology for solutions.

* Impart practical knowledge in data editing and topology.

* Train the student to perform geographic analysis.

Course Outcomes:

At the end of the course the student will be able to

* Create a cadastral map of a region/town for the GIS project.

* Perform Geographic analysis for any designed project.

* Create map and make final reports in GIS

SYLLABUS

1. Data input (spatial and attribute) editing and creating topology
2. Performing Geographic Analysis for the designed project
3. Design a project based on cadastral/line drawing/map of a town/ region for GIS project; identification of project problem.
4. Presenting the results (map/report) of the analysis
5. Viva presentation

GI 3207 : DIGITAL IMAGE PROCESSING LAB

Course Objective:

The objective of the course is to

* Impart practical knowledge in image transformation techniques

* Train the student in image classification techniques

Course Outcomes:

After completion of the course student will be able to

* Perform image transformations and image indices.

* Classify satellite data using supervised and unsupervised techniques.

* Perform viewshed analysis and change detection analysis for the given area.

SYLLABUS

1. Histogram equalization
2. Histogram matching
3. Convolution: Low pass filter, high pass filter, Edge Enhancement
4. Principle Component Analysis
5. Tasseled CAP
6. NDVI
7. Convolution: Horizontal, Vertical and Edge Detection
8. Fourier Transformation, Fourier magnitude
9. Supervised Classification,
10. Unsupervised Classification
11. Change Detection Analysis.

GI 3208 : GEOSPATIAL ANALYSIS WITH PYTHON LAB

Course Objectives:

The objective of the course is to

* To familiarize students with application of Python in Geospatial data

* Introduce various geospatial Libraries

* Impart practical knowledge on visualization of spatial data in python

* Train the student in various analysis operations on raster data.

Course Outcomes:

At the end of the course the student will be able to

* Identify and manage appropriate data models to represent spatial features

* Analyze and visualize geospatial information

* Gain experience writing Python scripts (to download, create, interact with and analyze geospatial data in ArcGIS and other software packages);

* Understand the basic concepts behind object-oriented scripting and computing languages;

* Able to create graphic models and custom tools for spatial analysis projects.

SYLLABUS

1. Installation of required geospatial libraries (GDAL, GeoPandas, Rasterio, Fiona, Shapely, Pandas, Numpy etc)
2. Reading and Writing the spatial data from various sources/formats
3. Visualization of geospatial data using python
4. Working with the attribute table and geometries
5. Resampling, Reprojection, and Reclassification of satellite data
6. Mathematical operation with Raster
7. NDVI calculation using NIR and RED band

Text Books:

* Python Scripting for ArcGIS, 2013. Paul A. Zandbergen

* Learning Geospatial Analysis with Python, third edition by Joel Lawhead.

GI 3209 : SOFT SKILLS

Course Objectives:

* To develop skills to communicate clearly.

* To aid students in building interpersonal skills.

* To enhance team building and time management skills.

* To inculcate active listening and responding skills.

Course Outcomes:

* Make use of techniques for self-awareness and self-development.

* Apply the conceptual understanding of communication into everyday practice.

* Understand the importance of teamwork and group discussions skills.

* Develop time management and stress management.

SYLLABUS

Introduction to Soft Skills: Communication – Verbal and Non Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behavior, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Text Books:

* Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.

* Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012

* Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.

* Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.

* Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010

* Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

(FOURTH YEAR) 1st SEMESTER

GI 4107 CLOUD-BASED GEOSPATIAL ANALYSIS

Course Objectives:

The objective of the course is to

* Explain satellite data processing using Google Earth Engine

* Train the student in common pre-processing and GIS techniques in Google Earth Engine.

* Train the student in using Google Earth Engine for environmental applications.

* Implement remote sensing workflows in Earth Engine.

Course Outcome:

After the completion of the course the student will

* To use the Google earth engine.

* To Perform a Cloud based Geo-Spatial Analysis.

Introduction: Google Earth Engine (GEE) is a cloud-based platform for planetary scale geospatial data analysis and communication. By placing more than 17 petabytes of earth science data and the tools needed to access, filter, perform, and export analyses in the same easy to use application, users are able to explore and scale up analyses in both space and time without any of the hassles traditionally encountered with big data analysis. Constant development and refinement have propelled GEE into one of the most advanced and accessible cloud-based geospatial analysis platforms available, and the near real time data ingestion and interface flexibility means users can go from observation to presentation in a single window.

SYLLABUS

1. Getting started with Google Earth Engine. Basics of Java Script
2. Understanding band combinations and image visualizations
3. Calculating Spectral Indices (NDVI, NDWI)
4. Image Classification
5. Classification Validation & Accuracy Assessment
6. Monitoring Vegetation changes over time
7. Working with SAR data in Google Earth Engine

Text Books:

* https://spatialthoughts.com/courses/google-earth-engine/
* https://tutorials.geemap.org/

PROFESSIONAL ELECTIVES

SPATIAL DATA MINING & NEURAL NETWORKS

Course Objectives:

The objective of the course is to

* Teach the concepts of database technology evolutionary path which has led to the need for data mining and its applications.

* Explain the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.

* Impart knowledge on basics of cluster analysis.

* Teach analysis of various feedback networks.

* Explain the applications of neural networks.

* Impart knowledge on neural networks algorithms.

Course Outcomes:

After completion of the course student will be able to

* Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate knowledge discovery.

* Assess raw input data, and process it to provide suitable input for a range of data mining algorithms.

* Discover and measure interesting patterns from different kinds of databases•

* Characterize and discriminate data summarization forms and determine data mining functionalities

* Design and implement a data-mining application using samples, realistic data sets and modern tools.

SYLLABUS

Data Mining: Introduction to Data Mining: importance and motivation of data mining, relational databases, data warehouses and data mining, translationaldatabases, advanced database systems and advanced database application, data mining functionalities, pattern classification of data mining systems, majorissues in data mining. Data mining primitives, definition of data mining tasks, data mining query language, designing of graphical user interface based on datamining query language and architecture of data mining systems.

Classification and Clustering, classification and prediction concepts and issues regarding classification and prediction, classification by decision treeintroduction, Bayesian classification, classification by backpropagation, classification based on concepts from Association rule mining, K- nearest neighborhood classifiers, case-based reasoning, genetic algorithms, roughest approach, fuzzy set approaches and prediction. Cluster analysis: introduction to cluster analysis,types of data in cluster analysis, categorization of major clustering methods.

Data mining applications: GIS and Data Mining – geospatial data mining for market intelligence; data mining for automated GIS data collection.

Neural Networks: Neural network fundamentals: introduction to Hopfield networks, learning in neural networks, applications of neuralnetworks, recurrent networks, distributed representations, multilayer networks and backpropagation algorithms.

Neural networks applications: neural network-based land transformation models; ANN and GIS in natural resource applications.

Text Books:

* Introduction to Data Mining by A. AddisonWesley Publication

* Neural Networks and Fuzzy systems by B. Kosko, Prentice_hall India

Reference Books:

* Geospatial Data Mining for Market Intelligence by Paul Duke (http://

www.tdan.com/view-articles/4921) Data mining for automated GIS data collection by K-H Anders, Photogrammetric Week 01, 2001 pp 263-272 (http://www.ifp.unistuttgart.de/publications/phowo01/Anders.pdf) Using GIS artificial 2.

* Neural networks and remote sensing to model urban change in the Minneapolis-St Paul and Detroit Metropolitan areas, by B.C. Pijanowski and B.A. Shellito (http://web.ics.purdue.edu/~bpijanow/ASPRS% 202001 % 20pijan.pdf)

SOFT COMPUTING TECHNIQUES

Course Objective:

The objective of the course is

* To make the students understand the concepts of Artificial Neural networks, Fuzzy logic and Genetic algorithms and also their application in Geoinformatics.

Course Outcomes:

At the end of the course, students will be able to

* Understand the concepts of Artificial Neural Network, Fuzzy logic, Genetic algorithms and also their application in Geoinformatics.

SYLLABUS

Soft computing and artificial neural networks :Soft Computing: Introduction - soft computing vs. hard computing - soft computing techniques - applications of soft computing - ANN : Structure and Function of a single neuron: Biological neuron, artificial neuron, the definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebbian learning rule/Delta rule, ADALINE, MADALINE and BPN

Fuzzy systems: Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp and fuzzy relations - introduction and features of membership functions, Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making.

Neuro-fuzzy modeling: Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional method.

Applications of soft computing in Geoinformatics: Image registration - Object recognition - Automated feature extraction - navigation – Integration of soft computing and GIS for flood forecasting and monitoring, Landslide susceptibility, Highway alignment, smart city planning, agriculture, solid waste disposal

Text Books:

* Freeman J.A. and Skapura B.M., “Neural Networks, Algorithms Applications and Programming Techniques”, Addison-Wesely, 1990

* Jang J.S.R.,Sun C.T and Mizutani E - Neuro Fuzzy and Soft computing Prentice hall New Jersey,1998

INTERNET OF THINGS

Course Objectives:

The Objective of the course is to understand the

* Fundamentals of Internet of Things and its building blocks along with their characteristics

* Recent application domains of IoT in everyday life

* Protocols and standards designed for IoT and the current research on it.

* Other associated technologies like cloud and fog computing in the domain of IoT

Course Outcomes:

After completion of the course the student will be able to

* Understand the application areas of IOT

* Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

* Understand building blocks of Internet of Things and characteristics.

* Design & develop IOT Devices.

SYLLABUS

Introduction of IoT Domains of IoT, M2M vsIoT,M2M to IoT; M2M to IoT - A Market Perspective; M2M to IoT - An Architectural Overview; M2M and IoT-Technology Fundamentals, Management of IoT.

IoT Communication Protocols: NFC, RFID, Zigbee; MIPI, M-PHY; UniPro, SPMI, SPI, M-PCIe; Wired vs. Wireless communication, GSM, CDMA, LTE, GPRS, small cell; Vulnerabilities and Risks associated with Protocols

IoT Platforms: Hardware, SoC, sensors, device drivers, IoT standards; Cloud computing for IoT; Bluetooth, Bluetooth Low Energy, beacons.

Community Impact of IoT: Federal, State, and Local Municipalities. Security and Privacy Risks, Implications of IoT on various systems: Brand Damage, Loss of Trust, Intellectual Property Theft, Data Leakage

Threat Actors: Sophisticated Actors, Insider Threat, Attack Patterns, Targeted Attacks; Collateral Damage Risk, Social Engineering and Phishing, Remote Access; Vulnerability Landscape; Extensive Vendor Vulnerabilities; Patterns in IoT

Network Vulnerabilities: Boundary protection, Information flow enforcement, Remote access, least privilege, Physical access control, Security function isolation. Implementing a Risk-Based IoT Security Program: Assess, Inventory Assets, Map Network, Document Remote Access, Implementation, Network Segmentation, Harden Systems, Control Remote Access, Log all access, Monitor, Document Policies and Procedures, Training, Lifecycle.

Data Analytics using IoT Tools for IoT, Making Things Smart: Getting Things onto the Internet, IoT in Home, Cities/Transportation, Retail, Healthcare, and Sports.

Text Books:

* "Learning Internet of Things" by Peter Waher, Packt publisher

* The Internet of Things: Enabling Technologies, Platforms, and Use Cases by Anupama C. Raman and Pethuru Raj

* "Practical Internet of Things Security" by Brian Russell, Drew Van Duren, Packt publisher

* "Raspberry Pi with Java: Programming the Internet of Things (IoT)" by James L. Weaver and Stephen Chin, Oracle Press.

Reference Books:

* "The Internet of Things (The MIT Press Essential Knowledge series)", By Samuel Greengard

* "The Silent Intelligence: The Internet of Things", by Daniel Kellmereit and Daniel Obodovski

CLIMATE CHANGE AND GIS

Course Objectives:

The Objective of the course is to

* Provide deep insights into the working of climate change and how to overcome it.

* Explain various issues and processes in climate change

* Impart knowledge on geospatial applications to tackle climate change issues.

Course Outcomes:

After completion of the course the student will be able to

* Identify factors influencing the global climate systems

* Assess impacts of climate change on global, regional and local scales

* Develop strategies for adaptation and mitigation measures

* Identify clean technologies for sustainable development

SYLLABUS

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

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

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

GIS applications in climate change: Introduction, Geo-Spatial Tools for climate change, Spatial and Attribute data in GIS for climate change, Steps in preparing maps for climate change, ArcCatalog and its applications for climate change

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

Text Books:

* Climate Change: A Multidisciplinary Approach- Burroughs, W.J.

Reference Books:

* The Suicidal Planet: How to Prevent Global Climate Change- Mayer Hillman,

* Field Notes from a Catastrophe: Man, Nature, and Climate Change- Kolbert, Elizabeth.

* Cradle to Cradle: Remaking the way we make things William McDonough,

GEOINFORMATICS FOR FORESTRY AND ECOLOGY

Course Objectives:

The objective of the course is to

* Impart knowledge on Indian vegetation and its classification

* Explain interpretation techniques of satellite imagery for vegetation.

* Impart knowledge on microwave remote sensing related forest applications.

* Explain fundamentals of Forest ecology.

Course Outcomes:

After completion of the course the student will be able to

* Develop knowledge in Indian vegetation and its classification

* Interpret satellite imagery to identify changes in vegetation.

* Perform image processing on digital data products.

* Discuss microwave remote sensing applications in forest studies.

SYLLABUS

Forest Classification: Natural vegetation of India and its classification: Concept of natural vegetation, forest / vegetation types of India and its classification. Spectral properties of vegetation & other features: Spectral response from vegetation under different spectral regions, effects of phenological changes on spectral behavior, spectral signatures etc. Aerial photo interpretation for forestry and ecological information extraction: Qualitative characteristics for interpretation of forest types, specifications for aerial remote sensing data, forest mapping using aerial photographs.

Forest Mapping: Visual interpretation of Satellite imagery and Change Detection: Image elements for extraction of vegetation related information from space borne images, monitoring forest change and damage by visual interpretation. Digital image processing for forest vegetation, mapping and change detection.

Microwave remote sensing and its applications in forestry: Concepts involved in interpretation of microwave remote sensing data for forest and landuse information extraction, merging multi spectral and microwave data, utility for volume/density classification. Forest Canopy Density mapping.

Forest Management: Forest fire assessment and risk zonation: Concepts and introduction about fire behavior; Fire mapping possibilities using RS data; Identification of fire prone areas using RS and GIS based spatial modeling. Forest resources information system: Concept of forest resources information system, compilation, integration and interpretation of information for forest management.

Forest ecology Ecological principles and concepts: Ecological principles and concepts, Ecological approaches for evaluation of various ecosystems. Structural analysis of vegetation: Spectral vegetation indices and enhancing; vegetation response in remote sensing data, Vegetation classification and mapping using RS data for ecological studies-terrestrial, wetland and Estuarine vegetation, Phytosociological analysis.

Text Books:

* Manual of Remote Sensing by American Society of Photogrammetry (latest edition).

* Principles of Remote Sensing by P. J. Curran (1985).

* Aerial Photographs in Land Use and Forest Surveys by M. S. Timar & A. R. Maslekar (1974).

* Land Evaluation for Forestry by Food and Agricultural Organization (FAO) (1984).

* Ecology and Field Biology by R. L. Smith (1974).

* Fundamentals of Ecology by E. P. Odum (1976).

* A Handbook of Ecology by R. S. Ambasht & N. K. Ambasht (1993).

Reference Books:

* Remote Sensing for Forest Surveys and Management by S. P. S. Kushwaha In: Proc. ISTE, Varanasi (1987).

* Landscape Ecology by T. T. R. Forman and M. Godron (1986).

* Special Properties of Plants. Appl. Opt. 4, pp 11-20 by D. M. Gates, H. J. Keegan, J. C. Shelter and V. R. Weidner (1965).

* Land Use and Forest Type Classification Proposed for Aerial Photo Interpretation by M. S. Tomar (1976).

* Revised Forest Types of India by H. G. Champion & S. K. Seth (1968). Vegetation Mapping by A. W. Kuchlar & I. S. Zonneveld.

GIS FOR HEALTH, UTILITY AND ENERGY

Course Objectives:

The objective of the course is to

* Impart knowledge on health-based impact classification in disease identify and spread.

* Explain interpretation techniques of satellite imagery for utility.

* Impart knowledge on GIS in energy related applications.

* Explain geospatial techniques in banking sector.

Course Outcomes:

After completion of the course the student will be able to

* Develop knowledge of GIS in demographic analysis

* Interpret satellite imagery to identify health facility locations.

* Perform analysis on digital data for planning and management.

* Discuss remote sensing applications in utility studies.

SYLLABUS

Introduction: definition and its importance, spatial distribution of population according to age, gender, racial group and socioeconomic segregation, geo-ethnography, labor market exploration, health equality, crime analysis, GIS for demographic analysis, trade area analysis, site selection for shopping centers, facility management.

Health GIS: Spatial epidemiology: RS and GIS in study of epidemics and their control-Disease mapping, bioterrorism, infectious disease modeling, Health facility location mapping, health and disease atlas of India. Recent Covid related Applications

Utilities: Power – site suitability assessment for power plants (thermal, hydroelectric, nuclear, mini-hydroelectric power plants), Solar & wind power assessment; GIS in electricity distribution network: Electricity mapping; Telecommunication – applications of GIS in telecommunication industry: Tower spotting; Water & wastewater Utilities.

Transportation & Banking – vehicle routing and scheduling, vehicle tracking system, Tourism – GIS application in Tourism planning; Banking: Market Analysis, Asset Management, Customer Database Management

Archeology: Importance of Archeological and Heritage sites, Role of digital mapping and database development for heritage sites, digital archeology, 3d visualization of Archeological and heritage buildings.

Text Books:

* Transportation Network Analysis - Bell, M.G.H. and Iida, Y.

* Remote sensing and urban analysis - Jean-Paul Donnay, Michael John Barnsley

* Beyond the map: archaeology and spatial technologies - Lock, G. and Harris, T.

* Digital Archaeology: Bridging Method and Theory - Patrick Daly

* Pattern Recognition and Signal Processing in Archaeometry: Mathematical and Computational Solutions for Archaeology - Constantin Papaodysseus

Reference Books:

* Network Analysis in Geography - Haggett, P. and Chorley, R.

* The Geography of Transport Systems - Rodrique, Jean-Paul

* Successful Tourism Management - Seth, P.N.

* The Tourism System: An Introductory Text - Mill and Morrison

GIS FOR TRANSPORTATION ENGINEERING

Course Objectives:

The objective of the course is to

* Teach basic concepts of Geoinformatics in the context of transportation and transportation networks.

* Impart knowledge on data needs and database development for doing transportation analysis in a GIS environment.

* Explain the concepts of transportation networks and algorithms and how they are incorporated into GIS.

Course Outcomes:

After completing this course student will be able to:

* Demonstrate knowledge of transportations systems: how they function, their importance to the space economy and the policies that regulate and promote transportation.

* Formulate and employ transportation models.

* Visualize and analyze transportation systems using GIS tools.

SYLLABUS

Traffic Engineering Studies and Analysis: Objectives, Sampling in traffic studies, sample size; Data collection, analysis and interpretation -Spot speed, Speed and delay, Volume, Origin – destination, Parking. Concept of PCU, Factors affecting capacity and level of service, Types of maneuvers and conflict points.

GIS based Spatial Analysis and Modeling: GIS and spatial Analysis; Urban sprawl; GIS Analytical functions; Coupling Transportation Analysis and Modeling with GIS; Customizing GIS; Supporting Advanced Transportation Analysis in GIS.

Transportation Planning using GIS: Travel Demand Estimation-Application of GIS, Traffic Analysis Zone (TAZ) and screen lines, Four Stage Planning Process (Brief description only), Network representation of a transportation System, Shortest Path determination, GIS based Transportation Planning, Spatial and Non spatial data for land use and transportation.

ITS: Introduction to Intelligent Transport System: Components of ITS, Application of ITS to Traffic Management System- Public Transportation Management System, Application of GIS in vehicle routing analysis and visualizations of traffic data in GIS, Integration of GPS and GIS, Travel time analysis using GPS-GIS integration.

GIS – T Data Models: Data Domains and Data Modeling in GIS – T; Data Modeling and Design Issues; Graph Theory and Network Analysis; Network representation of a Transportation System; Linear referencing methods and systems; Transportation Data Models for ITS. GIS-T applications: Scope of TransCAD and EMME in Transportation Planning (Introduction only).

Text Books:

* Hensher D. A., Button K. J., Haynes K. E., and Stopher P. R. (Eds.), Handbook of Transport Geography and Spatial Systems", Elsevier, 2004.

* Thill Jean-Claude, Geographical Information Systems in Transportation Research, Pergamon, 2000.

* Caliper Corporation, Travel Demand Modeling with TransCAD, 2009.

* Hutchinson, B. G., Principles of Urban Transportation Planning, McGraw Hill, 1979

* Kadiyali, L.R.Traffic Engineering and Transportation Planning, Khanna Publishers

Reference Books:

* Longley P. A., Barnsley M. J., Donnay Jean-Paul, Remote Sensing and Urban Analysis, Taylor & Francis, 2001.

DATA SCIENCE

Course Objectives:

The objectives of the course are to

* Introduce the basics concepts of Data Science.

* Solve problems using data science techniques.

* Understand problem solving through R.

* Visualize data during problem solving

Course Outcomes:

After successful completion of the course the student will be able to

* Explain the fundamentals of data science

* Solve real world problems using data modeling methods.

* Apply R techniques to various applications

* Explain the Hadoop architecture.

* Apply plots to visualize data.

SYLLABUS

Introduction to data science: Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

Modeling methods: Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.

Introduction to R: Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution.

Map reduce: Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting- Reducing phase execution.

Delivering results: Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. Case studies.

Text Books:

* Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014.

* Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.

* W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.

* Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.

* Nathan Yau, "Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics", Wiley, 2011.

Reference Books:

* Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.

* http://www.johndcook.com/R_language_for_programmers.html

* http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction

ARTIFICIAL INTELLIGENCE

Course Objectives:

The objective of the course is to

* Provide an overview and introduction of AI to students.

* Introduce principles of AI towards knowledge representation and inference mechanism.

* Train the student for exhibiting the skills for simulating intelligence behavior and mechanisms that can think, learn, understand and behave like humans.

* Train the student on how to create an Expert system, build intelligent behavior and explain how to advise its use.

* Explain various control strategies in building AI systems.

Course Outcomes:

Upon completion of the course student will be able to

* Know the clear definition of AI, different areas of AI. The problem solving procedures and applications of various techniques used in the process.

* Build a typical AI production system using knowledge representation and inference mechanisms.

* Exhibit his skills on simulation of intelligence behavior and mechanisms in writing the AI programs.

* Build a typical Expert system with intelligent behavior for advising its users.

SYLLABUS

Introduction to Artificial Intelligence: overview of AI, definition of AI, relationship between AI systems and other computing systems, comparison between AI programming and other conventional programming. Sub areas of AI, key issues of AI research, AI problems, AI techniques, problem characteristics and production systems.

Knowledge representation: Knowledge - general concepts, Procedural vs. declarative knowledge, formal systems, symbolic representation- syntax and semantics of FOPL, Properties of w.f.f, clausal forms, resolution and unification, structural representation - semantic nets, conceptual graphs, conceptual dependencies, frames and scripts, probabilistic reasoning - Bayesian networks, non-monotonic reasoning - TMS.

AI languages: LISP-basic list manipulation functions, predicates, LISP constructs, I/O operations in LISP, iteration and recursion in LISP, prolog syntax characters, predicates, rules, facts and goals in LISP variables, conjunctions, operators, back tracking, I/O operations and cut predicates.

Search and control strategies: example of search problems, uninformed search - BFS, DFS and comparisons, heuristic search - hill climbing, best - first search, constraints satisfaction and means end analysis, matching techniques.

Expert system – rule-based systems, backward vs. forward chaining, expert system shells, natural language processing - syntactic and semantic analysis, pragmatic processing, examples of NLP systems, goal state planning, non-linear planning and Hierarchical planning.

Text Books:

* Artificial Intelligence by E. Rich & Knight K- Tata McGraw-Hill

* Introduction to Artificial Intelligence by O.W.Patterson- Prentice-Hall India

Reference Books:

* Artificial Intelligence for R. Schalkoff, McGraw-Hill.

MACHINE LEARNING

Course Objectives:

The Objective of the course is to

* Provide an overview of Machine Learning.

* Understand the importance of various techniques in Machine Learning.

* Apply machine learning methods to solve different problems.

Course Outcomes:

Upon completion of the course student will be able to

* Illustrate Machine learning tasks and significance of binary classification

* Apply probability-based machine learning technique to solve problems.

* Analyze clustering and non-clustering techniques.

* Apply tree-based models for various applications.

SYLLABUS

Introduction to Machine Learning: Applications of Machine learning, Supervisory

Learning: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms

Bayesian Decision Theory: Classification, losses and risks, discriminant functions, utility theory, value of information, Bayesian networks, Influence diagrams, Association rules, Parametric Methods: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures

Clustering: Mixture densities, K-means clustering, Expectation Maximization algorithm, mixtures of Latent Variable Models, Supervised learning after clustering, Hierarchical clustering, choosing number of clusters, Non-parametric methods density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbors, nonparametric regression: smoothing models, choosing smoothing parameters

Decision trees and Linear Discrimination: Univariate classification and regression trees, rule extraction from trees, Multivariate trees, Generalizing linear model, two class and multi-class geometry of linear discriminant,

pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, discrimination by regression, Support vector machines, optimal separating hyperplane, kernel functions for non-separable spaces, SVM for regression.

Hidden Markov Models: Discrete Markov processes, Hidden Markov Models, Three basic problems of HMM, Evaluation problem, finding the state sequence, Learning model parameters, continuous observations, Model selection HMM Assessing and comparing classification Algorithms: Cross-validation and resampling methods, measuring error, interval estimation, hypothesis testing, assessing performance of a classifier, comparing two classification algorithms, comparing multiple classification algorithms based on variance

Text Book:

* Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 2006

Reference Books:

* Machine Learning, Tom Mitchell, McGraw Hill, 1997

* Pattern Classification, Richard 0. Duda, Peter E. Hart and David G. Stork, John Wiley & Sons Inc., 2001

COMPUTER GRAPHICS

Course Objectives:

The objective of the course is to

* Introduce basic concepts of computer graphics.

* Impart necessary theoretical background and demonstrate the application of computer science to graphics.

* Train the student to Develop programming skills in computer graphics through programming.

* Teach the Use of geometric transformation on graphics objects and their applications.

Course Outcomes:

Upon completion of the course student will be able to

* Understand the basics of computer graphics and interactive input and output devices.

* Design and implement the algorithms to draw.

* Apply different geometrical transformations such as translation, scaling, rotation, reflection in two dimensions.

* Understand two-dimensional coordinate transformation, viewing functions and various clipping algorithms.

* Understand the various display methods, geometrical & coordinate transformation in three dimensional.

SYLLABUS

Overview of Graphics Systems: Random-scan and raster scan monitors, Color CRT, Plasma panel displays, LCD Panels, Plotters, Film recorders, Graphics workstations, Display processors, Graphics software, Input/output Devices, Touch panels, light pens, graphics tables. Output primitives Points and lines, DDA, Bresenham's Line algorithm, parallel line algorithm, line function, circle generating algorithm, filled area primitives and pixel addressing.

Two-Dimensional Geometric Transformations: Two-Dimensional Geometric Transformations and viewing Use of homogeneous coordinate systems, Translation, scaling, rotation, Mirror reflection, Rotation about an arbitrary point, Zooming and panning, Rubber band methods, dragging, Parametric representation of a line segment. Point, line and polygon clipping.

Three-Dimensional Concepts: Three-Dimensional Concepts and object representations, polygon surfaces, Curved lines and surfaces, quadric surfaces, Blobby objects, Spline representations, Cubic Spline Interpolation methods, Bezier curves and surfaces.

Three-Dimensional Geometric and Modeling Transformations: Three-Dimensional Geometric and Modeling Transformations Translation, Rotation, Scaling, Other Transformations, Composite transformations, Three dimensional transformation functions, modeling and coordinate transformations. Three-Dimensional Viewing, Viewing coordinates, projections, Clipping, Three dimensional viewing functions. Three dimensional viewing. Visible-Surface Detection Methods Back face detection, Depth buffer method, Depth sorting method, Area subdivision method, and Visibility detection functions.

Illumination Models: Illumination Models and Surface-Rendering Methods Halftone Patterns and dithering techniques, Polygon rendering methods, Environment mapping Color Models and Color Applications Properties of light, Intuitive color concepts, RGB, YIQ, CMY, HSV color models.

Text Book:

* Computer graphics C version , second edition Donald Hearn & m.Pauline baker

WEB PROGRAMMING & APPLICATIONS

Course Objectives:

The objectives of the course is

* To expose the student about syntax of basic HTML language

* To familiarize about different web designing tools for web applications

* To teach about the scripting languages

* To impart knowledge on creating a web application environment.

Course Outcomes:

After completion of the course student will be able to

* Demonstrate the importance of HTML tags for designing web pages.
* How to style web pages using Cascading Style Sheets.
* Design interactive web pages with client and server side scripting.
* Create and deploy Web Applications over web server

SYLLABUS

Fundamentals of Web: Hyper Text Markup Language, Web designing through application tools (Microsoft FrontPage/Adobe Dream weaver), cascading style sheets. Netscape and Internet Explorer extensions.

Exercises: Basics of HTML: page layout, headers, paragraphs, links, lists. Cascading Style Sheets (CSS) & Page Layout with CSS HTML Tables & Frames HTML User Interface Controls, HTML Forms. Using Frontpage/Dreamweaver for Web Page Design.

Scripting Languages: CGI programming, Introduction to Scripting languages, (Java Script/ Vb Script/PHP/ Python), Java Script: History, Features of JavaScript, Syntax and Semantics and use in Web pages.

Exercises: Introduction to JavaScript; JavaScript: Arrays, loops, conditional statements and functions; Document Object Model (DOM); Capturing and handling events in JavaScript; Working with Windows and Frames.

Web programming & Application Development: TCP/IP Network model, Client Server technology, Web server, Web Application development using web technologies.

Exercises: Setting up Apache/IIS; Installing PHP; Installing MySQL; Installing and using PHPMyAdmin.

Server Side and Client side scripting: Introduction to Database connectivity, Open Database Connectivity Standard (ODBC), Data insertion, retrieval and selection criteria using database connectivity tools (Database and scripting languages).

Exercises:

A. Introduction to PHP; Working with Data Types and Operators; Building Functions and Control Structures; Manipulating Strings; Working with Files and Directories; Manipulating Arrays.

B. Introduction to SQL; Working with Databases and MySQL; Validating form data(server side);Error Handling and Debugging

Internet GIS: Introduction to Internet/Web GIS; Spatial (Raster and Vector) data dissemination using Web GIS; Distributed GIS development and Services;

Exercises: Configuring and installing map server (Proprietary & Open Source); creating a WebGIS application: publishing raster and Vector Data; Creation of OGC Services (WMS/WFS); Consuming/Creating OGC Services; Introduction to open layers.

Text Books:

* HTML - A Beginners guide, Second edition, Ian Lloyd, 2009.

* Discovering the Internet: Complete Concepts and Techniques by Gary B. Shelly, Thomas J. Cashman, H. Albert Napier, and Philip J. Judd.

* Learning Web Design: A Beginner's Guide to HTML, Graphics, and Beyond by Jennifer Niederst.

* PHP and My SQL for Dynamic Websites: Visual QuickPro Guide (2nd Edition) by Larry Ullman

Reference Books:

* Professional PHP5 Programmer to Programmer) by Edward Lecky-Thompson

* PHP5 and My SQL Bible by Tim Converse and Joyce Park with Clark Morgan

* Database connectivity, Bernard Van Haecke

* Internet GIS: Distributed geographic information services, ZR Peng and MH Tsou.

* Beginning Map server Open Source GIS Development by Bill Kropla (Apress)

OPEN SOURCE GIS & WEB MAPPING

Course Objectives:

The objective of the course is to

* It helps the candidate to think creatively and independently in Geoinformatics project implementation.
* It also gives complete freedom to modify the software to suit the needs.
* The course exposes major avenues of open source opportunities.

Course Outcomes:

At the end of the course the student will be able to understand.

* Concepts and protocols used in Open Source GIS.
* Functionalities of Open Source GIS software in Desktop and Web based environments.
* The availability of various Open Source GIS software and their architecture.

SYLLABUS

Basics for open source implementation: Open Source Software and Freeware W3C, WWW and Protocols – Software standards and open source GIS -OGC, GDAL and OSGeo, FOSS4G - Open source software for Desktop GIS and WEB mapping - Proprietary vs Open source - OGC Standards.

Open source development environment: Linux and Windows – Post-gre SQL and Database Engines - C, C++, OOP and Java streams - GNU, Mosix – WAP and Android stack –Scripts and Macros.

Desktop gis with open source gis: View Graphics – Data exchanges-portability and interoperability – Raster handling and Image analysis – vector data management –Rater and vector analysis - 2D/3D vectors with topology, 3D Voxel, 2D Raster.

Database management and user interface: Files vs Database - Distributed operations and Architecture – ODBC - Open source Database management tools- Database: Spatial and Attribute queries. Spatial functions and Analysis – Map Server, Application Server and Database server concepts.

Open software and web mapping: Open Source Software : GRASS, QGIS, OSSIM, Postgresql and (R) Environment – WEB Mapping Architecture and components – WEB mapping servers- Thin clients in WEB mapping - WMS, WFS, WCS, WPS and other web services- Open Server standards.

Text Books:

* Mitchell T (2005), Web mapping illustrated', O'Reilly Media Inc., Sebastopol, Canada.

* Neteler M, Helena M (2008), Open source GIS: A GRASS GIS approach', 3rd edn, Springer, New York.

Reference Book:

* Bill Kropla (2005) Beginning MapServer: Open Source GIS Development, A press (Springer Verlag) New york.

AIRBORNE & TERRESTRIAL LiDAR

Course Objectives:

The objective of the course is to

* Introduce the LiDAR concepts

* To provide exposure to LiDAR mapping and its applications

* Explain LiDAR data processing techniques.

Course Outcomes:

On completion of this course, the student shall be able to

* Understand the components of Airborne Laser Scanning System

* Plan for Airborne Laser Scanning data Acquisition

* Understand the concepts for generating DEM from Digital Surface Model by filtering

* Get exposed to various domain applications of Airborne Laser Scanner data

SYLLABUS

Laser and space borne laser profilers: Components of LASER: Active Material, Energy Source, Reflection Mirror – LASER Production- LASER Classification: Eye Safety, Class I to Class IV Lasers - Comparison of Various methods of deriving terrain height – LASER RANGING- Types of LiDAR: Range Finder LiDAR, Doppler LiDAR, DIAL – Principles of Laser Ranging: Pulse Laser, Continuous Wave Laser – Space Borne Laser Missions – GeoScience Laser Altimeter System (GLAS), LiDAR In-Space Technology Experiment (LITE), Chandrayan.

Airborne laser scanners: Components of Airborne Laser Scanning System – GPS, IMU, LASER Scanner, Position and Orientation System (PoS) – Types of Scanning Mechanism and Ground Measuring Pattern – Synchronization of Laser Scanner and PoS- LASER Scanners Specification and Salient Features – Concept of Multi return – 3D Cloud Points – Reflectivity of Ground features – Range Correction Factor.

LiDAR data processing: Pre Processing: Direct Georeferencing, Combining Inertial and Navigation Data - Determination of Flight Trajectory - Data processing – Coordinate Transformations – Geolocating Laser Foot Prints – Strip Adjustment – Digital Surface Model to Digital Elevation Model: Filtering, Ground Point Filtering – Flight Planning – Quality Control Parameters – Preparation of flight plan.

LiDAR data management and applications: Airborne Laser Scanner Error Sources - LiDAR data format: ASCII vs Binary, LAS Format – Software used for LiDAR data processing and management – Merits of Airborne Laser Terrain Mapping - Overview of LiDAR Applications - 3D city models – Road and Building Extraction – Forestry Applications – Power Line Mapping.

Terrestrial and bathymetric laser scanner: Terrestrial LiDAR: Static and Mobile (Vehicle Mounted) LiDAR -Terrestrial LASER Scanner Specification – Applications of Terrestrial LASER Scanning –Bathymetric LASER Scanner – Specification – Depth of Penetration: Secchi Depth – Applications of Bathymetric LASER Scanner

Text Books:

* Jie Shan and Charles K., Topographic laser ranging and scanning: principles and processing, CRC Press, Taylor & Francis Group, 2008

* Mathias Lemmens, Laser Altimetry: Principles and Applications, CRC Press 2006.

* Roger Read and Ron Graham, Manual of Aerial Survey: Primary Data Acquisition, Whittles Publishing, 2002.

Reference Books:

* Zhilin Li Qing Zhu, Chris Gold, Christopher Gold, and Digital Terrain Modeling: Principles and Methodology, CRC Press, 2004.

* Zhilin Li, Jun Chen, Emmanuel Baltsavias, Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences, CRC Press; 1 edition, 2008

* Percival, H.F. Small unmanned aircraft systems for low-altitude aerial surveys. J.Wildl.Manage

DRONE & UAV REMOTE SENSING

Course Objectives:

The objective of the course is to

* To provide exposure to drone remote sensing and its applications

* Explain planning and operations of UAV

* Impart knowledge on various drone sensors.

Course Outcomes:

At the end of the course the student will be able to

* Acquire all the knowledge they need to select the UAV system that best suits their application, correctly operate them and which remote-sensing analytical techniques can be used to obtain information from the images.

* Understand the capabilities and limitations of the UAV and data post-processing systems

SYLLABUS

UAV Remote Sensing Principles- UAV Technology and Imagery Acquisition, UAV Remote Sensing, UAV & Space Systems for Earth Observation, UAV Image Processing.

UAV Photogrammetry- UAV Photogrammetry Introduction, UAV Orthophoto generation, Digital Elevation Models (DEM) and 3D Point Cloud Generation.

UAV Operations and Mission Planning- UAV Technology, UAV Planning and Operations, UAV Autopilots, Autonomous Mission Planning, UAV Legislation and Legal Aspects.

UAV Remote Sensing Payload and Onboard Sensors- Multispectral Imagery, Hyperspectral Imagery, Thermal Imagery.

UAV Applications- Drone Remote Sensing in Utilities, Construction and Infrastructure Management, Drone Remote Sensing in Oil and Gas Industry, Drone Remote Sensing in Precision Agriculture, Drone Remote Sensing in Marine Projects, Drone Remote Sensing in Surveying and 3D City Models, Drone for Surveillance and Search & Rescue, UAV Humanitarian Applications, Drone Remote Sensing in Archaeology.

Text Books:

* Barnhart, R., Michael, M., Marshall, D., and Shappee, E. ed. 2016. Introduction to Unmanned Aircraft Systems, 2nd edition. Boca Raton. CRC Press.

* Fahlstrom, P. and Gleason, T. 2012. Introduction to UAV Systems. 4th edition. United Kingdom. John Wiley & Sons Ltd.

Reference Books:

* Wolf, P., DeWitt, B., and Wilkinson, B. 2014. Elements of Photogrammetry with Applications in GIS, 4th edition. McGraw-Hill.

OPEN ELECTIVES

GEOINFORMATICS FOR ENVIRONMENTAL MONITORING

Course Objectives:

The objective of this course is

* Water quality assessment, soil degradation assessment.

* Impart knowledge on geospatial applications in Urban Environment

* Monitoring of Air pollution and climate

* Impart knowledge on Marine pollution

* To expose the students to the applications of Remote Sensing and GIS.

Course Outcomes:

At the end of the course the student will be able to appreciate

* The possible applications of Remote Sensing and GIS in water quality, soil conservation and ecology

* The availability various remote sensing sensors for acquiring environmental datasets

* The use of satellite remote sensing in climatology and air pollution studies

SYLLABUS

Water and the Environment: Remote sensing of water quality–water pollution–potential pollution sources–water runoff, Remote Sensing and Water quality management–snow surface cover–flood prediction. Soils and landforms–soil erosion–salinity–flood damage –soil degradation using Remote Sensing and GIS.

Urban Environment: General consideration rural structure–Urban areas–Impact of industrial pollution– chemical effluents, land reclamation–disposal of solid waste.

Marine Environment: Sensors for environmental monitoring–sensors–visible and outside visible wavelength– absorption spectrometers–selection of ground truth sites–sea truth observations–Radar techniques for sensing ocean surface–thermal measurements–application of sensing, mapping oil slicks–Chlorophyll detection–Fisheries resources.

Air pollution and Global Climatology: Remote sensing techniques for Air quality monitoring–case studies–weather forecasting and climatology–emissivity characteristics–measurement of atmospheric temperature– composition–constituent distribution and concentration.

Case studies: River pollution–the case of Ganga River. Air Pollution in Delhi; Mathura Refinery and Taj Mahal; Urbanization and its impact on Visakhapatnam city environment.

Text Book:

* Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, second edition, Chapman and Hall, New York, 1993.

Reference Book:

* Lintz, J. and Simonent, D.S. Remote Sensing of environment Addision Wesley, Rading mars, 1976.

GEOINFORMATICS FOR EARTH SCIENCE APPLICATIONS

Course Objectives:

The objective of the course is to

* To impart knowledge on Remote sensing applications in Lithological studies

* To gain knowledge in remote sensing applications in Geological structures

* To familiarize with geospatial applications in Geomorphology

* To impart knowledge on RS & GIS techniques in Geological investigations

Course Outcomes:

After completion of the course the student will be able to

* Explain remote sensing applications in Lithological studies

* Understand the importance of Remote sensing in Geomorphological studies

* Explain Remote sensing applications in Geological investigations

* Gain knowledge on remote sensing application in disaster management

SYLLABUS

Remote sensing applications in lithological studies : Introduction; Scope for Geological applications in multispectral data, Thermal Data, Microwave data Mapping of Broad scale Lithological mapping using aerial photos and satellite imagery, Digital analysis for lithological discrimination.

Remote Sensing applications in structural analysis : Bedding and simple dipping strata, Folds, Faults, rift zones, Lineaments, Unconformity, Structural mapping–structural analysis through aerial-and satellite- data, digital techniques for structural analysis.

Remote sensing application in geomorphology: Nature and type of landforms like denudational, structural, fluvial, marine, Aeolian, glacial and volcanic.

Remote sensing application in geological investigations : Remote sensing in Mineral Exploration, Main types of Mineral Deposits and their surface indications, Stratigraphic & lithological Guides, Geomorphological guides, Structural guides, Guide formed by Rock alteration, Geobotanical guides. Groundwater, Petroleum, Hydrogeological mapping, Engineering Geological studies, Landslide studies and disaster management studies using Remote Sensing and GIS techniques – case studies

Engineering and Sub-surface exploration & Disaster Assessment : Engineering geological Investigations: river valley projects, dams and reservoirs, route location (highways and Railways) canal and pipeline alignments; neotectonics, seismic hazard and damage assessment, local ground condition, disaster assessment, volcanic and geothermal Energy applications, volcanic mapping and monitoring, identification of coal fires; environmental geology Resistivity, aeromagnetic and electromagnetic survey for subsurface explorations.

Text Books:

* Ravi P. Gupta, Remote sensing Geology-Springer Publisher, A1Books Co.in.

* Joseph Lintz (Jr) and David Simonett Remote Sensing of environment, Addison Wesley Publishing Company London, 1976.

* Parbin Singh Geology Katson Publishing House Ludhiana 4th edition 1985.

Reference Books:

* Manual of Remote Sensing Vol. II, American Society of Photogrammetry falls church Virginia – 1985.

* Three Dimensional Applications in Geographical Information Systems – by Jonathan Raper, Dept. of Geology, Birkbeck College, University of London – 1989

GEOINFORMATICS FOR AGRICULTURE SURVEY

Course Objective:

The objective of this course is to provide in-depth understanding of remote sensing, satellite image analysis, Geographic Information System (GIS) and Global Navigation Satellite System (GNSS) technologies and their applications in natural resources survey and monitoring including agriculture and soils, forestry and ecology, geology and mineral resources, water resources, coastal and marine resources, urban and regional planning, atmospheric studies and disaster management.

Course Outcomes:

After completion of the course the student will be able to

* Explain the remote sensing applications in soil studies

* understand the importance of applications in agrometeorology

* explain the remote sensing applications in agriculture surveys

SYLLABUS

Introduction: Information needs for Crop Inventory and agricultural water management, Digital and Visual techniques of land use mapping, Digital land use change detection; accuracy assessment

Crop Inventory: Importance of Remote Sensing in agriculture, Spectral characteristics of crops (Optical, Thermal & Microwave), Vegetative Indices, Principles of crop discrimination and average estimation.

Agricultural Water Management: Remote sensing techniques for irrigated/ non-irrigated crop inventory, irrigation water requirement, irrigation scheduling using remote sensing based crop water stress indices, ET estimation using remote sensing techniques, importance and assessment of soil moisture using remote sensing techniques (Optical, Thermal and Microwave),

Drought assessment: Definition and types of drought, Conventional and remote sensing based methods of agricultural drought assessment, (NADAM Project (National Agricultural Drought Assessment and Monitoring).

Crop Resource Survey: Satellite Agro-meteorology: Satellite sensors & specifications for agro-meteorological applications, agro-meteorological parameters retrieval ABHRR applications in agrometeorology GIS based land surface flux modeling.

Soil Conservation: Genesis & Mapping of degraded lands and their potential: Formation and agents, site characteristics of degraded lands, GIS application for assessment of potentiality and productivity, Genesis of shifting cultivation, salt – affected soils, wetlands, ravenous and gullied lands, desertic lands. Mapping using aerospace data. Comparison of empirical and process based models for soil loss estimation.

Text Books:

* Evapotranspiration and irrigation water requirements, edited by M. E. Jenson, R. D. Burman and R. G. Allen (1994).

* ASLE Manual and Reports on Engineering Practice. Scaling up in Hydrology using Remote sensing (1996). John Wiley Publication. Edited by J. B. Stewert,

* Remote sensing Applications in agriculture by Eston & Clarke. Applications of Remote Sensing to Agrometeorology (Ed. F. Toselli), Kluwer Academic Publishers.

* Introduction to Agrometeorology (1994), Second Edition by H. S. Man Oxford & IBH Publishing Co. Pvt Ltd. Bocoo, G.; Palacio, J. and Valenzuela, C. R. 1990.

* Soil reflectance in remote Sensing of earth Sciences: Manual of Remote Sensing, (Edited by Andrew N. Renez) 3rd edition, Vol. 3, pp. 111-118. (John Wiley & Sons. Inc.).

Reference Books:

* Gully erosions modeling using GIS and geomorphic knowledge, ITC Journal, 1990-3: 253-261. Csillag, F., Pasztor, L., and Biehl, 1993.

* Spectral band selection for the characterization of salinity status of soils. Remote sensing of Environment, 43, 231-242. Dwivedi, R. S. and Sreenivas, K. 1998.

* Image Transforms as a tool for the study of soil salinity and alkalinity dynamics. Int. J. Remote sensing, 19 (14): 605-619. Baumgardner, M. F., L. F. Silva, L. L. Biehl, and E. R. Stoner, 1985.

* E. T. Engman, R. A. Feddes and Y. Ken. Mutreja, K. N. (1986) Applied Hydrology. Tata McGraw-Hill Pub. New Delhi, pp: 314 – 171.

* Reflectance properties of soils, Adv. Agron., 38, 1-44. Ben-Dor, E., Irons. And Epema, G. F., 1999.

* Burrough, P. A., 1986. Principles of geographical information systems for land resources assessment. Oxford Univ. Press, New York.

GEOINFORMATICS FOR RESOURCES DEVELOPMENT AND DISASTER MANAGEMENT

Course Objectives:

The objectives of the course is to

* Introduce basic concepts and importance of Natural resources management

* To impart knowledge on geospatial applications in managing resources like water, soils and minerals

* Teach the concept of disaster management.

* To introduce the role of geoinformatics in managing different disasters.

Course Outcomes:

After completion of the course the student will be able to

* Understand the importance of natural resource management.

* Explain the role of geoinformatics in managing resources like water, soils and minerals

* Gain knowledge in concept of disaster management

* Summarize the application of geoinformatics in different disasters

SYLLABUS

Natural Resources Development: Introduction and Scope: role of geoinformatics technologies – aerial photographs; satellite remote sensing; GPS; and GIS in resource evaluation. Water resources – surface water and groundwater resources: mapping and monitoring of watersheds, tanks and reservoirs.

Soil and agricultural resources: Spectral behavior of soils; Mapping of soils using multispectral images; Evaluation of soil erosion prone zones through GIS; Remote sensing in Land use / land cover mapping; Crop area estimations; monitoring of crop vigor; Yield estimations. Forest resources: mapping of forest types; estimations of timber volume; monitoring of forest health – forest pests, forest fires, Trends in deforestation and afforestation.

Remote sensing techniques for identification of rocks and minerals; mapping of geological structures; surface manifestation of minerals and their identification; spectral properties of minerals; role of thermal and hyperspectral remote sensing in mineral exploration. Case studies.

Geoinformatics in Disaster Management: introduction and scope. Coastal Hazards: Storm surges and Tsunamis: Origin, propagation and run-up; Role of coastal topography, bathymetry and vegetation.

Geoinformatics applications in disaster mapping and mitigation; Risk zone mapping: earthquakes – identification of geological structures like faults; volcanic activity–thermal imaging for monitoring temperature changes; GIS-based decision support systems for disaster management.

Text Books:

* Remote sensing for earth resources 2nd Edition, (ed) D.P. Rao, AEG Publ., Hyderabad, 1999 Geomatics solutions for Disaster Management, Li, Zlatanova and Fabbri (ed), Springer, 2007.

* Role of remote sensing in disaster Management, Nirupama and S.P Simonovic, ICLR Research Paper Series 21, 2002.

* Remote Sensing imagery for natural resources monitoring: a guide for first time users, D.S. Wlike and J.T. Finn, Columbia University Press.

* Successful response starts with a map: Improving Geospatial Support for Disaster Management by Committee on Planning for Catastrophe: A Blueprint for Improving Geospatial Data, Tools, and Infrastructure, National Research Council, National Academies Press, 2006, ISBN: 0309103401.

Reference Books:

* Applications of Remote Sensing in Agriculture, M.D. Steven and J.A.Clark, Butterworths, 1990. Tsunamis- to survive from tsunami, Susumu Murata et al., 2009 World Scientific Books.

* Sea-Level Rise and Coastal vulnerability – an assessment of Andhra Pradesh coast, India through remote sensing and GIS, Nageswara Rao, K. et al., (2008)

* Journal of Coastal Conservation, Vol. 12: pp. 195-207 Imperatives for Tsunami Education, Nageswara Rao, K. (2007) Current Science, Vol. 93 (1) pp. 8-9.

* http://www.iclr.org/pdf/Niru_report%20Simonovic.pdf.

GEOINFORMATICS FOR WATERSHED MANAGEMENT

Course Objectives:

The objective of the course is to

* Expose student to different issues in watershed management

* To impart knowledge on soil related studies

* To impart knowledge on rainfall and run-off

* To impart knowledge on integrated water management in Agriculture

Course Outcomes:

After completion of the course the student will be able to

* Understand importance of watershed management and characteristics

* Estimate rainfall and runoff in catchments

* Gain knowledge on integrated water management in Agriculture

SYLLABUS

Watershed Concept: Issues in watershed management - land degradation, agricultural productivity, reservoirs sedimentation, depletion of bio resources, floods and droughts. Principles and approaches - principles of watershed management, different approaches in watershed management; Problem oriented approach, three dimensional approaches, integrated approach, steps in watershed management.

Land Management: Survey, layout; Preparation and Development. Contour demarcation, Bush clearance, updating, store picking and packing, leveling, shaping and consolidation, fencing, plowing; soil and soil moisture con-

servation. Soil survey; conservation measures. Contour techniques, plowing, furrowing, trenching and staking, Gully control. Previous check dams. Brushwood dam, Rock fill dam, Gabion; Impervious check dams.

Water Management: Surface water - Study of rainfall, estimation of run-off at micro catchments, stream gauging; Rainwater harvesting catchment, harvesting, harvesting structures, Ground water - exploration of canal command areas, potential areas; integrated water resources management, conjunctive use.

Integrated Management: Agriculture - Crop husbandry, soil enrichment, inter, mixed and strip cropping, clopping pattern; sustainable agriculture, Hybrid and improved seeds; Biomass management, crop rotation, legumes, organic fertilization, spider farming, pastures and silvopasture; horticulture; tree culture; form forestry; bund utilization, boundary plantation; social forestry; Energy - Renewable resource water power, solar energy wind power; biomass, fire food synthetic fuels, burning of municipal / garbage, ocean tides and waves.

Monitoring and Evaluation: People's Part - Awareness, participation, Response; State and integrated approach, Appreciation of the concept, training, transfer of technology, Resource and Development, Agro-industrial infrastructure; Sustainable society, livestock, small animal farming, pisciculture, sericulture, Health and hygiene education, transport, cues.

Text Books:

* Watershed Management, J.V.S. Murthy - Publishers; New Age International (P) Ltd., New Delhi.

* Space Technology Applications for Sustainable Developments at Watersheds, Technical Report, ISRO-HQ-TR-104-95, ISRO, Bangalore.

Reference Book:

* Watershed Management Project Planning, Monitoring and Evaluation; A Manual for the Asian Region - Asian-US Watershed Project - Forestry for Sustainable Development Program. University of Minnesota, College of Natural Resources, St. Paul Minnesota, U.S.A.

HYDROLOGY AND WATER RESOURCES ENGINEERING

Course Objective:

* This course will enable the students to use RS and GIS tools in the integrated water resource management, oceanography, and glaciology and watershed development.

Course Outcomes:

At the end of the course the student will be able to:

* Analyze the components of hydrological cycle

* Formulate rainfall-runoff and flood routing models

* Mapping the ocean water, surface fresh water and glaciology

* Monitoring the irrigation and watershed areas.

SYLLABUS

Introduction: Hydrology – definition and its importance, hydrological cycle, water budgeting, water demand estimation, surface water bodies, water content in ocean, sea, ice, lakes, dams, tanks, rivers and ground, water resource scenario in India, RS and GIS applications in water resources development and management.

Meteorology, Glaciology and Surface Fresh Water: Rainfall mapping, potential and actual evapo-transpiration, atmospheric water content, cloud mapping, rain forecasting, water quality parameters, cyclone forecasting; Glaciology: monitoring of snow melt and snow formation, snowmelt runoff estimation, estimation of damages; Surface Fresh Water: river diversion studies, site suitability for surface storages and hydro-electric power plants, storage yield analysis and reservoir sizing.

Hydrograph analysis: infiltration, effective rainfall, design storm, direct runoff hydrograph, unit hydrograph theory, derivation of runoff hydrograph from unit hydrograph; runoff analysis, rational method, NRCS approach, derivation of UG for ungauged catchments, synthetic unit hydrograph.

Flood and drought studies: flood frequency analysis, floodplain zoning, estimation of flood for different frequencies, flood forecasting, drought assessment and monitoring.

Irrigation and Watershed: Mapping and monitoring of catchment and command areas, land irrigability mapping, agriculture water demand estimation for different crops, tank information system, wetland mapping, siltation mapping; Watershed: delineation, morphometric analysis, rainfall-surface runoff model, reservoir sedimentation, water-harvesting structures, watershed development planning, mapping of drought prone areas.

Text Books:

* GIS for Water Resources and Watershed Management - John G Lyon

* Application of GIS in Hydrology and Water Resources Management - K.Kovar

* Geographic Information Systems in Water Resources Engineering - Lynn E.Johnson

* Developments In Water Science – Water Resources Systems Planning and Management - Jain S.K and Singh V.P.

Reference Books:

* Water, Wastewater and Storm Water Systems - U.M. Shamsi

* Introduction to Environmental Remote Sensing – Barrett E C

* Remote Sensing principles and interpretation – Sabins F. F.

* Remote Sensing and Image Interpretation – Thomas M Lillesand.

GEOINFORMATICS FOR COASTAL ZONE MANAGEMENT

Course Objectives:

The objective of the course is to

* Introduce the importance of Coastal zone management.

* Impart knowledge on coastal landforms and river deltas.

* Give knowledge on coastal wetlands and sea level changes.

* Impart knowledge on different coastal hazards.

Course Outcomes:

At the end of the course student will be able to

* Understand the importance of coastal zone management.

* Gain knowledge on deltas and other coastal landforms.

* Identify different coastal wetlands.

* Understand sea level changes and different coastal hazards.

* Gain knowledge on remote sensing application in coastal zone management.

SYLLABUS

Coastal and littoral zones – definitions and scope of study Shore zone processes – waves, tides and currents Coastal landforms; River deltas: types of deltas and their morphological variations Human activities and their impact on the delta-fringe coast.

Coastal wetlands: Mangrove swamps, marshes, lagoons, tidal channels/creeks and their significance in coastal stability and economic importance Continental margins – forms and processes; territorial waters and Exclusive Economic Zone Sea level changes – factors involved; effects of sea level oscillations on coastal zones.

Coastal Hazards: Storm surges and Tsunamis: Origin, propagation and run-up; Role of coastal topography, bathymetry and vegetation; Coastal hazard preparedness – coastal protection, education and awareness of coastal communities; Role of geoinformatics in assessment of coastal vulnerability to tsunamis.

Human activity and coastal environment: deforestation, agriculture/aquaculture, pollution and coastal structures, and their effect on coastal zones, Coastal vegetation; shelterbelts; coastal aquifers; freshwater-seawater interface Morphology of Indian coasts.

Coastal zone management: concepts, models and information systems Coastal Regulations Zones (CRZ) and Coastal Management Zones (CMZ): Indian context Application of remote sensing in coastal zone studies Role of Geographic Information Systems in coastal zone studies.

Text Books:

* Geomorphology by A.L. Bloom, Waveland Pr.Inc. 2004

* Deltas, Coleman, J.M., Continuing education Publication Co.Inc. 1976

* Coastal Sedimentary Environments, Davis, A.R. (Jr.), Springer-Verlag, 1985.

* Beaches and Coasts, King, C.A.M., Edward Arnold, 1972

* Introduction to Marine Geology and Geomorphology, King, C.A.M., Edward Arnold, 1974

* Applications in Coastal Zone Research Management, Martin, K.St. (ed), U.N. Institute for Training and Research, 1993.

Reference Books:

* Integrated Ocean and Coastal Management, Sain, B.C., and Knecht, R.W., UNESCO Publication, 1998.

* Subtle Issues in Coastal Management, Sudarshan et al., (ed), IIRS, DehraDun, 2000.

* Tsunamis – Case Studies and Recent Developments, Satake, K. (ed), Springer, 2000.

URBAN PLANNING & INFORMATION SYSTEMS

Course Objectives:

The objective of the course is to

* Introduce the concept of urban planning and its history in the Indian context.

* Impart knowledge in urban planning components

* Familiarize with geospatial application in urban planning

* Impart knowledge on aspect of transportation planning

Course Outcomes:

After completion of the course the student will be able to

* Gain knowledge in Urban planning and its history

* Understand the concepts of zoning, master plans etc.

* Use different GIS techniques and data types to assess urban planning problems

* Gain knowledge in transportation studies in urban context

SYLLABUS

Introduction: Planning: background and principles; Need for planning; Urbanization and its impact, Distribution of land use/land cover. Geoinformatics application in Urban Planning.

Formulation of Plans: Objectives and contents; Regional plan; Perspective plan; Master plan; Development plan; Project (scheme) plan; Delineation of planning area; Trend analysis; Land suitability analysis; Land use planning; Zoning and principles of zoning; Building ByLaws and its principles. Remote sensing for different levels of development planning.

Housing: Importance of housing; urban housing demand and production; Slums and squatters; Housing problem in India. National Housing policy; Site analysis - Layout design; Housing projects.

Transportation planning: Classification of urban roads; Traffic surveys: speed, time, delay surveys. Traffic volume; Origin Destination surveys; Parking surveys; Utility of remote sensing in traffic and transportation studies.

Urban Information System: Information system: Land; Housing; Transportation; Infrastructure; Trends in mapping using remote sensing, GIS and GPS; Database creation for Infrastructure development.

Text Books:

* Gallian B. Arthur and Simon Eisner, the Urban Pattern, City Planning and Design. Affiliated Press Pvt. Ltd., New Delhi 1985.

* Margaret Roberts, Ana Introduction to Town Planning Techniques, Hutchinson, London, 1980.

* Transportation Network Analysis - Bell, M.G.H. and Iida, Y.

* Remote sensing and urban analysis - Jean-Paul Donnay, Michael John Barnsley

Reference Books:

* Network Analysis in Geography - Haggett, P. and Chorley, R.

* The Geography of Transport Systems - Rodrique, Jean-Paul

* Successful Tourism Management - Seth, P.N.

* The Tourism System: An Introductory Text - Mill and Morrison

* Rangwala, Town Planning, Charotar Publishing House, Anand, India

SOIL SURVEY AND MAPPING

Course Objectives:

The objectives of the course are

* To give introduction of remote sensing and explain spectral characteristics of soils.

* To expose the student to physiographic analysis and soil mapping using aerial and satellite remote sensing data.

* To explain Soil morphology and classification

* To explain the Digital Image Processing techniques for soil resource mapping and

* To give introduction to Digital terrain modeling and explain its uses in terrain slope, aspect and physiography analysis for soil mapping.

Course Outcomes:

After the completion of the course the student will be to

* Understand the application of remote sensing and GIS in soil survey and mapping.

* Detect and distinguish various soil from other land cover features by learning about spectral characteristics of soils.

* Conduct physiographic analysis and soil mapping using aerial and satellite remote sensing data.

* Apply the Digital Image Processing techniques for soil resource mapping and

* Create and apply DTM for soil mapping.

SYLLABUS

Introduction: Definition and purpose of soil survey, remote sensing in soil survey, various country programmes and soil survey organizations.

Spectral Characteristics of Soils: soil texture, soil moisture, soil mineralogy, soil colour, organic matter and hyper-spectral remote sensing data

Physiographic Analysis and Soil Mapping: Importance of physiography - soil relationship, physiographic processes; External processes and Internal processes, soils & physiographic relationship in hilly landforms, alluvial landforms and soils, soil and physiographic relationships in aeolian landforms, a case study of physiographic analysis and soil mappingusing remote sensing.

Soil Morphology and Classification: soil morphology; soil colour, soil texture, mechanical composition, structure, consistence, concretions, calcareousness, roots, presence of clay skins, pores etc. Bases of soil classification- soil taxonomy, criteria for soil taxonomy, diagnostic horizons; categories of the system; order, soil orders in soil taxonomy, sub-order, great group, subgroup, family, series.

Digital Image Processing Techniques for Soil Resource Mapping: Spectral signature approach for soil resource mapping and its limitations, DIP techniques for soil mapping; Image enhancement; Contrast stretching, Spatial filtering, Spectral indices, Principal components analysis, Auxiliary enhancements. Image Classification; supervised and unsupervised classifications,

supervised classifications- Maximum Likelihood Classifier, Minimum Distance to Mean Classifier and Parallelopiped Classifier. A case Study of DIP for Soil Resource Mapping.

Digital Terrain Modelling (DTM) for Soil Mapping: landscape approach for inventory of soil resources, DTM– definition, preparation and uses of DTM. GIS approaches for physiographic analysis; geographical stratification, classifier operations, post classification sorting.

Text Books:

* Brady, Nyle C. (1990). The Nature and Properties of Soils. Tenth Edition. Mac Millan Publishing Company, New York.

* Dent David and Anthony Young, 1981. Soil Survey and Land Evaluation. George Allen & Unwin Ltd., U.K.

* Moulders, M.A. (1987). Remote Sensing in Soil Science. Elsevier Science Publishers.

Reference Books:

* Ahn,C-W.; M.F. Baunmgardner and Biehl, L.L. 1996. Soil mapping with the aid of hyperspectral imagery, American Society of Agronomy, Annual convenion in Indianapolis, Nov. 3-8.

* All India soil and Land Use Survey Organization (1971). Soil Survey Manual, I.A.R.I., New Delhi.

* Frost, R.E. (1960). Photo-interpretation of Soils. Manual of Photographic Interpretation. American Society of Photogrammetry.

* Burrough, P.A. (1986) - Principles of Geographic Information Systems. Oxford University Press, Oxford.

GEOINFORMATICS FOR WATER RESOURCES DEVELOPMENT

Course Objectives:

The objectives of the course are

* To expose student to river valley project planning including investigations and remote sensing applications.

* To understand applications of remote sensing for geological investigations and site selection criteria.

* To understand river morphology and study it using remote sensing approach.

* To apply geoinformatics for efficient water management in irrigation systems.

* To understand the procedure of conduction EIA for water resources development projects.

Course Outcomes:

After the completion of the course the student will be to

* To plan for River Valley Projects and select suitable site for the project.

* To conduct investigation for hydel resources.

* To use remote sensing data for the study of river morphology.

* To evaluate water management in irrigation command area.

* To apply geoinformatics for EIA for water resources development projects.

SYLLABUS

River Valley Project Planning : Purpose of planning, stages in the planning process, benefit cost ratio, advantages of river valley projects, classification of reservoirs, technical aspects in river valley project planning- engineering surveys, geological investigations, hydrological investigations, selection of site for a reservoir, remote sensing applications in river valley project planning.

Geo-Engineering Consideration for Investigation of Hydel Resources: Introduction, application of remote sensing data for site selection, type of information – lithology, structure, types of lineaments, unconsolidated material, watershed characteristic, study of surface drainage, study of river geometrics, study of sedimentation, soil erosion survey, location and extent of landslides, location of field check points and the necessity and planning of future surface geophysical investigations in the reservoir and dam sites. economic factors, supply of construction material, access route location.

River Morphology: Introduction, early history, geomorphological approach, key definitions; graded stream, base level, laminar flow, turbulent flow, gradient, discharge, sinuosity, wavelength, natural level, sandbar/braided bar, meander cutoff, oxbow lake, point bar. Paleochannel/ abandoned channel, types of river, river engineering aspects, meandering: bends, crossing, transitional sections, meanders and its relationship to hydrological variables (empirical approach), braiding, straight, river behaviour and its plan form, bank material, remote sensing approach- data, methodology, instruments

Evaluation of Water Management in Irrigation Command Area: Geoinformatics for efficient water management in irrigation systems - agricultural crop land inventory, assessment of water resources, estimation of irrigation water requirement, estimation of agricultural crop areas, status of irrigation water supply and irrigation water demand.

Environmental Impact Assessment of River Valley Project: Importance of River Valley Project, concept of environment – environment, environmental impact, environmental impact assessment. environmental benefits of river valley project - hydro-electric power, irrigation, drinking water supply, flood control, navigation. adverse environmental impact of river valley projects - sub-

mergence of agricultural land and human settlement, loss of forest, waterlogging problem, water pollution effect to flora and fauna. Remote Sensing as a tool in EIA of River Valley Projects – Monitoring, deforestation and afforestation in the river valley, identification of erosion prone areas, reservoir sedimentation, irrigation command area development, water pollution monitoring

Text Books:

* Bell, F.G., 1993 - Engineering Geology, Blackwell, Oxford.

* Foiker, P.G., 1986 - Engineering Geomorphology. Champman and Hall, New York.

* Edward Goldsmith & Nicholas Hildyard (1986), The Social and Environmental Effects of Large Dams, Sierra Club Books, ISBN: 0-87156-848-9.

* Gert A. Schultz, Edwin T. Engman (Editors) (2011), Remote Sensing in Hydrology and Water Management, Springer, ISBN 3642640362

Reference Books:

* Ministry of Irrigation (1984). A guide for estimating Irrigation Water requirements, Govt. of India, Ministry of Irrigation, Water management division, New Delhi, Technical Series No. 2 (Revised), PP. 144.

* Proceedings of National Symposium on Remote Sensing for Sustainable Development, 1992.

* Remote sensing for Resource Development and Environmental Management. Vol. 2, by M.C.J. Damen, G. Siccosmit and H. Th. Verstapper.

* The Social and Environmental Effects of Large Dams by E. Goldsmith & N. Nittildyard.

* Balakrishnan, P., 1986. A technical report on issues in Water Resources Development and Management and the role of Remote Sensing. ISRO-NNRMS-TR67-86

GEOINFORMATICS FOR WATER RESOURCES MANAGEMENT

Course Objectives:

The objectives of the course are

* To expose the student to the design of spatial and non-spatial data in Water Resources Engineering and data Integration

* To understand applications of RS and GIS for studies on drought monitoring.

* To understand GIS analysis for reservoir sedimentation and computing volumes.

* To know the importance of preparation of flood risk zone mapping and for flood damage assessment and use of spatial data for the mapping.

* To conduct GIS analysis for site suitability analysis for water harvesting structures.

Course Outcomes:

After the completion of the course the student will be to

* To organise and design spatial and non-spatial data and perform data Integration.

* To apply geoinformatics for the prediction of drought and its monitoring.

* To compute loss of reservoir capacity.

* To prepare flood risk zone map and conduct flood damage assessment.

* To plan and identify suitable sites for rainwater harvesting.

SYLLABUS

Spatial information systems: Introduction, organization and design of spatial and non-spatial data in water resources engineering. - characterization of spatial information systems, data quality, the time element, spatial objects. Spatial data models; raster and vector data models, Attribute data; spatial attributes, non-spatial attributes, attribute tables. Design of data base and its use and management in hydrology applications, Discussion on a case study.

Drought Monitoring: Introduction and definition. Classification; meteorological drought, hydrological drought and agricultural drought. Factors affecting drought; climatic factor, soil factor, plant factor. Drought indicators; meteorological, hydrological, agriculture, delayed sowing, socio-economic indicators. Conventional drought monitoring - statistical analysis of rainfall data and water balance methods. Remote sensing approach for drought assessment.

Reservoir Sedimentation: Introduction, effects of reservoir sedimentation, sediment deposition in reservoir, sediment distribution in reservoir, Remote Sensing and GIS based reservoir sedimentation studies. Discussion on a case study to compute reservoir volumes, including loss of stor-age capacity due to sedimentation using RS and GIS.

Flood Risk Zone Mapping and Flood Damage Assessment: Introduction, need for Flood Risk Zone Mapping (FRZM), concept of FRZM. Estimation of flood peaks - Rational method, empirical method, unit hydrograph technique and flood frequency studies (Gumbel's method and Log Pearson Type - III method). Role of Remote Sensing and GIS approach in the preparation of risk zone maps.

Site Suitability Analysis for Water Harvesting Structures – Introduction, decision rules in suitable site selection for water harvesting structures as per IMSD guidelines. Input GIS layers; DEM, classified slope map, soil map, runoff potential map, buffer maps for proximity analysis, geological map, etc. GIS analysis for site selection.

Text Books:

* Banham carter, Graeme F. 1994. "Geographic Information Systems for Geoscientists: Modelling with GIS, Elsevier, 1994.

* Handbook of Hydrology, Ministry of Agriculture (1972) Govt. of India, New Delhi.

* Integrated Mission for Sustainable Development technical guide lines, National Remote Sensing Agency, 1995, Department of Space, Govt. of India.

* Robert Laurini and Derek Thompson, 1992. "Fundamentals of Spatial Information Systems" (APIC Series), Academic Press, London, UK.

Reference Book:

* Anon (1991) "Integrated Approach to Flood Disaster Management and Rural Area Development" Water Resources Journal, ESCAP/UN, Bangkok, Thailand, PP 106.

GEOINFORMATICS FOR WATER RESOURCES ASSESSMENT

Course Objectives:

The objectives of the course are

* To make the student aware of various water resources issues and the role of remote sensing in the assessment of water resources towards planning for better water management.

* To understand applications of radar and satellite data for rainfall measurement.

* To understand GIS methodology for groundwater targeting.

* To expose surface water inventory using images.

* To become aware of snow melting runoff modelling using geoinformatics.

Course Outcomes:

After the completion of the course, the student will be to

* To quantify hydrological elements using remote sensing.

* To explore groundwater in hard rock and unconsolidated regions through H

* Hydromorphogeologic mapping.

* To conduct surface water inventory using satellite data.

* To apply geoinformatics for snowmelt runoff modelling.

SYLLABUS

Water Resources Assessment: Introduction to the role of remote sensing, water sector perspective. Water resources issues, minor irrigation tank inventory, snow-melt runoff forecasting, flood management, evaluation of water management in irrigation command area, watershed prioritisation for conservation planning.

Hydrologic Elements and Quantification: Elements of hydrology. Introduction to quantification through remote sensing. Precipitation; Form of precipitation. Measurement of precipitation - Symon's rain gauge, self-recording type, radar, satellite data, cloud indexing techniques. Snow and its spectral characteristics, evapotranspiration, electromagnetic properties of soil moisture.

Hydromorphogeologic Mapping: Groundwater exploration in consolidated material or hard rock terrain- introduction. Hills - Denudational Hill, Inselberg/ Residual Hill, Structural Hill, Denudo-Structural Hill, Dyke. Pediment Rock Cut Rolling Topography, Buried Pediment, Infilled Channels/Valley Fills. Hydromorphogeologic maps for targeting groundwater. Groundwater Exploration in Unconsolidated Material - Introduction, identification of landforms on unconsolidated materials using remote sensing data. Discussion on case studies.

Surface Water Inventory: Surface water resources, interaction of light and water, Visible data and LiDAR for water depth and penetration Studies. Identification of surface water – Sensors and their mapping capabilities. Applications of remote sensing for the identification of water bodies; Visual Methods and digital techniques.

Snowmelt Runoff Forecasting: Introduction, Model types and their use for various hydrologic applications -Energy Balance Method.

Text Books:

* Manual of remote sensing, Vol. II chapter on "Water Resources Assessment", American Society of Photogrammetry.

* Gert A. Schultz, Edwin T. Engman (Editors) (2011), Remote Sensing in Hydrology and Water Management, Springer, ISBN 3642640362

* Seidel K, Martinec J. 2004. Remote Sensing in Snow Hydrology: Runoff Modelling, Effect of Climate Change. Springer: Berlin.

Reference Books:

* Balakrishnan, P., 1986. A technical report on issues in Water Resources Development and Management and the role of Remote Sensing. ISRO-NNRMS-TR67-86

* E.C. Barret, M.J. Beaumont & R.W. Herschy, (1990), Satellite remote sensing for Operational Hydrology, Remote Sensing Reviews, Vol 4(2), Pages 451-466 | Published online: 19 Oct 2009, https://www.tandfonline.com/

* Mohsin Jamil Butt and Muhammad Bilal, (2011), Application of snowmelt runoff model for water resource management, Hydrological Processes, Hydrol. Process. 25, 3735–3747 (2011) Published online 29 April 2011 in Wiley Online Library.

HSS ELECTIVES

OPERATIONS RESEARCH

Course Objectives:

* Formulate a real world problem as a mathematical programming model.

* Provide knowledge of optimization techniques and approaches.

* Understand and study inventory problems.

* Know the network models.

* Put on knowledge in solving replacement problems and different queueing models

Course Outcomes:

* Learned to translate a real-world problem into a mathematical formulation.

* Formulate and Solve Transportation, Assignment and sequencing problems.

* Resolve inventory problems.

* Able to solve maximum flow and shortest path problems.

* Capable to solve replacement problems and analyze queueing models.

SYLLABUS

Introduction: Definitions of Operations Research; Phases of Operations Research; Types of Operations Research models; applications, merits and demerits of Operations Research.

Allocation: Linear Programming problem formulation; Basic assumptions; Graphical solution; Simplex method; Artificial variable technique; Two phase method; Big M method; Duality principle; Primal and Dual relation.

Transportation: Formulation; Solution methods; Unbalanced transportation problems - North west corner rule; Least cost entry method; Vogel's approximation method; Optimal solution; degeneracy.

Assignment: Formulation; Variations in Assignment problem; Travelling salesman problem.

Sequencing: Sequencing of - n jobs through two machines; n jobs through three machines; n jobs through m machines; 2 jobs through m machines.

Inventory Control: Introduction; Types of Inventory; Inventory costs; Deterministic models - Economic order quantity (EOQ) and Economic Production Quantity (EPQ) with and without shortages; Quantity discounts; P system; Q system; Inventory control Techniques.

Network Analysis: Network definitions; Time estimates in network analysis; Labeling using Fulkerson's rule; Forward pass computations; Backward pass computations; Project management using Critical Path Method(CPM) and Programme Evaluation and Review Technique(PERT).

Replacement: Introduction, Replacement of items that deteriorate with time - Value of money unchanging and changing, Replacement of items that fail completely.

Queueing models: Introduction; Single channel poisson arrivals; Exponential service times; Unrestricted queue with infinite population and finite population models; Multi channel poisson arrivals; Exponential service times with infinite population and restricted queue.

Text Books:

* Hamdy A Taha, "Operations Research- An Introduction" by TAHA , Prentice Hall, 2009.

* F.S. Hiller, G.J. Liberman,B. Nag and P.Basu "Introduction To Operations Research, Mc Graw Hill Education(India), 2012.

* S.D.Sharma, "Operations Research", Kedarnadh Ramnadh & Co.,2017.

Reference Books:

* R. Pannerselvam, "Operations Research", PHI..

* Richard Bronson, Schaum's Series," Operations Research", Mc Graw Hill

* N.V.S.Raju, "Operations Research- Theory and Practice" BS publications.

* V.K. Kapoor, "Operations Research" Sultan Chand & Sons.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives:

* To familiarize the students with the concepts of Management.

* To relate the concepts of Management with industrial organizations.

* To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.

* To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

On completion of the course, the students will be able to:

* Understand the roles, skills and functions of management.

* Distinguish the different types of business organizations.

* Identify the factors involved in Production Operations Management.

* Diagnose organizational problems and take suitable decisions.

* Establish good Human Resource Management practices.

* Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.

SYLLABUS

Basic Concepts of Management: Management :- Definition, Nature and Importance ; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management;

Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership , Partnership, Joint stock companies and Co-Operative organizations; Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship : Definition, Characteristics and Skills , Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques;, Stages in Project formulation ; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

* Sharma,S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.

* Vasant Desai , The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

* Aryasri , A.R., Management Science, McGraw HIll Education (India Private Limited , New Delhi 2014.

* Sheela, P. , and Jagadeswara Rao, K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

ORGANIZATIONAL BEHAVIOR

Course Objectives:

* To understand the basic concepts of organizational behavior, its foundations and importance.

* To enable students to have a basic perspective of Motivation and Motivation theories.

* To acquaint the students about group behavior in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes:

* Indentifying fundamental aspects of organizational dynamics.

* Evaluate main theories of motivation and formulating suitable motivational strategies.

* Analyze the behavior of individuals and groups in organizations.

* Understanding of Leadership theories and Leadership behavior.

* Apply relevant theories, concepts to address important Organizational Behavior questions.

SYLLABUS

Organizational Behaviour: Concept of Organisation - Concept of Organisational Behaviour - Nature of Organisational Behaviour - Role of Organisational behaviour - Disciplines contributing to Organisational Behaviour.

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation : Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication : Downward, Upward and Horizontal communication.

Organisational conflicts: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganisational conflict - Conflict management.

Organisational Change: Nature - Factors inOrganisational change - Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books:

* L.M.Prasad: Organisational Beaviour, Sultan Chand & Sons, New Delhi -110002

* K. Aswathappa: Organisational Behaviour, Himalaya Publishing House, New Delhi

Reference Book:

* Stephen Robbins: Organisational Behaviour, Pearsons Education, New Delhi.

GEO-ENGINEERING

SCHEME AND SYLLABI (With effect from 2021-22)

B.Tech. I Year - I Semester

Course code	Category	Course Title	Hours per week L	T	Internal Marks	External Marks	Total Marks	Credits
GI 1101	BS	Mathematics – I	4	0	30	70	100	3
GI 1102	BS	Physics	4	0	30	70	100	3
GI 1103	ES	Engineering Graphics	2	3	30	70	100	3
GI 1104	ES	Elements of Cartography	4	0	30	70	100	3
GI 1105	ES	Surveying	4	0	30	70	100	3
GI 1106	ES	Workshop	0	3	50	50	100	1.5
GI 1107	BS	Physics Lab	0	3	50	50	100	1.5
GI 1108	ES	Surveying Fieldwork	0	3	50	50	100	1.5
		Total Credits						19.5

B.Tech I Year - II Semester

GI 1201	BS	Mathematics – II	4	0	30	70	100	3
GI 1202	BS	Chemistry	4	0	30	70	100	3
GI 1203	HSS	English	4	0	30	70	100	3
GI 1204	ES	Computer Programming and Numerical Methods	4	0	30	70	100	3
GI 1205	ES	Geomorphology	4	0	30	70	100	3
GI 1206	HSS	English Language Lab	0	3	50	50	100	1.5
GI 1207	BS	Chemistry Lab	0	3	50	50	100	1.5
GI 1208	ES	Computer Programming and Numerical Methods Lab	0	3	50	50	100	1.5
		Total Credits						19.5

B.Tech II Year - I Semester

GI 2101	BS	Probability and Statistics	4	0	30	70	100	3
GI 2102	PC	Fundamentals of atmospheric systems	4	0	30	70	100	3
GI 2103	PC	Fundamentals of Geology	4	0	30	70	100	3
GI 2104	PC	Object Oriented Programming through C++ and JAVA	4	0	30	70	100	3
GI 2105	HSS	Managerial Economics	4	0	30	70	100	3
GI 2106	PC	Geology Lab	0	3	50	50	100	1.5
GI 2107	PC	Geomorphology Lab	0	3	50	50	100	1.5
GI 2108	PC	Object Oriented Programming Lab	0	3	50	50	100	1.5
GI 2109	SC	AutoCAD	1	2	50	50	100	2
GI 2110	MC	Professional Laws & Ethics and Universal Human values	0	0	00	100	100	0
GI 2111	MC	NCC/NSS	0	2	-	-	-	0
		Total Credits						21.5

B.Tech II Year - II Semester

GI 2201	ES	Information technology and Applications	4	0	30	70	100	3
GI 2202	BS/PC	Principles of Physical Oceanography	4	0	30	70	100	3
GI 2203	PC	Photogrammetry and Photo interpretation	4	0	30	70	100	3
GI 2204	PC	Remote Sensing -I	4	0	30	70	100	3
GI 2205	PC	Introduction to Python Programming	4	0	30	70	100	3
GI 2206	PC	Remote Sensing & Image Interpretation Lab	0	3	50	50	100	1.5
GI 2207	PC	Photogrammetry and Photo Interpretation Lab	0	3	50	50	100	1.5
GI 2208	SC	Mobile App Design	1	2	50	50	100	2
GI 2209	MC	Environmental Science	0	0	00	100	100	0
		Total Credits						20.0

Internship-I

B.Tech III Year - I Semester

GI 3101	PC	Geographical Information systems-I	4	0	30	70	100	3
GI 3102	PC	Database Management Systems	4	0	30	70	100	3
GI 3103	PC	Remote Sensing-II	4	0	30	70	100	3
GI 3104	PE	Professional Elective-I	4	0	30	70	100	3
GI 3105	OE	Open Elective -I	4	0	30	70	100	3
GI 3106	PC	Geographical Information systems-I Lab	0	3	50	50	100	1.5
GI 3107	PC	Database Management Systems Lab	0	3	50	50	100	1.5
GI 3108	SC	Digital Photogrammetry	1	2	50	50	100	2
GI 3109	INT	Internship-I			50	50	100	2
		Total Credits						22.0

B.Tech. III Year - II Semester

GI 3201	PC	Digital Image Processing	4	0	30	70	100	3
GI 3202	PC	Geographical Information Systems-II	4	0	30	70	100	3
GI 3203	PC	Geodesy & GPS	4	0	30	70	100	3
GI 3204	PE	Professional Elective-II	4	0	30	70	100	3
GI 3205	OE	Open Elective -II	4	0	30	70	100	3
GI 3206	PC	Geographical Information Systems-II Lab	0	3	50	50	100	1.5

GI 3207	PC	Digital Image Processing Lab	0	3	50	50	100	1.5
GI 3208	PC	Geospatial Analysis with Python Lab	0	3	50	50	100	1.5
GI 3209	SC	Soft Skills	1	2	50	50	100	2
		Total Credits						21.5

Internship-II

B.Tech. IV Year - I Semester

GI 4101	PE	Professional Elective-III	4	0	30	70	100	3
GI 4102	PE	Professional Elective-IV	4	0	30	70	100	3
GI 4103	PE	Professional Elective-V	4	0	30	70	100	3
GI 4104	OE	Open Elective- III	4	0	30	70	100	3
GI 4105	OE	Open Elective- IV	4	0	30	70	100	3
GI 4106	HSSE	HSS Elective	4	0	30	70	100	3
GI 4107	SC	Cloud-based Geospatial Analysis	1	2	50	50	100	2
GI 4108	INT	Internship-II			50	50	100	2
		Total Credits						22.0

B.Tech IV Year - II Semester

GI 4201	PROJ	Project work			100	100	200	14
		Total Credits						14.0

PROFESSIONAL ELECTIVES

1. Spatial Data Mining & Neural Networks
2. Soft Computing Techniques
3. Internet of Things
4. Climate change and GIS
5. Geoinformatics for Forestry and Ecology
6. GIS for Health, Utility and Energy
7. GIS for Transportation Engineering
8. Data Science
9. Artificial Intelligence
10. Machine Learning
11. Computer Graphics
12. Web Programming & Applications
13. Open-Source GIS & Web Mapping
14. Airborne & Terrestrial LiDAR
15. Drone & UAV Remote Sensing

OPEN ELECTIVES

1. Geoinformatics for Environmental Monitoring
2. Geoinformatics for Earth Science Applications
3. Geoinformatics for Agriculture Survey
4. Geoinformatics for Resources Development and Disaster Management
5. Geoinformatics for Watershed Management
6. Hydrology and Water Resources Engineering
7. Geoinformatics for Coastal Zone Management
8. Urban Planning & Information Systems
9. Soil Surveying and Mapping
10. Geoinformatics for Water Resources Development
11. Geoinformatics for Water Resources Management
12. Geoinformatics for Water Resources Assessment

HSS ELECTIVES

1. Operations Research
2. Industrial Management and Entrepreneurship
3. Organizational Behavior

(FIRST YEAR) 1st SEMESTER

GI 1101 : MATHEMATICS-I

Course Objectives:

* To transmit the knowledge of Partial differentiation.

* To know of getting maxima and minima of function of two variables and finding errors and approximations.

* To evaluate double and triple integrals, volumes of solids and area of curved surfaces.

* To expand a periodical function as Fourier series and half-range Fourier series.

Course Outcomes:

* Find the partial derivatives of functions of two or more variables.

* Evaluate maxima and minima, errors and approximations.

* Evaluate double and triple integrals, volumes of solids and area of curved surfaces.

* To expand a periodical function as Fourier series and half-range Fourier series.

* Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.

SYLLABUS

Partial Differentiation

Introduction - Functions of two or more variables - Partial derivatives - Homogeneous functions– Euler s theorem - Total derivative - Change of variables – Jacobins. Mean value Theorems (without proofs)

Applications of Partial Differentiation : Geometrical interpretation -Tangent plane and Normal to a surface -Taylor s theorem for functions of two variables - Errors and approximations -Total differential. Maxima and Minima offunctionsoftwovariables-Lagrange smethodofundeterminedmultipliers-Differentiation under the integral Sign - Leibnitz srule.

Multiple Integrals : Introduction - Double Integrals - Change of Order of Integration - Double Integrals in Polar Coordinates - Triple Integrals - Change of Variables.

Multiple Integrals-Applications : Area enclosed by plane curves - Volumes of solids - Area of a curved surface - Calculation of Mass - Center of gravity - Moment of inertia - product of inertia – principal axes- Beta Function Gamma Function - Relation between Beta and Gamma Functions. Error Function or Probability Integral.

Fourier Series : Introduction - Euler s Formulae - Conditions for a Fourier Expansion - Functions having points of discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even Periodic Functions, Half-Range Series - Parseval s Formula. Practical Harmonic analysis.

Text Book:

* Scope and Treatment as in “Higher Engineering Mathematics”, by Dr. B.S. Grewal, 43rd Edition, Khanna publishers.

Reference Books:

* Graduate Engineering Mathematics by V B Kumar Vatti., I.K.International publishing house Pvt. Ltd.

* Advanced Engineering Mathematics by ErwinKreyszig.

* A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.

* Advanced Engineering Mathematics by H.K. Dass. S. ChandCompany.

* Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw HillCompany.

* Higher Engineering Mathematics by Dr.M.K.Venkataraman.

GI 1102 : PHYSICS

Course Objectives:

* To impart knowledge in basic concept of physics of Thermodynamics relevantto engineeringapplications.

* To grasp the concepts of physics for electromagnetism and its application toengineering. Learn production of Ultrasonics and their applications inengineering.

* To Develop understanding of interference, diffraction and polarization: connect it toa few engineeringapplications.

* To Learn basics of lasers and optical fibers and their use in someapplications.

* To Understand concepts and principles in quantum mechanics and NanopahseMaterials. Relate them to someapplications.

Course Outcomes:

* Understand the fundamentals of Thermodynamics and Laws ofthermodynamics. Understand the working of Carnot cycle and concept ofentropy.

* Gain Knowledge on the basic concepts of electric and magnetic fields. Understandthe concept of the nature of magnetic materials. Gain knowledge on electromagnetic induction and its applications.

* Understand the Theory of Superposition of waves. Understand the formation of Newton sringsandtheworkingofMichelson sinterferometer. Remember the basics of diffraction, Evaluate the path difference. Analysis of Fraunhofer Diffraction due to a singleslit

* Understand the interaction of matter with radiation, Characteristics of Lasers, Principle, working schemes of Laser and Principle of Optical Fiber. Realize their role in optical fibercommunication.

* Understand the intuitive ideas of the Quantum physics and understand dual nature of matter. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent one Dimensional Schrodinger s wave equation. Understand the fundamentals and synthesis processes of Nanophase materials.

SYLLABUS

THERMODYNAMICS

Introduction, Heat and Work, First law of thermodynamics and applications, Reversible and Irreversible process, Carnot cycle and Efficiency, Second law of thermodynamics, Carnot s Theorem, Entropy, Second law in terms of entropy, Entropy and disorder, Third law of thermodynamics (statementonly).

ELECTROMAGNETISM

Concept of electric flux, Gauss s law - some applications, Magnetic field - Magnetic force on current, torque on current loop, The Biot-Savart s Law, B near a long wire, B for a circular Currentloop, Ampere slaw, Bforasolenoid, Halleffect, Faraday slawofinduction, Lenz slaw, Induced magneticfields, Displacement current, Maxwell sequations (noderivation), Magnetic materials: Classification of magnetic materials and properties.

Ultrasonics : Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, acoustic grating, applications of ultrasonics.

OPTICS

Interference: Principles of superposition – Young s Experiment – Coherence - Interference in thin films (reflected light), Newton s Rings, Michelson Interferometer and its applications.

Diffraction: Introduction, Differences between interference and diffraction, Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit (Qualitative and quantitative treatment).

Polarisation: Polarisation by reflection, refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and Half wave plate, circular and elliptical polarization.

Lasers and fibre optics: Introduction, characteristics of a laser beam, spontaneous and stimulated emission of radiation, population inversion, Ruby laser, He-Ne laser, Semiconductor laser, applications of lasers. Introduction to optical fibers, principle of propagation of light in optical fibers, Acceptance Angle and cone of a fibre, Numerical aperture, Modes of propagations, classification of fibers, Fibre optics in communications, Application of optical fibers.

MODERN PHYSICS

Introduction, De Broglie concept of matter waves, Heisenberg uncertainty principle, Schrodinger time independent wave equation, application to a particle in a box. Free electron theory of metals, Kronig - Penney model (qualitative treatment), Origin of energy band formation in solids, Classification of materials into conductors, semi conductors andinsulators.

NANOPHASE MATERIALS

Introduction, properties, Top-down and bottom up approaches, Synthesis - Ball milling, Chemical vapour deposition method , sol-gel methods, Applications of nano materials.

Text Books:

* Physics by David Halliday and Robert Resnick – Part I and Part II -Wiley.

* A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand

* Engineering Physics by R.K. Gaur and S.L. Gupta –DhanpatRai

Reference Books:

* Modern Engineering Physics by A.S.Vadudeva

* University Physics by Young and Freedman

GI 1103 : ENGINEERING GRAPHICS

Course Objectives:

* Understand the basics of Engineering Graphics and BISconventions.

* Develop the graphical skills for communication of concepts, ideas and designof engineering products through technicaldrawings

* Demonstrate and practice the various profiles/curves used in engineeringpractice through standardprocedures.

* Demonstrate and practice the orthographic projections of points, lines, planes,solids and section ofsolids

* Demonstrate and practice the development of surfaces of simplesolids

* Familiarize the basic concept of isometric viewsclearly.

Course Outcomes:

* Develop simple engineering drawings by considering BISstandards.

* Able to draw different engineering curves with standardProcedures

* Comprehend the basics of orthographic projections and deduce orthographic projections of points, lines, planes and solids at different orientations in real lifeenvironment.

* Visualize clearly the sections ofsolids.

* Apply the concepts of development of surfaces while designing/analyzing anyproduct.

* Recognize the significance of isometric drawing to relate 2D environment with 3D environment.

SYLLABUS

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions, and Scales. Curves: Conic sections: General construction of ellipse, parabola and hyperbola. Construction of involutes of circle and polygons only. Normal and tangent to curves.

Projections of Points: Principal or Reference Planes, Projections of a point situated in any one of the fourquadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane.

Projections of Straight Line Inclined to Both the Reference Planes: Projections of Planes: Projection of Perpendicular planes: Perpendicular to both reference planes, perpendicular to one reference plane and parallel to other reference plane and perpendicular to one reference plane and inclined to other reference plane. Projection of Oblique planes. Introduction to Auxiliary Planes.

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to other and axes inclined to both the reference planes.

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids (Prism, Pyramid, Cylinder and Cone) in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Isometric Views: Isometric projection, Isometric scale and Isometric view. Isometric view of Prisms, Pyramids, cylinder, cone, and their combinations.

Text Book:

* Elementary Engineering Drawing by N.D.Bhatt, Charotar Publishing House.

Reference Book:

* Engineering Graphics by K.L. Narayana and P. Kannaiah, Tata Mc-Graw Hill

GI 1104 ELEMENTS OF CARTOGRAPHY

Course Objectives:

* Understand the basics of Maps and Scales
* Understand the basics of map projections
* Acquisition of Mapdata
* Demonstrate the various map designs
* Demonstrate and practice the development of surfaces of simplesolids
* Create an idea about relief feature of theterrain

Course Outcomes:

* Students can understand the basic rules to prepare amap.
* Students are able to draw maps based on Topo sheets for theirrequirements.
* Students able to draw different signs, symbols, lines, and curves withstandard Procedures.
* Students can Visualize clearly the sections and Apply the concepts of developmentof surfaces while designing/ analyzing anyproduct.

SYLLABUS

Fundamentals of Maps and Scale

Maps: basic characteristics of maps; types of maps – classified by scale, function and subject matter. Map scale; Representation of scale on maps; Determining the scale of a map;Geographical coordinates - latitudes and longitudes; Properties of the graticule

Map Projections : Map Projections - conformal, equivalent and azimuthal projections; Perspective projections, Non-perspective projections, Conventional projections Conical projections; Cylindrical Projections; Zenithal projections; Space map projection

Sources of Map data : Ground surveys: Principles of surveying; Measurement technology – traditional and automated survey systems

Remote sensing: aerial photography and satellite-based imaging;

Census: population enumerations, geocoding – entity focus and aggregation

Spatial sampling: sample size, sampling units, dispersion of sampling units, sample distribution

Cartographic Map Design : Cartographic design: Graphic elements of map design; Contrast, Figure-ground, colour and balance. Typography and lettering - type form, type size and type colour; Methods of lettering - cerographic technique, free-hand lettering, stick-up lettering, mechanical lettering; Guidelines for positioning of letters; lettering as a graphic symbol.Relief and Slope Representation

Relief representation on maps: Pictorial methods– hachuring, hill-shading; Quantitative methods – spot heights, Bench Marks, contours

Slope representation: Methods of expression of slopes – degrees, gradient percentage; finding slopes from contours – Wentworth s method and Smith s method Block diagrams, Digital Cartography

Text Books:

* Elements of Cartography by A.H. Robinson, J.L. Morrison, P.C. Muehrcke, A.J. Kimerlingand S.T. Guptill, John Wiley & Sons, 2004

* Elements of Cartography by A.H. Robinson and K.D. Sale, John Wiley & Sons

Reference Books:

* Fundamentals of Cartography by R.P. Misraand A.Ramesh, McMillan Co., New Delhi

* Elements of Practical Geography by R.L. Singh, Kalyani Publishers, NewDelhi

GI 1105 : SURVEYING

Course Objectives:

* Understand the basics of Surveying

* To determine the relative position of any objects or points of theearth.

* To determine the distance and angle between differentobjects.

* To prepare a map or plan to represent an area on a horizontal plan.

* To develop methods through the knowledge of modern science and the technology and use them in the field.

* To solve measurement problems in an optimal way.

Course Outcomes:

* The students are able to understand the use of different surveying instruments and their use

* Students are able to calculate compute the area and earthwork for different works by using surveying instruments.

* Use and operate dumpy Level and Theodelite in the field.

* Apply the knowledge of principles and purpose of Tacheometry in finding out the constants.

* Use total station in the field for land survey.

* Summarize the basic principles of GPS and GIS.

SYLLABUS

Fundamentals and Classification of Surveying : Principles of Surveying, Classification of Surveying, Introduction to various traditional surveys – Chain Surveying: Instruments, Sources of errors – Compass Surveying: Definitions of Bearings, Theory of Magnetic Compass, Problems and errors in compass survey – Plane Table Surveying: Working Operations, Leveling – Centering – Orientation, Methods of Plane Table Surveying.

Types and Methods of Leveling : Leveling – Methods of Leveling – Dumpy Level: Differential Leveling, Profile Leveling, Cross sections, Reciprocal Leveling, Precise Leveling – BS, FS, IS, HI, TP, reduction of levels – Theodolite: Measurement of horizontal and vertical angles, Open and Closed traversing, Concepts of Trigonometric leveling.

Tacheometric Surveying : Tacheometric Surveying – Principles of Tacheometry, Stadia method - Principle of Stadia method, Distance and Elevation formulae for staff vertical & staff normal, Subtense method - Principle of Subtense method, vertical base observations, horizontal base subtense measurement, methods of reading the staff, Tangential method – constant base tangential measurements, variable base tangential measurements.

Concepts of Triangulation : Concepts of Triangulation – Geodetic surveying, classification of triangulation systems, Triangulation figures and systems, Topographic Surveying – methods of representing relief, contours and contour interval, characteristics of contours, procedure in topographic surveying, contour interpolation.

Advanced Methods of Surveying : Advanced Methods of Surveying – Electronic devices: Total Station, Global Positioning System, Differential Global Positioning System, Remote Sensing, Aerial Photogrammetry.

Text Books:

* B.C. Punmia. Surveying (Volume I & II).

* Paul R Wolf. Elements of Photogrammetry – With Application in GIS. Mc Graw Hill

Reference Book:

* Laxmi Publications Surveying Volume – 1, 5th Edition. S. K. Duggal.

GI 1106 WORKSHOP

Course Objectives:

* Get hands on experience with the working skills in Carpentry trade.

* Know how to work with Sheet Metal tools.

* Get familiar with the working skills of Metal Fitting operations.

* Get hands on experience with house hold electrical wiring.

Course Outcomes:

* Can be able to work with Wood Materials in real time applications.

* Can be able to build various parts with Sheet Metal in day-to-day life.

* Can be able to apply Metal Fitting skills in various applications.

* Can be able to apply this knowledge to basic house electrical wiring and repairs.

SYLLABUS

Carpentry: Any three jobs from – Half lap joint, Mortise and Tenon joint, Half – lap Dovetail joint, Corner Dovetail joint, Central Bridle joint.

Sheet Metal: Any three jobs from – Square tray, Taper tray(sides), Funnel, Elbow pipe joint. Fitting: Any three jobs from – Square, Hexagon, Rectangular fit, Circular fit and Triangular fit. House wiring: Any three jobs from – Tube light wiring, Ceiling fan wiring, Stair-case wiring, Corridor wiring.

Text Books:

* Elements of workshop technology, Vol.1 by S. K. and H. K.Choudary.

* Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.

Reference Book:

* Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/ eVikas.

GI 1107 PHYSICS LAB

Course Objectives:

* To enable the students to acquire skill, technique and utilization of theInstruments

* Draw the relevance between the theoretical knowledge and to imply it in a practicalmanner with respect to analyze various electronic circuits and itscomponents.

* To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiberoptics.

* To familiarize the handling of basic physical apparatus like Vernier callipers, screwgauge, spectrometers, travelling microscope, laser device, optical fibre,etc.

Course Outcomes:

* Ability to design and conduct experiments as well as to analyze andinterpret

* Ability to apply experimental skills to determine the physical quantities related toHeat, Electromagnetism andOptics

* The student will learn to draw the relevance between theoretical knowledge and the meansto imply it in a practical manner by performing various relativeexperiments.

SYLLABUS

1. Determination of Radius of Curvature of a given Convex Lens By forming Newton sRings.
2. Determination of Wavelength of Spectral Lines in the Mercury Spectrum byNormal Incidencemethod.
3. Study the Intensity Variation of the Magnetic Field along axis of Current CarryingCircular Coil.
4. Determination of Cauchy s Constants of a Given Material of the Prismusing Spectrometer.
5. Determination of Refractive Index of Ordinary ray $?_o$ and Extraordinary $?_e$ray.
6. Determination of Thickness Given Paper Strip by WedgeMethod.
7. Calibration of Low RangeVoltmeter.
8. Calibration of Low RangeAmmeter.
9. Determination of Magnetic Moment and Horizontal Component of Earth s MagneticField.
10. Lees Method - Coefficient of thermal Conductivity of a BadConductor.
11. Carey Foster s Bridge – Verification of laws of Resistance and Determination OfSpecific Resistance.
12. Melde s Apparatus – Frequency of electrically maintained TuningFork.
13. Photoelectriccell-Characteristics.
14. Planks Constants.
15. Laser- Diffraction.

Text Books:

* Physics by David Halliday and Robert Resnick – Part I and Part II -Wiley.

* A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand

* Engineering Physics by R.K. Gaur and S.L. Gupta –DhanpatRai

Reference Books:

* Modern Engineering Physics by A.S.Vadudeva

* University Physics by Young and Freedman

GI 1108 SURVEYING FIELDWORK

Course Objectives:

* To enable the students to acquire skill, technique and utilization of the Instruments

* Understand the basics of Surveying

* To impart the practical knowledge in basic concepts on Surveying Instruments

* To determine the distance and angle between different objects.

* To solve measurement problems in an optimal way.

Course Outcomes:

* The students are able to understand the use of different surveying instruments and their use

* Students are able to calculate compute the area and earthwork for different works by using surveying instruments.

* Use and operate of Chain, Compass and Plane Table in the field.

* Use and operate dumpy Level and Theodelite in the field.

* Apply the knowledge of principles and purpose of Tacheometry in finding out the constants.

* Use total station in the field for land survey.

* Summarize the basic principles of handheld GPS.

SYLLABUS

1. Chain survey
2. Prismatic Compass survey
3. Dumpy Level
4. Survey Plane Table Survey
5. Total Station Survey
6. GPS Survey
7. Integration of field surveys with various software.

Text Books:

* B.C. Punmia. Surveying (Volume I & II).

* Paul R Wolf. Elements of Photogrammetry – With Application in GIS. Mc Graw Hill

Reference Book:

* Laxmi Publications Surveying Volume – 1, 5th Edition. S. K. Duggal.

(FIRST YEAR) 2nd SEMESTER

GI 1201 : MATHEMATICS – II

Course Objectives:

* The way of obtaining rank, eigen values and eigen vectors of amatrix.

* To know the importance of Cayley-Hamilton theorem and getting canonical form a given quadratic form.

* To solve the system of equations by using direct and indirect methods.

* To solve first order and higher order differential equations by various methods.

* To obtain the Laplace transforms and inverse Laplace transforms for a given functions and their applications.

Course Outcomes:

* Find rank, eigen values and eigen vectors of a matrix and understand the importance of Cayley-Hamilton theorem.

* Reduce quadratic form to canonical forms and solving linear systems by direct and indirect methods.

* Demonstrate solutions to first order differential equations by various methods and solve basic applications problems related to electrical circuits, orthogonal trajectories and Newton s law of cooling

* Discriminate among the structure and procedure of solving higher order differential equations with constant and variable coefficients.

* Understand Laplace transforms and its properties and finding the solution of ordinary differential equations.

SYLLABUS

Linear Algebra : Rank of a matrix- Echelon form, Normal Form - Solution of Linear System of Equations - Consistency of Linear System of Equations - Direct & Indirect Methods: Gauss elimination method, LU Factorization method, Gauss Seidal Method. Complex Matrices: Hermitian, Skew- Hermitian and Unitary Matrices and their Properties.

Eigen Values and Eigen Vectors : Eigen Values and Eigen Vectors of a Matrix - Cayley-Hamilton theorem - Inverse and Powers of a Matrix using Cayley-Hamilton's theorem and its applications. Diagonalization of a Matrix - Quadratic Forms - Reduction of Quadratic Form to Canonical Form - Nature of a Quadratic Form.

Ordinary Differential Equations of First Order and its Applications : Formation of ordinary differential equations (ODEs) - Solution of an ordinary differential equation-Equationsofthefirstorderandfirstdegree-Linear differential equation-Bernoulli s equation - Exact differential equations - Equations reducible to exact equations - Orthogonal Trajectories - Simple Electric (LR & CR) Circuits - Newton s Law of Cooling - Law of Natural growth and decay.

Differential Equations of Higher Order : Solutions of Linear Ordinary Differential Equations with Constant Coefficients - Rules for finding the complimentary function - Rules for finding the particular integral - Method of variation of parameters - Cauchy s linear equation - Legendre s linear equation - Simultaneous linear differential equations.

Laplace Transforms : Introduction - Existence Conditions - Transforms of Elementary Functions - Properties of Laplace Transforms - Transforms of Derivatives - Transforms of Integrals - Multiplication by t^n - Division by t – Evaluation of integrals by Laplace Transforms - Inverse Laplace Transform - Applications of Laplace Transforms to Ordinary Differential Equations - Simultaneous Linear Differential Equations with Constant Coefficients - Second Shifting Theorem - Laplace Transforms of Unit Step Function, Unit Impulse Function and Laplace Transforms of Periodic Functions.

Text Book:

* Scope and Treatment as in "Higher Engineering Mathematics", by Dr. B.S. Grewal, 43rd edition, Khanna publishers.

Reference Books:

* Advanced Engineering Mathematics by ErwinKreyszig.

* Graduate Engineering Mathematics by V B Kumar Vatti., I.K. International publishing house Pvt. Ltd.

* A text book of Engineering Mathematics, by N.P. Bali and Dr. Manish Goyal. Lakshmi Publications.

* Advanced Engineering Mathematics by H.K. Dass. S. ChandCompany.

* Higher Engineering Mathematics by B.V. Ramana, Tata Mc Graw HillCompany.

GI 1202 : CHEMISTRY

Course Objectives:

* To apply the basic knowledge of Chemistry to the EngineeringDiscipline.

* To develop knowledge about water and its treatment for industrial and potablepurposes.

* To develop understanding in the areas of Polymers, Mechanism of Corrosion of Metals and Corrosion Control Methods, Fuels, Lubricants and Nanomaterials for of conducting polymers, bio-degradable polymers and fiber reinforced plastics and apply the knowledge for solving existing challenges faced in various engineering and societalareas.

Course Outcomes:

* This course applies the basic concepts and principles studied in Chemistry to Engineering.

* It provides an application of chemistry to different branches ofengineering

* The students will be able acquire knowledge in the areas of Water Chemistry,Polymers,Corrosion, Fuels and Lubricants and nanomaterials and suggest innovative solutions for existing challenges in theseareas.

SYLLABUS

Water Chemistry : Sources of Water – Impurities and their influence of living systems – WHO Limits – Hardness and its Determination – Boiler Troubles and their removal – Water Softening Methods – Lime- Soda, Zeolite and Ion Exchange - Municipal Water Treatment-Break Point Chlorination – Desalination of Sea Water – Reverse Osmosis Method, Electro-dialysis.

Polymers and Plastics : Polymers: Definition – Types of Polymerization (Addition & Condensation) – Mechanisms of Addition Polymerization – Radical and Ionic – Thermodynamics of Polymerization Process.

Plastics: Thermosetting and Thermoplastics – Effect of Polymer Structure on Properties of Cellulose Derivatives – Vinyl Resins – Nylon (6,6), Reinforced Plastics – Conducting Polymers. Corrosion

Corrosion: Origin and Theory – Types of Corrosion: Chemical and Electrochemical; Pitting, Inter granular, Waterline, Stress – Galvanic Series – Factors Effecting Corrosion.

Corrosion Controlling Methods: Protective Coatings: Metallic Coatings, Electroplating and Electroless Plating – Chemical conversion Coatings – Phosphate, Chromate, Anodized, Organic Coatings – Paints and Special Paints.

Fuels and Lubricants : Solid Fuels: Wood and Coal, Ranking of Coal – Analysis (Proximate and Ultimate) Coke Manufacture–OttoHoffmann sProcess–Applications;LiquidFuels:PetroleumRefining– Motor Fuels – Petrol and Diesel Oil – Knocking – Octane number – Cetane Number; Gaseous Fuels: Biogas, LPG and CNG – Characteristics – Applications; Rocket Fuels: Propellants – Classification –Characteristics

Lubricants: Classification – Mechanism – Properties of Lubricating Oils – Selection of Lubricants for Engineering Applications.

Nanomaterials : Nanomaterials, Properties and application of fullerenes, fullerols, Carbon nanotubes and nanowires. Synthesis - Top-down and Bottom-up approaches - Nanocomposites - Nanoelectronics- Applications of nanomaterials in catalysis, telecommunication and medicine.

Text Books:

* Engineering Chemistry – PC Jain and M. Jain – Dhanpath Rai and Sons, NewDelhi.

* A Text book of Engineering Chemistry – S. S. Dara – S. Chand & Co. New Delhi.

Reference Books:

* Engineering Chemistry – B. K. Sharma – Krishna Prakashan –Meerut.

* Introduction to Nanoscience - S. M. Lindsay - Oxford UniversityPress

* Engineering Chemistry - B. L. Tembe, Kamaluddin and M. S. Krishnan,(NPTEL).

GI 1203 : ENGLISH

Course Objectives:

* To make students understand the explicit and implicit meanings of atext/topic;

* To give exposure to new words and phrases, and aid to use them in differentcontexts;

* To apply relevant writing formats to draft essays, letters, emails and presentations;and

* To adapt oneself to a given situation and develop a functional approach to finding solutions: adaptability and problemsolving.

Course Outcomes:

* Students will be able to analyse a given text and discover the various aspects related to language andliterature;

* Learn the various language structures, parts of speech and figures ofspeech;

* Develop one s reading and writing abilities for enhanced communication;and

* Learn to apply the topics in real-life situations for creative and criticaluse.

SYLLABUS

On the conduct of life: William Hazlitt

Life skills: Values and Ethics

If: Rudyard Kipling

The Brook: Alfred Tennyson

Life skills: Self-Improvement

How I Became a Public Speaker: George Bernard Shaw

The Death Trap: Saki

Life skills: Time Management

On saving Time: Seneca

Chindu Yellama

Life skills: Innovation

Muhammad Yunus

Politics and the English Language: George Orwell

Life skills: Motivation

Dancer with a White Parasol: Ranjana Dave

Grammar:

Prepositions – Articles – Noun-Pronoun Agreement, Subject-Verb Agreement – Misplaced Modifiers – Clichés, Redundancies.

Vocabulary:Introduction to Word Formation – Root Words from other Languages – Prefixes and Suffixes – Synonyms, Antonyms – Common Abbreviations

Writing:Clauses and Sentences – Punctuation – Principals of Good Writing – Essay Writing – Writing a Summary

Writing: Essay Writing Life skills: Innovation Muhammad Yunus

Text Book:

* Language and Life: A Skills Approach Board of Editors, Orient Blackswan Publishers, India. 2018.

References Books:

* Practical English Usage, Michael Swan. OUP.1995.

* Remedial English Grammar, F.T. Wood.Macmillan.2007

* On Writing Well, William Zinsser. Harper Resource Book.2001

* Study Writing, Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.

* Communication Skills, Sanjay Kumar and PushpLata. Oxford University Press.2011.

* Exercises in Spoken English, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

GI 1204 : COMPUTER PROGRAMMING AND NUMERICAL METHODS

Course Objectives:

* The course is designed to provide complete knowledge of C language.

* To provide students with understanding of code organization and functional hierarchical decomposition with using complex datatypes.

* To provide knowledge to the Students to develop logics which will help them to create programs, applications in C.

* This course aims to identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

* This course provides the fundamental knowledge which is useful in understanding the other programming languages.

Course Outcomes:

* Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and Apply them in problem solving.

* Apply various operations on derived data types like arrays and strings in problem solving.

* Design and Implement of modular Programming and memory management using Functions, pointers.

* Apply Structure, Unions and File handling techniques to Design and Solve different engineering programs with minimal complexity.

* Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

Introduction to C: Basic structure of C program, Constants, Variables and data types, Operators and Expressions, Arithmetic Precedence and associativity, Type Conversions. Managing Input and Output Operations Formatted Input, FormattedOutput.

Decision Making, Branching, Looping, Arrays & Strings: Decision making with if statement, Simple if statement, The if…else statement, Nesting of if…else statement, the else..if ladder, switch statement, the (?:) operator, the GOTO

statement., The while statement, the do statement, The for statement, Jumps in Loops ,One, Two-dimensional Arrays, Character Arrays. Declaration and initialization of Strings, reading and writing of strings, String handling functions, Table ofstrings.

Functions: Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions: No Arguments and no Return Values, Arguments but no Return Values, Arguments with Return Values, No Argument but Returns a Value, Functions that Return Multiple Values. Nesting of functions, recursion, passing arrays to functions, passing strings to functions, the scope, visibility and lifetime ofvariables.

Pointers: Accessing the address of a variable, declaring pointer variables, initializing of pointer variables, accessing variables using pointers, chain of pointers, pointer expressions, pointersandarrays, pointers and character strings, array of pointes, pointersas function arguments, functions returning pointers, pointers to functions, pointers to structures-Program Applications

Structure and Unions: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures, structures within structures, structures and functions and unions, size of structures and bit-fields- Programapplications.

File handling: Defining and opening a file, closing a file, Input/ Output operations on files, Error handling during I/O operations, random access to files and Command Line Arguments- ProgramApplications

Numerical Methods: Solutions of Algebraic and Transcendental Equations, Bisection Method, Newton Raphson Method. Newton s forward and backward Interpolation, Lagrange s Interpolation in unequal intervals. Numerical Integration: Trapezoidal rule, Simpson s 1/3 rules. Solutions of Ordinary First Order Differential Equations: Euler s Method, Modified Euler s Method and Runge-Kutta Method.

Text Books:

* Programming in ANSI C, E Balagurusamy, 6th Edition. McGraw Hill Education (India) Private Limited.

* Introduction to Numerical Methods, SS Sastry, PrenticeHall

Reference Books:

* Let Us C ,YashwantKanetkar, BPB Publications, 5thEdition.

* Computer Science, A structured programming approach using C", B.A.Forouzan and R.F.Gilberg, " 3rd Edition, Thomson,2007.

* The C–Programming Language B.W. Kernighan, Dennis M. Ritchie, PHI.

* Scientific Programming: C-Language, Algorithms and Models in Science, Luciano M. Barone (Author), Enzo Marinari (Author), Giovanni Organtini, WorldScientific.

GI 1205 GEOMORPHOLOGY

Course Objectives:

* The objectives of this course are to introduce the concepts in Geomorphology in adequate manner, many facets of surface relief features and to understand various aspects of their growth and evolution on the Earth.

* Understand the relationship between numerous Earth s surface landforms and the processes responsible for creating and sharping them.

* Develop "back of the envelope" calculation skills to estimate geomorphic rates, landform size / shape, and timing, by employing the laws of conservation (mass, momentum,etc.).

* Gain an appreciation for the frequency-magnitude distributions of geomorphic events throughout Earth history and how those distributions influence the landscape wesee.

* They can predict where on Earth particular geomorphic processes should be operating.

Course Outcomes:

* The course will provide an understanding of the conceptual and dynamic aspects of landform development.

* Students will also learn the relevance of applied aspects of Geomorphology in various fields.

* Describe the morphology of the landscape and related processes in areas influenced by fluvial, glacial, periglacial, aeolian, coastal, and arid systems.

* Describe major scientific ideas and theories about the development of the landscape.

* Critically analyse geomorphological issues in a scientific context at local, regional and global scales.

* Use topographic maps, aerial photographs, and other quantitative techniques to analyse landforms and processes of land formation.

* Use basic techniques to identify, measure, and analyse landforms and processes of land formation.

SYLLABUS

Fundamental concepts : Definition and scope of geomorphology; Fundamental concepts in geomorphology; Endogenetic processes: volcanism and tectonism; Exogenetic processes: weathering, Mass-wasting and erosion; geomorphic agents.

Scope and significance of Geomorphology : Scope and significance of soil studies; soil and regolith; soil forming factors – geological, climatic, topographical, biological and time factors; Soil components – mineral matter, or-

ganic matter, soil-water and soil-air; Soil Properties – colour, texture, structure, acidity and alkalinity; soil profile; Pedogenic regimes – laterisation, gleisation, podzologisation, calcification and salinisation; soil classifications – zonal system, and Seventh approximation system.

Geomorphic Landforms (Fluvial processes and Shore Zone processes)

Fluvial processes and landforms: Valleys and valley forming processes - associated features; Alluvium – active and relict alluvium; Floodplain morphology; Types of streams - Genetic classification of streams; Alluvial fans and deltas, Shore Zone processes and landforms: Shore line, shore zone and coast; Wind waves, tides, littoral currents, storm surges and tsunamis; Erosional and depositionallandforms.

Geomorphic Landforms (Glacial processes and Eolian processes)

Glacial processes and landforms: Ice and glaciers; types of glaciers; glacial motion; Regimen of glaciers – nourishment and wastage of glaciers; active, passive and dead glaciers; erosional and depositional landforms.

Eolian processes and landforms: Dominance of wind processes in arid and semi-arid regions; erosional and deposition all and forms.

Applied Geomorphology : Applied geomorphology: landform interpretation for groundwater explorations; mineral exploration – surface expressions of ore bodies; weathering residues, placer deposits; applications in engineering projects: route selection – highways, canals, transmission lines; site selections – dam sites, industries; townships

Text Books

* Geomorphology by A.L. Bloom, Waveland Pr.Inc.2004

* Principles of Geomorphology by W.D. Thornbury, Wiley Eastern,1984

Reference Books:

* Landscape Systems by T.L. McKnight, Pretice-Hall International,1987

* Fundamentals of Geomorphology by R. Huggett, Routledge,2007

GI 1206 : ENGLISH LANGUAGE LAB

Course Objectives:

* To make students recognize the sounds of English through Audio-Visualaids;

* To help students build their confidence and help them to overcome their inhibitions and self- consciousness while speaking inEnglish;

* To familiarize the students with stress and intonation and enable them to speak English effectively;and

* To give learners exposure to and practice in speaking in both formal and informalcontexts.

Course Outcomes:

* Students will be sensitized towards recognition of English sound patterns and the fluencyin their speech will beenhanced;

* A study of the communicative items in the laboratory will help students become successful in the competitiveworld;

* Students will be able to participate in group activities like roleplays, group discussions and debates;and

* Students will be able to express themselves fluently and accurately in social as well professionalcontext.

SYLLABUS

Introduction to Phonetics: The Sounds of English (Speech sound – vowels and consonants) - Stress and Intonation - Accent and Rhythm.

Listening Skills: Listening for gist and specific information - listening for Note taking, summarizing and for opinions - Listening to the speeches of eminent personalities.

Speaking Skills: Self-introduction - Conversation Skills (Introducing and taking leave) - Giving and asking for information - Role Play - Just A Minute (JAM) session - Telephone etiquette.

Reading and Writing skills: Reading Comprehension – Précis Writing - E-Mail writing - Punctuation.

Presentation skills: Verbal and non-verbal communication - Body Language - Making a Presentation.

Reference Books:

* Ashraf Rizvi. Effective Technical Communication. Tata McGraw Hill Education Private Limited, New Delhi.

* Speak Well. Orient Blackswan Publishers, Hyderabad.

* Allan Pease. Body Language. Manjul Publishing House, NewDelhi.

GI 1207 : CHEMISTRY LAB

Course Objectives:

* To develop the fine skills of quantitative determination of various chemical components through titrimetricanalysis

* To prepare and use ionexchange/ zeolite columns for the removal of hardness ofwater

* To develop the skill of organic synthesis through the preparation of a polymer/drug

Course Outcomes:

* The course provides quantitative determine the amount of various chemical species in solutions by titrations and conduct the quantitative determinations withaccuracy

* The course provides to develop novel materials to be used as zeolite and prepare columns for removal of hardness ofwater

* The course provides to synthesise a polymer or adrug

SYLLABUS

1. Determination of Sodium Hydroxide with HCl (Na_2CO_3 Primary Standard)
2. Determination of Alkalinity (Carbonate and Hydroxide) of watersample
3. Determination of Fe(II)/Mohr s Salt byPermanganometry
4. Determination of Oxalic Acid byPermanganometry
5. Determination of Chromium (VI) by Mohr s SaltSolution
6. Determination of Zinc by EDTAmethod
7. Determination of Hardness of Water sample by EDTAmethod
8. Determination of Chlorine in water by IodometricTitration
9. Ionexchange/ Zeolite column for removal of hardness ofwater
10. Synthesis of Polymer/drug

Reference Books:

* Vogel s Quantitative Chemical Analysis – V – Edition –Longman.

* Experiments in Applied Chemistry (For Engineering Students) – Sinita Rattan – S. K. Kataria & Sons, New Delhi

GI 1208 : COMPUTER PROGRAMMING AND NUMERICAL METHODS LAB

Course Objectives:

* To impart writing skill of C programming to the students and solving problems.

* To write and execute programs in C to solve problems such as Modularize the problems into small modules and then convert them into programs.,

* To write and execute programs in C to solve problems such as arrays, files, strings, structures and different numerical methods.

* This reference has been prepared for the beginners to help them understand the basic to advanced concepts related to Objective-C Programming languages.

Course Outcomes:

* Understand various computer components, Installation of software. C programming development environment, compiling, debugging, and linking and executing a program using the development environment.

* Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs.

* Construct programs that demonstrate effective use of C features including arrays, strings, structures, pointers and files.

* Apply and practice logical ability to solve the real world problems.

* Apply Numerical methods to Solve the complex Engineering problems.

SYLLABUS

1. Write a program to read x, y coordinates of 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straightline?

2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (e.g. for, while, and dowhile).

3. Write a set of string manipulation functions e.g. for getting a substring from a given position, Copying one string to another, Reversing a string, adding one string to another.

4. Write a program which determines the largest and the smallest number that can be stored in different data types like short, int, long, float, and double. What happens when you add 1 to the largest possible integer number that can bestored?

5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descendingorder.

6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporarymatrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their mean and standarddeviation.

8. Given two points on the surface of the sphere, write a program to determine the smallest arc length betweenthem.

9. Implement bisection method to find the square root of a given number to a givenaccuracy.

10. Implement Newton Raphson method to det. a root of polynomial equation.

11. Given table of x and corresponding f(x) values, Write a program which will determine f(x) value at an intermediate x value by using Lagrange sinterpolation/

12. Write a function which will invert amatrix.

13. Implement Simpson s rule for numericalintegration.

14. Write a program to solve a set of linear algebraicequations.

(SECOND YEAR) 1st SEMESTER

GI 2101 PROBABILITY AND STATISTICS

Course Objectives:

The objective of the course is to introduce the students to:

* The basic concepts in probability, conditional probability and independent events.

* The random variables and mathematical expectation.

* Different types of distributions, designs and queueing models.

* The concept of reliability, series and parallel systems.

Course Outcomes:

Upon completion of this course the student will be able to,

* Find derivatives of random variables

* Evaluate distributions, Regressions and Transformation of random variables.

* Understand random process classification, Markov process and queueing models

* Understand concept of reliability, Series and parallel systems

* Understand design of experiments, quality control and different designs

SYLLABUS

Probability and Random Variables:Probability concepts, Random variables, Moments, Moment Generating function, Binomial, Poisson, Geometric, Negative binomial, Exponential, Gamma, Weibull distributions, Functions of random variable, Chebychev inequality.

Two Dimensional RandomVariables,Marginal and conditional distributions, Covariance, Correlation and Regression, Transformation of random variables, Central limit theorem.

Random Processes: Classification,Stationary and Markov processes, Poisson process, pure birth process, Birth and death process, Markov chains, Markovian queueing models.

Reliability Engineering: Conceptsof reliability, Hazard function, Series and parallel systems, Reliability and Availability of Markovian systems, Maintainability, Preventive maintenance.

Design of Experiments and Quality Control: Completely randomized design, Randomized block design, Latin square design, Process control, Control charts of measurements and attributes, Tolerance limits.

Text Books:

* Miller, I.R and Freund, J.D., Probability and Statistics for engineers, Prentice-Hall, 1995

* Kapur, J.N and Saxena, H.C, Mathematical statistics, S. Chand & Company Ltd., New Delhi, 1997

* Balagurusamy, E, Reliability engineering, Tata-McGraw Hill Publishers, New Delhi, 1984

* Bhat, U.N, Elements of applied stochastic processes, Wiley Series in Probability and Mathematical statistics, New York, 1983

GI 2102 : FUNDAMENTALS OF ATMOSPHERIC SYSTEMS

Course Objectives:

The Objective of the course is

* To impart the basic knowledge in concepts of Atmosphere Science and Meteorology.

* To give knowledge on weather system and disturbances.

* To impart knowledge on weather forecasting.

Course Outcomes:

Upon completion of this course the student will be able to,

* Understand the atmospheric structure and composition.

* Measure atmospheric pressure and wind parameters.

* Understand concepts of monsoons and their movements.

* Understand weather disturbances and weather forecasting models.

SYLLABUS

The Atmosphere: Nature, origin, composition and vertical structure.

Insolation and Heat Budget: Insolation, solar constant, distribution, atmospheric depletion of solar radiation, heat budget, latitudinal heat budget. Temperature of the atmosphere: Heat and temperature, processes of heat energy transfer, heating and cooling of atmosphere; Controls of temperature; Distribution of temperature: Air temperature and its measurement, measurement of sunshine and insolation; Horizontal distribution, seasonal distribution, vertical distribution, temperature inversion.

Air Pressure and winds: Measurement of air pressure, variations of air pressure and weather, pressure gradient; Pressure variations: diurnal and seasonal; basic atmospheric pressure patterns; vertical variation in air pressure; horizontal distribution of pressure; seasonal variations in pressure pattern; Wind: Factors affecting wind direction and speed, wind observation and measurement; wind shift.General circulation of the atmosphere: Thermal cir-

culation on non-rotating earth, thermal circulation on a rotating earth. Surface wind systems. Departure from idealized circulation pattern; Surface wind systems; Latitudinal shifting of wind belts; Longitudinal variations in air flow patterns; Winds in tropical region; Sub tropical winds; Westerlies; polar winds; Jet stream

Atmospheric Moisture: Sources of atmospheric moisture, humidity measurements, evaporation, factors affecting evaporation, potential evapotranspiration;Clouds: Formation and classification.

Precipitation: Causes, forms, processes, and types, observations of precipitation, regional distribution and seasonal variation of precipitation, artificial precipitation.

Monsoons: Economic importance of monsoon, concepts of the origin of monsoon, Asian monsoon; Indian monsoon, burst of monsoon, climatic significance of monsoon.

Weather disturbances:Air masses: source regions, classification, air mass modification.

Fronts: General characteristics, frontogenesis and frontolysis, classification of fronts.

Tropical disturbances: Types of tropical disturbances, origin of tropical cyclones, movement and tracks of hurricanes, hurricane seasons, regional distribution.

Thunderstorms, tornadoes and waterspouts: Thunderstorms-origin and structure, stage of development, Thunderstorm electricity and thunder, precipitation in thunder storm, classification and distribution; tornadoes and waterspouts.

Weather forecasting and analysis: Historical background, how weather forecasting in done, types of weather forecasts, weather forecasting methods, satellites in weather forecasting.

Applied climatology: climate and natural vegetation, climate and agriculture, climate and animal husbandry, climate and housing, Air pollution and health, climate and human comfort, climate and urban planning.

Text Books:

* Climatology, Lal, D.S., Sharda Pustak Bhawan,11,University road, Allahabad, 2003

* General climatology, Howard J. Critch field, Prentice-Hall of India private Limited, New Delhi, 1987.

Reference Books:

* Physical Geography, Tikka, R.N., KedarNath Ram Nath&Co, Meerut, 2006

* Meteorology Today, C.Donald Ahrens, West Publishing company, New York, Third edition

* Atmosphere, weather and climate, Siddhartha, K., Kisalaya Publications Pvt. Ltd., 2004

GI 2103 : FUNDAMENTALS OF GEOLOGY

Course Objectives:

The Objective of the course is

* To train the student in basics of geology, i.e.Origin of theearth,layers of earth.

* To impart knowledge on rock and mineral types, geological landforms and formations.

* To impart knowledge on geophysical investigations.

* To teach the importance of geology in designing of dams, reservoirs, tunnels and roads.

Course Outcomes:

Upon successful completion the student will be able to,

* Understand the dynamics of Earth – endogenetic and exogenetic forces.

* Identify different minerals and their properties.

* Identify different rocks, their origin and properties.

* Identify lithology and structure of geological formations.

* Understand geological importance in different civil engineering projects.

SYLLABUS

Branches of Geology – Solar system, Origin of the Earth, Age of the Earth, Interior of the Earth, Isostasy, Elements of seismology, Earthquakes, Volcanoes, Elementary knowledge on continental drift and plate tectonics with evidences. Groundwater.

Crystal symmetry, forms, twinning; crystal chemistry; optical mineralogy, classification of minerals, diagnostic physical and optical properties of rock forming minerals. – study of the following rock forming minerals – Olivine family, Quartz family, Feldspar family, Amphibole Family, Pyroxene family, Mica family, Garnet – Processes of ore mineral formation – Coal and petroleum – origin and occurrence in India.

Igneous rocks - classification, forms, Structures and textures – Description of Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt.Sedimentary rocks - classification, forms, structures and textures- Description of sandstone, limestone, shale, Conglomerate and breccia. Metamorphic rocks - classification, forms, structures and Textures-Description of Quartzite, Marble, Slate, Phyllite, Gneiss and Schist, Khondalite, Charnockite. Igneous and metamorphic provinces of India.

Strike, Dip, Plunge; Description and classification of folds, faults, Joints and Unconformities; Use of Brunton compass; Clinometer compass.

Stratigraphy: Stratigraphic principles; Geological time scale, major stratigraphic divisions of India. -Major geological formation of India: Archeans group, Cuddapah system, Vindhyan formations, Gondwana system, Deccan traps, siwaliks. Geology and Mineral Resources of Andhra Pradesh.

Geophysical Investigations(Electrical, Seismic survey) for constructions of dams, reservoirs, buildings, roads, coastal structures, and Tunnels. Importance of geology in construction and development of civil Engineering projects.

Text Books:

* Parbin Singh, “Engineering and General Geology”, Katson Publication House, 2013.

* K.M. Bangar “Principles of Engineering Geology. Standard publishers Distributors.

* Krynine and Judd, “Engineering Geology and Geotechniques”, McGraw Hill Book Company, 1970.

Reference Books:

* Legeet, “Geology and Engineering”, McGraw Hill Book Company, 1998.

* Blyth, “Geology for Engineers”, ELBS, 1985.

GI 2104 : OBJECT ORIENTED PROGRAMMING THROUGH C++ AND JAVA

Course Objectives:

The objective of the course is

* To understand the concepts and features of Object Oriented Programming.

* To examine key aspects of C++ and Java.

* To learn java’s exception handling mechanism, multithreading, packages and interfaces.

* To develop skills in internet programming using applets and swing.

Course Outcomes:

Upon completion of the course the student will be able to

* Define, understand and differentiate Object oriented concepts.

* Understand basics of Java.

* Create different classes and Objects.

* Understand concept of Inheritance, Polymorphism.

* Design and develop applications using applets and swings.

SYLLABUS

Overview of object-oriented programming (OOP): OOP paradigm, basic concepts underlying OOP: data abstraction and encapsulation, objects and classes, inheritance, polymorphism.

Operator overloading, function overloading, single inheritance, multiple inheritance.

Review of Language constructs of C used in C++: variables, types and type declarations, user defined data types; increment and decrement operators, relational and logical operators; if then else clause; conditional expressions, input and output statement, loops, switch case, arrays, stacks, queues, structure, unions, functions, pointers; preprocessor directives and examples of these applications in C++.

Creation of Classes and Objects, accessing class members, Private Vs Public, Constructor and Destructor, Objects, Member Functions , Method definition, Inline Function Implementation, Constant member functions, Overloading Member Functions ,Need of operator overloading, prefix and postfix, overloading binary operators and examples in C++.Inheritance and types, protected data, private data, public data, inheriting constructors and destructors, constructor for virtual base classes, constructors and destructors of derived classes, and virtual functions, size of a derived class, order of invocation. Polymorphism and Virtual Functions, Importance of virtual function, abstract base classes and pure virtual functions, virtual destructors, File and Streams Components of a file, different operation of the file, communication in files, creation of file streams, stream classes, header files, updating of file, opening and closing a file, file pointers and their manipulations, functions manipulation of file pointers, detecting end-of file.

JAVA Language: Basics of Java, Constants, Variables, and Data Types, Operators and Expressions, Decision Making and Branching, Decision Making and Looping, Class fundamentals, declaring objects, assigning object reference variables, introducing methods, Constructors, this keyword, Garbage collection, The Finalize () method, A stack class, Over loading constructors, Using objects as parameters, Arguments passing, Returning objects, Recursion.

Advanced OOP in Java: Arrays, Strings and Vectors Inheritance basics, Member access and inheritance, using super class, creating a multilevel hierarchy, Method overriding, Dynamic method dispatch, Using abstract classes, Using final with inheritance, The object class. Packages: Putting Classes Together, Defining a package, Understanding classpath, Importing Packages, Defining an interface, Implementing interfaces, Applying Interfaces, Variable in interfaces. Multithreaded Programming, Managing Errors and Exceptions.

Applet Programming: The applet class, Applet architecture, An applet skeleton: Initialization and termination, Overriding update, Status window, Handling

events: The event class, Processing mouse events, Handling keyboard events, HTML applet tag, Passing parameters to applets, Applet context and show document, The audio clip & applets tub interface, Outputting to the console. Swing concepts, JDBC connectivity Managing Input / Output Files in JAVA.

Text Books:

* Object Oriented Programming in C++ by E. Balaguruswamy, TMH Publishing Co. Ltd.,New Delhi.

* Mastering C++ by KR Venugopal and Rajkumar, T Ravishankar; Tata McGraw HillPublishing Co. Ltd., New Delhi

* Programming with Java: A Primer, 3E, E BALAGURUSAMY, Tata McGraw Hill

* The Complete Reference JAVA, Patrick Naughton and Herbert Schildt, Tata McGraw-Hill Publishing Company Ltd

Reference Books:

* Object Oriented Programming using C++ by B Chandra, Narosa Publishing House Pvt,Ltd., Daryaganj, New Delhi 110002

* Object Oriented Programming using C++ by R Rajaram, New age International (P) Ltd, Publishers New Delhi.

GI 2105 : MANAGERIAL ECONOMICS

(Common for all Branches)

Course Objectives:

* To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.

* To understand the Micro and Macro Environment of Business.

* To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

After completion of the course, student will be able to:

* Understand the various economic activities in business and industry.

* Analyze the real-world business problems.

* Make optimal business decisions for the effective and efficient management of Organisations.

SYLLABUS

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis: Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve. Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations.

Theory of Production and Cost analysis: Production - Meaning, Production function and its assumptions, use of production function in decision making; Cost analysis - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacementcosts, Historicalcosts, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly, Oligopoly, Importance of kinked demand curve; Monopolistic Competition.

Pricing and Business Cycles: Pricing Analysis: Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing, Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetrationpricing, Mark- up and Mark- down pricing of retailers. Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

* Sankaran,S., Managerial Economics,Marghan Publications, 2015, Chennai.

* Aryasri, A.R., Managerial Economics and Financial Analysis, MC Graw Hill Education, New Delhi,2015.

Reference Books:

* Dwivedi, D.N., Managerial Economics,Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.

* Dewett, K.K., Modern Economic Theory, S.Chand& Company Ltd., New Delhi, 2005.

GI 2106 : GEOLOGY LAB

Course Objective:

This course is to train the students to in the laboratory to interpret the geological maps, models, rocks and mineral samples.

Course Outcomes:

Upon successful completion of the course, the student get necessary experimental knowledge and training to

* Identify the minerals based on their physical properties by simple tests.
* Solve various geological problems.
* Classify rocks using basic geologic classification systems.
* Interpret the geological structures in the geological maps and model.

SYLLABUS

1. Working with Geological maps and sections.
2. Identification of some important rock forming minerals.
3. Description and Identification of typical rocks.
4. Identification of geological structures- folds, faults and joints.

GI 2107 : GEOMORPHOLOGY LAB

Course Objective:

The course enables the students to identify various geomorphological features from topographic maps in the laboratory.

Course Outcomes:

Upon successful completion of the course, the student will gain necessary knowledge to:

* Identify Landforms from topographic maps.
* Gain in-depth knowledge topographic profiles.
* Prepare slope maps.
* Interpret lithological and climatic controls in formation of different drainage patterns.

SYLLABUS

1. Description of landform models.
2. Topographic profiles – projected and composite profiles.
3. Preparation of slope maps.
4. Stream profiles from topographic maps.
5. Landform interpretation from topographic maps.
6. Drainage Morphometry.

GI 2108 : OBJECT ORIENTED PROGRAMMING LAB

Course Objective:

The objective of the course is

* To impart knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.

* To teach the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc. and exception handling mechanisms.

* To impart knowledge on the principles of inheritance, Polymorphism, packages and interface.

Course Outcomes:

Upon completion of the course the student will be able to,

* Write Object oriented programme using c++.
* Write Object oriented programs with Java.
* Identify classes, objects, members of a class and relationships among them needed for a specific problem.
* Write Java application programs using OOP principles and proper program structuring.

SYLLABUS

Cycle -I :

Write a function using variables as arguments to swap the values of a pair of integers

Write a program to read a matrix of size m*n from the keyboard and display the same on the screen.

Define a class to represent a bank account including the following members: - Data members: a) Name of the depositors; b) Account number; c) Type of account; d) Balance amount in the account and Member function - To assign initial values, To deposit an amount, To withdraw an amount after checking the balance, To display the name and balance.

Create a class Float that contains 2 float data members. Overload all the 4 arithmetic operators so that to operate on the objects of float. Operations related to file handling

Cycle – II

Write programs in JAVA to implement the following concepts-

Streams and File operations; Packages in JAVA; Exception handling mechanism; Applets and applications; Multi-threading in JAVA; Fundamental applications using swing.

GI 2109 Auto CAD

Course Objectives:

The Objective of the course is to,

* Introduce the concepts of CAD, its interface.
* Teach different tools and Geometry.
* Impart knowledge on different layouts & annotations.
* Introduce the concept of 3D CAD.

Course Outcomes:

Upon successful completion of the course the student will be able to,

* Operate CAD interface.
* Utilize different tools of CAD.
* Performs drawings and modify their geometry and annotations.
* Gain knowledge on 3D CAD.
* Import survey data and calculate different parameters.

SYLLABUS

Introduction: About Autodesk & AutoCAD, CAD History, Graphical User Interface, Application Menu, Workspaces, Ribbon, File Tabs, Accessing Help, Drawing Templates, Standards Based Design, Create New Drawings and Templates, Managing Layers, Configure Object Property Settings, Automatic Management of Layers, Layer Functions and Display

Geometry: Drawing Creation Workflows and Organization, Structuring Data in Drawings, Reusing and Editing Structured Data. Tools for Creating Key Geometry: Core Design Tools: Creating Rectangles, Placing Hatch, Fillets, Chamfers, Contours, Power Snaps, Centerlines, Construction Lines, Designing with Lines, Adding Standard Feature Data for Holes and Slots.

Tools for Manipulating Geometry: Editing Tools, Power Commands, Associative Hide.

Drawing & Printing: Model Space Views in Layouts,Creating Drawing Sheets in Model Space,Annotation,Title Blocks and Drawing Borders. Dimensioning and Annotating Drawings; Annotation and Annotation Symbols,Creating Dimensions,Editing Dimensions. Printing Concepts,Working in Layouts, Creating Layouts, Guidelines for Layouts. Import & Export, DWG Files, IGES Files, Project Documentation, Printing Layouts, Print & Plot Settings. Projects Printing / Plotting

AutoCAD 3D: Auto CAD Civil 3D GUI,AutoCAD Civil 3D Toolspace,AutoCAD Civil 3D Panorama,Workshops,AutoCAD Civil 3D Projects,Sharing Data,Using Data Shortcuts for Project Management. Lines and curves,Introduction to Parcels,Creating and Editing Parcels, Parcel Reports, Labels, Tables.

Survey & Surfaces: Survey Workflow Overview,Survey Figures, Points, Importing Survey Data,Point Groups. Surface Processes, Surface Properties,Contour Data,Other Surface Data, Breaklines and boundaries, Surface Labels. Surface Volume Calculations, Surface Analysis Display.

GI 2110 : PROFESSIONAL LAWS & ETHICS AND UNIVERSAL HUMAN VALUES

(Common for all Branches)

Course Objectives:

The objective of the course is

* Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
* This course will illuminate the students in the concepts of laws and its applicability to engineers
* Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
* Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and professional lives.
* To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional lives
* The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

* Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law-abiding person and They would have better critical ability
* Self-explore by using different techniques to live in harmony at various levels
* Analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life
* Students are expected to become more aware of themselves and their surroundings (family, society, nature)

* They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

* They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society)

SYLLABUS

Need, Basic Guidelines, Content and Process for Value Education Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations,Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

Understanding Harmony in the Family and Society - Harmony in Human – Human RelationshipUnderstanding values in human-human relationship: meaning of Justice (nine universalvalues in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies.

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

Concept of Law and Law of Torts : Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books:

* R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

* R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.

* R. Subramanian, "Professional Ethics", Oxford University Press.

* S.B.Srivasthva, Professional Ethics & Human Values, SciTech Publications(India)Pvt. Ltd. New Delhi.

* D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.

* Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

Reference Books:

* Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.

* A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.

* The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiment with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful –Cecile Andrews, J C Kumarappa "Economy of Permanence", PanditSunderlal "Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India.

* G K Kapoor, "Business Law" and Sen &Mitra, "Business & Commercial Laws" and Calvin Frank Allen, "Business law for Engineers"

* Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). Introduction to Psychology. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.

* Govindarajan, M; Natarajan, G. M. &Senthilkumar, V.S. (2013). Professional Ethics & Human Values. Prentice Hall: New Delhi

* Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.

* Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.

* Caroline Whitbec, "Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.

(SECOND YEAR) 2nd SEMESTER

GI 2201 : INFORMATION TECHNOLOGY AND APPLICATIONS

Course Objectives:

The Objective of the course is

* To teach basics of computers and different components.

* To give knowledge on different types of data and their representation.

* To impart overview of Operating system fundamentals and software.

* To impart knowledge business information systems, e-commerce.

* To impart knowledge on Computer networking, Internet, Email.

Course Outcomes:

Upon successful completion the student will be able to

* Identify computer, its components and other devices.

* Understand different types of computer data, storage.

* Understand and operate different operating systems and other applications.

* Explain E-commerce architecture, payment schemes, Intellectual property rights.

* Operate internet, email and communicate through internet.

SYLLABUS

Computer Fundamentals: Introduction to computers, types of computers, basic components of computer systems- CPU-memory, Input devices-Keyboard, smart cards, Light pen, touch screen, mouse, digitizer.Output devices – Video display devices, flat panel display, printers, audio output.

Data Acquisition: Acquisition of Numbers and Textual Data: Input units, internal representation of numeric data, representation of characters, error detecting codes. Acquisition of image Data: Acquisition of textual data, pictures, storage format for pictures, fundamentals of image compression, image acquisition with digital camera.

Acquiring Audio Data: basics of audio signals, acquiring and storing audio signals.

Acquisition of Video: Capturing a moving scene with a video camera, compression of video data, MPEG compression standard.

Computer Software:Overview of Operating Systems: operating system fundamentals, software – system software, application software (overview of Word, Excel, PowerPoint). Overview of Windows; Linux (Windows-Desktop-Control panel -Start menu; Operations on file (new, save, copy, edit, etc).

Business Information Systems and E-commerce:Types of information needed by organizations, Management structure and information needs, design of an operational information system, system life cycle, computer system for transaction processing.

E-commerce: Introduction, Business to business, business to customer and customer to customer e-commerce, their advantages and disadvantages. E-commerce system architecture, payment schemes, electronic cheque payment, Cash transactions, EDI, Intellectual properties rights and e-commerce.

Computer Networks and Internet: Overview of computer Networks and Internet: computer networks - LAN, WAN and their applications, intranet, naming computers connected to internet.

Some Internet Applications: Email, Information browsing, WWW, Information retrieval from the web, Other facilities provided by the browser, audio on the internet, pictures, animation, video on the internet. Introduction to applications such as Google maps and Google earth.

Text Books:

* Introduction to Information technology by V. Rajaraman, PHI

* Information technology: Theory and Practice by Pradeep K.Sinha, Priti Sinha, PHI

Reference Books:

* Introduction to Computers by Peter Norton

* Information Technology: Principles and Applications Hardcover – 1 January 2004 by Ray Ajoy Kumar, Acharya Tinku

GI 2202 : PRINCIPLES OF PHYSICAL OCEANOGRAPHY

Course Objectives:

The Objective of the course is,

* To impart knowledge on Oceans and their physical properties

* To impart knowledge on oceanographic instruments, measurement of different parameters

* To give knowledge on ocean waves, tides and their characteristics.

* To impart knowledge on sea level change, its effects and conservation of Marine resources

Course Outcomes:

Upon successful completion of the course the student will be able to,

* Understand the concept of oceans, their importance and physical properties.

* Understand measurement of sea temperature, salinity. Waves.

* Explain Tides, waves and their characteristics.

* Understand about sea level changes, its effects.

* Identify different marine resources and their conservation concepts.

SYLLABUS

The World Oceans; Physical Properties of Sea Water and their Distribution: Salinity of Sea Water: Factors Affecting Salinity, Salinity Distribution in Oceans. Temperature in the Oceans: Factors Influencing Sea Water Temperature, Temperature Distribution in Oceans. Pressure; Density: Factors Affecting Density of Ocean Water, Density distribution in the Oceans; Colour of Sea Water: Colour Determination, Factors influencing the Colour of Sea Water. Light Transmission in Sea Water: Extinction Coefficients in the Sea, Variation of Extinction Coefficient; Sound Transmission in Sea Water: Velocity of Sound Waves, Variation of Sound Velocity in the Ocean, Refraction of Sound-Shadow Zone and Sound Channel, Attenuation of Sound in the Ocean.

Oceanographic Instruments and methods: Sea Water Temperature Measurement, Salinity Measurement, Current Measurement, Ocean Wave Measurements, Tide Measuring Instruments, Water Transparency Measurement, Radiation Measurement and Platform- Sea and Airborne and Remote Sensing Satellites, Satellite Navigation, DGPS, Eco-sounder.

Ocean Waves: Classification of Ocean Waves, Characteristics of Waves, Motion of an Ocean Wave, Wind-Generated Waves, Wave Height Conditions in Different Regions of the Oceans, Deep Water Wave Characteristics in the Arabian Sea and Bay of Bengal of Indian Coasts, Wave Propagation in Shallow Water, Problem Waves.

Ocean Tides: Tide Producing Forces, Tide Characteristics, Tidal Theories, Harmonic Analysis and Prediction of Tides, Tidal Ranges and Tidal Periods, Tidal Bore

Water Masses: Introduction, T-S diagrams, Properties of Water Masses, Types of Water Masses.

Ocean Circulation: Introduction, Currents: Some General observations, Factors controlling Ocean Circulation, El Nino, Western Intensification of currents, Currents in Atlantic Ocean, Currents in Pacific Ocean, Currents in Indian Ocean.

Sea level changes: Introduction, Evidences for Sea Level Changes, Mechanisms of Sea level Changes, Impact of Sea level Change, Impact of Projected Sea level rise.

Marine Resources: Introduction, Maritime zones, Types of Marine Resources, Resources: extent, distribution and utilization, Problems of Marine Resources-Marine Pollution, Conservation of Marine Resources.

Text Books:

* Descriptive Physical Oceanography, Reddy, M.P.M., Oxford & IBH Publishing Co. 2001

* Oceanography – A Brief Introduction, Siddhartha, K., Kisalaya Publications, 2004

* Introductory Oceanography, Harold V.Thurman, Macmillan Publishing Company, 1994

Reference Books:

* Introductory Oceanography, J.Weisberg and H.Parish, McGraw-Hill Kogakusha,1974

* Descriptive Physical Oceanography, Gorge L. Pickard and William J. Emery, Pergamon Press, Fourth Edition.

GI 2203 : PHOTOGRAMMETRY AND PHOTO INTERPRETATION

Course Outcomes:

The Objective of the course is,

* To impart knowledge on basic concepts of Photogrammetry.

* To impart knowledge on aerial photographs, measurements and interpretation.

* To measure different errors and elevations from photographs.

* To impart knowledge on importance of aerial photographs in different surveys and projects.

Course Outcomes:

Upon successful completion of course the student will be able to,

* Classify the photogrammetry methods and their applications.

* Determine the scale, ground coordinates and the aerial extent of aerial photograph.

* Demonstrate interior and exterior orientation on two overlapping aerial photographs.

* Measure parallax and compute elevations from parallax measurements.

* Prepare mosaics, orthophotos and photomaps for mapping of resources.

SYLLABUS

Fundamentals of Photogrammetry and photo interpretation; History of aerial photography; Types of photographs: vertical and oblique photographs. Aerial cameras: lens, optical axis, focal length, focal plane and fiducial marks; Principal Point; Geometry of vertical photographs.

Scale on vertical photographs – over flat terrain and variable terrain; average photo scale; Methods of determining the scale on vertical photographs. Overlap, side lap and flight planning.

Stereoscopic viewing of vertical photographs; Depth perception; Stereoscopes and their use; Vertical exaggeration – factors involved and determination.

Relief Displacement on vertical photographs. Determination of horizontal ground lengths, directions and angles from photo coordinates. Parallax: Y-parallax and X-Parallax; Parallax measurement – monoscopic method and stereoscopic method – principle of floating mark.

Aerial mosaics: comparison with maps. Elements of air photo pattern: rock types, landforms, surface drainage patterns, erosion features, gray tones, vegetative and land use details.

Applications of aerial photographic techniques in soil surveys; forest surveys, agricultural and land use planning; geological and geomorphological investigations; civil engineering projects.

Latest developments in Photogrammetry: UAV survey, Drone surveying.

Text Books:

* Elements of Photogrammetry' by P.R.Wolf and B.A. Dewitt, McGraw Hill, 2004

* Remote Sensing and image Interpretation' by Thomas M. Lillesand and R.W. Kiefer, John Wiley & Sons, Inc., 2000.

* Aerial Photographic interpretation' by Donald R. Lueder, McGraw-Hill 1959

Reference Book:

* P.J. Curran, Principles of Remote Sensing, ELBS/Longman1985

GI 2204 : REMOTE SENSING -I

Course Objective:

The Objective of this course is,

* To impart knowledge on remote sensing basics.

* To give knowledge on EMR interaction with different earth surface features.

* To impart knowledge on different remote sensing techniques.

* To impart knowledge on different remote sensing satellite programs.

Course Outcomes:

Upon successful completion the student will be able to

* Understand basic concepts of Remote Sensing.

* Analyze energy interaction in the atmosphere and earth surface features.

* Identify earth surface features from satellite images.

* Understand concepts of different remote sensing techniques.

SYLLABUS

Introduction : Remote sensing system, Observe Earth from space. Remote Sensing-A historic prospective, Indian remote sensing programme.The earth Observation Evolution–Paradigm shift, Legal and ethical aspect. Electro Magnetic Radiation (EMR): Velocity of EM radiation, Propagation of EM waves, Attenuation, quantum nature of EM radiation, Thermal emission, EM radiation for Remote Sensing Fundamentals of Radiometry: Measure Geometry-concept of the solid angle, radiometric quantities, Surface characteristic for Radiometric Measurements, Observation geometry in Remote sensing, Radiometric Measurements, scene Reflectance Measurement. Physical Basis of Signature: Signature in the Reflective OIR region, Thermal Infrared (TIR), Microwave region.

EMR Interaction with Atmosphere:Atmospheric characteristics – atmospheric gas composition – pressure and temperature variation with altitude – Rayleigh, Mie scattering and non-selective scattering– atmospheric windows – Atmospheric effects on solar radiation and microwave spectrum –Thermal infrared radiation – Emissivity – Emittance of materials – Kirchoff's Law in spectroscopy – Wien's Displacement Law, Stefan Boltzmann Law – ocean colour temperature measurement –Introduction to Microwave Remote sensing EMR Interaction with Earth materials: Spectral signature concepts – Factors affecting spectral reflectance of materials. Instruments used to study the spectral reflectance – spectrophotometer – spectro-radiometer.

Remote Sensor – An overview:Classification of Remote sensor, selec-

tion of sensor parameters, spatial resolution, spectral resolution, radiometric resolution, Temporal resolution Optical and Infrared sensors: Quality of Image in Optical system, Imaging mode, Photographic camera, Television camera, Opto-mechanical scanners, Opto-mechanical scanners operated from satellites, Push broom cameras, Whisk broom cameras. Microwave sensors.

Platforms & Sensors: Principles of satellite Missions, Locating satellites in space, Types of Orbit, Airborne platforms – balloons, helicopters, aircrafts – Space borne platforms – Sun synchronous and Geosynchronous satellites – Projectile geometry – Land coverage – Repetivity – On track and Across track stereovision capability. IRS, LANDSAT, SPOT, CANADA, JAPAN, EUROPEAN, satellite series. Sensors and its specifications, Multispectral Scanner (MSS) used in Landsat series satellites,Return Beam Vidicon (RBV) used in Landsat series satellites, Thematic Mapper (TM) used in Landsat series satellites, High Resolution Visible (HRV) Imager used in SPOT Satellite,LinearImage Self Scanning (LISS) Camera used in IRS series,WiFS,AWiFS,MODIS, Thermal Scanners.

Image Interpretation:Introduction to image Interpretation. Basic principles of Image Interpretation, Elements of Image Interpretation. Techniques of image Interpretation and interpretation Keys Methods of searching and sequence of Interpretation. Methods of analysis and Reference levels.

Text Books:

* Lillisand T.M. and Kiefer R.W. Remote Sensing and Image Interpretation (4th ed), John willey and Sons, Inc, New York, 2000.

* Fundamentals of Remote sensing- George Joseph, University Press.

* Floyd F. Sabins, Jr. Remote Sensing – Principles and Interpretation W.H. Freeman and Company, New York, 1986.

Reference Books:

* Raymond. M. Measures – “Laser Remote Chemical Analyses John Wiley and sons, 1988.

* Pandey S.N. Principles and Applications of Photogeology. Wiley Eastern, 1987.

* Druny S.A. Image Interpretation in Geology, Chapman and Hall, London, 1983.

* Arumugam. M. Engineering Physics, Anuradha Publishers, 1998.

* Janza. F.J., Blue, H.M., and Johnston, J.E., “Manual of Remote Sensing Vol. I., American Society of Photogrammetry, Virginia, U.S.A., 1975.

GI 2205 : INTRODUCTION TO PYTHON PROGRAMMING

Course Objectives:

This objective of the course is to

* Explain Syntax and Semantics and create Functions in Python.

* Impart knowledge on Handle Strings and Files in Python

* Explain Lists, Dictionaries and Regular expressions in Python.

* Teach how to Implement Object Oriented Programming concepts in Python.

* Handle Python packages with PIP and create modules.

Course Outcomes:

At the end of the course student will be able to

* Examine Python syntax and semantics able to use Python flow and control functions.

* Demonstrate proficiency in handling Strings and File Systems.

* Create, run and manipulate Python Program using core data structures like Lists, Dictionaries and use Regular Expressions.

* Interpret the concepts of Object-Oriented Programming as used in Python.

* Examine Python packages via PIP

SYLLABUS

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Object Oriented Programming OOP in Python: Classes, ‘self-variable’, Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Modules: Creating modules, import statement, from. Import statement, namespacing, Python packages Introduction to PIP, Installing Packages via PIP, Using Python Packages.

Libraries: Python libraries for Data Science: Numpy, Pandas, Matplotlib; Python Libraries for GIS: ArcPy, GeoPandas, GDAL/OG, RSGISLib.

Text Books:

* Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
* Learning Python, Mark Lutz, Orielly.

GI 2206 : REMOTE SENSING& IMAGE INTERPRETATION LAB

Course Objective:

The Objective of the course is

* To train student in operation of spectral radiometer.
* To impart knowledge on satellite image interpretation.
* To impart knowledge with bands, indexes of satellite images.
* To impart knowledge on preparation of base maps and their interpretation.

Course Outcomes:

Upon successful completion the student will be able to,

* Read ancillary information of remotely sensed data.
* Calculate different parameters of satellite images.
* Identify the different features from imageries.
* Interpret images and prepare thematic maps.

SYLLABUS

1. Operating Spectral radiometer in the field to collect radiometric values from various natural and artificial features of land surface.
2. Identification of various land features from the satellite images in association with topo sheets and field visits. Calculations of coverage of satellite images for different latitudes, number of swath paths for various satellites.
3. Study of imagery indexes.
4. Visual study of single band images.
5. Visual study of multi-spectral images.
6. Preparation of base maps from the topographic maps.
7. Preparation of thematic maps from visual interpretation.

GI 2207 : PHOTOGRAMMETRY AND PHOTO INTERPRETATION LAB

Course Objectives:

The Objective of the course to train student in,

* Calculation of scale,parallax,principal points from aerial photographs.
* Preparation of aerial mosaics.
* Identification and Interpretation of different features and phenomena from aerial photographs.

Course Outcomes:

Upon completion of the course the student will be able to,

* Operate Stereoscope to view aerial Photographs.
* Determine geometrical elements of aerial photograph
* Analyze the aerial photographs for physical measurements.
* Prepare aerial mosaics.
* Identify and Interpret different landforms from aerial Photographs.

SYLLABUS

* Testing stereo vision; Use of Lens stereoscope and Mirror stereoscope;
* Use of Parallax Bar for height calculation from aerial photographs; Calculation of scale of the photographs; Marking Principal point and conjugate principal point on the stereo pairs
* Preparation of aerial mosaics; Interpretation of aerial photographs for identification of landforms of fluvial, Aeolian, glacial, coastal, volcanic and arid processes
* Identification of tectonic elements from aerial photographs.

GI 2208 : MOBILE APP DESIGN

Course Objectives:

The objective of the course is

* To facilitate students to understand android SDK.
* To help students to gain a basic understanding of android application development
* To inculcate working knowledge of android studio development tool

Course Outcomes:

Upon successful completion of the course, students will be able to:

* Identify various concepts of mobile programming that make it unique from programming for other platforms,
* Critique mobile applications on their design pros and cons,
* Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
* Program mobile applications for the both android and ios operating system that use basic and advanced phone features
* Deploy applications to the android marketplace for distribution.

SYLLABUS

Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment Factors in Developing Mobile Applications: +Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User. More on UIs: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal UIs.

Intents and Services: Android Intents and Services, Characteristics of Mobile Applications, Successful Mobile Development. Storing and Retrieving Data: Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.

Communications Via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web Telephony: Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Graphics: Performance and Multithreading, Graphics and UI Performance, Android Graphics Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia Putting It All Together: Packaging and Deploying, Performance Best Practices, Android Field Service App. Security and Hacking: Active Transactions, More on Security, Hacking Android. Platforms and Additional Issues: Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing

PRACTICALS:

1. Installation of Android Studio
2. Development of Hello World Application
3. Create an application that takes the name from a text box and shows hello messages along with the name entered in box when the user clicks OK button.
4. Create a screen that has input boxes and on clicking submit it must display all the data below submit button
5. Development of calculator Application
6. Design an android application using Radio buttons

Text Book:

* Reza B 'Far (2004), Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, Cambridge University Press.

GI 2209 : ENVIRONMENTAL SCIENCE

(Common for all Branches)

Course Objectives:

The objectives of the Environmental Science course are to

* Familiarize the fundamental aspects of environment and the environmental management'

* Provide information of some of the important international conventions which will be useful during the future endeavors after graduation.

* Make realize the importance of natural resources management for the sustenance of the life and the society.

* Apprise the impact of pollution getting generated through the anthropogenic activities on the environment

* Provide the concept of Sustainable Development, energy and environmental management

* Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes:

After completion of the course the students will have

* Knowledge on the fundamental aspects of environment and the environmental management

* The knowledge on the salient features of the important international conventions

* Understanding of the importance of natural resources management for the sustenance of the life and the society.

* Familiarity on various forms of pollution and its impact on the environment.

* Understand the elements of Sustainable Development, energy and environmental management

* Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

Introduction: Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems.

Salient features of International conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

Natural Resources Management: Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

Forest resources: Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

Water resources: Exploitation of surface and groundwater, Floods, droughts, Dams:benefits and costs.

Mineral Resources: Impact of mining on the environment and possible environmental management options in mining and processing of the minerals. Sustainable resource management (land, water, and energy), and resilient design under the changing environment.

Environmental Pollution: Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

Air pollution: impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

Solid waste management: Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

Sustainable Development: Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

Energy and Environment: Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

Management of plastic waste and E-waste: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

* Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.

* Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India

* Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.

* Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

* Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications

* Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

* Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)

* Jadhav, H &Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.

* MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.

* MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

(THIRD YEAR) 1st SEMESTER

GI 3101 : GEOGRAPHIC INFORMATION SYSTEMS –I

Course Objectives:

The objective of the course is to

* Familiarize with the concept of GIS, its components, along with its advantages

* Focus on different available data formats in GIS

* Impart knowledge of spatial data structures details and input, management and output processes

* Explain different possible areas of GIS applications

Course Outcomes:

After completion of the course student will be able to

* Gain knowledge in fundamental concepts of GIS

* Develop skills in collecting, editing different types of GIS data

* Demonstrate expertise in database management in GIS

* Represent and visualize DEMs in GIS

SYLLABUS

Introduction to Geographical Information Systems: Introduction maps and spatial information. Computer-assisted mapping and map analysis, Map Projections – Usage of Maps Geographic Information Systems. The components of geographical Information System; Future directions and trends in GIS Datadisplay, Data Storage, Spatial Indexes, Data analysis tool – Computer-

Assisted Cartography – Advantages, Disadvantages, GIS and Computer-Assisted Cartography – History of GIS – Basic Components of GIS – Hardware, Software, Organizational Context – Comparison of GIS and Hardcopy Maps – GISSoftware available in Market.

Data Files and Databases: Data Types – Non-Spatial Data – Nominal, Ordinal, interval, ratio-Spatial Data – Points, Lines and Polygons / Area –File Types – Simple lists, Ordered Sequential Files – Indexed Files – Database – Functions, Database structures – Hierarchical, Network, Relational.

Raster Data structures: Raster Data Model – Creating a raster – Cell by cell entry, digital data, Scanner – Tessellations – Regular, Irregular –Geometry of Regular Tessellations – Shape, Adjacency, Connectivity, Orientation – Resolution of Regular Cell – Data Encoding, Rule of dominance, Rule ofimportance, Center of Cell, Space Filling Curves – Run length, Block, Row Order, Prime Row Order, Peano Order, Pi Order – Variable Resolution regular cells – Quadtree data structure – Irregular Tessellations – Theissen polygons, Triangulation, Delaunay triangles.

Vector Data Structure:Vector Data Model – Arcs, Storing area – Database Creation – Digitizer, On Screen Digitizing – Topology – EulerEquation, Topological Consistency, Topological Errors, Error identification, Topological Editing, Line weeding, Node matching, Dangle truncation, Fuzzy tolerance,Digital Line Graph, Arc Node Structure, DIME etc.

Continuous Surface Representation: Digital Elevation Models – Elevation data capture, Interpolation, DEM representation – Altitude matrix, TINstructure – DEM interpretation, Scale, Visualization, Applications.

Text Books:

* Burrough P.A., Principles of Geographical Information Systems for Land Resources Assessment, Oxford University Press.

* Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999.

Reference Books:

* Star J. Estes. J GIS – An Introduction, Prentice Hall, NJ, USA, 1990.

* Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996.

GI 3102 : DATABASE MANAGEMENT SYSTEMS

Course Objectives:

The objective of the course is to

* Summarize the role of a database management system in an organization

* Demonstrate basic database concepts, including the structure and operation of therelational data model

* Introduce simple and moderately advanced database queries using Structured Query Language (SQL)

* Explain and successfully apply logical database design principles, including E-R diagrams and database normalization

* Demonstrate the concept of a database transaction and related database facilities, including concurrency control, and data object locking and protocols

Course Outcomes:

After completion of the course student will be able to

* Understand and evaluate the role of database management system in an organization apply logical database design principles, including E-R diagrams

* Infer database queries using Structured Query Language (SQL)

* Demonstrate the concept of a database transaction and related database facilities, including concurrency control, and data object locking and protocols

* Design and develop a small database project using database software

SYLLABUS

Databases and Database User : Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS.

Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architectures for DBMSs, Classification of Database Management Systems.

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher Than Two.

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.

Relational Database Design by ER and EER - to - Relational Mapping: Relational Database Design Using ER-to-Relational Mapping, Mapping EER Model , Constructs to Relations.

Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries INSERT, DELETE, and UPDATE Statements in SQL, Specifying Constraints as Assertions and Triggers, Views (Virtual Tables) in SQL, Additional Features of SQL.

Introduction to SQL Programming Techniques :Database Programming: Issues and Techniques, Embedded SQL, Dynamic SQL, and SQLJ Database Programming with Function Calls: SQL/CLI and JDBC, Database Stored Procedures and SQL/PSM.

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.

Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, Geographic Information Systems (GIS), Genome Data Management.

Text Books:

* Fundamentals of Database Systems, 5/E (Chap 1-3,5-11 and 30) RamezElmasri, Shamkant B. Navathe, Pearson Ed

* Database Management Systems , 3/e, Raghurama Krishnan, Johannes Gehrke, TMH

* Database System Concepts, 5/E AviSilberschatz, Korth, Tata Mc Graw Hill.

Reference Books:

* Database principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning

* Introduction to database Systems, 8/e C J date, PEA

GI 3103 : REMOTE SENSING – II

Course Objectives:

The objective of the course is to

* Impart knowledge on satellite data reception and processing

* To familiarize student with types of errors and correction for satellite images

* To introduce the concept of thermal remote sensing and microwave remote sensing

* To familiarize with interpretation of thermal and radar imagery.

Course Outcomes:

At the end of the course the student will be able to understand

* The types and configuration of various satellites and sensors

* Types of errors and correction of satellite images

* The concepts of thermal and hyperspectral remote sensing

* The concepts of microwave remote sensing

* Interpretation of RADAR images

SYLLABUS

Data reception, Data processing & Data generation: Ground station, Global and Indian data products Satellite Data Receiving and data generation, Data processing & correction.

Radiometric and Geometric corrections: Radiometric corrections Random noise correction Atmospheric correction, Geometric errors and corrections, Distortion evaluated from tracking data, distortion evaluated from ground control Image correction. Ground Investigation in support of Remote sensing Uses of ground data, calibration correction, Interpretation of properties, Training sets, Accuracy evaluation, test sites.

Thermal Imaging : Thermal Imaging: Introduction - IR region of the Electromagnetic spectrum, Atmospheric transmission, Kinetic and radiant temperature, Thermal properties of materials, Emissivity, Radiant temperature, Thermal conductivity, Thermal capacity, thermal inertia, Apparent thermal inertia, Thermal diffusivity IR - radiometers, Airborne and Satellite scanner system Characteristics of IR images, Scanner distortion, image irregularities, Film density and recorded Temperature ranges Effects of weather on images: Clouds, Surface winds, Penetration of smoke plumes; Interpretation of thermal imagery; Advantages of Thermal imagery.

Introduction to Microwave Remote Sensing: Introduction, Microwaves for Remote sensing, History of Microwave Remote Sensing, The E M R, radar operating principle; Radar equations, Definitions Incidence angle, Look angle, depression angle, Azimuth angle, Spatial Resolutions in Radar, Range Resolution, Azimuth Resolution. Types of Microwave sensors, Real Aperture Radar (RAR), Synthetic Aperture Radar (SAR), Geometry of Radar Imagery, Microwave Radiometers, Microwave Scatterometer, Microwave Altimeter, Airborne and Spaceborne Platforms and Sensors, SEASAT, SIR-A, SIR-B , JERS, ERS and EOS.

Radar data & Data Interpretation: Spatial Resolutions in Radar: Range resolution, Azimuth Resolution, Radar return and Image signature, System properties (Wavelength, Polarization and Incidence angle) Terrain properties: Di-electric constant, Surface Roughness, Feature Orientation. Forms of Radar return: Spectral Reflection, Corner Reflection or Diffuse scattering Radar image characteristics, slant range distortion, Relief displacement, Lay-over, Foreshortening, Radar shadow, Parallax and Stereo capability, speckle. Interpretation of SLAR image, SAR Image, Atmospheric applications, Ocean and Land, SAR interferometry.

Text Books:

* Lillisand T.M. and Kiefer R.W. Remote Sensing and Image Interpretation (4th ed), John willey and Sons, Inc, New York, 2000

* Fundamentals of Remote sensing- George Joseph, University Press.

* Applied Remote Sensing, C.P. Lo, Longman, Scientific and Technical Publishers

Reference Books:

* Remote Sensing in hydrology, Engman, E.T. Gurney, R.J.

* Remote Sensing in water management in command areas, Govardhan.

GI 3106 : GEOGRAPHIC INFORMATION SYSTEMS -I LAB

Course Objectives:

The objective of the course is to

* Familiarize yourself with different GIS software.

* Train students in creating spatial layers in GIS.

* Train students in performing basic GIS tasks.

* Teach Map analysis.

Course Outcomes:

After completion of the course the student will be able to

* Understand basic GIS data concepts.

* Perform basic GIS analysis.

* Demonstrated a practical application of GIS.

* Gain practical experience in spatial analysis in GIS.

SYLLABUS

1. Getting familiar with ArcGIS software

2. Geo-referencing & Reprojection: mage to image rectification, keyboard entry rectification - setting projections

3. Geodatabase Creation & digitizing entities like point, line and polygon data.

4. Editing and adding labels, cleaning and generating coverage topology.

5. Map Design (Layout & Composition) & Thematic Map creation

6. Attribute data addition and query generation

7. Vector Analysis- Buffer, Overlay operations (clip, union,intersect,erase)

8. Surface Analysis – Generating TIN, Hillshade, Slope, Aspect from DEM

GI 3107 : DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives:

The objective of the course is to

* To familiarize with features of commercial RDBMS packages such as ORACLE,MS Access and SQL

* To impart practical knowledge on design and implement a database schema.

* To demonstrate the use of basic SQL commands on DDL ML,DCL,TCL and construct queries on them.

* To train the student to develop application programs using PL/SQL.

Course Outcomes:

Upon completion of the laboratory work the student will be able to

* Apply the basic concepts of database systems and applications.

* Use the basic SQL and construct queries using SQL in database creation and interaction.

* Design a commercial relational database system by writing SQL using the system.

* Analyze and select storage and recovery techniques of the database system.

SYLLABUS

1. Study features of a commercial RDBMS package such as ORACLE, MS Access, MYSQL & Structured Query Languages (SQL) used with the RDBMS.

2. (Select two of RDMSS) Laboratory exercises should include

3. Exercise 1: Defining schemes for applications, creation of a database.

4. Exercise 2: Writing SQL Queries, to retrieve information from the database.

5. Exercise 3: Use of host Languages, interface with the embedded SQL.

6. Exercise 4: Use of forms& report writing packages available with the chosen RDBMS product. Some sample examples, which may be programmed, are given below:

1. Accounting package for a shop, Database manager for a magazine agency or a newspaper agency.

2. Ticket booking for performances.

3. Preparing greeting cards & birthday cards.

4. Personal accounts- insurance, loans, mortgage payments, etc. Doctor's dairy & billing system.

5. Personal bank account Class marks management, hostel accounting, Video tape library, History of cricket scores, Cable TV transmission program manager, Personal library.

GI 3108 : DIGITAL PHOTOGRAMMETRY

Course Objectives:

The objective of the course is to

* Introduce the concepts of analytical and digital photogrammetry

* Impart knowledge on principles of softcopy photogrammetry and production of DEMs

* Teach traditional ground control survey methods and GPS usage.

* Impart knowledge on photogrammetry applications in various fields.

Course Outcomes:

After completion of the course student will be able to

* Explain fundamental principles of analytical photogrammetry.

* Conduct surveys to establish ground control for photogrammetric operations

* Assess the quality and accuracy of digital elevation models.

* Discuss application of photogrammetry in various fields.

SYLLABUS

Introduction to Analytical Photogrammetry: Image measurements, Control points, Collinearity condition, Coplanarity condition, Space resection by collinearity, Space intersection by collinearity, Analytical Stereo model, Analytical Interior Orientation, Analytical Relative Orientation, Analytical Absolute Orientation, Analytical Self calibration.

Principles of Softcopy Photogrammetry: System Hardware, Image measurements, Orientation procedures, Epi polar geometry, Digital image matching, Automatic production of digital elevation model and Orthophotos.

Ground Control for Aerial Photogrammetry &Aerotriangulation: Traditional field survey methods of establishing horizontal & vertical controls .Ground control surveys by GPS, Pass Points for Aero triangulation, Sequential construction of Strip model from independent models, Independent model Aerotriangulation by simultaneous Transformations, Bundled Adjustment, Bundled Adjustment by GPS control, Triangulation with Satellite images, Computational strategies for triangulation.

DEM Quality Assessment: Vertical & Horizontal Accuracy, Post Spacing, Vertical & Horizontal Datum, Projection and Coordinate system, DEM Editing, TIN/DEM Accuracy testing, Quality Control, TIN interpolation DEM User Requirements – Accuracy and Cost Considerations – Technology-based cost comparisons, Area-based cost comparisons, and Accuracy-based cost comparisons.

Photogrammetric Applications in GIS: Hazardous Waste Management, Water Quality Management, WildLife Management, Environmental Restoration, Land Development, Transportation, Hydrography, Multipurpose Land Information System.

PRACTICALS:

1. Creation of Non-oriented Digital Stereo Models
2. Creation of Oriented Digital Stereo Models
3. Accuracy of Digital Stereo Models
4. Measurements of 3Dimensional information
5. Collecting & Editing 3D GIS data
6. Aerial Triangulation
7. Triangulation with Satellite Imagery
8. Orthorectification
9. Automatic Digital Terrain Model Extraction

Text Book:

* Paul R Wolf and Bon A. Dewitt, Elements of Photogrammetry (3 ed), McGraw Hill David F. Maune.

Reference Book:

* Digital Elevation Model Technologies and Applications: The DEM User Manual. The American Society of Photogrammetry and Remote Sensing, Bethesda, Maryland.

(THIRD YEAR) 2nd SEMESTER

GI 3201 : DIGITAL IMAGE PROCESSING

Course Objective:

To make the undergraduate Engineering Students understand the concepts, principles, processing of Satellite data in order to extract useful information from them.

Course Outcomes:

At the end of the course the student will be able to understand

* Various components and characteristics of image processing systems
* The concepts of image geometry and radiometry and corrections
* Various types of image enhancement techniques used for satellite image processing

SYLLABUS

Introduction – Image processing system considerations. Initial statistical extraction – univariate and multivariate statistics, histogram and its significance in remote sensing data. Preprocessing- Radiometric corrections and Geometric Corrections of Remote Sensing Data Image Enhancements – Image Reduction & Magnification, Transects, contrast enhancement: linear, non-linear, Spatial Filtering: Spatial Convolution filtering, Image transform – Arithmetic operations' based image transforms, principal component analysis, Tasseled cap transformation, Fourier transforms, Fast Fourier frequency domain filters

Image segmentation: points, lines and edge detection and combined detection

Thresholding: The Basics of Intensity Thresholding, The Role of Noise, The Role of Illumination and Reflectance, Basic Global Thresholding, Split and merge Segmentation

Thematic information extraction: pattern recognition: Supervised Classification: Select the Appropriate Classification Algorithm Unsupervised Classification, Fuzzy Classification, Object-Based Image Analysis (OBIA) Classification, Classification Based on Machine Learning Decision Trees and Regression Trees, Neural Networks.

Change detection: Steps Required to Perform Change Detection, Binary Change Detection Algorithms Provide Change/No-Change Information. Interpretation of Hyperspectral Image Data – Data Characteristics, Challenges to Data Interpretation, Data Calibration Techniques, Interpretation using Spectral Information, Hyperspectral Interpretation by Statistical Methods, Feature Reduction, Regularized Covariance Estimators.

Text Books:

* John, R.Jensen, Introductory Digital Image Processing – Prentice-Hall, New Jersey, 1986

* Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, 3rd ed, Pearson Int.Ed.

Reference Book:

* John A. Richards, Xiuping Jia, Remote Sensing Digital Image Analysis: An Introduction, Published by Springer, 1999.

GI 3202 GEOGRAPHICAL INFORMATION SYSTEMS-II

Course Objectives:

The objective of the course is to:

* Spatial data manipulation in Geographic information system
* Impart knowledge on spatial and non-spatial data analysis.
* To teach fundamentals of spatial data modeling.
* Familiarize with quality and errors in GIS data

Course Outcomes:

After completion of the course student will be able to

* Gain knowledge in manipulation and transformation of spatial data.
* Understand spatial and non-spatial data analysis.
* Define spatial modeling and explain various models
* Understand the importance of data quality in GIS.

SYLLABUS

Spatial Data Manipulation and Transformation: Line intersections – Point-in-line, Point-in-segment, Point-in-polygon, line intersection with polygons, Union and Intersections of Polygons, shape measures of polygons, buffer zones – Data Transformation – Change in Dimensionality, Change in position – Rubber Sheeting, Tin Sheeting – Vector to Raster, Raster to Vector Conversion.

Spatial and Non-spatial Data Analysis – Raster and Vector : Display of raster data–Local operators–recoding, overlaying–Local Neighborhood operators–Filtering, Slopes and Aspects – Extended Neighborhood operators–Distance, Buffer zones, Visible area or Viewshed –Zonal operations–Zone identification, Zone area, Zone Perimeter, Distance from Zone boundary – Vector data–Polygon overlay, polygon statistics, Network Analysis–Non-spatial data analysis–Structured Query Language.

Spatial Modeling: Modeling – Definition – Spatial Modeling – External Model, Conceptual Model, Logical Model, Internal Model – GIS applications in Resource Management – AM / FM studies.

Data Quality and Error Data Propagation in GIS: Data Quality–Accuracy – Spatial Accuracy, Temporal Accuracy, Thematic Accuracy– Resolution –Spatial resolution, thematic Resolution, Temporal resolution–Consistency– Completeness– Data Quality in Spatial Data Transfer Standards–Lineage, Positional, Attribute accuracy, Logical Consistency, Completeness–Error Propagation.

Miscellaneous Topics: Multi Criteria Evaluation in GIS – Data capture using GPS for GIS FM studies – Object Oriented Database Models. Recent trends in GIS.

Text Books:

* Burrough P.A., Principles of Geographical Information System for Land Resources Assessment, Oxford University Press.

* Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999.

Reference Books:

* Star J. Estees, J GIS – An Introduction, Prentice Hall, NJ, USA, 1990.

* Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996.

GI 3203 : GEODESY AND GPS

Course Objectives:

The objective of the course is to

* To introduce the concepts of Geodesy and its history

* To impart knowledge of Different coordinate systems and datums

* To introduce GPS and its segments

* To impart knowledge of GPS applications in different fields

Course Outcomes:

At the end of the course the student will be able to understand

* Fundamentals of Geodesy, Techniques involved in establishment of geodetic control

* Concepts of geoid, ellipsoid and their interrelationship

* Various types of coordinate systems and relationship between them

* GPS and its segments

* Civilian, Defense, Agricultural applications of GPS

SYLLABUS

Basic principles of Geodesy; History of Geodesy; Spherical Earth; Ellipsoidal Earth; Geoidal Earth; Geodetic Survey Systems; Horizontal Positioning –Determination of Astronomic position, Triangulation, Trilateration; Vertical Positioning.

Fundamentals of Reference Systems and Frames: Geodetic and Cartesian coordinate system; principles of coordinate transformation; Datums:Horizontal and vertical datums – national, regional and local datums; Major datums and Indian datum; World Geodetic System(WGS) WGS84; tidal datums.

Satellite Geodesy: definition; observational systems: Historical systems; Doppler; laser; radar altimetry.

Global Positioning System (GPS): Definition; GPS elements – space segment, user segment and control segment; Observation principles; phasemeasurement techniques; determining orthometric heights; GPS Error Sources and Error Handling Procedures: Atmospheric effects, clock and orbital errors, multipath, anti-spoofing and selective availability, etc; interference and jamming. Accuracy issues, GPS satellite navigation message; GPS time, fundamental andderived frequencies.

GPS receivers: Multi-Channel, sequential and multiplexing receivers; GPS applications: Defense, civilian, Navigational and Geodetic applications;GPS-GIS integration; GPS applications in surveying, mapping, GIS and land navigation and precision farming; integration with other sensors: GPS in intelligenttransportation and fleet management.

Text Books:

* Physical Geodesy by Weikko A. Heiskanen and Helmet Moritz, Freeman and Company.

* GPS: Theory and Practice, B. Hofmann-Wellenhof, H. Lichtenegger and J.Collins, 5th Revised Edition, Springer, Wien, New York, 2001.

* GPS: Theory and applications, B. Parkinson, J. Spilker, Jr. (Eds), Vol. I & II, AIAA, 370 L'Enfant Promenade SW, Washington, DC 20024, 1996

Reference Books:

* GPS for Geodesy, A. Kleusberg and P. Teunissen (Eds), Springer-Verlag, 1996.

* GPS Satellite Surveying, A. Leick, 2nd edition, John Wiley & Sons, 1995

GI 3206 : GEOGRAPHIC INFORMATION SYSTEMS - II LAB

Course Objectives:

The objective of the course is to

* Train the student to identify problems and apply GIS technology for solutions.

* Impart practical knowledge in data editing and topology.

* Train the student to perform geographic analysis.

Course Outcomes:

At the end of the course the student will be able to

* Create a cadastral map of a region/town for the GIS project.
* Perform Geographic analysis for any designed project.
* Create map and make final reports in GIS

SYLLABUS

1. Data input (spatial and attribute) editing and creating topology
2. Performing Geographic Analysis for the designed project
3. Design a project based on cadastral/line drawing/map of a town/ region for GIS project; identification of project problem.
4. Presenting the results (map/report) of the analysis
5. Viva presentation

GI 3207 : DIGITAL IMAGE PROCESSING LAB

Course Objective:

The objective of the course is to

* Impart practical knowledge in image transformation techniques
* Train the student in image classification techniques

Course Outcomes:

After completion of the course student will be able to

* Perform image transformations and image indices.
* Classify satellite data using supervised and unsupervised techniques.
* Perform viewshed analysis and change detection analysis for the given area.

SYLLABUS

1. Histogram equalization
2. Histogram matching
3. Convolution: Low pass filter, high pass filter, Edge Enhancement
4. Principle Component Analysis
5. Tasseled CAP
6. NDVI
7. Convolution: Horizontal, Vertical and Edge Detection
8. Fourier Transformation, Fourier magnitude
9. Supervised Classification,
10. Unsupervised Classification
11. Change Detection Analysis.

GI 3208 : GEOSPATIAL ANALYSIS WITH PYTHON LAB

Course Objectives:

The objective of the course is to

* To familiarize students with application of Python in Geospatial data
* Introduce various geospatial Libraries
* Impart practical knowledge on visualization of spatial data in python
* Train the student in various analysis operations on raster data.

Course Outcomes:

At the end of the course the student will be able to

* Identify and manage appropriate data models to represent spatial features
* Analyze and visualize geospatial information
* Gain experience writing Python scripts (to download, create, interact with and analyze geospatial data in ArcGIS and other software packages);
* Understand the basic concepts behind object-oriented scripting and computing languages;
* Able to create graphic models and custom tools for spatial analysis projects.

SYLLABUS

1. Installation of required geospatial libraries (GDAL, GeoPandas, Rasterio, Fiona, Shapely, Pandas, Numpy etc)
2. Reading and Writing the spatial data from various sources/formats
3. Visualization of geospatial data using python
4. Working with the attribute table and geometries
5. Resampling, Reprojection, and Reclassification of satellite data
6. Mathematical operation with Raster
7. NDVI calculation using NIR and RED band

Text Books:

* Python Scripting for ArcGIS, 2013. Paul A. Zandbergen
* Learning Geospatial Analysis with Python, third edition by Joel Lawhead.

GI 3209 : SOFT SKILLS

Course Objectives:

* To develop skills to communicate clearly.
* To aid students in building interpersonal skills.

* To enhance team building and time management skills.

* To inculcate active listening and responding skills.

Course Outcomes:

* Make use of techniques for self-awareness and self-development.

* Apply the conceptual understanding of communication into everyday practice.

* Understand the importance of teamwork and group discussions skills.

* Develop time management and stress management.

SYLLABUS

Introduction to Soft Skills: Communication – Verbal and Non Verbal Communication - Personal grooming (Etiquette, Attitude, Body Language), Posture, Gestures, Facial Expressions, Eye Contact, Space Distancing, Presentation Skills, Public Speaking, Just a Minute (JAM) sessions, Adaptability.

Goal Setting and Time Management: Immediate, Short term, Long term, Smart Goals, Strategies to Achieve goals, Types of Time, Identifying Time Wasters, Time Management Skills, Stress Busters.

Leadership and Team Management: Qualities of a Good Leader, Team Dynamics, Leadership Styles, Decision Making, Problem Solving, Negotiation Skills.

Group Discussions: Purpose (Intellectual ability, Creativity, Approach to a problem, Tolerance), Group Behavior, Analysing Performance.

Job Interviews: Identifying job openings, Covering Letter and CVs / Resumes, Interview (Opening, Body-Answer Q, Close-Ask Q), Telephone Interviews, Types of Questions.

Text Books:

* Krannich, Caryl, and Krannich, Ronald L. Nail the Resume! Great Tips for Creating Dynamite Resumes. United States, Impact Publications, 2005.

* Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012

* Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Education, 2001.

* Pease, Allan. Body Language. Delhi: Sudha Publications, 1998.

* Rizvi, Ashraf M. Effective Technical Communication: India, McGraw-Hill Education. 2010

* Thorpe, Edgar &Showick Thorpe. Winning at Interviews. 2nd Edition. Delhi: Dorling Kindersley, 2006.

(FOURTH YEAR) 1st SEMESTER

GI 4107 : CLOUD-BASED GEOSPATIAL ANALYSIS

Course Objectives:

The objective of the course is to

* Explain satellite data processing using Google Earth Engine

* Train the student in common pre-processing and GIS techniques in Google Earth Engine.

* Train the student in using Google Earth Engine for environmental applications.

* Implement remote sensing workflows in Earth Engine.

Course Outcome:

After the completion of the course the student will

* To use the Google earth engine.

* To Perform a Cloud based Geo-Spatial Analysis.

Introduction: Google Earth Engine (GEE) is a cloud-based platform for planetary scale geospatial data analysis and communication. By placing more than 17 petabytes of earth science data and the tools needed to access, filter, perform, and export analyses in the same easy to use application, users are able to explore and scale up analyses in both space and time without any of the hassles traditionally encountered with big data analysis. Constant development and refinement have propelled GEE into one of the most advanced and accessible cloud-based geospatial analysis platforms available, and the near real time data ingestion and interface flexibility means users can go from observation to presentation in a single window.

SYLLABUS

1. Getting started with Google Earth Engine. Basics of Java Script
2. Understanding band combinations and image visualizations
3. Calculating Spectral Indices (NDVI, NDWI)
4. Image Classification
5. Classification Validation & Accuracy Assessment
6. Monitoring Vegetation changes over time
7. Working with SAR data in Google Earth Engine

Text Books:

* https://spatialthoughts.com/courses/google-earth-engine/

* https://tutorials.geemap.org/

PROFESSIONAL ELECTIVES

SPATIAL DATA MINING & NEURAL NETWORKS

Course Objectives:

The objective of the course is to

* Teach the concepts of database technology evolutionary path which has led to the need for data mining and its applications.

* Explain the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.

* Impart knowledge on basics of cluster analysis.

* Teach analysis of various feedback networks.

* Explain the applications of neural networks.

* Impart knowledge on neural networks algorithms.

Course Outcomes:

After completion of the course student will be able to

* Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate knowledge discovery.

* Assess raw input data, and process it to provide suitable input for a range of data mining algorithms.

* Discover and measure interesting patterns from different kinds of databases

* Characterize and discriminate data summarization forms and determine data mining functionalities

* Design and implement a data-mining application using samples, realistic data sets and modern tools.

SYLLABUS

Data Mining: Introduction to Data Mining: importance and motivation of data mining, relational databases, data warehouses and data mining, translationaldatabases, advanced database systems and advanced database application, data mining functionalities, pattern classification of data mining systems, majorissues in data mining. Data mining primitives, definition of data mining tasks, data mining query language, designing of graphical user interface based on datamining query language and architecture of data mining systems.

Classification and Clustering, classification and prediction concepts and issues regarding classification and prediction, classification by decision treeintroduction, Bayesian classification, classification by backpropagation, classification based on concepts from Association rule mining, K- nearest neighborhood classifiers, case-based reasoning, genetic algorithms, roughest approach, fuzzy set approaches and prediction. Cluster analysis: introduction to cluster analysis,types of data in cluster analysis, categorization of major clustering methods.

Data mining applications: GIS and Data Mining – geospatial data mining for market intelligence; data mining for automated GIS data collection.

Neural Networks: Neural network fundamentals: introduction to Hopfield networks, learning in neural networks, applications of neuralnetworks, recurrent networks, distributed representations, multilayer networks and backpropagation algorithms.

Neural networks applications: neural network-based land transformation models; ANN and GIS in natural resource applications.

Text Books:

* Introduction to Data Mining by A. AddisonWesley Publication

* Neural Networks and Fuzzy systems by B. Kosko, Prentice_hall India

Reference Books:

* Geospatial Data Mining for Market Intelligence by Paul Duke (http://www.tdan.com/view-articles/4921) Data mining for automated GIS data collection by K-H Anders, Photogrammetric Week 01, 2001 pp 263-272 (http://www.ifp.unistuttgart.de/publications/phowo01/Anders.pdf) Using GIS artificial

* Neural networks and remote sensing to model urban change in the Minneapolis-St Paul and Detroit Metropolitan areas, by B.C. Pijanowski and B.A. Shellito (http://web.ics.purdue.edu/~bpijanow/ASPRS% 202001% 20pijan.pdf)

SOFT COMPUTING TECHNIQUES

Course Objective:

The objective of the course is

* To make the students understand the concepts of Artificial Neural networks, Fuzzy logic and Genetic algorithms and also their application in Geoinformatics.

Course Outcomes:

At the end of the course, students will be able to

* Understand the concepts of Artificial Neural Network, Fuzzy logic, Genetic algorithms and also their application in Geoinformatics.

SYLLABUS

Soft computing and artificial neural networks :Soft Computing: Introduction - soft computing vs. hard computing - soft computing techniques - applications of soft computing - ANN : Structure and Function of a single neuron:

Biological neuron, artificial neuron, the definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebbian learning rule/Delta rule, ADALINE, MADALINE and BPN

Fuzzy systems: Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp and fuzzy relations - introduction and features of membership functions, Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making.

Neuro-fuzzy modeling: Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional method.

Applications of soft computing in Geoinformatics: Image registration - Object recognition - Automated feature extraction - navigation – Integration of soft computing and GIS for flood forecasting and monitoring, Landslide susceptibility, Highway alignment, smart city planning, agriculture, solid waste disposal

Text Books:

* Freeman J.A. and Skapura B.M., "Neural Networks, Algorithms Applications and Programming Techniques'', Addison-Wesely, 1990

* Jang J.S.R.,Sun C.T and Mizutani E - Neuro Fuzzy and Soft computing Prentice hall New Jersey,1998

INTERNET OF THINGS

Course Objectives:

The Objective of the course is to understand the

* Fundamentals of Internet of Things and its building blocks along with their characteristics

* Recent application domains of IoT in everyday life

* Protocols and standards designed for IoT and the current research on it.

* Other associated technologies like cloud and fog computing in the domain of IoT

Course Outcomes:

After completion of the course the student will be able to

* Understand the application areas of IOT

* Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

* Understand building blocks of Internet of Things and characteristics.

* Design & develop IOT Devices.

SYLLABUS

Introduction of IoT Domains of IoT, M2M vsIoT,M2M to IoT; M2M to IoT - A Market Perspective; M2M to IoT - An Architectural Overview; M2M and IoT-Technology Fundamentals, Management of IoT.

IoT Communication Protocols: NFC, RFID, Zigbee; MIPI, M-PHY; UniPro, SPMI, SPI, M-PCIe; Wired vs. Wireless communication, GSM, CDMA, LTE, GPRS, small cell; Vulnerabilities and Risks associated with Protocols

IoT Platforms: Hardware, SoC, sensors, device drivers, IoT standards; Cloud computing for IoT; Bluetooth, Bluetooth Low Energy, beacons.

Community Impact of IoT: Federal, State, and Local Municipalities. Security and Privacy Risks, Implications of IoT on various systems: Brand Damage, Loss of Trust, Intellectual Property Theft, Data Leakage

Threat Actors: Sophisticated Actors, Insider Threat, Attack Patterns, Targeted Attacks; Collateral Damage Risk, Social Engineering and Phishing, Remote Access; Vulnerability Landscape; Extensive Vendor Vulnerabilities; Patterns in IoT

Network Vulnerabilities: Boundary protection, Information flow enforcement, Remote access, least privilege, Physical access control, Security function isolation. Implementing a Risk-Based IoT Security Program: Assess, Inventory Assets, Map Network, Document Remote Access, Implementation, Network Segmentation, Harden Systems, Control Remote Access, Log all access, Monitor, Document Policies and Procedures, Training, Lifecycle.

Data Analytics using IoT Tools for IoT, Making Things Smart: Getting Things onto the Internet, IoT in Home, Cities/Transportation, Retail, Healthcare, and Sports.

Text Books:

* "Learning Internet of Things" by Peter Waher, Packt publisher

* The Internet of Things: Enabling Technologies, Platforms, and Use Cases by Anupama C. Raman and Pethuru Raj

* "Practical Internet of Things Security" by Brian Russell, Drew Van Duren, Packt publisher

* “Raspberry Pi with Java: Programming the Internet of Things (IoT)” by James L. Weaver and Stephen Chin, Oracle Press.

Reference Books:

* “The Internet of Things (The MIT Press Essential Knowledge series)”, By Samuel Greengard

* “The Silent Intelligence: The Internet of Things”, by Daniel Kellmereit and Daniel Obodovski

CLIMATE CHANGE AND GIS

Course Objectives:

The Objective of the course is to

* Provide deep insights into the working of climate change and how to overcome it.

* Explain various issues and processes in climate change

* Impart knowledge on geospatial applications to tackle climate change issues.

Course Outcomes:

After completion of the course the student will be able to

* Identify factors influencing the global climate systems

* Assess impacts of climate change on global, regional and local scales

* Develop strategies for adaptation and mitigation measures

* Identify clean technologies for sustainable development

SYLLABUS

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

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

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

GIS applications in climate change: Introduction, Geo-Spatial Tools for climate change, Spatial and Attribute data in GIS for climate change, Steps in preparing maps for climate change, ArcCatalog and its applications for climate change

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

Text Books:

* Climate Change: A Multidisciplinary Approach- Burroughs, W.J.

Reference Books:

* The Suicidal Planet: How to Prevent Global Climate Change- Mayer Hillman,

* Field Notes from a Catastrophe: Man, Nature, and Climate Change- Kolbert, Elizabeth.

* Cradle to Cradle: Remaking the way we make things William McDonough,

GEOINFORMATICS FOR FORESTRY AND ECOLOGY

Course Objectives:

The objective of the course is to

* Impart knowledge on Indian vegetation and its classification

* Explain interpretation techniques of satellite imagery for vegetation.

* Impart knowledge on microwave remote sensing related forest applications.

* Explain fundamentals of Forest ecology.

Course Outcomes:

After completion of the course the student will be able to

* Develop knowledge in Indian vegetation and its classification

* Interpret satellite imagery to identify changes in vegetation.

* Perform image processing on digital data products.

* Discuss microwave remote sensing applications in forest studies.

SYLLABUS

Forest Classification: Natural vegetation of India and its classification: Concept of natural vegetation, forest / vegetation types of India and its classification. Spectral properties of vegetation & other features: Spectral response from vegetation under different spectral regions, effects of phenological changes on spectral behavior, spectral signatures etc. Aerial photo interpretation for forestry and ecological information extraction: Qualitative characteristics for interpretation of forest types, specifications for aerial remote sensing data, forest mapping using aerial photographs.

Forest Mapping: Visual interpretation of Satellite imagery and Change Detection: Image elements for extraction of vegetation related information from

space borne images, monitoring forest change and damage by visual interpretation. Digital image processing for forest vegetation, mapping and change detection.

Microwave remote sensing and its applications in forestry: Concepts involved in interpretation of microwave remote sensing data for forest and landuse information extraction, merging multi spectral and microwave data, utility for volume/density classification. Forest Canopy Density mapping.

Forest Management: Forest fire assessment and risk zonation: Concepts and introduction about fire behavior; Fire mapping possibilities using RS data; Identification of fire prone areas using RS and GIS based spatial modeling. Forest resources information system: Concept of forest resources information system, compilation, integration and interpretation of information for forest management.

Forest ecology Ecological principles and concepts: Ecological principles and concepts, Ecological approaches for evaluation of various ecosystems. Structural analysis of vegetation: Spectral vegetation indices and enhancing; vegetation response in remote sensing data, Vegetation classification and mapping using RS data for ecological studies-terrestrial, wetland and Estuarine vegetation, Phytosociological analysis.

Text Books:

* Manual of Remote Sensing by American Society of Photogrammetry (latest edition).

* Principles of Remote Sensing by P. J. Curran (1985).

* Aerial Photographs in Land Use and Forest Surveys by M. S. Timar & A. R. Maslekar (1974).

* Land Evaluation for Forestry by Food and Agricultural Organization (FAO) (1984).

* Ecology and Field Biology by R. L. Smith (1974).

* Fundamentals of Ecology by E. P. Odum (1976).

* A Handbook of Ecology by R. S. Ambasht & N. K. Ambasht (1993).

Reference Books:

* Remote Sensing for Forest Surveys and Management by S. P. S. Kushwaha In: Proc. ISTE, Varanasi (1987).

* Landscape Ecology by T. T. R. Forman and M. Godron (1986).

* Special Properties of Plants. Appl. Opt. 4, pp 11-20 by D. M. Gates, H. J. Keegan, J. C. Shelter and V. R. Weidner (1965).

* Land Use and Forest Type Classification Proposed for Aerial Photo Interpretation by M. S. Tomar (1976).

* Revised Forest Types of India by H. G. Champion & S. K. Seth (1968). Vegetation Mapping by A. W. Kuchlar & I. S. Zonneveld.

GIS FOR HEALTH, UTILITY AND ENERGY

Course Objectives:

The objective of the course is to

* Impart knowledge on health-based impact classification in disease identify and spread.

* Explain interpretation techniques of satellite imagery for utility.

* Impart knowledge on GIS in energy related applications.

* Explain geospatial techniques in banking sector.

Course Outcomes:

After completion of the course the student will be able to

* Develop knowledge of GIS in demographic analysis

* Interpret satellite imagery to identify health facility locations.

* Perform analysis on digital data for planning and management.

* Discuss remote sensing applications in utility studies.

SYLLABUS

Introduction: definition and its importance, spatial distribution of population according to age, gender, racial group and socioeconomic segregation, geo-ethnography, labor market exploration, health equality, crime analysis, GIS for demographic analysis, trade area analysis, site selection for shopping centers, facility management.

Health GIS: Spatial epidemiology: RS and GIS in study of epidemics and their control-Disease mapping, bioterrorism, infectious disease modeling, Health facility location mapping, health and disease atlas of India. Recent Covid related Applications

Utilities: Power – site suitability assessment for power plants (thermal, hydroelectric, nuclear, mini-hydroelectric power plants), Solar & wind power assessment; GIS in electricity distribution network: Electricity mapping; Telecommunication – applications of GIS in telecommunication industry: Tower spotting; Water & wastewater Utilities.

Transportation & Banking – vehicle routing and scheduling, vehicle tracking system, Tourism – GIS application in Tourism planning; Banking: Market Analysis, Asset Management, Customer Database Management

Archeology: Importance of Archeological and Heritage sites, Role of digital mapping and database development for heritage sites, digital archeology, 3d visualization of Archeological and heritage buildings.

Text Books:

* Transportation Network Analysis - Bell, M.G.H. and Iida, Y.

* Remote sensing and urban analysis - Jean-Paul Donnay, Michael John Barnsley

* Beyond the map: archaeology and spatial technologies - Lock, G. and Harris, T.

* Digital Archaeology: Bridging Method and Theory - Patrick Daly

* Pattern Recognition and Signal Processing in Archaeometry: Mathematical and Computational Solutions for Archaeology - Constantin Papaodysseus

Reference Books:

* Network Analysis in Geography - Haggett, P. and Chorley, R.

* The Geography of Transport Systems - Rodrique, Jean-Paul

* Successful Tourism Management - Seth, P.N.

* The Tourism System: An Introductory Text - Mill and Morrison

GIS FOR TRANSPORTATION ENGINEERING

Course Objectives:

The objective of the course is to

* Teach basic concepts of Geoinformatics in the context of transportation and transportation networks.

* Impart knowledge on data needs and database development for doing transportation analysis in a GIS environment.

* Explain the concepts of transportation networks and algorithms and how they are incorporated into GIS.

Course Outcomes:

After completing this course student will be able to:

* Demonstrate knowledge of transportations systems: how they function, their importance to the space economy and the policies that regulate and promote transportation.

* Formulate and employ transportation models.

* Visualize and analyze transportation systems using GIS tools.

SYLLABUS

Traffic Engineering Studies and Analysis: Objectives, Sampling in traffic studies, sample size; Data collection, analysis and interpretation -Spot speed, Speed and delay, Volume, Origin – destination, Parking. Concept of PCU, Factors affecting capacity and level of service, Types of maneuvers and conflict points.

GIS based Spatial Analysis and Modeling: GIS and spatial Analysis; Urban sprawl; GIS Analytical functions; Coupling Transportation Analysis and Modeling with GIS; Customizing GIS; Supporting Advanced Transportation Analysis in GIS.

Transportation Planning using GIS: Travel Demand Estimation-Application of GIS, Traffic Analysis Zone (TAZ) and screen lines, Four Stage Planning Process (Brief description only), Network representation of a transportation System, Shortest Path determination, GIS based Transportation Planning, Spatial and Non spatial data for land use and transportation.

ITS: Introduction to Intelligent Transport System: Components of ITS, Application of ITS to Traffic Management System- Public Transportation Management System, Application of GIS in vehicle routing analysis and visualizations of traffic data in GIS, Integration of GPS and GIS, Travel time analysis using GPS-GIS integration.

GIS – T Data Models: Data Domains and Data Modeling in GIS – T; Data Modeling and Design Issues; Graph Theory and Network Analysis; Network representation of a Transportation System; Linear referencing methods and systems; Transportation Data Models for ITS. GIS-T applications: Scope of TransCAD and EMME in Transportation Planning (Introduction only).

Text Books:

* Hensher D. A., Button K. J., Haynes K. E., and Stopher P. R. (Eds.), Handbook of Transport Geography and Spatial Systems", Elsevier, 2004.

* Thill Jean-Claude, Geographical Information Systems in Transportation Research, Pergamon, 2000.

* Caliper Corporation, Travel Demand Modeling with TransCAD, 2009.

* Hutchinson, B. G., Principles of Urban Transportation Planning, McGraw Hill, 1979

* Kadiyali, L.R.Traffic Engineering and Transportation Planning, Khanna Publishers

Reference Books:

* Longley P. A., Barnsley M. J., Donnay Jean-Paul, Remote Sensing and Urban Analysis, Taylor & Francis, 2001.

DATA SCIENCE

Course Objectives:

The objectives of the course are to

* Introduce the basics concepts of Data Science.

* Solve problems using data science techniques.

* Understand problem solving through R.

* Visualize data during problem solving

Course Outcomes:

After successful completion of the course the student will be able to

* Explain the fundamentals of data science

* Solve real world problems using data modeling methods.

* Apply R techniques to various applications

* Explain the Hadoop architecture.

* Apply plots to visualize data.

SYLLABUS

Introduction to data science: Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation – introduction to NoSQL.

Modeling methods: Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes – Memorization Methods – Linear and logistic regression – unsupervised methods.

Introduction to R: Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R - manipulating objects – data distribution.

Map reduce: Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase - Shuffling and sorting- Reducing phase execution.

Delivering results: Documentation and deployment – producing effective presentations – Introduction to graphical analysis – plot() function – displaying multivariate data – matrix plots – multiple plots in one window - exporting graph - using graphics parameters. Case studies.

Text Books:

* Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.

* Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2014.

* W. N. Venables, D. M. Smith and the R Core Team, “An Introduction to R”, 2013.

* Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packt Publishing Ltd., 2014.

* Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.

Reference Books:

* Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.

* http://www.johndcook.com/R_language_for_programmers.html

* http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction

ARTIFICIAL INTELLIGENCE

Course Objectives:

The objective of the course is to

* Provide an overview and introduction of AI to students.

* Introduce principles of AI towards knowledge representation and inference mechanism.

* Train the student for exhibiting the skills for simulating intelligence behavior and mechanisms that can think, learn, understand and behave like humans.

* Train the student on how to create an Expert system, build intelligent behavior and explain how to advise its use.

* Explain various control strategies in building AI systems.

Course Outcomes:

Upon completion of the course student will be able to

* Know the clear definition of AI, different areas of AI. The problem solving procedures and applications of various techniques used in the process.

* Build a typical AI production system using knowledge representation and inference mechanisms.

* Exhibit his skills on simulation of intelligence behavior and mechanisms in writing the AI programs.

* Build a typical Expert system with intelligent behavior for advising its users.

SYLLABUS

Introduction to Artificial Intelligence: overview of AI, definition of AI, relationship between AI systems and other computing systems, comparison between AI programming and other conventional programming. Sub areas of AI, key issues of AI research, AI problems, AI techniques, problem characteristics and production systems.

Knowledge representation: Knowledge - general concepts, Procedural vs. declarative knowledge, formal systems, symbolic representation- syntax and semantics of FOPL, Properties of w.f.f, clausal forms, resolution and unification, structural representation - semantic nets, conceptual graphs, con-

ceptual dependencies, frames and scripts, probabilistic reasoning - Bayesian networks, non-monotonic reasoning - TMS.

AI languages: LISP-basic list manipulation functions, predicates, LISP constructs, I/O operations in LISP, iteration and recursion in LISP, prolog syntax characters, predicates, rules, facts and goals in LISP variables, conjunctions, operators, back tracking, I/O operations and cut predicates.

Search and control strategies: example of search problems, uninformed search - BFS, DFS and comparisons, heuristic search - hill climbing, best -first search, constraints satisfaction and means end analysis, matching techniques.

Expert system – rule-based systems, backward vs. forward chaining, expert system shells, natural language processing - syntactic and semantic analysis, pragmatic processing, examples of NLP systems, goal state planning, non-linear planning and Hierarchical planning.

Text Books:

* Artificial Intelligence by E. Rich & Knight K- Tata McGraw-Hill

* Introduction to Artificial Intelligence by O.W.Patterson- Prentice-Hall India

Reference Books:

* Artificial Intelligence for R. Schalkoff, McGraw-Hill.

MACHINE LEARNING

Course Objectives:

The Objective of the course is to

* Provide an overview of Machine Learning.

* Understand the importance of various techniques in Machine Learning.

* Apply machine learning methods to solve different problems.

Course Outcomes:

Upon completion of the course student will be able to

* Illustrate Machine learning tasks and significance of binary classification

* Apply probability-based machine learning technique to solve problems.

* Analyze clustering and non-clustering techniques.

* Apply tree-based models for various applications.

SYLLABUS

Introduction to Machine Learning: Applications of Machine learning, Supervisory

Learning: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms

Bayesian Decision Theory: Classification, losses and risks, discriminant functions, utility theory, value of information, Bayesian networks, Influence diagrams, Association rules, Parametric Methods: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures

Clustering: Mixture densities, K-means clustering, Expectation Maximization algorithm, mixtures of Latent Variable Models, Supervised learning after clustering, Hierarchical clustering, choosing number of clusters, Non-parametric methods density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbors, nonparametric regression: smoothing models, choosing smoothing parameters

Decision trees and Linear Discrimination: Univariate classification and regression trees, rule extraction from trees, Multivariate trees, Generalizing linear model, two class and multi-class geometry of linear discriminant, pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, discrimination by regression, Support vector machines, optimal separating hyperplane, kernel functions for non-separable spaces, SVM for regression.

Hidden Markov Models: Discrete Markov processes, Hidden Markov Models, Three basic problems of HMM, Evaluation problem, finding the state sequence, Learning model parameters, continuous observations, Model selection HMM Assessing and comparing classification Algorithms: Cross-validation and resampling methods, measuring error, interval estimation, hypothesis testing, assessing performance of a classifier, comparing two classification algorithms, comparing multiple classification algorithms based on variance

Text Book:

* Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 2006

Reference Books:

* Machine Learning, Tom Mitchell, McGraw Hill, 1997

* Pattern Classification, Richard 0. Duda, Peter E. Hart and David G. Stork, John Wiley & Sons Inc., 2001

COMPUTER GRAPHICS

Course Objectives:

The objective of the course is to

* Introduce basic concepts of computer graphics.

* Impart necessary theoretical background and demonstrate the application of computer science to

graphics.

* Train the student to Develop programming skills in computer graphics through programming.

* Teach the Use of geometric transformation on graphics objects and their applications.

Course Outcomes:

Upon completion of the course student will be able to

* Understand the basics of computer graphics and interactive input and output devices.

* Design and implement the algorithms to draw.

* Apply different geometrical transformations such as translation, scaling, rotation, reflection in two dimensions.

* Understand two-dimensional coordinate transformation, viewing functions and various clipping algorithms.

* Understand the various display methods, geometrical & coordinate transformation in three dimensional.

SYLLABUS

Overview of Graphics Systems: Random-scan and raster scan monitors, Color CRT, Plasma panel displays, LCD Panels, Plotters, Film recorders, Graphics workstations, Display processors, Graphics software, Input/output Devices, Touch panels, light pens, graphics tables. Output primitives Points and lines, DDA, Bresenham's Line algorithm, parallel line algorithm, line function, circle generating algorithm, filled area primitives and pixel addressing.

Two-Dimensional Geometric Transformations: Two-Dimensional Geometric Transformations and viewing Use of homogeneous coordinate systems, Translation, scaling, rotation, Mirror reflection, Rotation about an arbitrary point, Zooming and panning, Rubber band methods, dragging, Parametric representation of a line segment. Point, line and polygon clipping.

Three-Dimensional Concepts: Three-Dimensional Concepts and object representations, polygon surfaces, Curved lines and surfaces, quadric surfaces, Blobby objects, Spline representations, Cubic Spline Interpolation methods, Bezier curves and surfaces.

Three-Dimensional Geometric and Modeling Transformations: Three-Dimensional Geometric and Modeling Transformations Translation, Rotation, Scaling, Other Transformations, Composite transformations, Three dimensional transformation functions, modeling and coordinate transformations. Three-Dimensional Viewing, Viewing coordinates, projections, Clipping, Three dimensional viewing functions. Three dimensional viewing. Visible-Surface Detection Methods Back face detection, Depth buffer method, Depth sorting method, Area subdivision method, and Visibility detection functions.

Illumination Models: Illumination Models and Surface-Rendering Methods Halftone Patterns and dithering techniques, Polygon rendering methods, Environment mapping Color Models and Color Applications Properties of light, Intuitive color concepts, RGB, YIQ, CMY, HSV color models.

Text Book:

* Computer graphics C version , second edition Donald Hearn & m.Pauline baker

WEB PROGRAMMING & APPLICATIONS

Course Objectives:

The objectives of the course is

* To expose the student about syntax of basic HTML language

* To familiarize about different web designing tools for web applications

* To teach about the scripting languages

* To impart knowledge on creating a web application environment.

Course Outcomes:

After completion of the course student will be able to

* Demonstrate the importance of HTML tags for designing web pages.

* How to style web pages using Cascading Style Sheets.

* Design interactive web pages with client and server side scripting.

* Create and deploy Web Applications over web server

SYLLABUS

Fundamentals of Web: Hyper Text Markup Language, Web designing through application tools (Microsoft FrontPage/Adobe Dream weaver), cascading style sheets. Netscape and Internet Explorer extensions.

Exercises: Basics of HTML: page layout, headers, paragraphs, links, lists. Cascading Style Sheets (CSS) & Page Layout with CSS HTML Tables & Frames HTML User Interface Controls, HTML Forms. Using Frontpage/Dreamweaver for Web Page Design.

Scripting Languages: CGI programming, Introduction to Scripting languages, (Java Script/ Vb Script/PHP/ Python), Java Script: History, Features of JavaScript, Syntax and Semantics and use in Web pages.

Exercises: Introduction to JavaScript; JavaScript: Arrays, loops, conditional statements and functions; Document Object Model (DOM); Capturing and handling events in JavaScript; Working with Windows and Frames.

Web programming & Application Development: TCP/IP Network model, Client Server technology, Web server, Web Application development using web technologies.

Exercises: Setting up Apache/IIS; Installing PHP; Installing MySQL; Installing and using PHPMyAdmin.

Server Side and Client side scripting: Introduction to Database connectivity, Open Database Connectivity Standard (ODBC), Data insertion, retrieval and selection criteria using database connectivity tools (Database and scripting languages).

Exercises:

A. Introduction to PHP; Working with Data Types and Operators; Building Functions and Control Structures; Manipulating Strings; Working with Files and Directories; Manipulating Arrays.

B. Introduction to SQL; Working with Databases and MySQL; Validating form data(server side);Error Handling and Debugging

Internet GIS: Introduction to Internet/Web GIS; Spatial (Raster and Vector) data dissemination using Web GIS; Distributed GIS development and Services;

Exercises: Configuring and installing map server (Proprietary & Open Source); creating a WebGIS application: publishing raster and Vector Data; Creation of OGC Services (WMS/WFS); Consuming/Creating OGC Services; Introduction to open layers.

Text Books:

* HTML - A Beginners guide, Second edition, Ian Lloyd, 2009.

* Discovering the Internet: Complete Concepts and Techniques by Gary B. Shelly, Thomas J. Cashman, H. Albert Napier, and Philip J. Judd.

* Learning Web Design: A Beginner's Guide to HTML, Graphics, and Beyond by Jennifer Niederst.

* PHP and My SQL for Dynamic Websites: Visual QuickPro Guide (2nd Edition) by Larry Ullman

Reference Books:

* Professional PHP5 Programmer to Programmer) by Edward Lecky-Thompson

* PHP5 and My SQL Bible by Tim Converse and Joyce Park with Clark Morgan

* Database connectivity, Bernard Van Haecke

* Internet GIS: Distributed geographic information services, ZR Peng and MH Tsou.

* Beginning Map server Open Source GIS Development by Bill Kropla (Apress)

OPEN SOURCE GIS & WEB MAPPING

Course Objectives:

The objective of the course is to

* It helps the candidate to think creatively and independently in Geoinformatics project implementation.

* It also gives complete freedom to modify the software to suit the needs.

* The course exposes major avenues of open source opportunities.

Course Outcomes:

At the end of the course the student will be able to understand.

* Concepts and protocols used in Open Source GIS.

* Functionalities of Open Source GIS software in Desktop and Web based environments.

* The availability of various Open Source GIS software and their architecture.

SYLLABUS

Basics for open source implementation: Open Source Software and Freeware W3C, WWW and Protocols – Software standards and open source GIS -OGC, GDAL and OSGeo, FOSS4G - Open source software for Desktop GIS and WEB mapping - Proprietary vs Open source - OGC Standards.

Open source development environment: Linux and Windows – Post-gre SQL and Database Engines - C, C++, OOP and Java streams - GNU, Mosix – WAP and Android stack –Scripts and Macros.

Desktop gis with open source gis: View Graphics – Data exchanges-portability and interoperability – Raster handling and Image analysis – vector data management –Rater and vector analysis - 2D/3D vectors with topology, 3D Voxel, 2D Raster.

Database management and user interface: Files vs Database - Distributed operations and Architecture – ODBC - Open source Database management tools- Database: Spatial and Attribute queries. Spatial functions and Analysis – Map Server, Application Server and Database server concepts.

Open software and web mapping: Open Source Software : GRASS, QGIS, OSSIM, Postgresql and (R) Environment – WEB Mapping Architecture and components – WEB mapping servers- Thin clients in WEB mapping - WMS, WFS, WCS, WPS and other web services- Open Server standards.

Text Books:

* Mitchell T (2005), Web mapping illustrated', O'Reilly Media Inc., Sebastopol, Canada.

* Neteler M, Helena M (2008), Open source GIS: A GRASS GIS approach',

3rd edn, Springer, New York.

Reference Book:

* Bill Kropla (2005) Beginning MapServer: Open Source GIS Development, A press (Springer Verlag) New york.

AIRBORNE & TERRESTRIAL LiDAR

Course Objectives:

The objective of the course is to

* Introduce the LiDAR concepts

* To provide exposure to LiDAR mapping and its applications

* Explain LiDAR data processing techniques.

Course Outcomes:

On completion of this course, the student shall be able to

* Understand the components of Airborne Laser Scanning System

* Plan for Airborne Laser Scanning data Acquisition

* Understand the concepts for generating DEM from Digital Surface Model by filtering

* Get exposed to various domain applications of Airborne Laser Scanner data

SYLLABUS

Laser and space borne laser profilers: Components of LASER: Active Material, Energy Source, Reflection Mirror – LASER Production- LASER Classification: Eye Safety, Class I to Class IV Lasers - Comparison of Various methods of deriving terrain height – LASER RANGING- Types of LiDAR: Range Finder LiDAR, Doppler LiDAR, DIAL – Principles of Laser Ranging: Pulse Laser, Continuous Wave Laser – Space Borne Laser Missions – GeoScience Laser Altimeter System (GLAS), LiDAR In-Space Technology Experiment (LITE), Chandrayan.

Airborne laser scanners: Components of Airborne Laser Scanning System – GPS, IMU, LASER Scanner, Position and Orientation System (PoS) – Types of Scanning Mechanism and Ground Measuring Pattern – Synchronization of Laser Scanner and PoS- LASER Scanners Specification and Salient Features – Concept of Multi return – 3D Cloud Points – Reflectivity of Ground features – Range Correction Factor.

LiDAR data processing: Pre Processing: Direct Georeferencing, Combining Inertial and Navigation Data - Determination of Flight Trajectory - Data processing – Coordinate Transformations – Geolocating Laser Foot Prints – Strip Adjustment – Digital Surface Model to Digital Elevation Model: Filtering, Ground Point Filtering – Flight Planning – Quality Control Parameters – Preparation of flight plan.

LiDAR data management and applications: Airborne Laser Scanner Error Sources - LiDAR data format: ASCII vs Binary, LAS Format – Software used for LiDAR data processing and management – Merits of Airborne Laser Terrain Mapping - Overview of LiDAR Applications - 3D city models – Road and Building Extraction – Forestry Applications – Power Line Mapping.

Terrestrial and bathymetric laser scanner: Terrestrial LiDAR: Static and Mobile (Vehicle Mounted) LiDAR -Terrestrial LASER Scanner Specification – Applications of Terrestrial LASER Scanning –Bathymetric LASER Scanner – Specification – Depth of Penetration: Secchi Depth – Applications of Bathymetric LASER Scanner

Text Books:

* Jie Shan and Charles K., Topographic laser ranging and scanning: principles and processing, CRC Press, Taylor & Francis Group, 2008

* Mathias Lemmens, Laser Altimetry: Principles and Applications, CRC Press 2006.

* Roger Read and Ron Graham, Manual of Aerial Survey: Primary Data Acquisition, Whittles Publishing, 2002.

Reference Books:

* Zhilin Li Qing Zhu, Chris Gold, Christopher Gold, and Digital Terrain Modeling: Principles and Methodology, CRC Press, 2004.

* Zhilin Li, Jun Chen, Emmanuel Baltsavias, Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences, CRC Press; 1 edition, 2008

* Percival, H.F. Small unmanned aircraft systems for low-altitude aerial surveys. J.Wildl.Manage

DRONE & UAV REMOTE SENSING

Course Objectives:

The objective of the course is to

* To provide exposure to drone remote sensing and its applications

* Explain planning and operations of UAV

* Impart knowledge on various drone sensors.

Course Outcomes:

At the end of the course the student will be able to

* Acquire all the knowledge they need to select the UAV system that best suits their application, correctly operate them and which remote-sensing analytical techniques can be used to obtain information from the images.

* Understand the capabilities and limitations of the UAV and data post-processing systems

SYLLABUS

UAV Remote Sensing Principles- UAV Technology and Imagery Acquisition, UAV Remote Sensing, UAV & Space Systems for Earth Observation, UAV Image Processing.

UAV Photogrammetry- UAV Photogrammetry Introduction, UAV Orthophoto generation, Digital Elevation Models (DEM) and 3D Point Cloud Generation.

UAV Operations and Mission Planning- UAV Technology, UAV Planning and Operations, UAV Autopilots, Autonomous Mission Planning, UAV Legislation and Legal Aspects.

UAV Remote Sensing Payload and Onboard Sensors- Multispectral Imagery, Hyperspectral Imagery, Thermal Imagery.

UAV Applications- Drone Remote Sensing in Utilities, Construction and Infrastructure Management, Drone Remote Sensing in Oil and Gas Industry, Drone Remote Sensing in Precision Agriculture, Drone Remote Sensing in Marine Projects, Drone Remote Sensing in Surveying and 3D City Models, Drone for Surveillance and Search & Rescue, UAV Humanitarian Applications, Drone Remote Sensing in Archaeology.

Text Books:

* Barnhart, R., Michael, M., Marshall, D., and Shappee, E. ed. 2016. Introduction to Unmanned Aircraft Systems, 2nd edition. Boca Raton. CRC Press.

* Fahlstrom, P. and Gleason, T. 2012. Introduction to UAV Systems. 4th edition. United Kingdom. John Wiley & Sons Ltd.

Reference Books:

* Wolf, P., DeWitt, B., and Wilkinson, B. 2014. Elements of Photogrammetry with Applications in GIS, 4th edition. McGraw-Hill.

OPEN ELECTIVES

GEOINFORMATICS FOR ENVIRONMENTAL MONITORING

Course Objectives:

The objective of this course is

* Water quality assessment, soil degradation assessment.
* Impart knowledge on geospatial applications in Urban Environment
* Monitoring of Air pollution and climate
* Impart knowledge on Marine pollution
* To expose the students to the applications of Remote Sensing and GIS.

Course Outcomes:

At the end of the course the student will be able to appreciate

* The possible applications of Remote Sensing and GIS in water quality, soil conservation and ecology
* The availability various remote sensing sensors for acquiring environmental datasets
* The use of satellite remote sensing in climatology and air pollution studies

SYLLABUS

Water and the Environment: Remote sensing of water quality–water pollution–potential pollution sources–water runoff, Remote Sensing and Water quality management–snow surface cover–flood prediction. Soils and landforms–soil erosion–salinity–flood damage –soil degradation using Remote Sensing and GIS.

Urban Environment: General consideration rural structure–Urban areas–Impact of industrial pollution– chemical effluents, land reclamation–disposal of solid waste.

Marine Environment: Sensors for environmental monitoring–sensors–visible and outside visible wavelength– absorption spectrometers–selection of ground truth sites–sea truth observations–Radar techniques for sensing ocean surface–thermal measurements–application of sensing, mapping oil slicks–Chlorophyll detection–Fisheries resources.

Air pollution and Global Climatology: Remote sensing techniques for Air quality monitoring–case studies–weather forecasting and climatology–emissivity characteristics–measurement of atmospheric temperature– composition–constituent distribution and concentration.

Case studies: River pollution–the case of Ganga River. Air Pollution in Delhi; Mathura Refinery and Taj Mahal; Urbanization and its impact on Visakhapatnam city environment.

Text Book:

* Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, second edition, Chapman and Hall, New York, 1993.

Reference Book:

* Lintz, J. and Simonent, D.S. Remote Sensing of environment Addision Wesley, Rading mars, 1976.

GEOINFORMATICS FOR EARTH SCIENCE APPLICATIONS

Course Objectives:

The objective of the course is to

* To impart knowledge on Remote sensing applications in Lithological studies

* To gain knowledge in remote sensing applications in Geological structures

* To familiarize with geospatial applications in Geomorphology

* To impart knowledge on RS & GIS techniques in Geological investigations

Course Outcomes:

After completion of the course the student will be able to

* Explain remote sensing applications in Lithological studies

* Understand the importance of Remote sensing in Geomorphological studies

* Explain Remote sensing applications in Geological investigations

* Gain knowledge on remote sensing application in disaster management

SYLLABUS

Remote sensing applications in lithological studies : Introduction; Scope for Geological applications in multispectral data, Thermal Data, Microwave data Mapping of Broad scale Lithological mapping using aerial photos and satellite imagery, Digital analysis for lithological discrimination.

Remote Sensing applications in structural analysis : Bedding and simple dipping strata, Folds, Faults, rift zones, Lineaments, Unconformity, Structural mapping–structural analysis through aerial-and satellite- data, digital techniques for structural analysis.

Remote sensing application in geomorphology: Nature and type of landforms like denudational, structural, fluvial, marine, Aeolian, glacial and volcanic.

Remote sensing application in geological investigations : Remote sensing in Mineral Exploration, Main types of Mineral Deposits and their surface indications, Stratigraphic & lithological Guides, Geomorphological guides, Structural guides, Guide formed by Rock alteration, Geobotanical guides. Groundwater, Petroleum, Hydrogeological mapping, Engineering Geological studies, Landslide studies and disaster management studies using Remote Sensing and GIS techniques – case studies

Engineering and Sub-surface exploration & Disaster Assessment : Engineering geological Investigations: river valley projects, dams and reservoirs, route location (highways and Railways) canal and pipeline alignments; neotectonics, seismic hazard and damage assessment, local ground condition, disaster assessment, volcanic and geothermal Energy applications, volcanic mapping and monitoring, identification of coal fires; environmental geology Resistivity, aeromagnetic and electromagnetic survey for subsurface explorations.

Text Books:

* Ravi P. Gupta, Remote sensing Geology-Springer Publisher, A1Books Co.in.

* Joseph Lintz (Jr) and David Simonett Remote Sensing of environment, Addison Wesley Publishing Company London, 1976.

* Parbin Singh Geology Katson Publishing House Ludhiana 4th edition 1985.

Reference Books:

* Manual of Remote Sensing Vol. II, American Society of Photogrammetry falls church Virginia – 1985.

* Three Dimensional Applications in Geographical Information Systems – by Jonathan Raper, Dept. of Geology, Birkbeck College, University of London – 1989

GEOINFORMATICS FOR AGRICULTURE SURVEY

Course Objective:

The objective of this course is to provide in-depth understanding of remote sensing, satellite image analysis, Geographic Information System (GIS) and Global Navigation Satellite System (GNSS) technologies and their applications in natural resources survey and monitoring including agriculture and soils, forestry and ecology, geology and mineral resources, water resources, coastal and marine resources, urban and regional planning, atmospheric studies and disaster management.

Course Outcomes:

After completion of the course the student will be able to

* Explain the remote sensing applications in soil studies

* understand the importance of applications in agrometeorology

* explain the remote sensing applications in agriculture surveys

SYLLABUS

Introduction: Information needs for Crop Inventory and agricultural water management, Digital and Visual techniques of land use mapping, Digital land use change detection; accuracy assessment

Crop Inventory: Importance of Remote Sensing in agriculture, Spectral characteristics of crops (Optical, Thermal & Microwave), Vegetative Indices, Principles of crop discrimination and average estimation.

Agricultural Water Management: Remote sensing techniques for irrigated/ non-irrigated crop inventory, irrigation water requirement, irrigation scheduling using remote sensing based crop water stress indices, ET estimation using

remote sensing techniques, importance and assessment of soil moisture using remote sensing techniques (Optical, Thermal and Microwave),

Drought assessment: Definition and types of drought, Conventional and remote sensing based methods of agricultural drought assessment, (NADAM Project (National Agricultural Drought Assessment and Monitoring).

Crop Resource Survey: Satellite Agro-meteorology: Satellite sensors & specifications for agro-meteorological applications, agro-meteorological parameters retrieval ABHRR applications in agrometeorology GIS based land surface flux modeling.

Soil Conservation: Genesis & Mapping of degraded lands and their potential: Formation and agents, site characteristics of degraded lands, GIS application for assessment of potentiality and productivity, Genesis of shifting cultivation, salt – affected soils, wetlands, ravenous and gullied lands, desertic lands. Mapping using aerospace data. Comparison of empirical and process based models for soil loss estimation.

Text Books:

* Evapotranspiration and irrigation water requirements, edited by M. E. Jenson, R. D. Burman and R. G. Allen (1994).

* ASLE Manual and Reports on Engineering Practice. Scaling up in Hydrology using Remote sensing (1996). John Wiley Publication. Edited by J. B. Stewert,

* Remote sensing Applications in agriculture by Eston & Clarke. Applications of Remote Sensing to Agrometeorology (Ed. F. Toselli), Kluwer Academic Publishers.

* Introduction to Agrometeorology (1994), Second Edition by H. S. Man Oxford & IBH Publishing Co. Pvt Ltd. Bocoo, G.; Palacio, J. and Valenzuela, C. R. 1990.

* Soil reflectance in remote Sensing of earth Sciences: Manual of Remote Sensing, (Edited by Andrew N. Renez) 3rd edition, Vol. 3, pp. 111-118. (John Wiley & Sons. Inc.).

Reference Books:

* Gully erosions modeling using GIS and geomorphic knowledge, ITC Journal, 1990-3: 253-261. Csillag, F., Pasztor, L., and Biehl, 1993.

* Spectral band selection for the characterization of salinity status of soils. Remote sensing of Environment, 43, 231-242. Dwivedi, R. S. and Sreenivas, K. 1998.

* Image Transforms as a tool for the study of soil salinity and alkalinity dynamics. Int. J. Remote sensing, 19 (14): 605-619. Baumgardner, M. F., L. F. Silva, L. L. Biehl, and E. R. Stoner, 1985.

* E. T. Engman, R. A. Feddes and Y. Ken. Mutreja, K. N. (1986) Applied Hydrology. Tata McGraw-Hill Pub. New Delhi, pp: 314 – 171.

* Reflectance properties of soils, Adv. Agron., 38, 1-44. Ben-Dor, E., Irons. And Epema, G. F., 1999.

* Burrough, P. A., 1986. Principles of geographical information systems for land resources assessment. Oxford Univ. Press, New York.

GEOINFORMATICS FOR RESOURCES DEVELOPMENT AND DISASTER MANAGEMENT

Course Objectives:

The objectives of the course is to

* Introduce basic concepts and importance of Natural resources management

* To impart knowledge on geospatial applications in managing resources like water, soils and minerals

* Teach the concept of disaster management.

* To introduce the role of geoinformatics in managing different disasters.

Course Outcomes:

After completion of the course the student will be able to

* Understand the importance of natural resource management.

* Explain the role of geoinformatics in managing resources like water, soils and minerals

* Gain knowledge in concept of disaster management

* Summarize the application of geoinformatics in different disasters

SYLLABUS

Natural Resources Development: Introduction and Scope: role of geoinformatics technologies – aerial photographs; satellite remote sensing; GPS; and GIS in resource evaluation. Water resources – surface water and groundwater resources: mapping and monitoring of watersheds, tanks and reservoirs.

Soil and agricultural resources: Spectral behavior of soils; Mapping of soils using multispectral images; Evaluation of soil erosion prone zones through GIS; Remote sensing in Land use / land cover mapping; Crop area estimations; monitoring of crop vigor; Yield estimations. Forest resources: mapping of forest types; estimations of timber volume; monitoring of forest health – forest pests, forest fires, Trends in deforestation and afforestation.

Remote sensing techniques for identification of rocks and minerals; mapping of geological structures; surface manifestation of minerals and their identification; spectral properties of minerals; role of thermal and hyperspectral remote sensing in mineral exploration. Case studies.

Geoinformatics in Disaster Management: introduction and scope. Coastal Hazards: Storm surges and Tsunamis: Origin, propagation and run-up; Role of coastal topography, bathymetry and vegetation.

Geoinformatics applications in disaster mapping and mitigation; Risk zone mapping: earthquakes – identification of geological structures like faults; volcanic activity–thermal imaging for monitoring temperature changes; GIS-based decision support systems for disaster management.

Text Books:

* Remote sensing for earth resources 2nd Edition, (ed) D.P. Rao, AEG Publ., Hyderabad, 1999 Geomatics solutions for Disaster Management, Li, Zlatanova and Fabbri (ed), Springer, 2007.

* Role of remote sensing in disaster Management, Nirupama and S.P Simonovic, ICLR Research Paper Series 21, 2002.

* Remote Sensing imagery for natural resources monitoring: a guide for first time users, D.S. Wlike and J.T. Finn, Columbia University Press.

* Successful response starts with a map: Improving Geospatial Support for Disaster Management by Committee on Planning for Catastrophe: A Blueprint for Improving Geospatial Data, Tools, and Infrastructure, National Research Council, National Academies Press, 2006, ISBN: 0309103401.

Reference Books:

* Applications of Remote Sensing in Agriculture, M.D. Steven and J.A.Clark, Butterworths, 1990. Tsunamis- to survive from tsunami, Susumu Murata et al., 2009 World Scientific Books.

* Sea-Level Rise and Coastal vulnerability – an assessment of Andhra Pradesh coast, India through remote sensing and GIS, Nageswara Rao, K. et al., (2008)

* Journal of Coastal Conservation, Vol. 12: pp. 195-207 Imperatives for Tsunami Education, Nageswara Rao, K. (2007) Current Science, Vol. 93 (1) pp. 8-9.

* http://www.iclr.org/pdf/Niru_report%20Simonovic.pdf.

GEOINFORMATICS FOR WATERSHED MANAGEMENT

Course Objectives:

The objective of the course is to

* Expose student to different issues in watershed management
* To impart knowledge on soil related studies
* To impart knowledge on rainfall and run-off
* To impart knowledge on integrated water management in Agriculture

Course Outcomes:

After completion of the course the student will be able to

* Understand importance of watershed management and characteristics
* Estimate rainfall and runoff in catchments
* Gain knowledge on integrated water management in Agriculture

SYLLABUS

Watershed Concept: Issues in watershed management - land degradation, agricultural productivity, reservoirs sedimentation, depletion of bio resources, floods and droughts. Principles and approaches - principles of watershed management, different approaches in watershed management; Problem oriented approach, three dimensional approaches, integrated approach, steps in watershed management.

Land Management: Survey, layout; Preparation and Development. Contour demarcation, Bush clearance, updating, store picking and packing, leveling, shaping and consolidation, fencing, plowing; soil and soil moisture conservation. Soil survey; conservation measures. Contour techniques, plowing, furrowing, trenching and staking, Gully control. Previous check dams. Brushwood dam, Rock fill dam, Gabion; Impervious check dams.

Water Management: Surface water - Study of rainfall, estimation of run-off at micro catchments, stream gauging; Rainwater harvesting catchment, harvesting, harvesting structures, Ground water - exploration of canal command areas, potential areas; integrated water resources management, conjunctive use.

Integrated Management: Agriculture - Crop husbandry, soil enrichment, inter, mixed and strip cropping, clopping pattern; sustainable agriculture, Hybrid and improved seeds; Biomass management, crop rotation, legumes, organic fertilization, spider farming, pastures and silvopasture; horticulture; tree culture; form forestry; bund utilization, boundary plantation; social forestry; Energy - Renewable resource water power, solar energy wind power; biomass, fire food synthetic fuels, burning of municipal / garbage, ocean tides and waves.

Monitoring and Evaluation: People's Part - Awareness, participation, Response; State and integrated approach, Appreciation of the concept, training, transfer of technology, Resource and Development, Agro-industrial infrastructure; Sustainable society, livestock, small animal farming, pisciculture, sericulture, Health and hygiene education, transport, cues.

Text Books:

* Watershed Management, J.V.S. Murthy - Publishers; New Age International (P) Ltd., New Delhi.

* Space Technology Applications for Sustainable Developments at Watersheds, Technical Report, ISRO-HQ-TR-104-95, ISRO, Bangalore.

Reference Book:

* Watershed Management Project Planning, Monitoring and Evaluation; A Manual for the Asian Region - Asian-US Watershed Project - Forestry for Sustainable Development Program. University of Minnesota, College of Natural Resources, St. Paul Minnesota, U.S.A.

HYDROLOGY AND WATER RESOURCES ENGINEERING

Course Objective:

* This course will enable the students to use RS and GIS tools in the integrated water resource management, oceanography, and glaciology and watershed development.

Course Outcomes:

At the end of the course the student will be able to:

* Analyze the components of hydrological cycle
* Formulate rainfall-runoff and flood routing models
* Mapping the ocean water, surface fresh water and glaciology
* Monitoring the irrigation and watershed areas.

SYLLABUS

Introduction: Hydrology – definition and its importance, hydrological cycle, water budgeting, water demand estimation, surface water bodies, water content in ocean, sea, ice, lakes, dams, tanks, rivers and ground, water resource scenario in India, RS and GIS applications in water resources development and management.

Meteorology, Glaciology and Surface Fresh Water: Rainfall mapping, potential and actual evapo-transpiration, atmospheric water content, cloud mapping, rain forecasting, water quality parameters, cyclone forecasting; Glaciology: monitoring of snow melt and snow formation, snowmelt runoff estimation, estimation of damages; Surface Fresh Water: river diversion studies, site suitability for surface storages and hydro-electric power plants, storage yield analysis and reservoir sizing.

Hydrograph analysis: infiltration, effective rainfall, design storm, direct runoff hydrograph, unit hydrograph theory, derivation of runoff hydrograph from unit hydrograph; runoff analysis, rational method, NRCS approach, derivation of UG for ungauged catchments, synthetic unit hydrograph.

Flood and drought studies: flood frequency analysis, floodplain zoning, estimation of flood for different frequencies, flood forecasting, drought assessment and monitoring.

Irrigation and Watershed: Mapping and monitoring of catchment and command areas, land irrigability mapping, agriculture water demand estimation for different crops, tank information system, wetland mapping, siltation mapping; Watershed: delineation, morphometric analysis, rainfall-surface runoff model, reservoir sedimentation, water-harvesting structures, watershed development planning, mapping of drought prone areas.

Text Books:

* GIS for Water Resources and Watershed Management - John G Lyon
* Application of GIS in Hydrology and Water Resources Management - K.Kovar
* Geographic Information Systems in Water Resources Engineering - Lynn E.Johnson
* Developments In Water Science – Water Resources Systems Planning and Management - Jain S.K and Singh V.P.

Reference Books:

* Water, Wastewater and Storm Water Systems - U.M. Shamsi
* Introduction to Environmental Remote Sensing – Barrett E C
* Remote Sensing principles and interpretation – Sabins F. F.
* Remote Sensing and Image Interpretation – Thomas M Lillesand.

GEOINFORMATICS FOR COASTAL ZONE MANAGEMENT

Course Objectives:

The objective of the course is to

* Introduce the importance of Coastal zone management.
* Impart knowledge on coastal landforms and river deltas.
* Give knowledge on coastal wetlands and sea level changes.
* Impart knowledge on different coastal hazards.

Course Outcomes:

At the end of the course student will be able to

* Understand the importance of coastal zone management.
* Gain knowledge on deltas and other coastal landforms.
* Identify different coastal wetlands.
* Understand sea level changes and different coastal hazards.
* Gain knowledge on remote sensing application in coastal zone management.

SYLLABUS

Coastal and littoral zones – definitions and scope of study Shore zone processes – waves, tides and currents Coastal landforms; River deltas: types of deltas and their morphological variations Human activities and their impact on the delta-fringe coast.

Coastal wetlands: Mangrove swamps, marshes, lagoons, tidal channels/creeks and their significance in coastal stability and economic importance Continental margins – forms and processes; territorial waters and Exclusive Economic Zone Sea level changes – factors involved; effects of sea level oscillations on coastal zones.

Coastal Hazards: Storm surges and Tsunamis: Origin, propagation and run-up; Role of coastal topography, bathymetry and vegetation; Coastal hazard preparedness – coastal protection, education and awareness of coastal communities; Role of geoinformatics in assessment of coastal vulnerability to tsunamis.

Human activity and coastal environment: deforestation, agriculture/aquaculture, pollution and coastal structures, and their effect on coastal zones, Coastal vegetation; shelterbelts; coastal aquifers; freshwater-seawater interface Morphology of Indian coasts.

Coastal zone management: concepts, models and information systems Coastal Regulations Zones (CRZ) and Coastal Management Zones (CMZ): Indian context Application of remote sensing in coastal zone studies Role of Geographic Information Systems in coastal zone studies.

Text Books:

* Geomorphology by A.L. Bloom, Waveland Pr.Inc. 2004

* Deltas, Coleman, J.M., Continuing education Publication Co.Inc. 1976

* Coastal Sedimentary Environments, Davis, A.R. (Jr.), Springer-Verlag, 1985.

* Beaches and Coasts, King, C.A.M., Edward Arnold, 1972

* Introduction to Marine Geology and Geomorphology, King, C.A.M., Edward Arnold, 1974

* Applications in Coastal Zone Research Management, Martin, K.St. (ed), U.N. Institute for Training and Research, 1993.

Reference Books:

* Integrated Ocean and Coastal Management, Sain, B.C., and Knecht, R.W., UNESCO Publication, 1998.

* Subtle Issues in Coastal Management, Sudarshan et al., (ed), IIRS, DehraDun, 2000.

* Tsunamis – Case Studies and Recent Developments, Satake, K. (ed), Springer, 2000.

URBAN PLANNING & INFORMATION SYSTEMS

Course Objectives:

The objective of the course is to

* Introduce the concept of urban planning and its history in the Indian context.

* Impart knowledge in urban planning components

* Familiarize with geospatial application in urban planning

* Impart knowledge on aspect of transportation planning

Course Outcomes:

After completion of the course the student will be able to

* Gain knowledge in Urban planning and its history

* Understand the concepts of zoning, master plans etc.

* Use different GIS techniques and data types to assess urban planning problems

* Gain knowledge in transportation studies in urban context

SYLLABUS

Introduction: Planning: background and principles; Need for planning; Urbanization and its impact, Distribution of land use/land cover. Geoinformatics application in Urban Planning.

Formulation of Plans: Objectives and contents; Regional plan; Perspective plan; Master plan; Development plan; Project (scheme) plan; Delineation of planning area; Trend analysis; Land suitability analysis; Land use planning; Zoning and principles of zoning; Building ByLaws and its principles. Remote sensing for different levels of development planning.

Housing: Importance of housing; urban housing demand and production; Slums and squatters; Housing problem in India. National Housing policy; Site analysis - Layout design; Housing projects.

Transportation planning: Classification of urban roads; Traffic surveys: speed, time, delay surveys. Traffic volume; Origin Destination surveys; Parking surveys; Utility of remote sensing in traffic and transportation studies.

Urban Information System: Information system: Land; Housing; Transportation; Infrastructure; Trends in mapping using remote sensing, GIS and GPS; Database creation for Infrastructure development.

Text Books:

* Gallian B. Arthur and Simon Eisner, the Urban Pattern, City Planning and Design. Affiliated Press Pvt. Ltd., New Delhi 1985.

* Margaret Roberts, Ana Introduction to Town Planning Techniques, Hutchinson, London, 1980.

* Transportation Network Analysis - Bell, M.G.H. and Iida, Y.

* Remote sensing and urban analysis - Jean-Paul Donnay, Michael John Barnsley

Reference Books:

* Network Analysis in Geography - Haggett, P. and Chorley, R.

* The Geography of Transport Systems - Rodrique, Jean-Paul

* Successful Tourism Management - Seth, P.N.

* The Tourism System: An Introductory Text - Mill and Morrison

* Rangwala, Town Planning, Charotar Publishing House, Anand, India

SOIL SURVEY AND MAPPING

Course Objectives:

The objectives of the course are

* To give introduction of remote sensing and explain spectral characteristics of soils.

* To expose the student to physiographic analysis and soil mapping using aerial and satellite remote sensing data.

* To explain Soil morphology and classification

* To explain the Digital Image Processing techniques for soil resource mapping and

* To give introduction to Digital terrain modeling and explain its uses in terrain slope, aspect and physiography analysis for soil mapping.

Course Outcomes:

After the completion of the course the student will be to

* Understand the application of remote sensing and GIS in soil survey and mapping.

* Detect and distinguish various soil from other land cover features by learning about spectral characteristics of soils.

* Conduct physiographic analysis and soil mapping using aerial and satellite remote sensing data.

* Apply the Digital Image Processing techniques for soil resource mapping and

* Create and apply DTM for soil mapping.

SYLLABUS

Introduction: Definition and purpose of soil survey, remote sensing in soil survey, various country programmes and soil survey organizations.

Spectral Characteristics of Soils: soil texture, soil moisture, soil mineralogy, soil colour, organic matter and hyper-spectral remote sensing data

Physiographic Analysis and Soil Mapping: Importance of physiography - soil relationship, physiographic processes; External processes and Internal processes, soils & physiographic relationship in hilly landforms, alluvial landforms and soils, soil and physiographic relationships in aeolian landforms, a case study of physiographic analysis and soil mappingusing remote sensing.

Soil Morphology and Classification: soil morphology; soil colour, soil texture, mechanical composition, structure, consistence, concretions, calcareousness, roots, presence of clay skins, pores etc. Bases of soil classification- soil taxonomy, criteria for soil taxonomy, diagnostic horizons; categories of the system; order, soil orders in soil taxonomy, sub-order, great group, subgroup, family, series.

Digital Image Processing Techniques for Soil Resource Mapping: Spectral signature approach for soil resource mapping and its limitations, DIP techniques for soil mapping; Image enhancement; Contrast stretching, Spatial filtering, Spectral indices, Principal components analysis, Auxiliary enhancements. Image Classification; supervised and unsupervised classifications, supervised classifications- Maximum Likelihood Classifier, Minimum Distance to Mean Classifier and Parallelopiped Classifier. A case Study of DIP for Soil Resource Mapping.

Digital Terrain Modelling (DTM) for Soil Mapping: landscape approach for inventory of soil resources, DTM– definition, preparation and uses of DTM. GIS approaches for physiographic analysis; geographical stratification, classifier operations, post classification sorting.

Text Books:

* Brady, Nyle C. (1990). The Nature and Properties of Soils. Tenth Edition. Mac Millan Publishing Company, New York.

* Dent David and Anthony Young, 1981. Soil Survey and Land Evaluation. George Allen & Unwin Ltd., U.K.

* Moulders, M.A. (1987). Remote Sensing in Soil Science. Elsevier Science Publishers.

Reference Books:

* Ahn,C-W.; M.F. Baunmgardner and Biehl, L.L. 1996. Soil mapping with the aid of hyperspectral imagery, American Society of Agronomy, Annual convenion in Indianapolis, Nov. 3-8.

* All India soil and Land Use Survey Organization (1971). Soil Survey Manual, I.A.R.I., New Delhi.

* Frost, R.E. (1960). Photo-interpretation of Soils. Manual of Photographic Interpretation. American Society of Photogrammetry.

* Burrough, P.A. (1986) - Principles of Geographic Information Systems. Oxford University Press, Oxford.

GEOINFORMATICS FOR WATER RESOURCES DEVELOPMENT

Course Objectives:

The objectives of the course are

* To expose student to river valley project planning including investigations and remote sensing applications.

* To understand applications of remote sensing for geological investigations and site selection criteria.

* To understand river morphology and study it using remote sensing approach.

* To apply geoinformatics for efficient water management in irrigation systems.

* To understand the procedure of conduction EIA for water resources development projects.

Course Outcomes:

After the completion of the course the student will be to

* To plan for River Valley Projects and select suitable site for the project.

* To conduct investigation for hydel resources.

* To use remote sensing data for the study of river morphology.

* To evaluate water management in irrigation command area.

* To apply geoinformatics for EIA for water resources development projects.

SYLLABUS

River Valley Project Planning: Purpose of planning, stages in the planning process, benefit cost ratio, advantages of river valley projects, classification of reservoirs, technical aspects in river valley project planning- engineering surveys, geological investigations, hydrological investigations, selection of site for a reservoir, remote sensing applications in river valley project planning.

Geo-Engineering Consideration for Investigation of Hydel Resources: Introduction, application of remote sensing data for site selection, type of information – lithology, structure, types of lineaments, unconsolidated material, watershed characteristic, study of surface drainage, study of river geometrics, study of sedimentation, soil erosion survey, location and extent of landslides, location of field check points and the necessity and planning of future surface geophysical investigations in the reservoir and dam sites. economic factors, supply of construction material, access route location.

River Morphology: Introduction, early history, geomorphological approach, key definitions; graded stream, base level, laminar flow, turbulent flow, gradient, discharge, sinuosity, wavelength, natural level, sandbar/braided bar, meander cutoff, oxbow lake, point bar. Paleochannel/ abandoned channel, types of river, river engineering aspects, meandering: bends, crossing, transitional sections, meanders and its relationship to hydrological variables (empirical approach), braiding, straight, river behaviour and its plan form, bank material, remote sensing approach- data, methodology, instruments

Evaluation of Water Management in Irrigation Command Area: Geoinformatics for efficient water management in irrigation systems - agricultural crop land inventory, assessment of water resources, estimation of irrigation water requirement, estimation of agricultural crop areas, status of irrigation water supply and irrigation water demand.

Environmental Impact Assessment of River Valley Project: Importance of River Valley Project, concept of environment – environment, environmental impact, environmental impact assessment. environmental benefits of river valley project - hydro-electric power, irrigation, drinking water supply, flood control, navigation. adverse environmental impact of river valley projects - submergence of agricultural land and human settlement, loss of forest, waterlogging problem, water pollution effect to flora and fauna. Remote Sensing as a tool in EIA of River Valley Projects – Monitoring, deforestation and afforestation in the river valley, identification of erosion prone areas, reservoir sedimentation, irrigation command area development, water pollution monitoring

Text Books:

* Bell, F.G., 1993 - Engineering Geology, Blackwell, Oxford.

* Foiker, P.G., 1986 - Engineering Geomorphology. Champman and Hall, New York.

* Edward Goldsmith & Nicholas Hildyard (1986), The Social and Environmental Effects of Large Dams, Sierra Club Books, ISBN: 0-87156-848-9.

* Gert A. Schultz, Edwin T. Engman (Editors) (2011), Remote Sensing in Hydrology and Water Management, Springer, ISBN 3642640362

Reference Books:

* Ministry of Irrigation (1984). A guide for estimating Irrigation Water requirements, Govt. of India, Ministry of Irrigation, Water management division, New Delhi, Technical Series No. 2 (Revised), PP. 144.

* Proceedings of National Symposium on Remote Sensing for Sustainable Development, 1992.

* Remote sensing for Resource Development and Environmental Management. Vol. 2, by M.C.J. Damen, G. Siccosmit and H. Th. Verstapper.

* The Social and Environmental Effects of Large Dams by E. Goldsmith & N. Nittildyard.

* Balakrishnan, P., 1986. A technical report on issues in Water Resources Development and Management and the role of Remote Sensing. ISRO-NNRMS-TR67-86

GEOINFORMATICS FOR WATER RESOURCES MANAGEMENT

Course Objectives:

The objectives of the course are

* To expose the student to the design of spatial and non-spatial data in Water Resources Engineering and data Integration

* To understand applications of RS and GIS for studies on drought monitoring.

* To understand GIS analysis for reservoir sedimentation and computing volumes.

* To know the importance of preparation of flood risk zone mapping and for flood damage assessment and use of spatial data for the mapping.

* To conduct GIS analysis for site suitability analysis for water harvesting structures.

Course Outcomes:

After the completion of the course the student will be to

* To organise and design spatial and non-spatial data and perform data Integration.

* To apply geoinformatics for the prediction of drought and its monitoring.

* To compute loss of reservoir capacity.

* To prepare flood risk zone map and conduct flood damage assessment.

* To plan and identify suitable sites for rainwater harvesting.

SYLLABUS

Spatial information systems: Introduction, organization and design of spatial and non-spatial data in water resources engineering. - characterization of spatial information systems, data quality, the time element, spatial objects. Spatial data models; raster and vector data models, Attribute data; spatial attributes, non-spatial attributes, attribute tables. Design of data base and its use and management in hydrology applications, Discussion on a case study.

Drought Monitoring: Introduction and definition. Classification; meteorological drought, hydrological drought and agricultural drought. Factors affecting drought; climatic factor, soil factor, plant factor. Drought indicators; meteorological, hydrological, agriculture, delayed sowing, socio-economic indicators. Conventional drought monitoring - statistical analysis of rainfall data and water balance methods. Remote sensing approach for drought assessment.

Reservoir Sedimentation: Introduction, effects of reservoir sedimentation, sediment deposition in reservoir, sediment distribution in reservoir, Remote Sensing and GIS based reservoir sedimentation studies. Discussion on a case study to compute reservoir volumes, including loss of stor-age capacity due to sedimentation using RS and GIS.

Flood Risk Zone Mapping and Flood Damage Assessment: Introduction, need for Flood Risk Zone Mapping (FRZM), concept of FRZM. Estimation of flood peaks - Rational method, empirical method, unit hydrograph technique and flood frequency studies (Gumbel's method and Log Pearson Type - III method). Role of Remote Sensing and GIS approach in the preparation of risk zone maps. Site Suitability Analysis for Water Harvesting Structures – Introduction, decision rules in suitable site selection for water harvesting structures as per IMSD guidelines. Input GIS layers; DEM, classified slope map, soil map, runoff potential map, buffer maps for proximity analysis, geological map, etc. GIS analysis for site selection.

Text Books:

* Banham carter, Graeme F. 1994. "Geographic Information Systems for Geoscientists: Modelling with GIS, Elsevier, 1994.

* Handbook of Hydrology, Ministry of Agriculture (1972) Govt. of India, New Delhi.

* Integrated Mission for Sustainable Development technical guide lines, National Remote Sensing Agency, 1995, Department of Space, Govt. of India.

* Robert Laurini and Derek Thompson, 1992. "Fundamentals of Spatial Information Systems" (APIC Series), Academic Press, London, UK.

Reference Book:

* Anon (1991) "Integrated Approach to Flood Disaster Management and Rural Area Development" Water Resources Journal, ESCAP/UN, Bangkok, Thailand, PP 106.

GEOINFORMATICS FOR WATER RESOURCES ASSESSMENT

Course Objectives:

The objectives of the course are

* To make the student aware of various water resources issues and the role of remote sensing in the assessment of water resources towards planning for better water management.

* To understand applications of radar and satellite data for rainfall measurement.

* To understand GIS methodology for groundwater targeting.

* To expose surface water inventory using images.

* To become aware of snow melting runoff modelling using geoinformatics.

Course Outcomes:

After the completion of the course, the student will be to

* To quantify hydrological elements using remote sensing.

* To explore groundwater in hard rock and unconsolidated regions through H

* Hydromorphogeologic mapping.

* To conduct surface water inventory using satellite data.

* To apply geoinformatics for snowmelt runoff modelling.

SYLLABUS

Water Resources Assessment: Introduction to the role of remote sensing, water sector perspective. Water resources issues, minor irrigation tank inventory, snow-melt runoff forecasting, flood management, evaluation of water management in irrigation command area, watershed prioritisation for conservation planning.

Hydrologic Elements and Quantification: Elements of hydrology. Introduction to quantification through remote sensing. Precipitation; Form of precipitation. Measurement of precipitation - Symon's rain gauge, self-recording type, radar, satellite data, cloud indexing techniques. Snow and its spectral characteristics, evapotranspiration, electromagnetic properties of soil moisture.

Hydromorphogeologic Mapping: Groundwater exploration in consolidated material or hard rock terrain- introduction. Hills - Denudational Hill, Inselberg/ Residual Hill, Structural Hill, Denudo-Structural Hill, Dyke. Pediment Rock Cut Rolling Topography, Buried Pediment, Infilled Channels/Valley Fills. Hydromorphogeologic maps for targeting groundwater. Groundwater Exploration in Unconsolidated Material - Introduction, identification of landforms on unconsolidated materials using remote sensing data. Discussion on case studies.

Surface Water Inventory: Surface water resources, interaction of light and water, Visible data and LiDAR for water depth and penetration Studies. Identification of surface water – Sensors and their mapping capabilities. Applications of remote sensing for the identification of water bodies; Visual Methods and digital techniques.

Snowmelt Runoff Forecasting: Introduction, Model types and their use for various hydrologic applications -Energy Balance Method.

Text Books:

* Manual of remote sensing, Vol. II chapter on "Water Resources Assessment", American Society of Photogrammetry.

* Gert A. Schultz, Edwin T. Engman (Editors) (2011), Remote Sensing in Hydrology and Water Management, Springer, ISBN 3642640362

* Seidel K, Martinec J. 2004. Remote Sensing in Snow Hydrology: Runoff Modelling, Effect of Climate Change. Springer: Berlin.

Reference Books:

* Balakrishnan, P., 1986. A technical report on issues in Water Resources Development and Management and the role of Remote Sensing. ISRO-NNRMS-TR67-86

* E.C. Barret, M.J. Beaumont & R.W. Herschy, (1990), Satellite remote sensing for Operational Hydrology, Remote Sensing Reviews, Vol 4(2), Pages 451-466 | Published online: 19 Oct 2009, https://www.tandfonline.com/

* Mohsin Jamil Butt and Muhammad Bilal, (2011), Application of snow-melt runoff model for water resource management, Hydrological Processes, Hydrol. Process. 25, 3735–3747 (2011) Published online 29 April 2011 in Wiley Online Library.

HSS ELECTIVES

OPERATIONS RESEARCH

Course Objectives:

* Formulate a real world problem as a mathematical programming model.

* Provide knowledge of optimization techniques and approaches.

* Understand and study inventory problems.

* Know the network models.

* Put on knowledge in solving replacement problems and different queueing models

Course Outcomes:

* Learned to translate a real-world problem into a mathematical formulation.

* Formulate and Solve Transportation, Assignment and sequencing problems.

* Resolve inventory problems.

* Able to solve maximum flow and shortest path problems.

* Capable to solve replacement problems and analyze queueing models.

SYLLABUS

Introduction: Definitions of Operations Research; Phases of Operations Research; Types of Operations Research models; applications, merits and demerits of Operations Research.

Allocation: Linear Programming problem formulation; Basic assumptions; Graphical solution; Simplex method; Artificial variable technique; Two phase

method; Big M method; Duality principle; Primal and Dual relation.

Transportation: Formulation; Solution methods; Unbalanced transportation problems - North west corner rule; Least cost entry method; Vogel's approximation method; Optimal solution; degeneracy.

Assignment: Formulation; Variations in Assignment problem; Travelling salesman problem.

Sequencing: Sequencing of - n jobs through two machines; n jobs through three machines; n jobs through m machines; 2 jobs through m machines.

Inventory Control: Introduction; Types of Inventory; Inventory costs; Deterministic models - Economic order quantity (EOQ) and Economic Production Quantity (EPQ) with and without shortages; Quantity discounts; P system; Q system; Inventory control Techniques.

Network Analysis: Network definitions; Time estimates in network analysis; Labeling using Fulkerson's rule; Forward pass computations; Backward pass computations; Project management using Critical Path Method(CPM) and Programme Evaluation and Review Technique(PERT).

Replacement: Introduction, Replacement of items that deteriorate with time - Value of money unchanging and changing, Replacement of items that fail completely.

Queueing models: Introduction; Single channel poisson arrivals; Exponential service times; Unrestricted queue with infinite population and finite population models; Multi channel poisson arrivals; Exponential service times with infinite population and restricted queue.

Text Books:

* Hamdy A Taha, "Operations Research- An Introduction" by TAHA , Prentice Hall, 2009.

* F.S. Hiller, G.J. Liberman,B. Nag and P.Basu "Introduction To Operations Research, Mc Graw Hill Education(India), 2012.

* S.D.Sharma, "Operations Research", Kedarnadh Ramnadh & Co.,2017

Reference Books:

* R. Pannerselvam, "Operations Research", PHI..

* Richard Bronson, Schaum's Series," Operations Research", Mc Graw Hill

* N.V.S.Raju, "Operations Research- Theory and Practice" BS publications.

* V.K. Kapoor, "Operations Research" Sultan Chand & Sons.

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives:

* To familiarize the students with the concepts of Management.

* To relate the concepts of Management with industrial organizations.

* To explain the factors affecting productivity and how productivity can be increased in an Industrial undertaking.

* To set forth a basic framework for understanding Entrepreneurship.

Course Outcomes:

On completion of the course, the students will be able to:

* Understand the roles, skills and functions of management.

* Distinguish the different types of business organizations.

* Identify the factors involved in Production Operations Management.

* Diagnose organizational problems and take suitable decisions.

* Establish good Human Resource Management practices.

* Acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities.

SYLLABUS

Basic Concepts of Management: Management :- Definition, Nature and Importance ; Functions of the Management; Levels of Management; F.W Taylor's Scientific Management; Henry Fayol's Principles of Management; Forms of Business Organizations: Introduction, Types of Business organizations: Private Sector- Individual Ownership , Partnership, Joint stock companies and Co-Operative organizations; Public sector- Departmental Organizations, Public Corporations and Government Companies; The Joint sector Management.

Production and operations Management: Plant location- Factors to be considered in the selection of Plant location; Break - even analysis- Significance and managerial applications; Importance of Production Planning and Control and its Functions; Human Resource Management and Functions of Human Resource Manager (in brief); Functions of Marketing; Methods of Raising Finance.

Entrepreneurship : Definition, Characteristics and Skills, Types of Entrepreneurs, Entrepreneur vs. Professional Managers, , Growth of Entrepreneurs, Nature and Importance of Entrepreneurs, Women Entrepreneurs, Problems of Entrepreneurship.

Entrepreneurial Development and Project Management: Institutions in aid of Entrepreneurship Development, Idea generation: Sources and Techniques;, Stages in Project formulation ; Steps for starting a small enterprise - Incentives for Small Scale Industries by Government.

Text Books:

* Sharma,S.C, and Banga, T.R., Industrial Organization & Engineering Economics, Khanna Publishers, Delhi, 2000.

* Vasant Desai , The Dynamics of Entrepreneurial Development and Management (Planning for future Sustainable growth),HImalayan Publishing House, 2018.

Reference Books:

* Aryasri , A.R., Management Science, McGraw HIll Education (India Private Limited , New Delhi 2014.

* Sheela, P. , and Jagadeswara Rao, K., Entrepreneurship, Shree Publishing House, Guntur, Andhra Pradesh, 2017.

ORGANIZATIONAL BEHAVIOR

Course Objectives:

* To understand the basic concepts of organizational behavior, its foundations and importance.

* To enable students to have a basic perspective of Motivation and Motivation theories.

* To acquaint the students about group behavior in organizations, including communication, leadership conflicts and organizational change and how these are linked to and impact organizational performance.

Course Outcomes:

* Indentifying fundamental aspects of organizational dynamics.

* Evaluate main theories of motivation and formulating suitable motivational strategies.

* Analyze the behavior of individuals and groups in organizations.

* Understanding of Leadership theories and Leadership behavior.

* Apply relevant theories, concepts to address important Organizational Behavior questions.

SYLLABUS

Organizational Behaviour: Concept of Organisation - Concept of Organisational Behaviour - Nature of Organisational Behaviour - Role of Organisational behaviour - Disciplines contributing to Organisational Behaviour.

Motivation: Definition - Nature of Motivation - Role of Motivation - Theories of Motivation : Maslow's Need Hierarchy Theory, Herzberg's Motivation Hygiene Theory and Mc Gregor's Theory X and Theory Y.

Group Dynamics: Meaning - Concept of Group - Types of groups -Formal and Informal groups - Group development - Group cohesiveness and factors affecting group cohesiveness.

Leadership: Concept of Leadership - Difference between Leadership and Management - Importance of Leadership - Leadership styles: Autocratic leadership, Participative leadership and Free Rein leadership.

Communication: Meaning - Communication Process - Forms of communication: Oral, Written and Non- Verbal communication - Direction of communication : Downward, Upward and Horizontal communication.

Organisational conflicts: Concept of conflict - Reasons for conflict - Types of Conflict: Intrapersonal conflict, Interpersonal conflict, Intragroup conflict, Intergroup conflict, Interorganisational conflict - Conflict management.

Organisational Change: Nature - Factors inOrganisational change - Planned change: Process of planned change - Resistance to change: Factors in resistance to change - Overcoming resistance to change.

Text Books:

* L.M.Prasad: Organisational Beaviour, Sultan Chand & Sons, New Delhi -110002

* K. Aswathappa: Organisational Behaviour, Himalaya Publishing House, New Delhi

Reference Book:

* Stephen Robbins: Organisational Behaviour, Pearsons Education, New Delhi.