B.E. (Geoinformatics) Programme

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

I. To prepare students for successful careers in Geospatial Industries and Information Technology that meet the needs of India and for other Countries.

II. To develop the professional ability among students to collect various Geospatial relates from various platform, data, analyze, synthesis and create user oriented real world applications.

III. To provide opportunity for students to work as part of teams on multidisciplinary projects.

IV. To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering and multidisciplinary problems and to prepare them for graduate studies.

V. To promote students awareness of the life-long learning and to introduce them to professional ethics and codes of professional practice.
PROGRAMME OUTCOMES B.E. (GEOINFORMATICS) PROGRAMME

a) Graduates will demonstrate basic knowledge in B.E (Geoinformatics) and engineering.

b) Graduates will demonstrate the ability to model and development of application in Geospatial arena interpret and analyze data, and report results.

c) Graduates will demonstrate the ability to develop Geospatial system that meets desired specifications and requirements.

d) Graduates will demonstrate the ability to function on engineering and science laboratory teams, as well as on multidisciplinary problem solving teams.

e) Graduates will demonstrate the ability to identify, formulate and solve Geomatics related problems.

f) Graduates will demonstrate an understanding of their professional and ethical responsibilities.

g) Graduates will be able to communicate effectively in both verbal and written forms.

h) Graduates will have the confidence to apply Geospatial techniques in global and societal contexts.

i) Graduates should be capable of self-education and clearly understand the value of lifelong learning.

j) Graduates will be broadly educated and will have an understanding of the impact of engineering on society and demonstrate awareness of contemporary issues.

k) Graduates will be familiar with modern hardware and software tools and equipments to analyze Geospatial/Geomatics engineering problems.
The B.E (Geoinformatics) Program outcomes leading to the achievements of the objectives are summarized in the following table.

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### ELECTIVES FOR B.E. GEOINFORMATICS ENGINEERING

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<td>Geoinformatics for Agriculture and Forestry</td>
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<td>Human Rights</td>
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OBJECTIVES:

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one’s place, important festivals etc. – Introducing oneself, one’s family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one’s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II

Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking & answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Lab descriptions (general/specific description of laboratory experiments) - Definitions - Recommendations; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association; E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause & effect / compare & contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.
UNIT V

9 + 3

Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters.

TOTAL: 60 PERIODS

OUTCOMES:
Learners should be able to
• speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
• write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
• read different genres of texts adopting various reading strategies.
• listen/view and comprehend different spoken discourses/excerpts in different accents

TEXTBOOKS:

REFERENCES:

EXTENSIVE READERS:

Website Resources
1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com
OBJECTIVES:
- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I  MATRICES  9+3

UNIT II  INFINITE SERIES  9+3

UNIT III  FUNCTIONS OF SEVERAL VARIABLES  9+3

UNIT IV  IMPROPER INTEGRALS  9+3

UNIT V  MULTIPLE INTEGRALS  9+3

TOTAL: 60 PERIODS

OUTCOMES:
- This course equips students to have basic knowledge and understanding in one fields of materials and integral

TEXTBOOKS:

REFERENCES:
PH8151 ENGINEERING PHYSICS L T P C
(Common to all branches of B.E / B.Tech programmes) 3 0 0 3

OBJECTIVE:
• To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

UNIT II ACOUSTICS AND ULTRASONICS 9

UNIT III THERMAL PHYSICS 9

UNIT IV APPLIED OPTICS 9
UNIT V SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

TEXTBOOKS:

REFERENCES:

CY 8151 ENGINEERING CHEMISTRY L T P C
(Common to All Branches of Engineering and Technology) 3 0 0 3

OBJECTIVES:
- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.
UNIT III  KINETICS AND CATALYSIS

UNIT IV  PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT V  NANOCHEMISTRY

OUTCOMES:
- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, kinetics and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.

TEXTBOOKS:

REFERENCES:

GE8151  COMPUTING TECHNIQUES  L T P C
3 0 0 3

OBJECTIVES: The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.
UNIT I  INTRODUCTION  8

UNIT II  C PROGRAMMING BASICS  10

UNIT III  ARRAYS AND STRINGS  9

UNIT IV  FUNCTIONS AND POINTERS  9

UNIT V  STRUCTURES AND UNIONS  9
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design C Programs for problems.
• Write and execute C programs for simple applications.

TEXTBOOKS:

REFERENCES:

GE 8152  ENGINEERING GRAPHICS  L T P C  2 0 3 4

OBJECTIVES:
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
• To expose them to existing national standards related to technical drawings.
CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I  PLANE CURVES AND FREE HAND SKETCHING  5+9
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES  5+9
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  PROJECTION OF SOLIDS  5+9
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV  PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES  5+9
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  6+9
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (Demonstration Only)  3
Introduction to drafting packages and demonstration of their use.

TOTAL (L:30+P:45):75 PERIODS

OUTCOMES: On Completion of the course the student will be able to
- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.
TEXTBOOK:

REFERENCES:

Publication of Bureau of Indian Standards:

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only.
   The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH 8161 PHYSICS LABORATORY
(Common to all branches of B.E. / B.Tech. Programmes) L T P C 0 0 2 1

OBJECTIVES:
- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

1. Torsional pendulum Determination of rigidity modulus of wire and moment of inertia of disc
2. Non–uniform bending Determination of young’s modulus
3. Lee’s disc Determination of thermal conductivity of a bad conductor
4. Potentiometer Determination of thermo e.m.f. of thermocouple
5. Air wedge Determination of thickness of a thin sheet of paper
6. i. Optical fibre Determination of Numerical Aperture and acceptance angle
   ii. Compact disc Determination of width of the groove using laser
7. Acoustic grating Determination of velocity of ultrasonic waves in liquids
8. Post office box Determination of Band gap of a semiconductor
9. Spectrometer Determination of wavelength using grating
10. Viscosity of liquids Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS
OUTCOMES:
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CY 8161 CHEMISTRY LABORATORY L T P C
(Common to all branches of Engineering and Technology) 0 0 2 1

OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.
  1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
  2. Determination of total, temporary & permanent hardness of water by EDTA method.
  3. Determination of DO content of water sample by Winkler’s method.
  4. Determination of chloride content of water sample by argentometric method.
  5. Estimation of copper content of the given solution by iodometry.
  6. Determination of strength of given hydrochloric acid using pH meter.
  7. Determination of strength of acids in a mixture of acids using conductivity meter.
  8. Estimation of iron content of the given solution using potentiometer.
  9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
 10. Estimation of sodium and potassium present in water using flame photometer.
 14. Determination of CMC.
 15. Phase change in a solid.

OUTCOMES:
- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

REFERENCES:
OBJECTIVES: The student should be made to:
- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:
1. Search, generate, manipulate data using MS office/Open office
2. Presentation and visualization - graphs, charts, tables, 2D, 3D.
5. String manipulations in C
7. Solving numerical problems using C
8. Using Structures and Unions in C

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
Hardware: 30 Terminals
Software:
- MS Office / Open Office software
- C-Compiler
- MATLAB 7 / Octave 3 / Scilab 5
- Processing 1.5

TOTAL: 45 PERIODS

OUTCOMES: At the end of the course, the student should be able to:
- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

GROUP – A (CIVIL & ELECTRICAL)

1. CIVIL ENGINEERING PRACTICE 12

Plumbing
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line
sketches.
Laying pipe connection to the suction side of a pump – inlet. Laying pipe connection to the delivery side of a pump – outlet.
Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

**Wood Work**
Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

**Study**
Study of joints in door panels, wooden furniture
Study of common industrial trusses using models.

2. **ELECTRICAL ENGINEERING PRACTICE**
Basic household wiring using switches, fuse, indicator – lamp etc., Preparation of wiring diagrams
Staircase light wiring
Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp

**GROUP – B (MECHANICAL AND ELECTRONICS)**

3. **MECHANICAL ENGINEERING PRACTICE**

**Welding**
Arc welding of butt joints, lap joints, tee joints
Gas welding Practice. Basic Machining
Simple turning, drilling and tapping operations. Machine assembly Practice.
Study and assembling the following: Centrifugal pump, mixies and air conditioners.
Demonstration on
Smithy operations like the production of hexagonal bolt. Foundry operation like mould preparation for grooved pulley.

4. **ELECTRONIC ENGINEERING PRACTICE**
Soldering simple electronic circuits and checking continuity. Assembling electronic components on a small PCB and testing.
Study of Telephone, FM radio, low-voltage power supplies.

**TOTAL: 45 PERIODS**

**OUTCOMES:**
- ability to fabricate carpentry components and pipe connections including plumbing works.
- ability to use welding equipments to join the structures.
- ability to fabricate electrical and electronics circuits.
OBJECTIVES:
- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component

UNIT I
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II
Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his success, thanking one's friend / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercise on Grammar and vocabulary, Extensive reading activity (reading stories / novels from links), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students’ dialogues.

UNIT III
Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret etc.); Reading - Speed reading – reading passages with the time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading the articles from the journals - Format for the journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. 'rock', 'train', 'ring'); E-materials - Interactive exercise on Grammar & vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU materials – Attending a meeting and writing minutes.

UNIT IV
Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice
in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/ agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL: 60 PERIODS

OUTCOMES: Learners should be able to

- speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
- read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
- listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXT =BOOKS:

REFERENCES:

EXTENSIVE READERS:
WEB RESOURCES:
1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com

MA 8251 MATHEMATICS – II L T P C
(Common to all branches of B.E. / B.Tech. Programmes in II Semester) 3 1 0 4

OBJECTIVES:
• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
• To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
• To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
• To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS 9+3
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS 9+3
Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION 9+3
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, $az$, $1/z$, $z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9+3
UNIT V  LAPLACE TRANSFORMS


TOTAL: 60 PERIODS

OUTCOMES:
- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

REFERENCES:

PH8204  PHYSICS FOR GEOINFORMATICS ENGINEERING  L T P C  3 0 0 3

OBJECTIVES
- To understand the principles of radiation mechanism, and energy interactions with atmosphere and earth features.
- To gain knowledge about the gravitational fields and its variations on earth.
- To introduce imaging and non-imaging sensors in measuring and recoding energy variations.

UNIT I  ELECTROMAGNETIC RADIATION
UNIT II INTERACTION OF EMR WITH ATMOSPHERE AND EARTH’S SURFACE 9

UNIT III OPTICS FOR REMOTE SENSING 9

UNIT IV GRAVITATION AND SATELLITES 9
Newton’s law of gravitation - gravitational field and potential - determination of gravity, variation of acceleration due to gravity of the earth with depth and with altitude - Variation of acceleration due to gravity due to rotation of the earth – Refraction.Diffration - fresnel theory, Circular diffraction - diffraction gravity, Polarisation double diffraction - Escape velocity - Kepler’s law of planetary motion - doppler effect - Satellites - types of satellites - Earth observation satellites, communications satellites, Navigation satellites, weather satellites, military satellites and scientific satellites.

UNIT V ELECTRO-OPTIC NON-IMAGING AND IMAGING SENSORS 9

OUTCOMES:
- The students will have the knowledge on physics related to Civil Engineering and that knowledge will be used by them in Various applications.

REFERENCES:
UNIT I  BASICS AND STATICS OF PARTICLES  9 + 3

UNIT II  EQUILIBRIUM OF RIGID BODIES  9 + 3

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  9 + 3

UNIT IV  DYNAMICS OF PARTICLES  9 + 3

UNIT V  FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS  9 + 3
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction- Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL (L : 45 + T : 15) : 60 PERIODS

OUTCOMES:
• ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
• ability to analyse the forces in any structures.
• ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the concepts of remote sensing processes and its components.
- To expose the various remote sensing platform and sensors and to introduce the elements of data interpretation.

UNIT I REMOTE SENSING AND ELECTROMAGNETIC RADIATION (EMR)

UNIT II PLATFORMS AND SENSORS AND DATA PRODUCTS

UNIT III THERMAL REMOTE SENSING

UNIT IV HYPERSPECTRAL REMOTE SENSING
Diffraction principles - field spectrum – BDRF and spectral reflectance & imaging spectrometry-sensors - virtual dimensionality – Data reduction, Calibration and normalization – Huge’s phenomenon- Data Characteristics Binary encoding- thresholding - library matching.

UNIT V LIDAR
Li DAR – Principles and Properties- different LiDAR System- Space Borne and airborne LiDAR missions – Typical parameters of LiDAR system. Data Processing – geometric correction-dataquality enhancement – filtering LiDAR mapping applications – hydrology, Disaster mitigation and management.

OUTCOMES:
At the end of the course the student will be able to understand
- The characteristics of electromagnetic radiation and its interaction with earth features
- The types and configuration of various satellites and sensors
- The concepts of thermal and hyperspectral remote sensing and their applications
- The concept, processing of LIDAR and its applications

TEXTBOOKS:
REFERENCES:

GI8202 PLANE SURVEYING L T P C
2 2 0 4

OBJECTIVES:
- To introduce the rudiments of plane surveying principles to Geoinformatics Engineers.
- To learn the various methods of plane surveying to solve the real world problems.

UNIT I FUNDAMENTALS AND CHAIN SURVEYING 6+6
Definition- Classifications - Basic principles – Mistakes, errors and accuracy. Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting - applications.

UNIT II COMPASS SURVEYING AND PLANE TABLE SURVEYING 6+6

UNIT III THEODOLITE SURVEYING 6+6
Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry – Subtense method - Stadia constants - Anallactic lens.

UNIT IV ROUTE SURVEYING 6+6
Reconnaissance - Route surveys for highways, railways and waterways - Simple curves – Compound and reverse curves - Setting out Methods – Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves - Sight distances.

UNIT V HYDROGRAPHIC AND MINE SURVEYING 6+6

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- the use of various surveying instruments in mapping
- the error and adjustments procedures associated with surveying and mapping
- the applications of surveying in Route, Mine and Hydrography

TEXTBOOKS:
REFERENCES:

GI8203 PRINCIPLES OF GEOINFORMATICS ENGINEERING L T P C 3 0 0 3

OBJECTIVE:
- To introduce Geomatic Engineering principles, fundamentals, applications, and design concepts pertinent to earth resource management for the welfare of the people while safeguarding the environmental quality and optimal spatial governance.

UNIT II GEOMATIC BASICS
Definition - major constituents of the subject - structure of learning - prerequisites - branches and their roles - dynamics of the subject - components of science and humanities - managerial skills - problem solving in Geoinformatics.

UNIT II GENERAL ENGINEERING BASICS
Basics of Mechanics - Mohr’s Circle - Basics of Science, Engineering and Technology- Rhetoric Communications – epistemology - Labs and Orderliness - design tools – instrumentation - field work and log books – team work principles- rules, roles and code books, personal hygiene and safety – gender, age – group and social justice

UNIT III FUNCTIONAL CONSTITUENTS
Engineering life cycle - legality in g-governance planning - international conventions instandards - national standards - culture and community aspects - local needs and cost - EIA and public hearing - participatory planning - scale of operations

UNIT IV GEOMATIC PRODUCTS AND STANDARDS
Accuracy and reliability -sensor and data standards - maintainability - data security and restrictions - user rights and limitations - standardization of procedures and documents - user manuals - update of documents - inter operability - web standards

UNIT V ENGINEERING ETHICS
The engineer - engineering philosophy - obligation and whistle blowing - conduct of activities - professional equality - compassion and social cause - individual’s freedom and choice - safety and protection

TOTAL : 45 PERIODS

TEXT BOOKS :

REFERENCE:
GI8211 PLANE SURVEYING LABORATORY L T P C 0 0 4 2

OBJECTIVE:
1. To familiarize with the various surveying instruments and methods.

I CHAIN SURVEYING
   a) Ranging, chaining and pacing  b) Chain traversing

II COMPASS SURVEYING  a) Triangulation problem  b) Compass traversing

III PLANE TABLE SURVEYING  20
   a) Radiation and Intersection: Resection - Three point problem  b) Mechanical and Graphical solution
c) Trial and error method
d) Resection - Two Point problem  e) Plane table traversing

IV THEODOLITE SURVEYING  16
   a) Measurement of horizontal angles and vertical angles
   Heights and Distances by  b) Triangulation problem  c) Single plane method
d) Stadia and Tangential method

V SETTING OUT WORKS  8
   a) Simple curve using chain and tape only  b) Simple curve by Rankine’s method

(P:60) TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to
- Use various surveying instruments like chain, compass, plane table, theodolite for mapping
- Set the curves for highway or railway projects

REFERENCES:

MA8357 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS L T P C 3 1 0 4

OBJECTIVES:
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
• To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I  PARTIAL DIFFERENTIAL EQUATIONS  
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Classification of Partial Differential Equations – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous PDE.

UNIT II  FOURIER SERIES  

UNIT III  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION  
Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV  FOURIER TRANSFORM  

UNIT V  Z – TRANSFORM AND DIFFERENCE EQUATIONS  

TOTAL: 60 PERIODS

OUTCOMES:
• The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXTBOOK:

REFERENCES:

GI8301 GEO DATABASE SYSTEM L T P C 3 0 0 3

OBJECTIVE :
• To introduce the students to the concepts of DBMS, Spatial Database Management System (SDBMS), Spatial Database design, basic application program development and user interfaces.
UNIT I  INTRODUCTION

UNIT II  SPATIAL CONCEPTS AND DATAMODELS
Field based model – object based model – spatial data types – operations on spatial objects - Entity Relationship Model (ER Model) – Relational Model – Constraints and Normal forms of Relational Model - mapping ER model to Relational model – ER model with spatial concepts – Object-oriented data modeling with Unified Modeling Language (UML)

UNIT III  QUERY LANGUAGE
SQL – Data Definition – Data Manipulation - Basic structure of SQL – Set operations – Aggregate Functions –Simple queries – spatial vs non spatial- Nested sub queries – Complex queries – Views – Trigger - OGIS standard for extending SQL - example spatial SQL queries – Object relational SQL.

UNIT IV  SPATIAL STORAGE AND INDEXING

UNIT V  SPATIAL DATABASE SYSTEMS AND APPLICATION DESIGN AND DEVELOPMENTS
Exploring Spatial Geometry, Organizing spatial data, spatial data relationships and functionalities of any one commercial and one FOSS DBMS each – Application program and user Interfaces.

OUTCOMES:
At the end of the course the student will be able to understand
- Concepts and architecture of SDBMS
- Concepts of SQL and generation of queries
- Concepts of spatial data storage and design of SDBMS

TEXTBOOKS:

REFERENCES:

31
OBJECTIVES:
- This subject deals with geodetic measurements and Control Survey methodology.
- To introduce the basics of Astronomical Surveying and Practical Astronomy and its applications.

UNIT I  LEVELLING  6+6
Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of leveling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling - Precise levelling - Types of instruments - Adjustments - Field procedure- sources of errors.

UNIT II  CONTOURING, AREA AND VOLUME COMPUTATION  6+6

UNIT III  CONTROL SURVEYING  6+6
Horizontal and vertical control- Methods- specifications - Triangulation- Base line - Instruments and accessories – Corrections - Satellite station - Reduction to centre – Trigonometric levelling - Single and reciprocal observations - Traversing - Gale’s table.

UNIT IV  ASTRONOMICAL SURVEYING  6+6
Celestial sphere - Astronomical terms and definitions - Motion of sun - horizon, hour angle, right ascension and ecliptic Celestial coordinate systems – Sidereal, universal, zone and atomic time systems - Nautical Almanac.

UNIT V  PRACTICAL ASTRONOMY  6+6
Apparent altitude and corrections - Field observations and determination of time, longitude, Latitude and azimuth by altitude and hour angle method

OUTCOMES:
At the end of the course the student will be able to understand
- Concept of leveling and various methods used determination of level
- The procedures involved in computation of area, volume and interpolation of contour
- The methods used for establishment of horizontal and vertical control networks
- Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To familiarize the students about the various geological and Geomorphological methods and the exploration techniques of various minerals, rocks, ores and natural hazards.

UNIT I  INTRODUCTION
Geology for natural resources inventory – Branches of geology – Scope. Interior of the Earth, Stratigraphic sequence, weathering, Introduction to geological structures, Plate Tectonics – Earthquake and volcanic belts in India.

UNIT II  GEOMORPHOLOGY
Landforms and geomorphic processes – Classification and description of Structural, Denudational, Fluvial, Glacial, Aeolian, and Coastal landforms. Drainage pattern and morphometry.

UNIT III  PETROLOGY
Classification and description of rocks – Forms and mode of occurrence of rocks – Physical properties of important rocks and ore forming minerals – distribution of economic minerals in India.

UNIT IV  GEOPHYSICAL METHODS AND GEO- EXPLORATION

UNIT V  NATURAL HAZARDS

OUTCOMES:
At the end of the course the student will be able to understand
- The structure of earth and geological structures
- The concepts of various geomorphic units and rock types
- The use of geophysical and remote sensing methods for natural resources inventory
- Various natural hazards and application of remote sensing

TEXTBOOKS:

REFERENCES:

GI8303 PHOTOGRAMMETRY L T P C 3 0 2 4

OBJECTIVE
- To introduce basics and concepts of optics, Aerial photography acquisition and mapping from Aerial photographs.

UNIT I PRINCIPLES OF PHOTOGRAPHY & CO-ORDINATE MEASUREMENT 9
History of Photogrammetry - Definition, Applications - Types of Photographs, Classification - Photographic overlaps - contact printing - projection printing. Analog and Digital Aerial cameras, Linear array scanner – Construction - Camera accessories - Camera calibration - Terrestrial Metric cameras. Coordinate measurement using comparators - refinement of photo coordinates - Photo Interpretation.

UNIT II STEREOSCOPIC CONCEPTS & VERTICAL AND TILTED PHOTOGRAPHS 9
Stereoscopic depth perception - Different types of stereoscopes vertical exaggeration – base lining and orientation - principle of floating mark - methods of parallax measurement –vertical photographs - geometry, scale, parallax equations, - Tilted photograph - Geometry, Coordinate system, Scale - Scheimpflug Condition, Rectification Geometry, Graphical and Analytical methods.

UNIT III PROJECT PLANNING 9
Flight Planning - Crab & Drift - Computation of flight plan - Specification for Aerial photography - Basic horizontal and vertical control - Pre pointing and Post pointing - Planning for Ground Control survey.

UNIT IV STEREO PLOTTERS AND TECHNIQUES OF ORIENTATION 9

UNIT V ANALYTICAL STEREO PLOTTERS & ORTHOPHOTOGRAPHY 9
Analytical plotters- Orientations - Two dimension coordinate transformation - Classification of Orthophoto systems- Online and Offline instruments - Automatic Contouring - Instruments for Orthophoto productions - Digital Orthophotos

(L:45+P:30)TOTAL: 75 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- Photographic process and characteristics of tools used in photogrammetry
- Concepts of stereoscopy and geometry of various types of photographs
- The process of Planning photogrammetric operations
- The use of stereoplotters in map preparation and orthophoto generation

EXERCISES FOR PRACTICAL 30
1. Testing Stereovision with test card
2. Finding stereoscopic acuity
3. Determination of photo scale
4. Mirror Stereoscope - Base lining and Orientation of Aerial Photographs
5. Use of parallax bar to find the height of point
6. Determination slope using parallax point
7. Aerial photograph i) direct tracing of features for Urban planning and Highway planning
   ii) Radial line triangulation
8. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Analog Stereo Plotter

TEXTBOOKS:

REFERENCE:

OBJECTIVES:
- To introduce Cartography as science and technology of Map Making.
- The course also introduces its connections with Communication Science, Computer technology and IT.
- To outline the Cartography as a creative art.

UNIT I MAP – A SPECIAL GRAPHIC COMMUNICATOR

UNIT II ABSTRACTION OF EARTH AND MAP PROJECTION

UNIT III MAP COMPILATION AND DESIGN
Base map concepts – scanning and digitization – planimetric, topographic and thematic information – sample and census surveys – attribute data tables – Elements of a map - Map Layout principles – Map Design fundamentals – symbols and conventional signs - graded and ungraded symbols - color theory - colours and patterns in symbolization – map lettering
UNIT IV    MAP MAKING

UNIT V    MAP TRANSFORMATIONS

OUTCOME:
At the end of the course, the student shall
- Be familiar with appropriate map projection and co-ordinate system for production of maps.
- Be able compile and design maps for the required purpose.
- Be familiar with co-ordinate and datum transformations.

TEXTBOOKS:

REFERENCES:
4. Thematic Cartography and Geovisualisation 3rd edition by Terry A slocum, Robert B Mc Master, fritz C Kessler, Hugh H Howard, 2008 Pretice Hall

GI8311    CARTOGRAPHY LABORATORY

OBJECTIVES:
- Hands on experience of basics of map drawing.
- Designing the map.

EXERCISES:
1. Appreciating the map: marginal and extra marginal information; map scale; map content
2. Scales and map errors / accuracy.
3. Derivations of latitudes and longitudes with reference to ellipsoid.
4. Derivation of UTM for small scale and large scale Indian maps.
5. Simple conical, cylindrical and planer projection for a reduced earth (2 to 4cm reduced earth) – aspect and secant demo.

(L:45)TOTAL: 45 PERIODS

At the end of the course, the student shall
- Be familiar with appropriate map projection and co-ordinate system for production of maps.
- Be able compile and design maps for the required purpose.
- Be familiar with co-ordinate and datum transformations.

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4. Derivation of UTM for small scale and large scale Indian maps.
5. Simple conical, cylindrical and planer projection for a reduced earth (2 to 4cm reduced earth) – aspect and secant demo.
6. Map layouts for square and elogated maps
7. Attribute data and class interval selection
8. Graded symbolization and isopleth / choropleth map
9. Selection of line or dot shades
10. Color, combinations and brightness scales
11. Select symbols for terrain, economic and demographic features
12. Located qualitative symbol map
13. Map digitizing and compilation
14. Large scale and small scale compilation
15. Affine transformation.

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
• To design and produce thematic maps with suitable projection, symbols and color codes
• To compile and develop digital maps

REFERENCE:

GI8312 GEO DATABASE LABORATORY L T P C
0 0 4 2

OBJECTIVE:
• To get practical experience on the server – client setup on the database Management system and extending it to spatial data handling

EXERCISES:
1. Server / client operations
   • Starting / Shutdown of server – Client user creation - client connection over network
2. Data Definition of Tables and Views
   • Creation, Deletion and Modification of definition
3. Data Manipulation
   • Insert, delete and modify rows
4. Queries on Tables and views
   • Simple, complex, nested queries
5. Data Control of Tables and Views
   • Defining different constraints
   • Handling different permissions on tables and views
   • Index, sequence functions
6. Database triggers
   • Defining triggers
7. Spatial Data Creation and viewing
   • Creation of simple geometries (point, Line Polygon)
   • Indexing spatial data
   • Viewing spatial data
8. Basic Geometrical functions
   • Area and Length
• Buffering
• Union
9. Front end tool – applications
• Designing of database application with any front end tool

OUTCOMES:
At the end of the course the student will be able to
• Create database structure and populate database
• Apply geometric functions to derive spatial parameters
• Apply simple overlay and buffering tools on spatial database

REFERENCE:

GI8313 GEODETiC SURVEYiNg LABORATORY

OBJECTiVE:
• The objective of this course is to train the students to acquire skills in making precise measurements and obtaining accurate results.

EXCERCiSEs:
I. LEvELLiNG
   a) Taking spot levels
   b) Fly levelling using Dumpy level
   c) Fly levelling using Tilting level
   d) Check levelling
   e) Permanent adjustment of levels
   f) Contouring
   g) LS and CS
   h) Computation of volume of earth work from contours

II. FIELD ASTROiNiGY
   a) Study of motion of the Sun
      c) Determination of azimuth using known latitude
      d) Study of azimuth using hour angle
      e) Determination of latitude
      f) Determination of watch error

III. ESTABLISHMENT OF BASELINE

IV. THEODOLiTE TRAVERSING

OUTCOMES:
At the end of the course the student will be able to
• Observe level differences between stations using different types of leveling techniques
• Compute area, volume of earthwork from levels
• Determine azimuth, latitude and time from astronomical observations
REFERENCE:

MA8353  NUMERICAL METHODS  L T P C
            3 1 0 4

OBJECTIVES
• To provide the mathematical foundations of numerical techniques for solving linear system, eigen value problems, interpolation, numerical differentiation and integration and the errors associated with them;
• To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9+3

UNIT II  INTERPOLATION AND APPROXIMATION  9+3
Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton’s forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  9+3

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  9+3

UNIT V  BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  9+3
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

(L:45+T:15)TOTAL: 60 PERIODS
OUTCOMES:
- The students will have a clear perception of the power of numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXTBOOKS:

REFERENCES:

GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING  L T P C  3 0 0 3

OBJECTIVES:
- To the study of nature and the facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth’s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  14
Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hotspots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION  8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

TOTAL : 45 PERIODS

OUTCOMES:
Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

REFERENCES:

<table>
<thead>
<tr>
<th>COURSE CODE</th>
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**OBJECTIVES:**
- To facilitate the student to develop Object Oriented Programming
- To Familiarize GIS customisation programming using Java and AJAX.

**UNIT I CONCEPTS OF OBJECT ORIENTED PROGRAMMING**
- Principles - Abstract Data types - Inheritance - Polymorphism - Object Identity - Object Modeling
- Object Oriented Programming Languages - Object Oriented Databases - Object Oriented user Interfaces - Object Oriented GIS - Object Oriented Analysis - Object Oriented Design - Examples.

**UNIT II C++ PROGRAMMING FUNDAMENTALS**
- Introduction to C++ Keywords, Identifiers - Data types - Variables - Operators - Manipulators - Operator Overloading - Operator Precedence - Control Statements - Functions - Call by Reference - Arguments - Function Overloading – Exercises

**UNIT III CLASSES AND OBJECTS**
- Classes and Objects - Member Functions - Nesting of Member Functions - Constructors - Destructors - Type Conversions - Inheritance - Base class - Derived Class - Visibility modes - Single Inheritance - Multilevel Inheritance - Multiple Inheritance - Nesting – Polymorphism - File - Opening and Closing - Exercises

**UNIT IV JAVA PROGRAMMING**

**UNIT V SCRIPTS AND OOP**

**TOTAL : 45 PERIODS**

**OUTCOMES:**
- At the end of the course the student will be able to understand
- Concepts of Object Oriented programming techniques
- the tools and procedure involved in programming with C++, Java
- concepts of various scripting languages and their use in GIS customization

**TEXTBOOKS:**
REFERENCES:
2006
University Press,2010

GI8402 GEODESY L T P C
2 2 0 4

OBJECTIVE:
- To understand the geometry of the earth and its relationship with nature.

UNIT I FUNDAMENTALS 6+6
Definitions- Classifications, Problem of Geodesy and purpose of Geodesy. Historical
development and Organization of Geodesy. Reference Surfaces and their relationship.
Applications, Engineering, Lunar, Planetary and interferometric Synthetic aperture radar
Geodesy – Local and International Spheroid.

UNIT II GEOMETRIC GEODESY 6+6
Geometry of ellipsoid, fundamental mathematical relationship of ellipsoid, Geodetic,
Geocentric and Reduced latitudes and their relationship. Ellipsoidal Co-ordinates in terms of
Reduced, Geodetic and geocentric latitude. Radius of curvature in the meridian & prime vertical
and their relationship. Mean Radius of curvature in any azimuth, Length of the meridian arcs
and arcs of parallel and Area of trapezium on the ellipsoid. Curves on the ellipsoid, properties
of Geodesic.

UNIT III CO-ORDINATE SYSTEMS 6+6
Natural or Astronomical Co-ordinate System, Geodetic or Geographical co-ordinate System,
Rectangular or Cartesian Co-ordinate System and relationship between them. Curvilinear
Co-ordinate System. Deflection of Vertical, Spherical excess. Astro-Geodetic method of
determining the reference Spheroid.

UNIT IV PHYSICAL GEODESY 6+6
Basics - INGN -the significance of gravity measurements, Gravity field of earth, Concept of
equipotential, Geo potential and Sphero potential Surface - Normal gravity and its computations,
Methods of measuring Absolute and Relative gravity- Gravimeters-Reduction of gravity
disturbance-Fundamental equation of Physical Geodesy. Gravimetric determination of Geoid
and Deflection of Vertical,

UNIT V GEODETIC ASTRONOMY 6+6
Celestial Sphere – Astronomical triangle – celestial coordinates systems and its relationship
with Cartesian Co-ordinates and Transformation between them -Special star positions, Major
constellations- time systems (sidereal, Universal, atomic and standard) rising and setting of Stars with respect to Declination, hour angle and Azimuth, Culmination, Prime Vertical Crossing and Elongation.

OUTCOMES:
At the end of the course the student will be able to understand
- Various fundamentals of Geodesy
- Concepts of geoid, ellipsoid and their interrelationship
- Various types of coordinate systems and relationship between them
- The methods for measurement of gravity and gravity network

TEXTBOOKS:

REFERENCES:

OBJECTIVE:
- To understand the working of Total Station equipment and solve the surveying problems.

UNIT I FUNDAMENTALS OF TOTAL STATION AND GPS
Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Basic concepts of GPS - Historical perspective and development - applications - Geoid and Ellipsoid- satellite orbital motion - Keplerian motion – Kepler’s Law - Perturbing forces - Geodetic satellite - Doppler effect - Positioning concept – GNSS

UNIT II ELECTROMAGNETIC WAVES
Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI- Computation of group for light and near infrared waves at standard and ambient conditions- Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Second velocity correction -Total atmospheric correction- Use of temperature - pressure transducers.

UNIT III ELECTRO OPTICAL AND MICRO WAVE SYSTEM
Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparis on between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern
positioning systems – Traversing and Trilateration.

UNIT IV  SATELLITE SYSTEM
GPS - Different segments - space, control and user segments - satellite configuration - GPS signal structure - Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - GPS receivers.

UNIT V  GPS DATA PROCESSING
GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data -data processing – software modules -solutions of cycle slips, ambiguities, RINEX format. Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -basic constellation of satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
• Working principles of total station and GPS instruments
• Propagation of EMR through atmosphere and corrections for its effects
• The functioning various types total station and GPS equipments and their applications
• Various techniques available for surveying and mapping with total station and GPS.

TEXTBOOKS:

REFERENCES :

GI8411  OBJECT ORIENTED PROGRAMMING LABORATORY

OBJECTIVES :
• To implement different concepts of Object Oriented Programming using C++
• Hands on exercise on various OOPs concepts using C++.
• To Implement GIS customization using JAVA and AJAX

EXERCISES:
1. Arithmetic operations
2. Control structures
3. Graphic Libraries
4. Matrix manipulation and functions
5. Operator Overloading – binary and unary operators as friend and member functions
6. Uniary operator - Prefix and Postfix form
7. Nesting of member functions
8. Constructors, Destructors
9. Constructor Overloading
10. Inheritance and its forms
11. Visibility mode – public, private and protected
12. Runtime Polymorphism – Virtual functions
13. File opening and file closing
14. GIS customization using JAVA
15. GIS customization using AJAX

(P:60) TOTAL : 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to develop
- Programs using C++ language
- Codes implementing various Object oriented concepts
- Scripts using Java and AJAX

REFERENCE:

GI8412 TOTAL STATION AND GPS SURVEYING LABORATORY

OBJECTIVE:
- To train the students to acquire skill in making precise measurements and obtaining accurate results with Total Station and GPS.

EXERCISES:
- Study of Total Station
- Distance and Coordinate Measurement
- Missing Line Measurement
- Remote Elevation Measurement
- Resection
- Setting out: Point and Line
- Taking Offsets
- Area Measurement
- Total Station Traversing
- Study of Hand held GPS
- Study of Geodetic GPS
- Static and semi kinematics survey
- Differential Positioning
- Precise Positioning

TOTAL : 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to
- Work with Total Station and GPS instruments for measurement and mapping
- Use Total Station and GPS for alignment and setting out works

REFERENCE:
OBJECTIVE:
- To impart advanced knowledge in the field of Geodesy

UNIT I GEODETIC CONTROL 6+6

UNIT II GEODETIC COMPUTATIONS 6+6
Rectangular and Polar Co - ordinates - First and Second geodetic problem – Similarity and Helmet’s transformation- methods of point determinations – problems on intersection, resection, arc section and also with over determinations, polar method and its extension.

UNIT III ASTRONOMICAL COMPUTATIONS 6+6
Variation in celestial co - ordinates, Determination of Astronomical Azimuth- stars altitude and hour angle methods, astronomical latitude and longitude determination – sources of errors and its eliminations- problems

UNIT IV HEIGHT SYSTEMS 6+6

UNIT V MISCELLANEOUS TOPICS 6+6
Crystal movements and plate motion – methods of determination of horizontal and vertical movements – dam deformation- earth tides – tidal forces, tidal response of the solid earth, tidal loading, analyzing and predicting earth tides, earth tide instrumentation – satellite altimetry – observations, computation and interpretation – Applications.

OUTCOMES:
At the end of the course the student will be able to understand
- Techniques and tools involved in establishment of geodetic control
- Methods required for computation of geodetic and astronomical parameters
- Concepts of monitoring crustal movement, tide measurement and applications

TEXTBOOKS:

REFERENCES:
OBJECTIVE

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

UNIT I  FUNDAMENTALS OF IMAGE PROCESSING  9
Information Systems - Encoding and decoding - acquisition, storage and retrieval – data products-Digital Image Processing Systems - Hardware and software design consideration Scanner, digitizer - photo write systems.

UNIT II  SENSORS MODEL AND PRE PROCESSING  9

UNIT III  IMAGE ENHANCEMENT  9

UNIT IV  IMAGE CLASSIFICATION  9
Spectral discrimination - pattern recognition concepts - Baye’s approach - Signature and training sets – Separability test – parametric and non parametric classifiers – Segmentation (Spatial, Spectral)- Fuzzy set classification , member ship function and de-fuzzifications – sub-pixel classifier- hybrid classifiers - accuracy assessment – error matrix – Kappa statistics – ERGAS, RMS etc.,

UNIT V  OBJECT RECOGNITION  9
Morphological operators - descriptors - representation schemes – Compressions- Image matching , template, correlation, texture based operators, Geometry operators- Artificial Neural nets - Expert system, types and examples - Knowledge systems- representation knowledge handling – decision making paradigms.

(L:45) TOTAL : 45 PERIODS

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
- The concepts of Image classification and use of various classifiers
- Various object recognition techniques available for extraction of features

TEXTBOOKS :
REFERENCES:

GI8503 GEOINFORMATICS FOR LAND RESOURCES MANAGEMENT L T P C
3 0 0 3

OBJECTIVE:
- To familiarize the students in Land Resource Analysis and planning for sustainable development. Policy issues and legal aspects or consider equally important for Land Resource Development.

UNIT I LAND RESOURCE SYSTEMS

UNIT II LAND RESOURCE POTENTIALS

UNIT III POLICIES AND ISSUES
Land Holdings – Reserved and Restricted Lands – Hazard and Disaster Prone Areas – Land Acquisition - Land Use Policies – Land and Noxious Facilities – Legality and Community Participation – Conflicts of Interests

UNIT IV LAND USE MANAGEMENT

UNIT V SUSTAINABLE DEVELOPMENT

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- The concepts involved assessment of land resources
- The policies and issues involved in management of land resources
- The concept of sustainability and its implementation in land resources management.

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TEXTBOOKS:
1. Modeling In Resource Management And Environment Through Geoinformatics, By H.S. Sharma And P.R. Binda, 2007
2. Genesis, termination and succession in the life cycle of organizations: the, By M. Paul Brown, Institute of Public Administration of Canada

REFERENCES:
2. The A to Z of careers in South Africa 2008

GI8504  MICROWAVE REMOTE SENSING  LT PC 3 0 0 3

OBJECTIVE:
- To impart the knowledge in Microwave Remote Sensing and its application.

UNIT I  FUNDAMENTALS AND ACTIVE SYSTEM

UNIT II  MEASUREMENT AND DISCRIMINATION

UNIT III  SPECIAL TOPICS

UNIT IV  SAR SENSORS & APPLICATIONS OF RADAR

UNIT V  PASSIVE SYSTEM

OUTCOMES:
At the end of the course the student will be able to understand
- The fundamentals of microwave remote sensing systems like SLAR, SAR and RAR
- The concepts of Interferometry, Polarimetry, Altimetry and Scatterometer

TOTAL: 45 PERIODS
• Different satellite systems and sensors used in microwave remote sensing with their applications
• Concepts of passive microwave systems and applications

TEXTBOOKS:

REFERENCE:

GI8505 SURVEY ADJUSTMENT L T P C
3 0 0 3

OBJECTIVE:
• To impart skills in survey calculation and adjustment to suit field conditions

UNIT I MEASUREMENT AND ERROR
9

UNIT II THE CONCEPT OF ADJUSTMENT
9
Introduction - simple adjustment methods - Least squares method - Examples of least squares problems.

UNIT III LEAST SQUARES ADJUSTMENT
9
Techniques of least squares- concept of weight - least squares adjustment of indirect Observations - least squared adjustment of observations only- adjustment of Trisection.

UNIT IV ELEMENTARY PROBABILITY THEORY
9
Random events and probability - Random variables - continuous probability distributions- normal distribution - Expectation - measures of precision and accuracy - covariance and correlation, covariance, cofactor and weight matrices - Introduction to sampling.

UNIT V VARIANCE COVARIANCE PROPAGATION
9
Introduction - Derivation of the propagation laws - Examples - stepwise propagation- propagation of least squares - adjustment of indirect observations.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
• The concepts of error, error distribution and error adjustment procedures
• The procedure involved in error adjustment using least square adjustment, elementary
• probability theory and variance covariance propagation
TEXTBOOKS:

REFERENCE:

GI8551 GEOGRAPHIC INFORMATION SYSTEM
L T P C
3 0 0 3

OBJECTIVES:
- To introduce the fundamentals and components of Geographic Information System
- To provide details of spatial data structures and input, management and output processes.

UNIT I FUNDAMENTALS OF GIS
9

UNIT II SPATIAL DATA MODELS
9

UNIT III DATA INPUT AND TOPOLOGY
9

UNIT IV DATA QUALITY AND STANDARDS
9
Data quality - Basic aspects - completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards – Interoperability - OGC - Spatial Data Infrastructure

UNIT V DATA MANAGEMENT AND OUTPUT
9
Import/Export – Data Management functions- Raster to Vector and Vector to Raster Conversion - Data Output - Map Compilation – Chart/Graphs – Multimedia – Enterprise Vs. Desktop GIS-distributed GIS.

(L:45) TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- The basic concepts and components of GIS
- The techniques used for storage of spatial data and data compression
- The practices used for input, management and output of spatial data
- Concepts of spatial data quality and data standards

**TEXTBOOKS:**

**REFERENCE:**

**GI8511 DIGITAL IMAGE PROCESSING LABORATORY**

**OBJECTIVE:**
- To familiarize the undergraduate level students in the regular Image Processing Software with respect to basic processing required to generate thematic maps from Satellite data.

**EXERCISES:**
1. Study of image file formats and organization
2. Enhancement of image
3. Filters & edge enhancement
4. Band rationing and NDVI
5. Principle Component Analysis (PCA)
6. Mosaic & subset
7. Geo-reference : Image to map & Image to Image
8. Training Set Generation & Analysis
9. Reprojection to different co-ordinate systems
10. Classification : Supervised & unsupervised
11. Accuracy Assessment
12. Classification improvement / Sub –pixel classification
13. Vector conversion and layer manipulation
14. Creation of cartographic elements and presentation
15. Map Layout preparation

**TOTAL : 60 PERIODS**

**OUTCOMES:**
At the end of the course the student will be able to
- Enhance satellite imagery through filtering, band ratioing, PCA etc
- Georeference and project satellite imagery
- Classify and assess accuracy of classification.

**REFERENCE:**
OBJECTIVE:
- To provide practical and hands-on experience on Data Input, Data Management and Data Presentation capabilities of GIS

EXERCISES:
1. Data Input – Onscreen Digitisation – Creation of Point, Line and Polygon layers
2. Defining Projection, Datum and Coordinate System
3. Reprojection of Maps.
4. Attribute data input.
5. Measurement of Distance, Area
6. Coordinate Transformation
7. Tabular Data Analysis using SQL commands
8. Generating Charts from Tabular data
9. Linking External Database
10. Data Conversion – Vector to Raster
11. Data Conversion – Raster to Vector
12. Data Interchange – Conversion to interchange formats
13. Map Compilation for Point, Line and Polygon data
14. Map Joining and Edge Matching
15. Map Layout Design.

OUTCOMES:
At the end of the course the student will be able to
- Create spatial database and nonspatial databases in GIS environment
- Analyse spatial database and generate reports, maps

REFERENCE:

AIM:
- To learn the different principles and techniques of management in planning, organizing, directing and controlling.

OBJECTIVES:
- To study the Evolution of Management
- To study the functions and principles of management
- To learn the application of the principles in an organization
UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

UNIT II PLANNING

UNIT III ORGANISING

UNIT IV DIRECTING

UNIT V CONTROLLING
System and process of controlling –budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

REFERENCES:
OBJECTIVE:
- To introduce the principle and concepts of Interior, Relative and Absolute Orientation for mapping using Stereoplotters and basics of Digital and Non-topographic photogrammetry

UNIT I AERIAL TRIANGULATION PRINCIPLES AND ADJUSTMENTS
Basic concepts of strips and blocks photographic aerial triangulation - Analog triangulation-Independent Model Triangulation - Strip formation, graphical strip adjustment-polynomial strip adjustment - Analytical aerial triangulation, adjustment of blocks of aerial photographs- Three-dimensional coordinate transformation.

UNIT II NON TOPOGRAPHIC PHOTOGRAMMETRY
Applications - terrestrial cameras - stereometric cameras - horizontal and vertical angles from terrestrial photographs - Camera azimuth - analytical determination of horizontal position of a point from Photographic measurement - graphical method- use of plotting equipments - control consideration for terrestrial Photogrammetry - X-ray Photogrammetry.

UNIT III DIGITAL CAMERAS, SCANNERS & WORKSTATIONS

UNIT IV DIGITAL IMAGE HANDLING

UNIT V PHOTOGRAMMETRIC PRODUCTS AND APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- The concepts and procedure involved in aerial triangulation
- The methods and applications of terrestrial photogrammetry
- The components and characteristics of digital cameras, scanners
- The techniques used for handling digital data and generation of DEM,DTM, orthophoto

TEXTBOOKS:
1. Image Based Modeling : Advanced 3D Modelling from Panoramas with Greg downing by reg downing ,Alex Alvarez ,2005

REFERENCES :
GI8602 OPEN SOURCE GIS  L T P C  3 0 0 3

OBJECTIVE:
- The open source options are for research and development. 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 to major avenues of open source opportunities.

UNIT I  BASICS FOR OPEN SOURCE IMPLEMENTATION  9

UNIT II  OPEN SOURCE DEVELOPMENT ENVIRONMENT  9

UNIT III  DESKTOP GIS WITH OPEN SOURCE GIS  9

UNIT IV  DATA BASE MANAGEMENT AND USER INTERFACE  9
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 Data Base server concepts.

UNIT V  OPEN SOFTWARE AND WEB MAPPING  9

TOTAL: 45 PERIODS

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.

TEXTBOOKS:
REFERENCE:

GI8603 SPATIAL AND NETWORK ANALYSIS L T P C
3 0 0 3

OBJECTIVE:
- To provide exposure to Raster, Vector, Network and Geo-statistical Analysis Capabilities of GIS.

UNIT I RASTER ANALYSIS 9

UNIT II VECTOR ANALYSIS 9

UNIT III NETWORK ANALYSIS 9
Network - Introduction - Network Data Model - Elements of Network - Building a Network database - Geocoding - Address Matching - Shortest Path in a Network - Time and Distance Based shortest path analysis - Driving Directions - Closest Facility Analysis - Catchment / Service Area Analysis - Location - Allocation Analysis.

UNIT IV SURFACE AND GEOSTATISTICAL ANALYSIS 9

UNIT V CUSTOMISATION, WEB GIS, MOBILE MAPPING 9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
- Different tools available in GIS for analysis Raster and Vector data
- GIS functionalities to analysis network and surface data set
- The possibilities of customization of GIS
- The architecture of WebGIS and its applications
- Concept of recent techniques like mobile mapping and LBS
TEXTBOOKS:

REFERENCES:
2. John Peter Wilson, The handbook of geographic information science, Blackwell Pub., 2008
OBJECTIVES

- To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
- To help them improve their soft skills, including report writing, necessary for the workplace situations

2. Creating effective PPTs – presenting the visuals effectively
3. Using body language with awareness – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – sociability skills - questioning and clarifying skills – mock GD
8. Writing reports – collecting, analyzing and interpreting data – drafting the report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

TOTAL : 30 PERIODS

Requirements for a class of 30 students
1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD’s and DVD’s on relevant topics
5. Individual chairs for conducting group discussions

OUTCOMES:
At the end of the course learners should be able to
- Participate in conversations both formal and informal, attend phone calls and interviews successfully.
- Read different types of texts.
- Listen to, and understand foreign accents.

REFERENCES :
EXTENSIVE READERS :

WEB RESOURCES :
1. www.humanresources.about.com
2. www.careerride.com

GI8611 ADVANCED PHOTOGRAMMETRY LABORATORY L T P C 0 0 4 2

OBJECTIVE :
• To acquire knowledge about Interior, Relative and Absolute Orientation using Analog and Analytical Stereo plotters.

EXERCISES:
1. Digital Photogrammetric Workstation - Data input and Creation of Project
2. Image import - Image Enhancement
3. Control point editing
5. Orientation Management - Camera Calibration - Editing the Scheme point file
6. Imagery import - Relative Orientation - Absolute Orientation
7. ATM Adjustment - Automatic Point Measurement
8. DEM, DTM generation - Correction and Analysis, Mosaic & Feature extraction.
   Automatic Terrain Extraction
9. Editing the DTM
10. DTM Terrain analysis
11. Mosaic - Generating Orthophoto - Mosaic sheet cutting
12. Planimetric Mapping

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to
• Produce Orthophoto, DTM from digital photographs using DPW
• Produce planimetric maps from stereomodels using DPW

REFERENCE :
1. Paul. R Wolf, Bon A.DeWitt, Elements of Photogrammetry with application in GIS-

GI8612 SAPATIAL AND NETWORK ANALYSIS LABORATORY L T P C 0 0 4 2

OBJECTIVE
• To experience the students in various Spatial and Network analysis of Spatial Data and develop problem-solving skills using GIS
EXERCISES:
I. **Raster Analysis**
   - Classification and Reclassification
   - Surface analysis
     - Slope, Aspect, Hill Shade, Viewshed, Cut and Fill
   - Distance
   - Straight-line, cost weighted, shortest path
   - Map Algebra- Local, Neighbourhood and zonal functions.
   - Raster Statistics

II. **Vector Analysis**
   - Data Extraction
     - Split, Clip, Attribute Selection, Dissolve
   - Overlay
     - Union, Intersection, Erase, Identity
   - Proximity
   - Buffering
   - Basic Statistics
   - Frequency and summary statistics- attribute analysis

III. **Network Analysis**
   - Geocoding
   - Data preparation
   - Indexing
   - Address location searching
   - Address matching
   - Networking
   - Data preparation
   - Short route analysis
   - Complex short route with turn data
   - Service area analysis
   - Closest facility

IV. **Interpolation**
   - IDW, Spline, Kriging
   - Watershed Deliniation

V. **Customization**
   - Scripting/ embedded scripts
   - Batch Processing
   - Process Modeling

VI. **Web GIS**
   - Demo on Mapserver / WMS, WFS, WCS and WEB server with spatial data viewing at the client in a network environment

**TOTAL: 60 PERIODS**
OUTCOMES:
At the end of the course the student will be able to
- Analyse Raster and Vector data using various tools available in GIS
- Customize GIS environment writing simple scripts
- Appreciate use of WEB GIS in dissemination of spatial data sets.

REFERENCE:

GI8613 SURVEY CAMP
(During V Semester Winter) (2 Weeks)

Two weeks Survey Camp will be conducted during winter in the following activities:
1. Triangulation
2. Trilateration and
3. Rectangulation

OUTCOMES:
- At the end of the course the student will be able to apply the surveying techniques in field to establish horizontal and vertical control network using modern surveying equipments.

GI8701 DECISION SUPPORT SYSTEM FOR RESOURCE MANAGEMENT

OBJECTIVE:
- To impart the knowledge of Expert Systems, fuzzy logic and operation research techniques for Geoinformatics Engineering.

UNIT I STRUCTURE

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

UNIT III RULE BASED EXPERT SYSTEMS
Evolution – Architecture – Examples – backward and forward chaining - rules and meta rules – rule based systems – Case studies: MYCIN, PROSPECTOR
UNIT IV INEXACT REASONING


UNIT V OPERATION RESEARCH


OUTCOMES:

At the end of the course the student will be able to understand
- The structure of knowledge based system and its implementation
- The concepts of rule based expert system and fuzzy based systems
- The scope and applications of operation research techniques in geoinformatics

TEXTBOOKS:


REFERENCES:


GI8702 DISASTER MITIGATION AND MANAGEMENT L T P C FOR GEOINFORMATICS ENGINEERS 3 0 0 3

OBJECTIVE:

To understand various technological options especially Remote Sensing and GIS in Disaster management.

UNIT I DISASTER PRINCIPLES

Basic concepts and principles - Hydrological and geological disasters, characteristics crisis and consequences - Role of Government administration, University research organization and NGO’s - International disaster assistance - Sharing technology and technical expertise.

UNIT II LONG TERM MITIGATION MEASURES


UNIT III SAFETY RATING OF STRUCTURES

Slope stability of Ghat roads -Structural safety of Dams, Bridges, Hospitals, Industrial structures, - Disaster resistant structures - Low cost housing for disaster prone areas - Cyclone shelter projects and their implications - Reconstruction after disasters: Issues of practices.
UNIT IV  SPACE SCIENCE INPUT IN DISASTER MANAGEMENT
Remote sensing in Hazard evaluation - Zonation - Risk assessment - Damage assessment- Land use planning and regulation for sustainable development - Communication satellite application - Network - Use of Internet - Warning system - Post disaster review - Case studies.

UNIT V  EMERGENCY PLANNING USING SPATIAL AND NON-SPATIAL DATA
Information systems management - Spatial and non-spatial data bank creation - Operational emergency management - Vulnerability analysis of infrastructure and settlements - Predisaster and post disaster planning for relief operations - Potential of GIS application in development planning - Disaster management plan - Case studies.

OUTCOMES:
At the end of the course the student will be able to understand
- The concepts of disaster and disaster management
- Different techniques for analysis of disaster proneness and mitigation measures
- The use of spatial science in four folds of disaster management

TEXTBOOKS:

REFERENCES:

GI8703  GEOINFORMATICS PROJECT DESIGN AND MANAGEMENT  L T P C 3 0 0 3

OBJECTIVES:
- To provide insights into the design aspects of geomatic Engineering projects. The candidate shall be exposed to geomatic project formulation, selection of design tools, input of assessment methods and critical information and management. The candidate also familiarize with styles of reporting.

UNIT I  PROJECT FORMULATION

UNIT II  GRAPHICAL DESIGN TOOLS
Flowcharts - Data Flow Diagrams (DFD) - ER Diagrams - Hierarchical Input, Output Charts - CPM and PERT Charts - Gnatt Charts - UML Coding and CASE Tools

UNIT III  ASSESSMENT METHODS
UNIT IV  GEOMATIC INFORMATION MANAGEMENT
General Principles of Information Management (INFOSYS) - Information System Types – MIS, TPS. DSS - Geomatic Information Structure - Transaction Management - DSS in Geoinformatics

UNIT V  DESIGNING REPORTS
Formats and Content of Geomatic Reports - Standards in Reporting - Picture File Formats and Standards - Compression Standards and Files - Web Reporting Standards - WFS and WCS - Functions and Standards - Scripts in Web Reporting (PHP, Jscript, Python, AJAX, Ruby RAIL etc.)

OUTCOMES:
At the end of the course the student will be able to understand
- Methods used for geomatics project formulation and implementation
- Principles associated with assessment of geomatics projects and information management
- Different ways to design and present geomatics project reports

TEXTBOOKS :
2. Barry F. Kavanagh, Geoinformatics, Prentice Hall 2002

REFERENCES:

GI8751  DIGITAL CADASTRE  L T P C 3 0 0 3

OBJECTIVES:
- To introduce the students to the cadastral survey Methods and its applications in generation of Land information system. Cadastral surveys are those classes of land surveys which are executed for the purpose of systematically recording the land rights, producing register of land holdings or an inventory of land areas, land use and determine land tax.

UNIT I  INTRODUCTION

UNIT II  METHODS OF SURVEYING
UNIT III MAINTENANCE AND MEASUREMENTS

UNIT IV PHOTOGRAMMETRIC METHODS
Photogrammetry for cadastral surveying and mapping - Orthophoto map – Quality control measures - Organisation of cadastral offices – international scenario.

UNIT V MAPPING PROCEDURES AND LIS

TOTAL: 45 PERIODS

OUTCOME:
- The courses give the knowledge about Land Record System and computational procedure for modernization of the same.
- The students will be in position to understand the Government procedure in Land Record Management.

TEXTBOOKS:

REFERENCES:
2. Alias Abdul Rahman, Siyka Zlatanova,Volker Coors, Innovations in 3D geo information systems

GI8711 CREATIVE AND INNOVATIVE PROJECT

OBJECTIVES
- To acquire knowledge about the various tasks involved in a real time project and to train the students to complete the project in comprehensive manner in the area of Geoinformatics Engineering.
- To familiarize the graduate with project design principles so as to inculcate confidence and to provide skills in undertaking Geomatic projects.

STRATEGY:
The students shall be divided into groups with not more than 4 persons in each group. All the groups will be monitored by the assigned guide. The students instructor will identify a project related to Geoinformatics Engineering and will divide the project into 12 to 15 tasks. In each class of 4 hours duration, students shall have to complete one task in the laboratory itself under the supervision of the guide/instructor.
For continuous assessment, 75% weightage may be given (i.e., for report submission and model oral test) and 25% weightage may be given for the end semester evaluation. The end semester evaluation by presentation only and done by a panel of three faculty members including the course co-ordinator and guide.

(P:60) TOTAL: 60 PERIODS

GI8712   INDUSTRIAL TRAINING   L T P C
(During VI Semester Summer) (4 Weeks)  0 0 0 2

OBJECTIVES:
- To train the Geoinformatics Students for the Industry so as to make Students shall gain confidence in handling Practical Problems in Geoinformatics Engineering Task.
- The Student can gain skills in the related training institute both by observation and involving Practical work experience.

THE STRATEGY:
a) The Student individually contact the organizations involved in Geoinformatics Activities with the help of the Coordinator and fix the training period and Type of Training.
b) The Students shall be evaluated on the basis of 1) Dairy 2) Training Report 3) Viva-Voce Examination.
The evaluation committee consists of (1) Coordinator (2) Staff Member (3) Expert Member
c) The Student maintain the day wise work diary while undergoing the training and get it endorsed by the supervising officer : it shall be submitted as part of evaluation

THE REPORT:
 a) The Student prepares the document for the individual training following the principles of documentation standards with necessary flowcharts, diagrams, photographs and other details as the case may be. The document will be part of evaluation
b) The Student shall enclose a certificate duly signed from the Supervising Officer of the Place of Training and Coordinating Faculty
c) The Viva-Voce Examination shall be part of evaluation
(P:60 ) TOTAL: 60 PERIODS

GI8811   PROJECT WORK   L T P C
0 0 12 6

OBJECTIVES:
- The focus on project work is to enable the students to work individually or as a group of not more than four members on a project involving comprehension of their skills either on experimental or application studies related to Geoinformatics implementation. If more than one student is involved, the project shall be divided into part I, Part II etc, and each student has to concentrate in one of the parts. The group project may be on (i) one problem and segments of results or (ii) one problem solution (methodology) and different applications.
Every project work shall have a guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time Table and the time shall be utilized by the students to receive directions from the guide, library reading, laboratory work, computer analysis or field work and to present the progress made in the project. The student shall maintain a weekly progress chart and attach the same in the report along with the signature of the guide.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, methodology, project work details, results and conclusions. This final report shall be typewritten form as specified in the guidelines. The report shall follow the guidelines for format, structure, text size, number of pages and other style manual standards prescribe by the University.

The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

GI8001  2D AND 3D SURFACE MODELLING  L T P C  3 0 0 3

OBJECTIVE :

- To provide exposure to Surface Data in 2D and 3D and the analytical capabilities.

UNIT I  TOPOGRAPHIC SURFACE DATA FORMAT AND SOURCES  9
Sources of Topographic Data - X.Y.Z data - Ground Survey Methods, Airborne Laser Scanner Data. GPS Data, Photogrammetry, Stereo Satellite Images, Space based Altimeters: Radar and LiDAR, Interferometric Sources, SRTM, Topographic Maps - Comparison of various sources of Topographic Data - Methods of Representing Topographic Data - Digital Elevation Models, TIN Model, Contours.

UNIT II  2D - LAND SURFACE MODELLING  9
Geomorphometry - Conceptual and Digital Models of Land Surface - Various Methods of OEM Production - Land Surface Parameters: Local and Regional Parameters, Error analysis: Reducing errors in OEM, Reduction of errors in parameters and objects. Uncertainty in OEM, Geostatistical Analysis of errors in DEM, error Propagation

UNIT III  APPLICATIONS OF 2D LAND SURFACES  9

UNIT IV  3D SURFACE ANALYSIS  9
3D Array - Octree and 3D TIN - constructive solid geometry (CSG) - 3d TIN tessellations - 3D distance transformation and voronoi tessellation - 3D visualization and editing - 3D web GIS - 3D application in Flood modeling, urban engineering and climatic system analysis - shading and illumination - 3D and animation.
UNIT V VISUALISATION OF 2D AND 3D SURFACES

Visualisation of 2D and 3D surfaces - Software used for Visualisation: Proprietary GIS s/w, SAGA, Landserf, MicroDEM. VRML and Java for interactive 3D visualization - 3D City Models WEB 3D GIS

TOTAL: 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand
- The intricacies of implementation textbook knowledge into practice
- The concepts of developments and implementation of new techniques in geomatics

TEXTBOOKS:

GI8002 ADVANCED SURVEY ADJUSTMENT L T P C
3 0 0 3

OBJECTIVE:
- To impart advanced skills in survey adjustment to suit field conditions

UNIT I PRE ANALYSIS OF SURVEY MEASUREMENTS
Pre analysis procedure- Horizontal angle measurement with theodolite - Distance measurement by EDM - Elevation difference by Direct leveling - Survey tolerances.

UNIT II STATISTICAL ANALYSIS OF SURVEY MEASUREMENTS
Samples and statistics - The Chi-square distribution - The t-student distribution – common sample statistics - estimation of mean and variance - Confident interval for the mean and variance - Statistical testing - Test or the mean of probability distribution - Test of the variance of a probability distribution. Bivariate normal distribution.

UNIT III GENERAL LEAST SQUARES ADJUSTMENT
Introduction - Derivation - Precision estimation of special cases - Application of least squares adjustment in GIS and GPS.

UNIT IV APPLICATION IN PLANE COORDINATE SURVEYS
Introduction - the distance condition and its linearization - Azimuth condition and its linearization - Angle condition and its linearization - position fixing by Distance - Two parameter similarity transformation - Four parameter similarity Transformation.

UNIT V SPECIAL SUBJECTS OF STATISTICS
Theory of prediction and filtering - sequential adjustment (static and Kinematic Kalman-filter) Application of Kalman-filter in Geodesy; Goodness of fit - Test of any distribution.

(L:45) TOTAL: 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand
- Advancements in adjustments survey measurements using statistics analysis and least square adjustment procedure
- Concepts for adjustment and prediction of geodetic variables
TEXTBOOKS:

REFERENCE:

GI8003 AIRBORNE LASER TERRAIN MAPPING L T P C 3 0 0 3

OBJECTIVE:
- To introduce the concepts of Space Borne, Air Borne, Terrestrial and Bathymetric LASER Scanners for Topographic and Bathymetric Mapping

UNIT I SPACE BORNE RADAR AND LIDAR ALTIMETER 9
Principle and Properties of LASER- Range Finder, DIAL and Doppler LiDAR - Platforms: Terrestrial, Airborne and Space borne LiDAR – Space Borne LiDAR Missions – Space Borne Radar Altimeter for mapping Sea Surface Topography – Space Borne Laser Altimeter and Applications

UNIT II AIRBORNE LASER SCANNERS 9

UNIT III DATA ACQUISITION AND PRE PROCESSING 9

UNIT IV POST PROCESSING AND APPLICATIONS 9
Post Processing – Geo location of Laser Foot Prints – Various Co-ordinate Transformations involved - Strip Adjustment - Filtering - Ground Point filtering – Digital Elevation Model - Error Sources - Overview of LIDAR Applications in various domains - 3D city models – Corridor Mapping Applications – Forestry Applications - Feature extraction, Ortho images.

UNIT V TERRESTRIAL AND BATHYMETRIC LASER SCANNERS 9

TOTAL : 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand
- Concepts of ALTM and working principle
- Available types of ATLM sensors and components of ALTM system
- Process of data acquisition, data processing and possible applications
- The fundamentals of terrestrial and bathymetric scanners and their applications
TEXTBOOKS:

REFERENCES:
1. Zhilin Li, Qing Zhu, Chris Gold, Digital terrain modeling: principles and methodology, CRC Press, 2005

GI8004  CLOSE RANGE PHOTOGRAMMETRY  L T P C
3 0 0 3

OBJECTIVE:
- To focus how the terrestrial objects can be mapped by taking photographs.
- To study not only in engineering aspects but also in the Medicine, Forensic applications.

UNIT I  NON-TOPOGRAPHIC PHOTOGRAMMETRY  9
Introduction - Origin - basic Geometric concepts - Data acquisition - Camera systems – Metric - Non metric cameras - Analytic data reduction - Collinearity adjustment - Direct linear transformation - coordinate transformation - acquisition of digital imagery and processing - software modules for processing the data

UNIT II  STRUCTURAL STUDIES  9
Structural research: Deformation studies of deflection, buckling, - Advantages and disadvantages, Dam deformation, structural movement, Pavement yield. Hydraulic studies: Pipe surface roughness, shifting sand-bank, shoreline feature and coastal currents, experimental fluid mechanics.

UNIT III  MEDICINE  9
Monocular and binocular health studies, X-ray Photogrammetry, surface area and volume patients by Photogrammetry - merits over usual methods. Postural analysis - historical use of Photogrammetric methods - Study of body alignment and rate of body mechanics, remedial measures, advantages - Bio stereometrics.

UNIT IV  INDUSTRIAL PHOTOGRAMMETRY  9
Data acquisition systems - data reduction - deformation of engineering structures - pipe systems - measuring communication antennas - tunnel surveys - cooling towers and other applications - Applications in automobile industry - Architecture application: Drawing of details, monuments preservation and archaeological applications.

UNIT V  CRIMINOLOGY  9
Single and stereo photographs for forensic studies, investigation of criminal cases by black&white, ultra-violet, infrared and colour Photogrammetry, examples. Use of stereometric camera for crime detection, accident investigations. Mono or stereo camera for investigation. Anthropometry - Under water Photogrammetry - Electron microscopy, Hologrammetry - Moire topography - systems and applications - emerging trend.

(L:45) TOTAL : 45 PERIODS

Attested

DIRECTOR
OUTCOMES: At the end of the course the student will be able to understand
- The principles of terrestrial and close range photogrammetry
- The possible application of terrestrial and close range photogrammetry in medicine, structural analysis, criminology and industries

TEXTBOOKS:

REFERENCE:

GI8005 DIGITAL CARTOGRAPHY L T P C
3 0 0 3

OBJECTIVES:
- To gain knowledge and practice the art, science and technology of digital cartography for designing, visualization and communication of Maps and other Cartographic products using computing and information technology.
- To gain skills in the use of cartographic and GIS software, algorithms and hardware.

UNIT I INTRODUCTION

UNIT II DATA CAPTURE AND REPRESENTATION

UNIT III DIGITAL MAP DESIGN

UNIT IV GEOVISUALIZATION

UNIT V DIGITAL MAP MODELING
Map generalization – geo-statistics in generalization, and quantitative mapping – digital classification – contiguity and hierarchy in mapping – map models

(L:45) TOTAL : 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand
- The concept of digital mapping and automated mapping
- The principles involved in data collection and cartographic design of digital maps
- The concepts of geovisualisation and map modelling
TEXTBOOKS:

REFERENCES:
3. Ruas, dnme,” Advances in Cartography and GI Science,” Vol 1,2011

GI8006 ENVIRONMENTAL GEOINFORMATICS L T P C
3 0 0 3

OBJECTIVE :
- The objective of this course is to expose the students to the applications of Remote Sensing and GIS for water quality assessment, soil degradation assessment and monitoring pollution.

UNIT I WATER AND THE ENVIRONMENT 9
Sources and demands of water - Characteristics of water- Point and non-point sources of water pollution - Spectral responses of clear and contaminated water - chlorophyll- Remote Sensing of Water quality assessment - Classification of water quality for various purposes, Sampling procedure, quality analysis, Data base creation and quality modeling using GIS. Database Creation and designing water supply network, sewerage network using GIS. Runoff estimation- flood prediction modeling.

UNIT II SOIL CONSERVATION AND MANAGEMENT 9

UNIT III ECOLOGY AND ECOSYSTEM 9

UNIT IV SENSORS AND DATA FOR ENVIRONMENTAL MONITORING 9
Sensors for environmental monitoring - sensors - LIDARS- LASER Remote Sensing -visible and outside visible wave length -absorption spectrometers - selection of ground truthsites-sea truth observation - Radar techniques for sensing ocean surface - thermal measurements- application of remote sensing for oil slicks mapping - Chlorophyll detection - Fisheries resources - Coastal marine studies - determination of temperature and sea state.
UNIT V: AIR POLLUTION AND GLOBAL CLIMATOLOGY


TOTAL: 45 PERIODS

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 of various remote sensing sensors for acquiring environmental datasets
- The use of satellite remote sensing in climatology and air pollution studies

TEXTBOOKS:

REFERENCE:

GI8007 ERROR ANALYSIS AND DATA SECURITY L T P C 3 0 0 3

OBJECTIVES:
- To provide knowledge of uncertainty in handling geospatial data. Uncertainty exists in terms of data capture, positional accuracy, surface modeling and spatial modeling.
- To familiarize errors due to uncertainty and also mathematical foundations of errors including quality control

UNIT I: UNCERTAINTY
Concept of uncertainty – concept of error – dimension of global data - Spatial data quality - Measurement of uncertainty – Spatial data capture uncertainty - uncertainty in Spatial Analysis

UNIT II: MATHEMATICAL FOUNDATIONS
Geo Statistical Data and Lattice – Probability and Distribution function - shafier themes of evidence for spatial data – fuzzy logic – rough sets - information theory and entrophy

UNIT III: POSITIONAL AND ATTRIBUTE UNCERTAINTY

UNIT IV: UNCERTAINTIES IN SPATIAL MODELLING AND SPATIAL ANALYSIS

UNIT V: QUALITY CONTROL AND SECURITY

TOTAL: 45 PERIODS

75
OUTCOMES: At the end of the course the student will be able to understand
- The concepts of error, uncertainty and their measurement
- Mathematics basics required for quantification of uncertainty in mapping and modeling
- Concept of quality control procedures for spatial data quality and security

TEXTBOOKS:

REFERENCES:
1. An Introduction to Error analysis ; the study of uncertainty in physical measurements by John Robert Taylor, 2nd edition

GI8008 GEOINFORMATICS FOR CLIMATIC CHANGE STUDIES L T P C
3 0 0 3

OBJECTIVES:
- To address the climate as dynamical systems is the main objective of the course.
- To focus both historical, archaeological and anthropogenic evidences of climatic change.
- Special emphasis is given for hazard assessment and climatic change models

UNIT I BASICS OF CLIMATIC CHANGE

UNIT II THROPOGENIC IMPACTS
Anthropogenic impacts- agriculture and impacts - industries and pollutions – urbanization – vehicles, transport and fossil fuels - chemicals, synthetics, solid wastes and gas outputs – municipal wastes

UNIT III CHANGE ASSESSMENT

UNIT IV CHANGE HAZARDS

UNIT V CLIMATE CHANGE MODELS
Climate change Models – RCM –GCM-Ozone depletion – greenhouse gas carbon-sequestration-IPCC and Indian scenario

(L:45) TOTAL: 45 PERIODS
OUTCOMES: At the end of the course the student will be able to understand
- The concepts of climate change and effects of anthropogenic impacts
- The methods for analysis of climate change and corresponding hazards
- The methods and models available for prediction of future scenarios

TEXTBOOKS:
2. Jane McAdam, “Climate change and Displacement Multi disciplinary Perspectives” 2010

REFERENCES:
2. Heidi Cullen, The weather of the future; heat waves, extreme storms, and other scenes from a climate changed planet.
3. Stephen H Schneider, “Science as a contact sport inside the battle to save earth’s climate.
4. James Hoggan, Climate cover up; the crusate to Deny global warming.

GI8009 GEOINFORMATICS FOR HYDROLOGY AND WATER RESOURCES ENGINEERING

OBJECTIVE:
- To impart knowledge in various applications of hydrology and water resources using Geomatic technology.

UNIT I  HYDROLOGIC COMPONENTS

UNIT II  SURFACE WATER MODELLING

UNIT III  RISK AND DAMAGE ASSESSMENT

UNIT IV  GROUND WATER MODELLING
Origin – classification and properties of aquifer – ground water potential identification – surface indicators – aquifer parameters – hydrologic budgeting – different types of ground water models – mathematical modelling of ground water system - seawater intrusion – interfacing GIS with ground water model - artificial recharge of ground water

UNIT V  IRRIGATION AND WATERSHED MANAGEMENT

(L:45) TOTAL : 45 PERIODS
OUTCOMES: At the end of the course the student will be able to understand
- The components of hydrologic system and their measurement through remote sensing systems
- The techniques useful for assessment of Risk and Damage due to water related disasters using remote sensing and GIS
- The modeling tools for ground water flow modeling. Assess the irrigation water requirement and watershed management through intervention of remote sensing and GIS tools

TEXTBOOKS:
1. Dr. David Maidment and Dr. Dean Djokic, Hydologic and hydraulic modeling support with GIS, ESRI press New York - 2000.

REFERENCES:
2. Michael Good child, Bradley O parks, Louis T Steyart 1993 " Environmental modeling with GIS

GI8010 GEOINFORMATICS FOR OCEAN ENGINEERING AND COASTAL ZONE MANAGEMENT

OBJECTIVE
- To familiarize the students about the basics and Geomatic applications in the field of ocean Engineering and Coastal Management

UNIT I OCEAN ENGINEERING

UNIT II OCEANOGRAPHY AND NUMERICAL MODELLING

UNIT III COASTAL DYNAMICS
Coastal Hydrodynamics - Estuarian dynamics – Hydrodynamics of pollution dispersion – Modelling of suspended sediments – Coastal erosion – Shore line change dynamics – Coastal protection works – Design of Breakwater

UNIT IV GEOMATIC OCEANOGRAPHY
UNIT V  COSTAL ZONE MANAGEMENT


TOTAL : 45 PERIODS

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

- The basics of Ocean processes and characteristics of Ocean parameters
- The concepts of ocean dynamics and design of appropriate structures
- The use of remote sensing sensors for mapping and modeling oceanic processes and Coastal Zone management

TEXTBOOKS:

REFERENCES:

GI8011  GEOINFORMATICS FOR RISK MANAGEMENT  L T P C
3 0 0 3

OBJECTIVE:
- To introduce the concept of Risk Management and to analyse the role of Geoinformatics in risk management.

UNIT I  NATURAL HAZARDS

UNIT II  GEOMATIC DATA SOURCES
Need for Geographic Information – Multi-Scale Requirements for hazard analysis - Temporal data: Temporal Resolution Requirement – Off-nadir capability of various sensors – Spatial Resolution Requirement: Optical and Micorwave spectrum suitability for various hazards – Global Mapping Agencies of hazards

UNIT III  HAZARD MODELLING
UNIT IV  RISK ANALYSIS

UNIT V  RISK MANAGEMENT

OUTCOMES: At the end of the course the student will be able to understand
- Concepts of Risk, Hazard and various types of hazards
- Characteristics of remote sensing tools for hazard mapping and modeling
- Applications of remote sensing in Risk Analysis and Management

TEXTBOOKS:
1. John C. Pine, Natural Hazards Analysis, CRC Press, 2005

REFERENCE:

GI8012 HEALTH GIS L T P C 3 0 0 3

OBJECTIVES:
- The course is on geospatial analysis methods in health and to the kinds of problems for which these methods are appropriate. The course is appropriate as an elective for those who may have no background in human sciences but who have fair knowledge in RS and GIS and interested in questions of the health of populations in geographic context.

UNIT I  MAPPING DISEASE ECOLOGY
Disease types and causes — environmental and social factors — genetic and chronic aspects — gender and occupational bias — time and space factors in disease distribution — life cycle, statistical curves and modelling — hazards, disasters, accidents and health.

UNIT II  GEOSPATIAL DATA FRAMEWORK
Disease records and georeferencing — birth, movements and permanency — individuals, families and communities - problems of address coding and digitization — the privacy of records — risk and vulnerability — short term and long term trends — resurgence — historical records and reliability.

UNIT III  DISEASE MAPPING
Spatial patterns of disease — mapping causal factors - endemic and epidemic zonation - tests for spatial clustering and fragmentation - applications of RS and GIS in disease mapping — deterministic stochastic and uncertainty models -vulnerability and comforts.
UNIT IV LOCATION AND ALLOCATION STRATEGIES 9
Location of health centres and service areas — P-median scenarios — Network analysis and services — emergency services and alternative locations - the allocation of health resources — allocation of service areas and optimality — services and marginal people - improving access to socioeconomic and geographical contexts.

UNIT V HEALTH AND WEB-GIS 9
Sharing disease data and web — ontology requirements and applications - open source service environments - methods of XML aid OGC services — web map context, services and processing (WMS, WMC and VVPS) — web service quality and SDI

OUTCOMES: At the end of the course the student will be able to understand
- Techniques used for disease ecology mapping and disease mapping
- The usefulness of GIS for location allocation of health resources
- The tools for development of Health GIS systems

TEXTBOOKS :

REFERENCES:
2. GIS in Public Health Practice
3. GIS for Health and the environments: Development in Asia Pacific Region-Pom C Lai, Ann S.H Mak.
4. GIS and Health – Anthony C Gatrell- European Science Foundation

GI8013 INFORMATION AND COMMUNICATION TECHNOLOGY L T P C
3 0 0 3

OBJECTIVE:
- The course introduces concepts and basics of Information and Communication Technology (ICT) and its application in front line areas like education, agriculture, public health and disaster management.

UNIT I OVERVIEW OF INFORMATION AND COMMUNICATION SYSTEMS 9
UNIT II INFORMATION MANAGEMENT 9

UNIT III INFORMATION PROCESS AND DOCUMENTATION 9
Scientific reasoning and data analysis – interpretation and structuring – Tools and techniques in Text, Tabular and Graphic documentation - Tools and techniques in Maps, pictures and images – Internet and web tools and standards for documentation – Compression and transfer management.

UNIT IV VISUALIZATION AND OUTPUT 9
Videos and Computer visualization - WAP and Mobile tools and limits – Projection systems and visualization – output formats, printing, plotting and soft copies – constraints and limits of media

UNIT V ICT IN PROBLEM SOLVING AND DECISION MAKING 9
Application in School and higher Education – Social Networking – Use of UML, ER and other charting methods in Problem analysis and process designs – ICT in Utility services, WEB GIS agriculture, public health and disaster management.

TOTAL : 45 PERIODS

OUTCOMES:
- The student will have adequate knowledge on various communication systems so as to apply the knowledge for various fields such as Education, Agriculture, Public health and disaster management for dissemination of information to the public for management and preparedness.

TEXT BOOKS:

REFERENCES:
2. Fabrice Pany, Information Sciences, John Wiley & Sons, 2010

GI8014 LOCATION BASED SERVICES L T P C
3 0 0 3

OBJECTIVE :
- To impart knowledge to design and develop next generation Location based information systems involving mobile devices

UNIT I INTRODUCTION 9
Introduction - Evolution of Location Based Services - Application Areas of Location Based Services - Application Taxonomy – LBS Privacy – LBS Markets and Customer Segments
UNIT II PLATFORM AND ARCHITECTURE

LBS Components - Data Capture and Collection – LBS Middleware Standards (Open, GML, KML) – Mobile Platform Technologies for LBS

UNIT III DATA AND VISUALIZATION TOOLS

LBS Data – Crowd Sourcing and Openstreet Maps, Google Earth, Google Maps, Bing Maps – Content Distribution formats – GeoJSON, GeoRSS, KML - Generating KML’s Dynamically

UNIT IV CASE STUDY

Develop a real time case study on Location Based Services using the above concepts learned and submit a working application along with the presentation

(L:45) TOTAL: 45 PERIODS

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

- The concepts of Location Based Services and their architecture
- The tools available for data and visualization of LBS
- The methodology involved in developing a LBS in real time case study.

TEXTBOOKS:

1. Location-Based Services – Jochen Schiller & Agnes Voisard – Morgan Kaufmann Publishers-
2. Location-Aware Applications - Richard Ferraro & Murat Aktihanoglu

REFERENCES:


GI8015 PLANETARY REMOTE SENSING L T P C 3 0 0 3

OBJECTIVES:

- To provide an insight to the field of planetary science
- To enlighten the student on modern techniques available for remote sensing of planetary surfaces.

UNIT I FUNDAMENTALS AND EXPLORATION OF PLANETARY SURFACES


UNIT II ATMOSPHERIC RADIATION AND OBSERVATIONAL PLANETARY ASTRONOMY AND REMOTE SENSING

Theory of atmospheric radiative transfer processes - methods of solving the atmospheric equations - applications to problems in radiative transfer - remote sensing from the ground and from space - solutions to the “inverse” problem. Techniques and instrumentation used in observational astronomy-design of modern telescopes- optical configurations – detectors – statistics - spectrometers - spacecraft instrumentation-UV, optical, infrared, sub-millimeter and radar techniques;
UNIT III PLANETARY GEOLOGY AND CLIMATE

UNIT IV SPECTROSCOPY OF PLANETARY SURFACES (VISIBLE/IR)

UNIT V RADAR REMOTE SENSING OF PLANETARY SURFACES
Introduction- terminologies and Properties- Roughness and Dielectric Constant-Data Collection and Analysis, Planetary RADAR Studies-Moon, Mercury, Asteroids, Mars, Venus- RADAR Data-Surface properties-Scattering Models.

OUTCOME:
- At the end of course the students have
- Exposure to fundamentals of planetary surface and orbital mechanics.
- Understanding of principles and methods for planetary observations.
- Knowledge on Geology and Climate of various planets.
- Knowledge of remote sensing methods for mapping of planetary surfaces

TOTAL: 45 PERIODS

TEXTBOOKS:
1. Lecture notes on the formation and early evolution of planetary systems by Philip J. Armitage - arXiv, 2010

REFERENCES:
1. Radar Remote sensing of Planetary surfaces Bruce A.Campbell, Cambridge University Press, Publisher Date: 19 May 2011
OBJECTIVES:
1. To introduce the basic concepts of Remote Sensing of atmosphere and satellite meteorology.
2. To gain the knowledge on meteorological applications in weather forecasting aviation and trade applications.
3. To familiarize the Indian Meteorological satellites and sensors.

UNIT I   BASICS

UNIT II   WEATHER SATELLITES AND SENSING SYSTEMS
Weather Satellites and Sensing Systems — Orbit Types and Altitudes — View Angle and Implications — INSAT and KALPANA — TRMM and GPM — American and European Missions

UNIT III   DATA RECORDS AND APPLICATIONS

UNIT IV   METEOROLOGICAL APPLICATIONS
Meteorological Applications — Oceanographic Applications — Weather Forecasting — Aviation Meteorology — Agriculture and Irrigation Management — Meteorology in Transportation Industry — Business and Trade Application

UNIT V   MANAGEMENT AND MONITORING

OUTCOMES: At the end of the course the student will be able to understand
- Concepts of satellite meteorology and satellite sensors useful for the same
- The applications of meteorological studies in resource management, disaster management

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To develop an understanding of the issues and challenges in the field of transportation engineering.
- To understand the utility of Remote sensing and GIS for solving transportation engineering problems.

UNIT I ENGINEERING SURVEYS AND GEOMETRIC DESIGN
Roadways and railways — development — necessity for planning — classification of roads and railways — Alignment surveys and investigations using conventional and remote sensing techniques (preliminary, reconnaissance and final location surveys) — Design principles of highway geometric elements

UNIT II URBAN TRANSPORTATION SYSTEMS AND PLANNING
Urban transportation: policy alternatives — Transportation and the environment — Urban transport planning processes — Socio-demographic data and travel surveys — Transportation modeling — Traffic congestion — Plan evaluation and implementation — Planning and financing — Critiques of transportation modeling and forecasting

UNIT III REMOTE SENSING IN TRANSPORTATION
Study of geographic pattern of urban development using remote sensing data products — urban sprawl — parking studies using aerial photos — traffic analysis — accident analysis — sites suitability analysis for transport infrastructure — population distribution studies — improvisation of rural road network — regional road network connectivity — vehicle tracking — incident identification and management.

UNIT IV GIS AND TRANSPORTATION ANALYSIS
Transportation analysis in GIS: Introduction — network flows — shortest path algorithms — transportation databases: creation and maintenance — facility location — vehicle routing — highway and railway alignment — highway maintenance

UNIT V MODELLING AND INTELLIGENT TRANSPORTATION SYSTEMS (ITS)
Modelling land use transport interaction — ITS development — architecture — integration with GIS — applications — case studies.

OUTCOMES: At the end of the course the student will be able to understand
- Applications of remote sensing in alignment planning and geometric analysis
- The applications of remote sensing in transportation systems analysis and planning
- Tools for modeling of land use transport interaction, ITS architecture

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To impart knowledge to the students to understand role of Geoinformatics Technology for Urban planning and Management

UNIT I  FUNDAMENTALS


UNIT II  URBAN MAPPING


UNIT III  URBAN PLANNING


UNIT IV  URBAN ANALYSIS


UNIT V  URBAN MODELLING

Urban Growth Modelling - Planning Support Systems - Urban Environmental Monitoring and Modelling - 3D city Modelling – Case Studies

(L:45) TOTAL : 45 PERIODS

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

- The basics Urban mapping and Plan preparation
- The application of remote sensing in urban mapping
- The role of remote sensing in preparation of urban plans.
- The modeling techniques for modeling and prediction of future land use scenarios

TEXTBOOKS:


REFERENCES:

OBJECTIVE:
- This course enables the students to understand and apply remote sensing and GIS techniques in various fields of agriculture, soil, land and forest resources.

UNIT I CROPS 9

UNIT II SOILS 9

UNIT III LAND EVALUATION AND MANAGEMENT 9
Introduction - land use / land cover definition - land use / land cover classification-concepts and approaches of land evaluation - parametric methods - change detection in land uses - decision support system for land use planning - optimum land use planning for sustainable agriculture.

UNIT IV DAMAGE ASSESSMENT 9

UNIT V FORESTRY 9
Introduction - forest taxonomy - inventory of forests - forest type and density mapping-biomass assessment - timber volume estimation - factors for forest degradation-mapping degraded forests - deforestation and aforestation - forest fire mapping and damage assessment - sustainable development of forests.

(L:45) TOTAL : 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand
- Characterization of crops using Remote Sensing tools
- The concepts of soil mapping through remote sensing
- The evaluation of land capability for better land use planning

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I  HUMAN VALUES 10

UNIT II  ENGINEERING ETHICS 9

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV  SAFETY, RESPONSIBILITIES AND RIGHTS 9

UNIT V  GLOBAL ISSUES 8

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

TEXTBOOK :

REFERENCES:
OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I
INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II
APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III
INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV
DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.
UNIT V  DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

OUTCOMES:
The students will be able to

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

REFERENCES:
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005

GE 8073  HUMAN RIGHTS  L T P C
3 0 0 3

OBJECTIVES:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I  9

UNIT II  9

UNIT III  9
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV  9
Human Rights in India – Constitutional Provisions / Guarantees.
UNIT V

TOTAL : 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES: