PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

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

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

III. To provide an 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 (POs)

1. Graduates will acquire basic knowledge in B.E (Geoinformatics) and engineering.

2. Graduates will acquire the ability to model and development of application in Geospatial arena interprets and analyze data, and report results.

3. Graduates will acquire the ability to develop Geospatial system that meets desired specifications and requirements.

4. Graduates will acquire the ability to function on engineering and science laboratory teams, as well as on multidisciplinary problem solving teams.

5. Graduates will acquire the ability to identify, formulate and solve Geomatics related problems.

6. Graduates will acquire an understanding of their professional and ethical responsibilities.

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

8. Graduates will gain confidence to apply Geospatial techniques in global and societal contexts.

9. Graduates will be capable of self - education and clearly understand the value of lifelong learning.

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

11. 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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| | Satellite Image Processing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Open Elective I* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Soft Computing Techniques | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Professional Elective I | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Professional Elective II | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Geo Database Laboratory | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Satellite Image Processing Laboratory | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

| SEM 6 | Hydrology and Water Resources Engineering for Geoinformatics | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Open Source GIS | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Spatial Analysis and Applications | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Urban Geoinformatics | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Geodesy | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Professional Elective III | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Spatial Analysis and Applications Laboratory | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Survey Camp (2 Weeks – During V Semester) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Professional Communication | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SEM 7 | Agriculture and Forestry for Geoinformatics |  |  | ✓ | ✓ | ✓ | ✓ |
|       | Decision Support System for Resource Management | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
|       | Environmental Geoinformatics |  |  |  |  |  |  |
|       | Professional Elective IV |  |  |  |  |  |  |
|       | Open Elective II* |  |  |  |  |  |  |
|       | Open Elective III* |  |  |  |  |  |  |
|       | Industrial Training (4 weeks During VI Semester - Summer) |  |  |  |  |  |  |
|       | Technical Seminar | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| SEM 8 | Professional Elective V |  |  |  |  |  |  |
|       | Professional Elective VI |  |  |  |  |  |  |
|       | Project Work | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
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### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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### PROFESSIONAL ELECTIVE

#### SEMESTER V

**ELECTIVE – I**

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#### SEMESTER V

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#### SEMESTER VI

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### SEMESTER VIII
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OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I  SHARING INFORMATION RELATED TO ONESELF/FAMILY & FRIENDS  12
Reading- short comprehension passages, practice in skimming-scanning and predicting-
Writing- completing sentences- - developing hints. Listening- short texts- short form and
informal conversations. Speaking- introducing oneself - exchanging personal information-
Language development- Wh- Questions- asking and answering-yes or no questions- parts of

UNIT II  GENERAL READING AND FREE WRITING  12
Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice
questions and /or short questions/ open-ended questions)-inductive reading- short narratives
and descriptions from newspapers including dialogues and conversations (also used as short
Listening texts)- register Writing – paragraph writing- topic sentence- main ideas- free writing,
short narrative descriptions using some suggested vocabulary and structures –Listening-
telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking
leave- Language development – prepositions, conjunctions Vocabulary development-
guessing meanings of words in context.

UNIT III  GRAMMAR AND LANGUAGE DEVELOPMENT  12
Reading- short texts and longer passages (close reading) Writing- understanding text
structure- use of reference words and discourse markers-coherence-jumbled sentences
Listening – listening to longer texts and filling up the table- product description- narratives from
different sources. Speaking- asking about routine actions and expressing opinions. Language
development- degrees of comparison- pronouns- direct vs indirect questions- Vocabulary
development – single word substitutes- adverbs.

UNIT IV  READING AND LANGUAGE DEVELOPMENT  12
Reading- comprehension-reading longer texts- reading different types of texts- magazines
Writing- letter writing, informal or personal letters-e-mails-conventions of personal email-
Listening- listening to dialogues or conversations and completing exercises based on them.
Speaking- speaking about oneself- speaking about one’s friend- Language development-
Tenses- simple present-simple past- present continuous and past continuous- Vocabulary
development- synonyms-antonyms- phrasal verbs.

UNIT V  EXTENDED WRITING  12
Reading- longer texts- close reading –Writing- brainstorming -writing short essays –
developing an outline- identifying main and subordinate ideas- dialogue writing-Listening –
listening to talks- conversations- Speaking – participating in conversations- short group
conversations-Language development-modal verbs- present/ past perfect tense - Vocabulary
development-collocations- fixed and semi-fixed expressions

OUTCOMES: At the end of the course, learners will be able to:

- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends
  and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.
TEXT BOOKS:

REFERENCES
5. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book& Workbook) Cambridge University Press, New Delhi: 2005

MA8151 ENGINEERING MATHEMATICS – I  

OBJECTIVES:
- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS 12
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

UNIT III INTEGRAL CALCULUS 12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLE INTEGRALS 12

UNIT V DIFFERENTIAL EQUATIONS 12

TOTAL : 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following skills:
- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
• Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
• Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
• Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
• Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
• Apply various techniques in solving differential equations.

TEXT BOOKS:
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:
UNIT IV  QUANTUM PHYSICS

UNIT V  CRYSTAL PHYSICS
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

REFERENCES:

CY8151  ENGINEERING CHEMISTRY

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
UNIT I  WATER AND ITS TREATMENT  9

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III  ALLOYS AND PHASE RULE  9

UNIT IV  FUELS AND COMBUSTION  9

UNIT V  ENERGY SOURCES AND STORAGE DEVICES  9
Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:
• The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:
REFERENCES:

GE8151                      PROBLEM SOLVING AND PYTHON PROGRAMMING                          L T P C
                                                                 3 0 0 3

OBJECTIVES:
- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I                ALGORITHMIC PROBLEM SOLVING                              9
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II               DATA, EXPRESSIONS, STATEMENTS                              9
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III              CONTROL FLOW, FUNCTIONS                                    9
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV               LISTS, TUPLES, DICTIONARIES                                   9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V                FILES, MODULES, PACKAGES                                    9
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
• Represent compound data using Python lists, tuples, dictionaries.
• Read and write data from/to files in Python Programs.

TEXT BOOKS:

REFERENCES:

GE8152 ENGINEERING GRAPHICS

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) 1
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 FREEHAND SKETCHING 7+12
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12
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 traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
UNIT III  PROJECTION OF SOLIDS  5+12
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.

UNIT IV  PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF 
SURFACES 5+12
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.

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  6+12
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 - Perspective projection of simple solids-Prisms, pyramids and cylinders by 
visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of 
  objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

REFERENCES:
   Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, 
   introduction to Interactive Computer Graphics for Design and Production, Eastern 
   Delhi, 2015.

Publication of Bureau of Indian Standards:
   sheets.

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.
GE8161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

OBJECTIVES:
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS
1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton’s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

BS8161 PHYSICS AND CHEMISTRY LABORATORY (Common to all branches of B.E. / B.Tech Programmes)

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)
1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young’s modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
• apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

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 viscometry.
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.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

TOTAL: 30 PERIODS

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

TEXTBOOKS:
UNIT I  INTRODUCTION TECHNICAL ENGLISH  12
Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- Speaking – Asking for and giving directions- Reading – reading short technical texts from journals- Newspapers- Writing- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations
Vocabulary Development- technical vocabulary
Language Development – subject verb agreement - compound words.

UNIT II  READING AND STUDY SKILLS  12
Listening- Listening to longer technical talks and completing exercises based on them-Speaking – describing a process-Reading – reading longer technical texts- identifying the various transitions in a text- paragraping- Writing- interpreting charts, graphs- Vocabulary Development- vocabulary used in formal letters/emails and reports
Language Development- impersonal passive voice, numerical adjectives.

UNIT III  TECHNICAL WRITING AND GRAMMAR  12
Listening- Listening to classroom lectures/ talks on engineering/technology-Speaking – introduction to technical presentations- Reading – longer texts both general and technical, practice in speed reading; Writing- Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words.
Language Development- embedded sentences

UNIT IV  REPORT WRITING  12
Language Development- clauses- if conditionals.

UNIT V  GROUP DISCUSSION AND JOB APPLICATIONS  12
Listening- TED/Ink talks; Speaking – participating in a group discussion -Reading– reading and understanding technical articles Writing – Writing reports- minutes of a meeting- accident and survey- Vocabulary Development- verbal analogies Language Development- reported speech

TOTAL : 60 PERIODS

OUTCOMES:
At the end of the course learners will be able to:
- Read technical texts and write area-specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

REFERENCES:

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.
OBJECTIVES:
- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES

UNIT II VECTOR CALCULUS
Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, $cz$, $\frac{1}{z}$, $z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION

UNIT V LAPLACE TRANSFORMS

TOTAL: 60 PERIODS

OUTCOMES:
After successfully completing the course, the student will have a good understanding of the following topics and their applications:
- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green’s theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS:
REFERENCES:

PH8202 PHYSICS FOR GEOINFORMATICS ENGINEERING

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

UNIT III OPTICS FOR REMOTE SENSING

UNIT IV GRAVITATION AND SATELLITES
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 and rotation of the earth – Refraction. Diffraction - Fresnel theory, Polarisation, double refraction - Escape velocity - Kepler's law of planetary motion - Doppler effect - Orbital Mechanics, Concept of orbits- propulsion, aero dynamics, navigation guidance and control. 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

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course,
- the students will have knowledge on electromagnetic radiation,
- the students will acquire knowledge on interaction of electromagnetic radiation with matter and its applications in radar,
- the students will get knowledge on geometrical optics and its applications in remote sensing,
- the students will gain knowledge on the importance of gravitation and types of satellites for different applications, and
- the students will understand the basics of optical devices and their applications in optoelectronics.

TEXT BOOKS:

REFERENCES:
UNIT III  FET AND POWER ELECTRONIC DEVICES 9
FET – Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV  SIGNAL GENERATORS AND LINEAR ICS 9

UNIT V  DIGITAL ELECTRONICS 9
Boolean algebra, Logic Gates, , Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

OUTCOMES:
• Ability to identify electronics components and use of them to design circuits.

TEXT BOOK:

REFERENCES:
UNIT III NETWORKS AND COMMUNICATION

UNIT IV WEB SCRIPTING
Browser fundamentals - Types of servers - web site essentials - Introduction to Scripting languages - Types of scripting languages - Flow Control and Looping - online data handling - Cookies - Simple scripts for database integration - introduction to PHP and MYSQL.

UNIT V GEOINFORMATION

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Understand Computer systems and data formats
- Understand basics of Geoinformation
- Understand the role of complex network systems that handles Geo-information.
- Understand scripting languages and database.

TEXT BOOKS:

REFERENCES:

GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING
OBJECTIVES:
- To study the nature and 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

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 – hot-spots 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

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 – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES

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


UNIT V HUMAN POPULATION AND THE ENVIRONMENT


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 issues is at an infant stage.
- Ignorance and incomplete knowledge have led to misconceptions.
- Development and improvement in standards of living have led to serious environmental disasters.

**TEXTBOOKS:**

**REFERENCES:**

**GE8261 ENGINEERING PRACTICES LABORATORY**

**OBJECTIVES:**
To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP A (CIVIL & MECHANICAL)**

**I CIVIL ENGINEERING PRACTICE**

**Buildings:**
(a) Study of plumbing and carpentry components of residential and industrial buildings.
   Safety aspects.

**Plumbing Works:**
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
   Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

**Carpentry using Power Tools only:**
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
   Wood work, joints by sawing, planing and cutting.

**II MECHANICAL ENGINEERING PRACTICE**

**Welding:**
(a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.
(b) Gas welding practice

**Basic Machining:**
(a) Simple Turning and Taper turning
(b) Drilling Practice
Sheet Metal Work:
(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

Machine assembly practice:
(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example –
Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in
RLC circuit.
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding
measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose
PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
• fabricate carpentry components and pipe connections including plumbing works.
• use welding equipments to join the structures.
• Carry out the basic machining operations
• Make the models using sheet metal works
• Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and
• fittings
• Carry out basic home electrical works and appliances
• Measure the electrical quantities
• Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL
1. Assorted components for plumbing consisting of metallic pipes,
plastic pipes, flexible pipes, couplings, unions, elbows, plugs and
other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
(a) Rotary Hammer 2 Nos
(b) Demolition Hammer 2 Nos
(c) Circular Saw 2 Nos
(d) Planer                      2 Nos
(e) Hand Drilling Machine      2 Nos
(f) Jigsaw                     2 Nos

**MECHANICAL**
1. Arc welding transformer with cables and holders                      5 Nos.
2. Welding booth with exhaust facility                               5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.  5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.       2 Nos.
5. Centre lathe                                                   2 Nos.
6. Hearth furnace, anvil and smithy tools                           2 Sets.
7. Moulding table, foundry tools                                    2 Sets.
8. Power Tool: Angle Grinder                                        2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner        One each.

**ELECTRICAL**
1. Assorted electrical components for house wiring                  15 Sets
2. Electrical measuring instruments                                    10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V)                                              1 No.
5. Power Tools: (a) Range Finder                                    2 Nos
    (b) Digital Live-wire detector                                   2 Nos

**ELECTRONICS**
1. Soldering guns                                                   10 Nos.
2. Assorted electronic components for making circuits                50 Nos.
3. Small PCBs                                                      10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

GI8211  INTRODUCTION TO MATLAB

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**OBJECTIVES:**
The student should be made to:
- Be familiar with the MATLAB GUI and basic tool boxes
- Be exposed to vector and matrix operations
- Be familiar with arithmetic, logical and relational operations on matrix

**LIST OF EXPERIMENTS:**
1. Introduction to SDK of MATLAB
2. Basic Syntax and scalar arithmetic operations and calculations
3. Working with formulas
4. Arithmetic operations in matrix data
5. Matrix operations (Inverse, Transpose)
6. Reading an image file
7. Reading from and writing to a text file
8. Introduction to toolboxes
9. Data visualization and plotting
10. Relational operators in data
11. Logical operation in data
12. Loops in MATLAB
13. Computing Eigen value for a matrix
14. Random number generation - Montecarlo methods

TOTAL: 60 PERIODS

OUTCOMES:
Students will be able to
- Perform data handling in MATLAB environment
- Solve simple matrix problems
- Use built-in toolboxes

REFERENCES:

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<tr>
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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

MA8301 TRANSFORMS AND STATISTICS

OBJECTIVES:
- To acquaint the student with Fourier Series techniques used in wide variety of situations in which the functions used are not periodic and to solve boundary value problems
- To understand the Fourier transform techniques to solve boundary value problems
- To introduce the concept of Probability and random variables in Statistics which is central to many geometric applications.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.

UNIT I FOURIER SERIES 12
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 12

UNIT III RANDOM VARIABLES 12
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT IV TWO-DIMENSIONAL RANDOM VARIABLES 12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).
UNIT V

TESTS OF SIGNIFICANCE


TOTAL : 60 PERIODS

OUTCOMES:
Upon successful completion of the course, students should be able to:

- Apply Fourier series techniques used in wide variety of situations in which the functions used are not periodic and to solve boundary value problems
- Apply the Fourier transform techniques to solve boundary value problems
- To understand and apply the concept of Probability and random variables in Statistics which is central to many geometric applications.
- To apply the basic concepts of two dimensional random variables.
- To understand the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems

TEXTBOOKS:

REFERENCES:

GI8301

CARTOGRAPHY AND GIS CONCEPTS

OBJECTIVES:
- To introduce concepts of Cartography and GIS
- To expose the process of map making and production
- To introduce GIS data structures, data input and data presentation

UNIT I

ELEMENTS OF CARTOGRAPHY

Definition of Cartography - Maps - functions - uses — Types of Maps – Map Scales and Contents – Map projections – shape, distance, area and direction properties – perspective and mathematical projections – Indian maps and projections – Map co-ordinate systems – UTM and UPS references
UNIT II  MAP DESIGN AND PRODUCTION  9
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 - map production – map printing– colours and visualization – map
reproduction - Map generalization - geometric transformations – bilinear and affine
transformations

UNIT III  FUNDAMENTALS OF GIS  9
Introduction to GIS - Definitions – History of GIS - Components of a GIS – Hardware, Software,
Data, People, Methods – Introduction to data quality -Types of data – Spatial, Attribute data- types
of attributes – scales/ levels of measurements - spatial data models – Raster Data Structures –
Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data
models.

UNIT IV  DATA INPUT AND TOPOLOGY  9
Scanner - Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input
–Digitiser – Datum Projection and reprojecton -Coordinate Transformation – Topology -
Adjacency, connectivity and containment – Topological Consistency – Non topological file
formats - Attribute Data linking – Linking External Databases – GPS Data Integration - Raster to
Vector and Vector to Raster Conversion

UNIT V  DATA QUALITY AND OUTPUT  9
Assessment of Data quality - Basic aspects - completeness, logical consistency, positional
accuracy, temporal accuracy, thematic accuracy and lineage – Metadata – GIS Standards –
Interoperability - OGC - Spatial Data Infrastructure - -Data Output - Map Compilation –
Chart/Graphs – v

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student shall
- Be familiar with appropriate map projection and co-ordinate system for production of
  Maps and shall be able to compile and design maps for the required purpose.
- Be familiar with co-ordinate and datum transformations
- Understand the basic concepts and components of GIS, the techniques used for storage of
  spatial data and data compression
- Understand the concepts of spatial data quality and data standard

TEXTBOOKS:

REFERENCES:
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  6+6
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  6+6
Introduction to C++ - Keywords, Identifiers- Data types- Variables – Operators-Operator Overloading- Operator Precedence- Control Statements-Functions - Call by Reference - Arguments - Function Overloading – Exercises

UNIT III  CLASSES AND OBJECTS  6+6
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  6+6

UNIT V  SCRIPTS AND OOP  6+6

TOTAL : 60 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:
OBJECTIVES:
- To introduce the concepts of remote sensing processes and its components.
- To expose the various remote sensing platforms and sensors and to introduce the elements of data interpretation.

UNIT I  REMOTE SENSING AND ELECTROMAGNETIC RADIATION  9

UNIT II  EMR INTERACTION WITH ATMOSPHERE  9
Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere - Scattering (Rayleigh, Mie, non-selective scattering) absorption and refraction – Atmospheric effects on visible, infrared, thermal and microwave spectrum – Atmospheric windows.

UNIT III  EMR INTERACTION WITH EARTH MATERIAL  9

UNIT IV  PLATFORMS AND SENSORS  9

UNIT V  DATA PRODUCTS AND VISUAL INTERPRETATION  9

TOTAL: 45 PERIODS

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 elements of data interpretation

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the rudiments of plane surveying and geodetic principles to Geoinformatics Engineers.
- To learn the various methods of plane and geodetic surveying to solve the real world problems.
- To introduce the concepts of Control Surveying
- To introduce the basics of Astronomical Surveying

UNIT I  FUNDAMENTALS OF CONVENTIONAL SURVEYING  12
Definition - Classifications - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Chain traversing - Compass – Basic principles - Types - Bearing - System and conversions- Sources of errors and Local attraction - Magnetic declination-Dip-compass traversing - Plane table and its accessories - Merits and demerits - Radiation – Intersection - Resection – Plane table traversing.

UNIT II  LEVELLING  12

UNIT III  THEODOLITE SURVEYING  12
Horizontal and vertical angle measurements - Temporary and permanent adjustments – Heights and distances─Tacheometric surveying – Trigonometric levelling – Horizontal curves in route surveying – classification, functions and requirements - methods of setting out simple curves - setting out transition curves by offsets and angles

UNIT IV  CONTROL SURVEYING AND ADJUSTMENT  12

UNIT V  ASTRONOMICAL SURVEYING  12
Astronomical terms and definitions - Motion of sun and stars - Celestial coordinate systems – different time systems - Nautical Almanac - 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
- The use of various surveying instruments in mapping
- The error and adjustments procedures associated with surveying and mapping
- The methods used for establishment of horizontal and vertical control
- Concepts of astronomical surveying and methods to determine time, longitude, latitude and azimuth

TEXTBOOKS:
REFERENCES:

EC8491 COMMUNICATION THEORY

OBJECTIVES:
- To introduce the concepts of various analog modulations and their spectral characteristics
- To understand the properties of random process
- To know the effect of noise on communication systems
- To study the limits set by Information Theory

UNIT I AMPLITUDE MODULATION

UNIT II ANGLE MODULATION

UNIT III RANDOM PROCESS

UNIT IV NOISE CHARACTERIZATION
Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase – Noise performance analysis in AM & FM systems – Threshold effect, Pre-emphasis and de-emphasis for FM.

UNIT V SAMPLING & QUANTIZATION
Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM.

OUTCOMES:
At the end of the course, the student should be able to:
- Design AM communication systems
- Design Angle modulated communication systems
- Apply the concepts of Random Process to the design of Communication systems
- Analyze the noise performance of AM and FM systems
- Gain knowledge in sampling and quantization
TEXTBOOKS:

REFERENCES
5. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006

GI8311 PLANE AND GEODETIC SURVEYING LABORATORY

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

EXCERCISES : 4 hours each
1. Chain traversing
2. Compass traversing
3. Plane table surveying – Method of intersection
4. Plane table surveying – Three point problem(any one method)
5. Plane table surveying – Two point problem
6. Plane table traversing
7. Fly leveling using dumpy/tilting level
8. Check leveling using dumpy/tilting level
10. Determination of tacheometric constants using horizontal and inclined line of sight.
11. To determine the elevation of an object using single plane method when base is accessible and inaccessible
12. To determine the distance and difference in elevation between two inaccessible points using double plane method.
13. Heights and distances by stadia and tangential tacheometry
14. Theodolite traversing
15. Extra meridian observation to determine azimuth (Demonstration only).

TOTAL: 60 PERIODS

OUTCOME:
- At the end of the course the student will be able to use various surveying instruments like chain, compass, plane table, level and theodolite for mapping.

REFERENCES:

INSTRUMENTS REQUIRED FOR A BATCH OF 30
1. Metric Chain – 15 Nos.
2. Cross Staff – 15 Nos.
3. Metallic tape (30 m length) – 15 Nos.
4. Steel arrows – 150 Nos.
5. Prismatic Compass – 15 Nos.
8. Tilting level – 15 Nos.

GI8312 CARTOGRAPHY AND GIS LABORATORY

OBJECTIVES:
- Hands on experience of basics of cartography and GIS.
- Designing the map
- Development of GIS database and populating attributes data

EXERCISES:
1. Simple conical, cylindrical and planner projection for a reduced earth (2 to 4cm reduced earth) – aspect and secant demo.
2. Graded symbolization and isopleth / choropleth map
3. Map compilation and Design
4. Data Input – Onscreen Digitisation – Creation of Point, Line and Polygon layers
5. Projection, Reprojection and Coordinate Transformation of Maps
6. Attribute data input and Measurement of Distance, Area
7. Linking External Database and Tabular Data Analysis using SQL commands
8. Generating Graphs, Charts and Diagrams from Tabular data
9. Data Conversion – Vector to Raster and Raster to Vector
10. Map Joining, Edge Matching and Layout Design

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course the student will be able to
- To design and produce thematic maps with suitable projection, symbols and color codes
- To compile and develop digital maps
- To create spatial database and nonspatial databases in GIS environment
- To analyse spatial database and generate reports, maps
REFERENCES:

LIST OF EQUIPMENTS:
1. i7 computer system with minimum 4GB RAM, 500GB HDD - 15 nos for 30 students
2. Standard GIS Software - 15 user licenses
3. Two students can be allotted per system per session.

HS8381 INTERPERSONAL SKILLS/LISTENING AND SPEAKING

OBJECTIVES:
The Course will enable learners to:
• Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
• Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
• improve general and academic listening skills
• Make effective presentations.

UNIT I
Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II
Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV
Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V
Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL :30 PERIODS
OUTCOMES:
At the end of the course Learners will be able to:
Listen and respond appropriately.
Participate in group discussions
Make effective presentations
Participate confidently and appropriately in conversations both formal and informal

TEXTBOOKS:

REFERENCES:

MA8401 NUMERICAL METHODS AND GRAPH THEORY L T P C
4 0 0 4

OBJECTIVES:
• To introduce the basic concepts of solving algebraic and transcendental equations.
• To introduce the numerical techniques of interpolation in various intervals in real life situations.
• To acquaint the student with understanding of numerical techniques of empirical laws and curve fitting which play an important role in engineering and technology disciplines.
• To introduce basic concepts of graph theory to apply in engineering disciplines.
• To understand some algorithms to apply in engineering applications.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

UNIT II INTERPOLATION AND APPROXIMATION 12
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 EMPIRICAL LAWS AND CURVE-FITTING 12

UNIT IV INTRODUCTION TO GRAPH THEORY 12
Definition and examples of graphs - Subgraphs - Complement of a graph - Matrix representation of a graph - Graph isomorphism - Paths and cycles in graph - Euler trails and circuits - Hamilton paths and cycles - Definition and example of trees.
OUTCOMES:
Upon successful completion of the course, students should be able to:
- Apply the basic concepts of solving algebraic and transcendental equations.
- Apply the numerical techniques of interpolation in various intervals in real life situations.
- Understand the numerical techniques of empirical laws and curve fitting which play an important role in engineering and technology disciplines.
- Apply the basic concepts of graph theory in engineering disciplines.
- Appreciate the importance of some algorithms in applying in engineering applications.

TEXTBOOKS:

REFERENCES:

OBJECTIVES:
- To make the students realize the importance of Geology in understanding Geoinformatics.
- To familiarize the students about the various mineral and fuel resources and natural hazards.

UNIT I THE SOLID EARTH AND STRUCTURAL GEOLOGY
Scope and branches of Geology - Relevance to Geoinformatics - Geology for natural resources inventory - Interior of the Earth - Plate Tectonics - Introduction to geological structures.

UNIT II MINERALOGY AND PETROLOGY
Important rock forming minerals – physical properties and uses. Classification and description of rocks – Forms and mode of occurrence of rocks. Important ore forming minerals – physical properties and uses – Distribution of economic minerals in India. Geology of coal and Hydrocarbons.
UNIT III  GEOMORPHOLOGY  9
Geomorphic processes and Landforms – Classification and Description. Weathering; Drainage pattern and morphometry. Significance of Geomorphology in geo-resources exploration and natural hazard studies.

UNIT IV  GEOLOGIC HAZARDS  9

UNIT V  GEOPHYSICS AND REMOTE SENSING FOR GEOLOGY  9

TOTAL: 45 PERIODS

OUTCOMES:
By the end of the course the student will be able to understand the structure of earth and geological structures with following

- The importance of minerals, ores and rocks will be understood.
- The concepts of geomorphology and natural hazards will also be understood.
- The role of geophysics and remote sensing for natural resources inventory and to study and understand the planetary geology

TEXTBOOKS:

REFERENCES:

GI8402  ELEMENTS OF PHOTOGRAMMETRY  L T P C
4 0 0 4

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

UNIT I  PRINCIPLES AND PROPERTIES OF PHOTOGRAPHY  12
History - Definition, Applications - Types of Photographs, Classification - Photographic overlaps – Film-based Aerial Cameras – Construction - Camera accessories - Camera calibration - Digital Aerial cameras – Multiple frame and Line cameras - Linear array scanner - Flight Planning - Crab & Drift - Computation of flight plan - Basic horizontal and vertical control - Pre pointing and Post pointing.
UNIT II  GEOMETRIC PROPERTIES OF AERIAL PHOTOGRAPHS  12
Photo coordinate measurement - Refinement of photo coordinates - Vertical photographs - geometry, scale – Stereoscopes - Stereoscopic parallax - parallax equations - Tilted photograph - Geometry, Scale, Coordinate system – Relief displacement — Photo Interpretation.

UNIT III  STEREOPLOTTERS AND ORIENTATION  12
Projection system, Viewing, Measuring and Tracing system - parallelogram - Stereo plotters – Classification – Analog, semi analytical, Analytical and Digital; Analog Stereo Plotters - Interior orientation- Relative orientation- Absolute orientation; Analytical plotters- Interior Orientation: Two dimensional coordinate transformations – Collinearity condition and Coplanarity condition - Relative orientation - Three dimensional conformal coordinate transformation -

UNIT IV  AEROTRIANGULATION, TERRAIN MODELING, ORTHOPHOTO  12
Absolute orientation – Aerotriangulation: –Bundle Adjustment– DTM, DEM and DSM, Rectified photo, Orthophoto and True Orthophoto.

UNIT V  DIGITAL PHOTOGRAMMETRY  12

TOTAL: 60 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 ortho photo generation

TEXTBOOKS:

REFERENCES:

GI8403  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 DATA MODELS  
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  DESIGN AND DEVELOPMENT OF SPATIAL DATA BASE SYSTEM  

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:

GI8404  SATELLITE METEOROLOGY  
L T P C  3 0 0 3

OBJECTIVES:
• To introduce the basic concepts of Remote Sensing of atmosphere and satellite meteorology.
• To gain the knowledge on meteorological applications in weather forecasting aviation and trade applications.
• To familiarize the Indian Meteorological satellites and sensors.
UNIT I  BASICS  9
State of the atmosphere; Main constituents; Elements of radiative transfer in atmosphere- Basic quantities, Blackbody radiation – basic laws - Radiative transfer equation, Physics of Gaseous absorption, emission, Scattering, Solar radiation and surface reflection; Radiation balance;

UNIT II  WEATHER SATELLITES AND SENSING SYSTEMS  9
Operational polar orbiting and geostationary satellites, weather sensors, Satellite data archives; — INSAT and KALPANA – TRMM and GPM and others; Ground based sensors: AWS, ARG, Beacons, Doppler Radar, Flux Tower.

UNIT III  WEATHER SATELLITE DATA PROCESSING  9
Radar, Visible and IR data processing; Hydrometeorological parameter retrieval; Temperature, Rainfall, water vapour, Aerosol, Wind: speed, direction; Lighting-detection

UNIT IV  METEOROLOGICAL APPLICATIONS  9
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  9

TOTAL: 45 PERIODS

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:
2. Cracknell, – The Advanced Very High Resolution Radiometer (AVHRR)[], Taylor and Francis Int. Ltd., Great Britain, 1997

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

UNIT I  FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES  9
Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. 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 II  ELECTRO-OPTICAL AND MICROWAVE SYSTEM  9

UNIT III  SATELLITE SYSTEM  9
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, IRNSS and GAGAN - 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 IV  GPS DATA PROCESSING  9
GPS observables - code and carrier phase observation - linear combination and derived observables - concept of parameter estimation – downloading the data RINEX Format – Differential data processing – software modules -solutions of cycle slips, ambiguities, Concepts of rapid, static methods with GPS - semi Kinematic and pure Kinematic methods -satellite geometry & accuracy measures - applications- long baseline processing- use of different softwares available in the market.

UNIT V  HYDROGRAPHIC, MINE AND CADAstral SURVEYING  9

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 REMOTE SENSING AND PHOTOGRAMMETRY LABORATORY

OBJECTIVE:
- This course will facilitate the students to have hands on experience on different steps of visual interpretation of satellite images & photographs and digital interpretation of photographs.

REMOTE SENSING EXERCISES
1. Preparation of Base Map from Survey of India Topo sheets 4
2. Introduction to various satellite data products and image interpretation keys 4
3. Preparation of Land use/land cover map using Satellite Data / Aerial Photograph. 4
4. Spectral measurements using spectroradiometer and processing for
   (a) Water & Soil 4
   (b) Vegetation 4
   (c) Various surfaces and landcover 4

PHOTOGRAMMETRY EXERCISES
1. Testing stereovision with Stereogram card 4
2. Mirror stereoscope- base line, orientation of aerial photographs and Photo Interpretation 4
3. To find the height of point using Parallax bar 4
4. Scale of vertical photographs 4
5. Aerial Triangulation using digital photogrammetry 4
6. Bundle Block adjustment 4
7. Generation and editing of DTM and Contour 4
8. Orthophoto generation and Mosaic 4
9. Preparation of Planimetric map 4

TOTAL: 60 PERIODS

OUTCOME:
- On completion of this course, the student shall be able to acquire skills to carry out the Lab Exercises independently on visual interpretation of satellite images and digital processing of aerial photographs.

The following instruments and software are required

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Instrument</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Light Table</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Computer</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Spectroradiometer</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Pocket Mirror Stereoscope</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>Mirror Stereoscope</td>
<td>10</td>
</tr>
<tr>
<td>6.</td>
<td>Parallax bar</td>
<td>10</td>
</tr>
<tr>
<td>7.</td>
<td>Digital Photogrammetry Software (Free software also available)</td>
<td>5 licenses</td>
</tr>
<tr>
<td>8.</td>
<td>Anaglyphic Glass</td>
<td>20</td>
</tr>
<tr>
<td>9.</td>
<td>CAD software (Free software also available)</td>
<td>5 licenses</td>
</tr>
</tbody>
</table>
OBJECTIVE:

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

EXERCISES:

1. Study of Total Station 4
2. Distance and Coordinate Measurement 4
3. Missing Line Measurement 4
4. Remote Elevation Measurement 4
5. Resection 4
6. Setting out Point and Line 4
7. Setting out Offsets 4
8. Area Measurement 4
9. Total Station Traversing 4
10. Study of Hand held GPS 4
11. Study of Geodetic GPS 4
12. Static and semi kinematics survey 4
13. Differential Positioning 4
14. Precise Positioning 4
15. GPS Traversing 4

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:


LIST OF EQUIPMENTS

1. One Total Station equipment for every 10 students
2. One Handheld GPS equipment for every 10 students
3. One Geodectic GPS receiver for every 10 students

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title
Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph
UNIT II
Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in writing-Write a paragraph with reasons and examples-Write an opinion paragraph

UNIT III
Reading-Understanding pronoun reference and use of connectors in a passage-Speed reading techniques-Writing-Elements of a good essay-Types of essays-descriptive-narrative-issue-based-argumentative-analytical.

UNIT IV
Reading-Genre and Organization of Ideas-Writing-Email writing-visumes-Job application-project writing-writing convincing proposals.

UNIT V
Reading-Critical reading and thinking-understanding how the text positions the reader-identify Writing-Statement of Purpose-letter of recommendation-Vision statement

TOTAL: 30 PERIODS

OUTCOMES:
At the end of the course Learners will be able to:
- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

REFERENCES:

GI8501 HYPERSPECTRAL AND MICROWAVE REMOTE SENSING L T P C
3 0 0 3

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 THERMAL REMOTE SENSING AND ANALYSIS
Thermal radiation principles – Thermal interaction sensors and characters – thermal image characters – image degradation sources & correction – Land surface temperature measurement – Application: LST, emissivity mapping, SST, ET distribution, Urban heat islands, existing models

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

UNIT III HYPERSPECTRAL IMAGE ANALYSIS

UNIT IV MICROWAVE REMOTE SENSING

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

TOTAL : 45 PERIODS

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:
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 - satellite data formats - Digital Image Processing Systems - Hardware and software design consideration Scanner, digitizer - photo write systems.

UNIT II  SENSOR MODEL AND PRE PROCESSING  9

UNIT III  IMAGE ENHANCEMENT  9

UNIT IV  IMAGE CLASSIFICATION  9

UNIT V  ADVANCED CLASSIFIERS  9
Fuzzy set classification – sub- pixel classifier – hybrid classifiers, Texture based classification – Object based classifiers - Artificial Neural nets - Hebbian leaning - Expert system, types and examples - Knowledge systems.

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

TEXT BOOKS :

REFERENCES:

GI8503 SOFT COMPUTING TECHNIQUES

OBJECTIVE:
- The objective of the course is to make the students to understand the concepts of Artificial Neural Network, Fuzzy logic and Genetic algorithms and also their application in Geomatics.

UNIT I SOFT COMPUTING AND ARTIFICIAL NEURAL NETWORKS

UNIT II FUZZY SYSTEMS

UNIT III NEURO-FUZZY MODELLING

UNIT IV GENETIC ALGORITHM

UNIT V APPLICATIONS OF SOFT COMPUTING
image registration - Object recognition - Automated feature extraction - navigation – Integration of soft computing and GIS for flood forecasting and monitoring, Landslide susceptibility, Highway alignment, smart city planning, agriculture, solid waste disposal

OUTCOME:
- At the end of the course, students will be able to apply the concepts of Artificial Neural Network, Fuzzy logic, Genetic algorithms and also their application in Geomatic.

TEXTBOOKS:

TOTAL : 45 PERIODS
REFERENCES:

GI8511 GEO DATABASE LABORATORY

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

EXERCISES:
1. Basics of Database
   - Field, Record, table and relationships concepts on file type database
2. Server / client operations
   - Starting / Shutdown of server
   - Client user creation
   - client connection over network
3. Data Definition of Tables
   - Creation, Deletion and Modification of definition
4. Data Manipulation
   - Insert, delete and modify table data
5. Simple Queries
   - On single table
   - Linking with multiple tables
   - With simple conditions
6. Views
   - Creation of views
   - Querying on views
7. Queries on Tables and views
   - Simple, Complex, nested queries using the tables and views
8. Data Control of Tables and Views
   - Defining different constraints
   - Handling different permissions on tables and views
9. Index on tables
10. Database triggers
11. Spatial data creation
   - Creation of simple geometries (point, line and polygon) on database
12. Indexing and viewing spatial data
13. Topological querying on spatial data
14. Geometrical functions and analysis
   - Area and length, Buffer, Union and intersection
15. 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

TOTAL: 60 PERIODS
REFERENCE:

LIST OF EQUIPMENTS:
1. i7 computer system with minimum 4GB RAM, 500GB HDD - 15 nos for 30 students
2. Standard DBMS software with spatial data handling (Example: PostgreSQL DBMS with postgis)
3. Two students can be allotted per system per session.

GI8512 SATELLITE IMAGE PROCESSING LABORATORY L T P C 0 0 4 2

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:
Performing Following Task
1. Study of image file formats and organization
2. Preprocessing techniques : radiometric correction & alterations
3. Noise removal
4. Preprocessing techniques : Ground control and rectification
5. Image reading and writing
6. Enhancements – histogram, filters
7. Band ratioing and normalization – NDVI, SAVI & NDWI
8. Data reduction
9. Image fusion
10. Classification – supervised & unsupervised
11. Sub pixel classification
12. PCA
13. Accuracy assessment – correlation, RMSE & kappa
14. Image transformations
15. Vectorisation, & map compilation

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:

LIST OF EQUIPMENTS:
1. Number of i7 Computer system - 15 for 30 students (two students per system)
2. Standard Satellite image processing software - 15 user licenses
3. Satellite data in different spatial resolution and corresponding Toposheets
4. A1 size Scanner and Color plotter
OBJECTIVE:
- To impart knowledge in various applications of hydrology and water resources using Geomatic technology.

UNIT I HYDROLOGIC COMPONENTS 9

UNIT II SURFACE WATER MODELLING 9

UNIT III RISK AND DAMAGE ASSESSMENT 9

UNIT IV GROUND WATER MODELLING 9

UNIT V IRRIGATION AND WATERSHED MANAGEMENT 9

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:

REFERENCES:
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


UNIT II

DEVELOPMENT ENVIRONMENT


UNIT III

DESKTOP GIS


UNIT IV

DATA BASE MANAGEMENT AND USER INTERFACE

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

UNIT V

OPEN SOFTWARE AND WEB MAPPING


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:

OBJECTIVES:
- To expose students the relevance of Geoinformatics to Urban Planning and Management
- To introduce the latest developments in Remote Sensing methods useful for Urban Planning and Management
- To impart knowledge on possible applications of Geoinformatics for Urban planning and Management

UNIT I   INTRODUCTION

UNIT II   REMOTE SENSING FOR URBAN MAPPING

UNIT III   GEOINFORMATICS FOR URBAN PLANNING

UNIT IV   GEOINFORMATICS FOR URBAN ANALYSIS

UNIT V   VISUALIZATION, SIMULATION AND MODELING OF URBAN AREAS
Urban Growth Modelling - Air quality indexing and mapping - Noise pollution modelling - 3D City Modelling – Flood Modeling in Urban Areas - Geoinformatics for Smart Cities – Recent Advancements - Case Studies

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

GI8604 SPATIAL ANALYSIS AND APPLICATIONS 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

UNIT II VECTOR ANALYSIS

UNIT III NETWORK ANALYSIS

UNIT IV SURFACE AND GEOSTATISTICAL ANALYSIS

UNIT V CUSTOMISATION, WEB GIS, MOBILE MAPPING

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 Web GIS 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

GI8605 GEODESY  L T P C
4 0 0 4

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

UNIT I FUNDAMENTALS

UNIT II GEOMETRIC GEODESY

UNIT III PHYSICAL GEODESY

UNIT IV GEODETIC ASTRONOMY
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. Determination of Astronomical Azimuth- stars altitude and hour angle methods, astronomical latitude and longitude determination

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

TOTAL: 60 PERIODS
OUTCOMES:
At the end of the course the student will be able to understand
- Fundamentals of Geodesy, Techniques involved in establishment of geodetic control
- Concepts of geoid, ellipsoid and their interrelationship
- Various types of coordinate systems and relationship between them
- Methods required for computation of geodetic and astronomical parameters
- The methods for measurement of gravity and gravity network

TEXTBOOKS:

REFERENCES:

GI8611 SPATIAL ANALYSIS AND APPLICATIONS LABORATORY

OBJECTIVE:
- To experience the students in various Spatial and Network analysis of Spatial Data and develop problem-solving skills using GIS

EXERCISES:
A Raster Analysis
1. Data exploration-statistics & query analysis
2. Map algebra, Reclassification, arithmetic & logical overlay
3. Focal and zonal operations
4. Distance and shortest path analysis

B Vector Analysis
5. Attribute analysis & Data extraction
6. Overlay and Cost weighted overlay
7. Proximity – Buffer analysis

C Network Analysis
8. Network Conflation, Geocoding
9. Short route analysis
10. Service area, Closest facility analysis

D Surface Analysis
11. Slope and Aspect calculation
12. Interpolation techniques
13. Viewshed analysis & Watershed Delineation

E Customization
14. Scripting/ embedded scripts
15. Batch Processing and WebGIS demo

TOTAL: 60 PERIODS
OUTCOMES:
At the end of the course the student will be able to
- Analysis 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:

LIST OF EQUIPMENTS:
Each Batch should contain a maximum of 30 students.

2. A4 Scanner with minimum of 600 dpi resolution - 1 No
3. Printer/ Plotter - 1 No.

Software Requirements: GIS software with Spatial, Network and 3D Analysis tools - 15 Nos.
(Open source GIS software with above capabilities can also be used

GI8612 SURVEY CAMP
(2 WEEKS DURING V SEMESTER WINTER)  L T P C
0 0 0 2

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

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.
- Students will also be exposed to modern mapping techniques.

HS8581 PROFESSIONAL COMMUNICATION  L T P C
0 0 2 1

OBJECTIVES: The course aims to:
- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I
Introduction to Soft Skills— Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations
UNIT III
Introduction to Group Discussion—Participating in group discussions—understanding group dynamics - brainstorming the topic -- questioning and clarifying -- GD strategies- activities to improve GD skills

UNIT IV
Interview etiquette – dress code – body language – attending job interviews— telephone/skype interview -one to one interview & panel interview – FAQs related to job interviews

UNIT V
Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

OUTCOMES: At the end of the course Learners will be able to:
• Make effective presentations
• Participate confidently in Group Discussions.
• Attend job interviews and be successful in them.
• Develop adequate Soft Skills required for the workplace

Recommended Software
1. Globearena
2. Win English

REFERENCES:

GI8701 AGRICULTURE AND FORESTRY FOR GEOINFORMATICS L T P C
3 0 0 3

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 CROP INVENTORY AND REMOTE SENSING

UNIT II REMOTE SENSING FOR SOIL
UNIT III LAND EVALUATION AND MANAGEMENT 9
Introduction - land use / land cover definition - land use / land cover classification-concepts and approaches of land evaluation – Change dynamics – Land capability assessments - decision support system for land use planning - optimum land use planning for sustainable agriculture.

UNIT IV DAMAGE ASSESSMENT 9
Introduction - damage by pests and diseases - crop loss assessment by floods - flood hazard zone mapping - remote sensing capabilities and contributions for drought management - land degradation due to water logging and salinity - crop stress - reflectance properties of stressed crops - identification of crop stress - Agricultural insurance in India – CCIS,ECIS, FIIS and NAIS

UNIT V FOREST MANAGEMENT 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 afforestation - forest fire mapping and damage assessment – species mapping - sustainable development of forests.

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:

GI8702 DECISION SUPPORT SYSTEM FOR RESOURCE MANAGEMENT L T P C 3 0 0 3

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

UNIT I STRUCTURE OF EXPERT SYSTEMS 9

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UNIT II RULE BASED EXPERT SYSTEMS 9

UNIT III INEXACT REASONING 9

UNIT IV OPERATION RESEARCH 9

UNIT V NETWORK AND INVENTORY MODELS 9
Shortest route - minimal spanning tree - maximum flow models - project network- CPM and PERT network-critical path scheduling - Types of Inventory- The classical EOQ model -Deterministic inventory problems - Price breaks - Stochastic inventory problems- selective inventory control techniques

OUTCOME:
• At the end of the course, the student will be able to understand the concept of the Expert Systems, fuzzy logic and operation research techniques and their application in Geoinformatics Engineering.

TEXTBOOKS:

REFERENCES:

GI8703 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
Formation of Soils- classification - land forms- soil erosion-factors influencing soil erosion, soil contamination- distribution and accumulation of contaminants such as toxic metals, synthetic chemicals in soil- mining pollution- methods of conservation- afforestation- EMR responses with contaminated soil - modeling soil characteristics using satellite data-soil degradation assessment using Remote Sensing and GIS- Land reclamation.

UNIT III ECOLOGY AND ECOSYSTEM 9

UNIT IV AIR POLLUTION AND GLOBAL CLIMATOLOGY 9

UNIT V SENSORS AND DATA FOR ENVIRONMENTAL MONITORING 9

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

TEXTBOOKS:

REFERENCE:
OBJECTIVES:
- To train the Geoinformatics Students for the Industry so as the 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.

STRATEGY:
- 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.
- 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
- 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:
- 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
- The Student shall enclose a certificate duly signed from the Supervising Officer of the Place of Training and Coordinating Faculty
- The Viva-Voce Examination shall be part of evaluation

AIM: To work on a specific technical topic in Civil Engineering and acquire the skill of written and oral presentation. To acquire writing abilities for seminars and conferences.

TOTAL: 30 PERIODS

STRATEGY:
The students will work for two hours per week guided by a group of staff members. They will be asked to talk on any topic of their choice and to engage in dialogue with the audience. A brief copy on their talk also should be submitted. Similarly, the students will have to present a seminar of not more than fifteen minutes on the technical topic. They should also answer the queries on the topic. The students as the audience also should interact. Evaluation will be based on the general and technical presentation and the report and also on the interaction shown during the seminar.

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
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.

TOTAL: 300 PERIODS

GI8001 CLIMATE CHANGE STUDIES

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 ANTHROPOGENIC 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 CLIMATE CHANGE HAZARDS

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

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

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TEXTBOOKS:
2. Jane Mc Adam, Climate change and Displacement Multi-disciplinary Perspectives 2010

REFERENCES:
1. Richard Somerville, the forgiving Air: understanding Environmental change, II Edition.
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 Hogg, Climate cover up; the crusade to Deny global warming.

GE8071 DISASTER MANAGEMENT

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

GI8002  DIGITAL CARTOGRAPHY

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  9

UNIT IV  GEOVISUALIZATION  9

UNIT V  DIGITAL MAP MODELING  9
Map generalization – geo-statistics in generalization, and quantitative mapping – digital classification – contiguity and hierarchy in mapping – map models

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:

EC8094  SATELLITE COMMUNICATION  L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites
- Understand the basics of satellite Networks

UNIT I  SATELLITE ORBITS  9

UNIT II  SPACE SEGMENT  9
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.
UNIT III  SATELLITE LINK DESIGN  9
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV  SATELLITE ACCESS AND CODING METHODS  9

UNIT V  SATELLITE APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student would be able to:

- Analyze the satellite orbits
- Analyze the earth segment and space segment
- Analyze the satellite Link design
- Design various satellite applications

TEXTBOOKS:

REFERENCES:

GE8074  HUMAN RIGHTS  L T P C
3 0 0 3

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

UNIT I  9

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

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

UNIT V

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

REFERENCES:

GI8003 ADJUSTMENT COMPUTATIONS FOR GEOINFORMATICS

OBJECTIVE:
- To impart skills in computational adjustment for Geomatics problems

UNIT I MEASUREMENT AND ERROR

UNIT II LEAST SQUARES ADJUSTMENT
Introduction - simple adjustment methods - Least squares method - Examples of least squares problems. Techniques of least squares- concept of weight - least squares adjustment of indirect Observations - least squared adjustment of observations only.

UNIT III VARIANCE COVARIANCE PROPAGATION

UNIT IV PRE ANALYSIS OF SURVEY MEASUREMENTS
Pre analysis procedure- Horizontal angle and Distance measurement - elevation difference - Survey tolerances – Database creation using GIS: Modeling- Map layout.
UNIT V      APPLICATION IN GEOMATICS ENGINEERING

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
- To create GIS database by collecting quality datasets.

TEXTBOOKS:

REFERENCE:

GI8004      AIRBORNE AND TERRESTRIAL LASER 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
Principle and Properties of LASER- Production of Laser – Components of LASER – LiDAR – Types of LiDAR :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 , Moon Topography - Merits of ALS in comparison to Levelling, echo sounding, GPS leveling, Photogrammetry and Interferometry

UNIT II     AIRBORNE LASER SCANNERS

UNIT III DATA ACQUISITION AND PRE PROCESSING
Various Scanning Mechanism – Synchronization of GPS, IMU and ALS Data - Reflectivity of terrain objects – Laser Classification – Class I to Class IV Laser – Eye Safety - Flight Planning – Determination of various data acquisition parameters – Swath Width, Point Density, No. of Strips, Area Covered, Point Spacing - Data Processing – Determination of flight trajectory

UNIT IV     POST PROCESSING AND APPLICATIONS
UNIT V  TERRESTRIAL AND BATHYMETRIC LASER SCANNERS


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:
TEXTBOOKS:

REFERENCES:

GI8005 OCEANOGRAPHY AND COASTAL PROCESSES L T P C
3 0 0 3

OBJECTIVE:
• To familiarize the students about the basics and Geomatics applications in the field of Oceanography and coastal processes

UNIT I FUNDAMENTAL OCEANOGRAPY 9

UNIT II OCEAN CIRCULATIONS AND INSTRUMENTS 9

UNIT III OCEAN COLOR REMOTE SENSING 9
Ocean color radiometers – Radiative transfer theory - atmospheric correction - SST measurement -Cloud detection algorithms, single channel and McSST approach, Bayesian approach -Ocean primary productivity estimation–Bio-optical algorithms — Coastal Land Use/ Landcover — Ocean color Sensors & data products

UNIT IV COASTAL HAZARD REMOTE SENSING 9
Shoreline change mapping - Erosion and accretion estimation - Transect based and polygon based shoreline change analysis –Oil spill studies - Use of MSS and SAR images, statistical and Neural network approaches- Sea level rise - Sea surface variability from Altimeters and Scatterometers.

UNIT V DISASTER MANAGEMENT 9
Cyclones- Radars, Synthetic procedures, Dvorak Intensity and forecasting technique - Tsunami propagation and run up - Flood and storm surges —Total water level elevation measurement, HIROBM-BOOS model -mitigation strategies- Early warning systems.

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:

GI8006 HEALTH GIS L T P C 3 0 0 3

OBJECTIVE:
- 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 9
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 SPATIAL DATABASES FOR PUBLIC HEALTH 9
Health Data – Birth data, Morbidity data, Disease Registries and Survey Data Health Care and Health Care Utilization Data – Health Care Provider and Health Care Facility – Geolocating Health Data and Data Security and Privacy Issues — historical records and reliability.

UNIT III DISEASE MAPPING 9
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 –Case Studies .

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
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
TOTAL: 45 PERIODS

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:

GE8077 TOTAL QUALITY MANAGEMENT

OBJECTIVE:
• To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES
Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II
Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM

TOTAL: 45 PERIODS
OUTCOME:
- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

REFERENCES:
4. ISO9001-2015 standards

GE8072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:
- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT

UNIT II REQUIREMENTS AND SYSTEM DESIGN

UNIT III DESIGN AND TESTING
Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:

GI8007 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 UNIVERSE AND SOLAR SYSTEM 9
Origin of Universe - Big Bang and Steady state theories, Solar System - planets, satellites, asteroids, meteorites and comets and internal differentiation of the planets.
UNIT II  TERRESTRIAL PLANETS  
Geology and geophysics of terrestrial planets: earth, mars, venus and mercury; physical properties, composition, mineralogy and petrology of the planets and the Moon.

UNIT III  PLANETARY ATMOSPHERE  
Exo- and Endogenic processes associated with origin and internal evolution of planets – planetary volcanism, craters, elemental composition; mineralogy and petrology; thermal, seismic and magnetic properties.

UNIT IV  REMOTE SENSING FOR PLANETARY GEOLOGY  
Approaches to Remote Sensing analysis of the planetary surfaces; applications derived from interaction of electromagnetic radiation (X-ray, gamma-ray, visible, near-IR, mid-IR, radar).

UNIT V  PLANETARY EXPLORATION MISSIONS  
Past, present and future missions - Analyses and Interpretation of data gathered through various missions: identification of morphological features.

TOTAL: 45 PERIODS

OUTCOMES:
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

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

GI8008  SATELLITE WEATHER FORECASTING AND MODELLING  L T P C
3 0 0 3

OBJECTIVES:
- To introduce Weather Forecasting and Modeling in digital scenario applications.
- To familiarize with terms and techniques used in weather forecasting.
- To gain fair knowledge in Satellite Imaging and vertical profiling system in weather forecasting methods.
- To understand the role of Global and National level Satellites and observations in weather forecasting.

UNIT I  INTRODUCTION  
UNIT II  SATELLITE AND GROUND SENSORS

UNIT III  WEATHER FORECAST PROCESSING

UNIT IV  SHORT AND LONG TERM FORECAST

UNIT V  WEATHER FORECAST MODELS

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the candidate is knowledgeable in
- Weather forecasting tools, techniques and methods of weather forecasting.
- Global network of weather observation systems and integration.
- Satellites and its role in weather observations and analysis.
- Indian weather satellites and their observation tools

TEXTBOOKS:

REFERENCES:
2. Herhart Riehl (1954), Tropical Meteorology, Mcgraw hill Buole company, New York
6. http://www.esa.int/Our_Activities/Observing_the_Earth/The_Living_Planet_Programme/Meteorological_missions
OBJECTIVE:
- 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

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

UNIT V GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOME:
- 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.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To provide exposure to Various Geospatial analysis tools available in GIS
- To introduce algorithms involved in analysis of geospatial data
- To expose variety of applications of geodata analysis for solving real world problems

UNIT I    ANALYSIS OF SPATIAL DISTRIBUTIONS
Introduction spatial measurements and statistics - Geographic analysis with statistics
Understanding spatial data distributions - Measuring geographic distributions - Finding the center
- Measuring the compactness of the distribution - Measuring orientation and direction - Testing
statistical significance – Case Studies

UNIT II   ANALYSIS OF SPATIAL PATTERNS
Identifying spatial patterns - Statistical parameters to characterize patterns - Measuring the pattern
of feature locations - Measuring the spatial pattern of feature values - Defining spatial
neighborhoods and weights - Identifying clusters - Parameters for identification of clusters-
Analysis of features clusters - clusters of similar values – Case Studies

UNIT III  UNDERSTANDING SPATIAL AND TEMPORAL RELATIONSHIPS
Analyzing geographic relationships - statistics to analyze relationships- Identifying geographic
relationships - Analyzing geographic processes – Mapping Change – Various measures for
quantification of change – Time Series analysis – Track Maps -Case Studies

UNIT IV   GIS MODELLING
Introduction – GIS Modelling Process - Suitability Analysis – Design of Boolean Suitability Model
- Finding Suitable Locations by Selection, Overlay – Rating of Suitable Locations – Weighted
Overlay, Fuzzy Overlay – Use of Artificial Intelligence – Case Studies.

UNIT V    NETWORK MODELLING
Designing a Path Model – Modelling path in networks – Modelling overland path – Flow Modelling –
Modelling accumulation over surface – Tracing Flow over Network – Designing Interaction Models –
Allocation of Demand to facilities – Modelling Travel to facilities – Case Studies

TOTAL: 45 PERIODS

OUTCOMES:

- Students will gain thorough knowledge on the concepts of spatial data modeling
- Students will be able to model the real time flow networks and its implementation.

REFERENCES:

1. Andy Mitchell (2001), The ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns
   and Relationships, ESRI Press

GI8010 GIS BASED DISASTER PREPAREDNESS AND MITIGATION

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

UNIT I INTRODUCTION TO DISASTERS
Disaster: Definition and Classification - 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.

TOTAL: 45 PERIODS

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:

GI8011 WEB GIS L T P C
3 0 0 3

OBJECTIVE:
- This course provides skills in learning concepts and applications of web based services using GIS technology and web mapping

UNIT I GIS AND WEB GIS

UNIT II WEB GIS ARCHITECTURE

UNIT III WEB SERVICES
Open Geospatial Consortium (OGC), OGC collaboration with ISO, world wide web consortium (W3C) and others – Types of web service Specifications for GIS : Catalogue Services: CS Core and others, Processing Services: Sensor Planning Service(SPS), Web Processing Service(WPS) and others, Encoding : Geography markup Language(GML), City GML, Data Services : Web Coverage Service, Web Feature service, Portrayal Service: Web Map Service and other services

UNIT IV MOBILE GIS

UNIT V OPEN SOURCE WEB SERVERS AND APPLICATIONS
Open Source Web Servers – Open source standalone (client side) software for map services : Geozilla, QGIS Browser, osgEarth, Marble - Proprietary standalone (client side) software for web map services: Esri ArcGIS & ArcGIS Explorer,Google Earth, Global Mapper, Geoweb3d Desktop – Geo Server – Case Studies and applications Web/Internet GIS in various application domains

TOTAL: 45 PERIODS
TEXT BOOKS:

GE8073 FUNDAMENTALS OF NANOSCIENCE
L T P C 3 0 0 3

OBJECTIVE:
- To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMB.

UNIT III NANOMATERIALS

UNIT IV CHARACTERIZATION TECHNIQUES

UNIT V APPLICATIONS

TOTAL : 45 PERIODS
OUTCOMES:
At the end of course the students
- Will familiarize about the science of nanomaterials
- Will demonstrate the preparation of nanomaterials
- Will develop knowledge in characteristic nanomaterial

TEXTBOOKS:

REFERENCES: