ANNA UNIVERSITY :: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

R - 2008

CURRICULUM FROM III TO VIII SEMESTERS FOR

CURRICULUM FOR B.E GEOINFORMATICS ENGINEERING

SEMESTER III

Sl. No.	CODE NO.	COURSE TITLE	L	T	P	C
THEORY						
1	MA9211	Mathematics - III	3	1	0	4
2	GI9201	Surveying I	3	0	0	3
3	GI9202	Cartography	3	0	2	4
4	GI9203	Photogrammetry I	3	1	0	4
5	GI9204	Database Systems	3	0	0	3
6	AG9212	Applied Geology	3	0	0	3
PRACTICAL						
7	GI9205	Survey Practical I	0	0	4	2
8	GI9206	Photogrammetry Laboratory I	0	0	2	1
9	GI9207	Database Systems Laboratory	0	0	4	2
		TOTAL	**18**	**2**	**12**	**26**

SEMESTER IV

Sl. No.	CODE NO.	COURSE TITLE	L	T	P	C
THEORY						
1	MA9261	Probability and Statistics	3	1	0	4
2	GI9251	Surveying II	3	0	0	3
3	GI9252	Digital Image Processing	3	0	0	3
4	GI9253	Object Oriented Programming	3	0	2	4
5	GI9254	Electronic Surveying	3	0	2	4
6	GE9261	Environmental Science and Engineering	3	0	0	3
PRACTICAL						
7	GI9255	Survey Practical II	0	0	4	2
8	GI9256	Digital Image Processing Laboratory I	0	0	4	2
		TOTAL	**18**	**1**	**12**	**25**

SEMESTER V

Sl. No.	CODE NO.	COURSE TITLE	L	T	P	C
THEORY						
1	GI9301	Surveying III	3	0	0	3
2	GI9302	Microwave Remote Sensing	3	0	0	3
3	GI9303	Cadastral Surveying	3	0	0	3
4	GI9304	Geodesy	2	2	0	4
5	GI9305	Geographical Information System I	3	0	0	3
6		ELECTIVE – I	3	0	0	3
PRACTICAL						
7	GI9306	Survey Practical III	0	0	4	2
8	GI9307	GIS Laboratory I	0	0	4	2
9	GE9371	Communication Skills and Soft Skills	0	0	2	1
		TOTAL	**17**	**2**	**10**	**24**

SEMESTER VI

Sl. No.	CODE NO.	COURSE TITLE	L	T	P	C
THEORY						
1	GI9351	Satellite Geodesy	3	0	2	4
2	GI9352	Survey Adjustment	3	0	0	3
3	GI9353	Geographical Information System II	3	0	0	3
4	GI9354	Photogrammetry II	3	1	0	4
5		ELECTIVE – II	3	0	0	3
6		ELECTIVE – III	3	0	0	3
PRACTICAL						
7	GI9355	Survey Camp (During Winter)	0	0	4	2
8	GI9356	Photogrammetry Laboratory II	0	0	2	1
9	GI9357	GIS Laboratory II	0	0	4	2
10	GI9358	Technical Seminar	0	0	2	1
		TOTAL	**18**	**1**	**14**	**26**

SEMESTER VII

SI. No.	CODE NO.	COURSE TITLE	L	T	P	C
THEORY						
1	CE9401	Principles of Management	3	0	0	3
2	GI9401	Thermal and Hyper Spectral Remote Sensing	2	0	2	3
3	GI9402	Digital Photogrammetry	3	0	0	3
4	GI9403	Geographical Information System Applications	3	0	0	3
5	GI9404	Operations Research for Geoinformatics	3	0	0	3
6		ELECTIVE – IV	3	0	0	3
PRACTICAL						
7	GI9405	Digital Photogrammetry Laboratory	0	0	4	2
8	GI9406	Digital Image Processing Laboratory II	0	0	4	2
		TOTAL	**17**	**0**	**10**	**22**

SEMESTER VIII

SI. No.	CODE NO.	COURSE TITLE	L	T	P	C
THEORY						
1		ELECTIVE – V	3	0	0	3
2		ELECTIVE – VI	3	0	0	3
PRACTICAL						
3	GI9451	Project Work	0	0	12	6
		TOTAL	**6**	**0**	**12**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE: 188

ELECTIVES FOR B.E. ENGINEERING

TECHNOLOGY

CODE NO.	COURSE TITLE	L	T	P	C
GI9021	Close Range Photogrammetry	3	0	0	3
GI9022	Advanced Cartography	3	0	0	3
GI9023	Advanced Survey Adjustment	3	0	0	3
GI9024	Airborne Laser Terrain Mapping	3	0	0	3

APPLICATIONS

CODE NO.	COURSE TITLE	L	T	P	C
GI9025	Remote Sensing and GIS for Hydrology and Water Resources	3	0	0	3
GI9026	Remote Sensing and GIS for Ocean Engineering and Coastal Zone Management	3	0	0	3
GI9027	Remote Sensing and GIS for Environmental Monitoring	3	0	0	3
GI9028	Remote Sensing and GIS for Urban and Regional Planning	3	0	0	3
GI9029	Remote Sensing and GIS for Earth Sciences	3	0	0	3
GI9030	Remote Sensing and GIS for Agriculture and Forestry	3	0	0	3
GI9031	Remote Sensing and GIS for Meteorology	3	0	0	3
GI9032	Remote Sensing and GIS for Transportation Planning	3	0	0	3
GI9033	Remote Sensing and GIS for Disaster Mitigation and Management	3	0	0	3

OTHERS

CODE NO.	COURSE TITLE	L	T	P	C
GE9075	Intellectual Property Rights (IPR)	3	0	0	3
GE9072	Indian Constitution and Society	3	0	0	3
GE9073	Contract Laws and Regulations	3	0	0	3
GE9022	Total Quality Management	3	0	0	3
GE9021	Professional Ethics in Engineering	3	0	0	3
GE9023	Fundamentals of Nanoscience	3	0	0	3

MA9211   **MATHEMATICS-III**   **L T P C**
                                                                     3 1 0 4

AIM

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES

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

UNIT I   FOURIER SERIES   9+3

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   9+3

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT III   PARTIAL DIFFERENTIAL EQUATIONS   9+3

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

UNIT IV   APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   9+3

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT V   Z – TRANSFORM AND DIFFERENCE EQUATIONS   9+3

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

                                        L: 45, T: 15, TOTAL: 60 PERIODS

TEXT BOOK

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

GI9201   **SURVEYING I**   **L T P C**
                                                                              3 0 0 3

OBJECTIVE:

The main objective of this course is to introduce the rudiments of Land Survey methods and principles to Geoinformatics Engineers. This is the correct term and it falls under the general title of Land Surveying.

UNIT I   FUNDAMENTALS OF SURVEYING   4
Definition – Plane Surveying – Geodetic surveying – Branches of Surveying – Basic principles – Fieldwork and office work – Scales – Mistakes and errors – and accuracy.

UNIT II   CHAIN SURVEYING   9
Equipment – ranging and chaining – reciprocal ranging – well conditioned triangles – Errors in linear measurement and their corrections – Fieldwork – Office work – Obstacles.

UNIT III   COMPASS SURVEYING AND PLANE TABLE SURVEYING   12
Compass – Types – Bearing – systems – Local attraction – Magnetic declination – Dip – Traversing – Plotting – Adjustment of error – Plane table – Instruments and accessories – Merits and demerits – Methods – Radiation – intersection – resection – traversing.

UNIT IV   LEVELLING   14
Level line – Horizontal line – Datum – Levels and staves – Bench marks – temporary and permanent adjustments – Fly levelling – Check levelling – Procedure in levelling – Booking – Reduction – Curvature and refraction Reciprocal levelling – Longitudinal and Cross section – Plotting – Contouring – Methods – Characteristics and uses of contours – Plotting.

UNIT V   AREAS AND VOLUMES   6
The Planimeter – Areas enclosed by straight lines – Irregular figures – Volumes – Earthwork calculations – Capacity of reservoirs – Mass haul diagrams.

TOTAL : 45 PERIODS

TEXT BOOKS:
1.   James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
2.   Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.
3.   S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice' Hall of India 2004.

REFERENCES:
1.   A.M. Chandra, Plane Surveying, New Age International Publishers 2002.
2.   Alak De, Plane Surveying, S. Chand & Company Ltd., 2000.

GI9202   **CARTOGRAPHY**   **L T P C**
                                                                    3 0 2 4

OBJECTIVE:

The main objective of this course is to introduce Cartography and its elements as the Art and Science of Map Making. The course also describes its connections with the Communication Science and Digital Computer as structured and need based information of Spatial Data.

UNIT I   FUNDAMENTALS OF CARTOGRAPHY   9
Cartography today – Nature of Cartography – History of Cartography – Cartographic Visualization – Web Cartography – Graticules – Cartometry –Map Characteristics - Modern Trends.

UNIT II   EARTH   9
Earth-Map Relations – Basic Geodesy – Map Projections – Scale – Reference and Coordinate system – Transformation – Basic Transformation – Affine Transformation.

UNIT III   SOURCES OF DATA   9
Sources of data – Ground Survey and Positioning – Remote Sensing data collection – Census and sampling – data – Models for digital cartographic information – Map digitising.

UNIT IV   PERCEPTION AND DESIGN   9
Cartographic design – Colour theory and models – Colour and pattern creation and specification – colour and pattern – Typography and lettering the map – Map compilation – Demography and Statistical mapping.

UNIT V   CARTOGRAPHY ABSTRACTION   9
Selection and Generalisation Principles – Symbolisation – Topographic and thematic maps – Map production and Reproduction – Map series.

                                                          TOTAL : 45 PERIODS

TEXT BOOKS:

1. R.W. Anson and F.J. Ormeling, Basic Cartography for students and Technicians. Vol.I, II and III, Elsevier Applied Science Publishers, 3rd Edition, 2004.
2. Arthur, H. Robinson et al, Elements of Cartography, Seventh Edition, John Wiley and Sons, 2004.
3. John Campbell, Introductory Cartography, Wm.C. Brown Publishers, Third Edition, 2004.

REFERENCES:

1. Menno Jan Kraak & Ferjan Ormeling, Cartography Visualization of Geospatial Data, Second Edition, Pearson Education, 2004

GI9203   **PHOTOGRAMMETRY I**   **L T P C**
                                                                     3 1 0 4

OBJECTIVE:
The objective of this course is to introduce basics and concepts of optics, Aerial photography acquisition and mapping from aerial photographs.

UNIT I   BASIC OPTICS AND PRINCIPLES OF PHOTOGRAPHY   15
History of Photogrammetry – Definition, Applications – Types of Photographs, Classification – Photographic overlaps – Use of mirror, prism, wedges, lens formula, Scheimpflug condition, and lens aberration – lens resolving power – light distribution over image plane – Filters used – fiber optics. Principles of photographic process – relationship of aperture and shutter speed – contact printing - projection printing.

UNIT II   CAMERAS AND CO-ORDINATE MEASUREMENT   8
Types of Aerial cameras – Construction – Camera accessories – Camera calibration –Terrestrial Metric cameras. Coordinate measurement using comparators – Two dimension coordinate transformation – refinement of photo coordinates.

UNIT III   STEREOSCOPIC AND PLANIMETRIC MAPPING WITH VERTICAL,
**   TILTED AND OBLIQUE PHOTOGRAPHS   20**
Stereoscopic depth perception – Different types of stereoscopes vertical exaggeration – base lining and orientation – principle of floating mark – methods of parallax measurement – vertical photographs – geometry, scale, parallax equations, planimetric mapping – Tilted photograph – Geometry, Coordinate system, Scale, Planimetric mapping – Rectification – Geometry, Graphical and Analytical methods – Mosaics.

UNIT IV   PROJECT PLANNING AND GROUND CONTROL SURVEY   8
Flight Planning – Crab & Drift – Computation of flight plan – Specification for Aerial photography – Basic horizontal and vertical control – Pre pointing and Post pointing – Planning for Ground Control – Cost estimates.

UNIT V   PHOTO INTERPRETATION   9
Basic characteristics of Photographic images – Interpretation keys – Visual interpretation – Basic elements in Photographic interpretation – Example – Equipments for interpretation.

                              L:45 + T:15 TOTAL : 60 PERIODS

TEXTBOOKS:
1. Paul. R Wolf., Bon A.DeWitt, Elements of Photogrammetry with Application in GIS– McGraw Hill International Book Co., 3rd Edition, 2000

REFERENCES:

1. E.M.Mikhail, J.S.Bethel, J.C.McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2001.
2. Gollfried Konecny, Geoinformation: Remote Sensing, Photogrammetry and Geographical Information Systems, CRC Press, 1st Edition, 2002
3. Manual of Photogrammetry, American Society of Photogrammetry, 5th Edition 2004.

GI9204   **DATABASE SYSTEMS**   **L T P C**
                                                              3 0 0 3

OBJECTIVE:
The objective of this course is to introduce the students to basic concepts of
database, file systems and organization, Database Management System (DBMS)
and .Net for database.

UNIT I   INTRODUCTION   7
Data – Information - File system vs DBMS – Data models – Hardware and software
requirements – Database Management Systems – Database languages, Database
Architecture, users and administrators – Classification of Database Management
Systems

UNIT II   RELATIONAL DATA MODEL   9
Relational model – Data Structure – Constraints – Keys – Codd's Rule – Relational
Algebra – Fundamental operations - Additional operations – Extended operations –
Null values

UNIT III   SQL   9
SQL – Data Definition - Basic structure of SQL queries – Set operations – Aggregate
Functions – Null values – Nested sub queries – Complex queries – Views –
Embedded SQL – Dynamic SQL – Triggers

UNIT IV   DATABASE DESIGN AND MANAGEMENT   10
Design process – Entity Relationship Model – Constraints – EER – Diagrams –
Atomic domain and First Normal Form - Functional Dependency – Decomposition
using Functional dependencies – Normalization using Multi-Valued Dependencies
and Join Dependencies – Basic concepts of file organizations, indexing and hashing
- Database recovery techniques – Database Security – Handling Spatial Database

UNIT V   ACCESSING DATA USING ADO.NET AND VB.NET   10
ADO.Net Object Model using OLE DB managed provider – Other data providers –
Accessing XML data – Building Windows application using VB.Net – Programming
web applications with web form

                                                    TOTAL : 45 PERIODS

TEXT BOOKS:
1.   Abraham Silberschatz, Henry F. Korth and S.Sudharshan, "Database System
     Concepts", Fifth edition, Tata McGraw Hill, 2005
2.   Ramez Elmasri and Shamkant B.Navathe, "Fundamentals of Database Systems"
     Fourth edition, Pearson Education (Singapore) Pvt. Ltd. 1st Indian Reprint, 2004

REFERENCES:
1.   Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems",
     3nd Edition, , McGraw Hill Publishers, 2003
2.   Paul J. Deitel and Harvey M. Deital "Visual Basic 2005 for Programmers", 2nd
     Edition, Pearson Education, 2007.

AG9212   **APPLIED GEOLOGY**   **L T P C**
                                                                                            3 0 0 3

OBJECTIVE:
To familiarize the student about the various geological and methods for Geomorphological processes and the exploration of various natural resources

UNIT I   INTRODUCTION   9
Geology for natural resources inventory – Branches of geology - Scope. Interior of the Earth, Weathering, Plate Tectonics, Structural geology and introduction to geological structures – folds, faults, joints, lineaments

UNIT II   GEOMORPHOLOGY   9
Landforms and geomorphic process – Classification and description of Structural, Denudation, Fluvial, Aeolian, Glacial and Coastal landforms. Drainage pattern and morphometry.

UNIT III   MINERALS AND ROCKS   9
Physical properties of important rock and ore forming minerals- Classification and description of rocks - Forms and mode of occurrence - outline and distribution of economic minerals

UNIT IV   GEO-EXPLORATION   9
Geophysical methods – Seismic, Electrical, Gravity, and Magnetic - Remote sensing techniques for Geological mapping – Groundwater – Mineral - Hydrocarbon and Geothermal energy exploration.

UNIT V   NATURAL HAZARDS   9
Classification – Causes for natural hazards – Mitigation - Earthquakes – Landslides – Volcanism – Tsunami - Cyclones and Floods

                                                                    TOTAL : 45 PERIODS

TEXT BOOKS:

1. Ravi P. Gupta, Remote Sensing Geology, Springer-Verlag New York, 2002.

REFERENCES:

1. Arnaud Gerkens, J.C. Foundation of exploration geophysics. Amsterdam; New York: Elsevier; New York, NY, U.S.A., 2002
2. S.N. Pandey, Principles and Applications of Photo geology: New Age International (P) Ltd., New Delhi. 1988.
3. Bloom, A.L. Geomorphology: A systematic analysis of late Cenozoic landforms Waveland press, INC. Long Grove, Illinois. 1998.

GI9205   **SURVEY PRACTICAL I**   **L T P C**
                                                                      0 0 4 2

OBJECTIVE:
The objective of this course is to introduce the principles of surveying, instruments
and various methods.

UNIT I   CHAIN SURVEYING

a) Study of chain and its accessories
b) Ranging, chaining and Pacing
c) Chain traversing without cross staff
d) Chain traversing with cross staff

UNIT II   COMPASS SURVEYING

a) Study of Prismatic and Surveyor's Compasses
b) Triangulation problem
c) Compass traversing

UNIT III   PLANE TABLE SURVEYING

a) Study of plane table and its accessories
b) Radiation
c) Intersection: Triangulation problem
d) Resection – Three point problem
e) Mechanical method
f) Trial and error method
g) Graphical solution
h) Resection – Two Point problem
i) Plane table traversing

UNIT IV   STUDY OF MINOR INSTRUMENTS

                                                    TOTAL : 60 PERIODS

GI 9206   **PHOTOGRAMMETRY LABORATORY I**   **L T P C**
                                                                     0 0 2 1

OBJECTIVES:

- To determine the stereoscopic acquity for stereo measurement,
- To provide exposure in handling basic equipment like stereoscope, parallax bar
- To provide details about project planning activities and selection of Ground
  Control Points.

EXERCISE DESCRIPTION

1. Testing Stereovision with test card
2. Finding stereoscopic acquity

3. Determination of photo scale
4. Mirror Stereoscope – Base lining and Orientation of Aerial Photographs
5. Use of parallax bar to find the height of point
6. Determination of slope using parallax point
7. Aerial photograph i) direct tracing of features for Urban planning and Highway planning ii) Radial line triangulation
8. Study of Aerial camera / Terrestrial camera
9. Preparation of flight plan
10. Selection of ground control point (horizontal & vertical)
11. Introduction to Analytical Stereo plotting instrument

TOTAL : 30 PERIODS

GI9207   **DATABASE SYSTEMS LABORATORY**   **LT P C**
                                                                          0 0 4 2

OBJECTIVE:

To get practical experience on the server – client setup on the database management

1. Server / client operations

   The server / client – Starting / Shutdown of server - Configuring client over network

2. Data Definition of Tables and Views

   Exercises on Creation, Deletion and Modification of definition

3. Data Manipulation of Tables and views

   Exercises on queries and to insert, delete and modify rows

4. Data Control of Tables and Views

   Exercises on control of tables and views

5. Database triggers

   Use of queries on complex integrity constraints

6. Forms designing

   Designing of forms for input/output

7. Menu designing

   Designing of user menus for database interactions

8. Report preparations

   Generating formatted reports

9. Front end tool – applications

   Designing of database application with any front end tool

TOTAL : 60 PERIODS

MA9261 **PROBABILITY AND STATISTICS** **L T P C**
3 1 0 4

AIM:

This course aims at providing the required skill to apply the statistical tools in engineering problems.

OBJECTIVES:

- The students will have a fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomenon.
- Have the notion of sampling distributions and statistical techniques used in management problems.

UNIT I   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 II   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 III   TESTING OF HYPOTHESIS   12
Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – χ^2-test for goodness of fit – Independence of   attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV   DESIGN OF EXPERIMENTS   12
Completely randomized design – Randomized block design – Latin square design - 2^2 - factorial design.

UNIT V   STATISTICAL QUALITY CONTROL   12
Control charts for measurements ($\overline{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits -   Acceptance sampling.

L: 45 + T: 15   TOTAL : 60 PERIODS

TEXT BOOKS:
1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007.
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2007.

REFERENCES:
1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, 7th edition, 2008.
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists, 3rd edition, Elsevier, 2004.
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill edition, 2004.

GI 9251   **SURVEYING II**   **L T P C**
                                                                          3 0 0 3

OBJECTIVE:
This subject deals with angular measurements, distance measurements and Control Survey methodology.   The student is introduced briefly to Hydrographic Survey operations also.

UNIT I   THEODOLITE SURVEYING   10
Theodolite – Types – Description and uses – Temporary and Permanent adjustments of vernier transit - Horizontal angles vertical angles – Heights and distances – Traversing – Closing error and distribution – Gale's tables - Omitted measurements – Laser attachment.

UNIT II   TACHEOMETRIC SURVEYING   8
Tacheometric systems – Tangential, Stadia and Subtense methods – Stadia systems – Horizontal and inclined sights, vertical and normal staffing, fixed and movable hairs – stadia constants – Anallactic lens – Subtense bar.

UNIT III   CONTROL SURVEYING   15
Horizontal and Vertical control – Methods – Triangulation – Signals – Base line – Instruments and accessories – Corrections – Satellite station – Reduction to centre – Trigonometric levelling – Single and reciprocal observations – Precise levelling – Types of instruments – Adjustments – Field procedure.

UNIT IV   HYDROGRAPHIC SURVEYING   7
Tides – MSL – Sounding and methods – Location of Soundings and methods – Three-point problem – Strength of fix – Sextants and station pointer – River Surveys – Measurement of current and discharge.

UNIT V   TOPOGRAPHIC SURVEYING   5
Scale and Precision– Methods of Representation – Planning – Instruments – Location of details – Electronic positioning system– Uses of Digital Terrain Model (DTM) and Digital Elevation Model (DEM)– Modern Trends.

                                                          TOTAL : 45 PERIODS

TEXT BOOKS:
1. Kanetkar T.P. Surveying and Levelling, Vols I and II, United Book Corporation, Pune, 1994
2. Punmia V.C. Surveying, Vols I, II and III Laxmi Publications, 1989.

REFERENCES:
1. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
2. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.
3. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice' Hall of India 2004.
4. A.M. Chandra, Plane Surveying, New Age International Publishers 2002.
5. Alak De, Plane Surveying, S. Chand & Company Ltd., 2000.

GI 9252   **DIGITAL IMAGE PROCESSING**   **L T P C**
                                                                      3 0 0 3

OBJECTIVE:
To make the undergraduate students gain knowledge and learn analytic background
of digital image processing system to enable them in building one.

UNIT I   FUNDAMENTALS   6
Computers imaging systems, image representation- colour space, image sampling-
quantization – quality measurement-data products – storage and retrieval- Photowite
systems- dip systems and software.

UNIT II   PREPROCESSING   6
Encoding and decoding- sources of image degradation – atmospheric, radiometric
and geometric errors – systematic and non-systematic correction – image geometry
operations

UNIT III   IMAGE ENHANCEMENT   15
Image characters – histogram, scatter plots, statistics and spatial statistics for
processing –image models, spatial transforms – enhancements: radiometric and
geometric operators- Fourier transforms, scale space transforms, image fusion,
texture analysis

UNIT IV   IMAGE CLASSIFICATION   9
Spectral discrimination pattern matching –Baye's theorem- signature and feature
extraction- training and classification – supervised an d unsupervised methods –
error matrix and accuracy estimates

UNIT V   IMAGE ANALYSIS   9
Concept of uncertainty- fuzzy partitioning – neural nets - sub-pixel classification
concept – pattern recognition - feature descriptors – representations schemes –
multi-scale edge detection – expert systems

                                                            TOTAL: 45 PERIODS
TEXT BOOKS:

1. John A. Richards and Xiuping Jia , " Remote sensing digital Image Analysis – an
    introduction" Fourth edition, Springer Verlag, 2005.
2. Robert A. Schowengerdt, " Remote Sensing: Models and Methods for Image
    Processing - Third Edition", Academic Press, 2006.
3. Rafeal C. Gonzalez and Richards E. Woods, " ,Digital Image Processing - 2nd
    Edition, Addison-Wesley Inc, 2004

REFERENCES:

1. Anil K. Jain , "Fundamentals of Digital Image Processing " Prentice Hall, 1989.
2. John Jenson, " Introductory Digital Image Processing: a remote sensing
    perspective – second edition", Prentice Hall, 1995.

GI9253   **OBJECT ORIENTED PROGRAMMING**   **L T P C**
                                                                 3 0 2 4
OBJECTIVE:
This course will facilitate the student to develop Object Oriented Programming and
GIS Customisation programming using Visual Basic.

UNIT I   CONCEPTS OF OBJECT ORIENTED PROGRAMMING   12

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   14

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

UNIT III   CLASSES AND OBJECTS   17

Classes and Objects – Member Functions – Private and Public Member function – Nesting of Member Functions – Array of Objects – Pointer to Members – Constructors – Destructors – Type Conversions – Exercises

UNIT IV   INHERITANCE AND POLYMORPHISM   16

Inheritance – Base class – Derived Class – Visibility modes – Single Inheritance – Multilevel Inheritance – Multiple Inheritance – Nesting – Polymorphism – File – Opening and Closing – File Modes – File Pointers – Random Access – Error Handling – Exercises.

**UNIT V   GIS CUSTOMISATION PROGRAMMING USING
                  VISUAL BASIC   16**

Accessing databases with the Data Controls – ADO Object Model – ODBC and data access Objects – ODBC using DAO and Remote Data Objects – Data Environment and Data Report – ActiveX Controls – GIS Customisation – Case studies.

L: 45 + P: 30 TOTAL : 75 PERIODS

TEXT BOOKS:
1. Balagurusamy.E., Object Oriented Programming with C++, Tata Mc.Graw Hill Publications, 2001
2. Stanley B.Lippman, A C++ Primer, 2nd Edition, Addison Wesley Publications, Second Edition 2000.

REFERENCES:
1. Bjarne Stroustrup, The C++ Programming Language, Addison Wesley Publications, Third Edition, 2000.
2. Tony Stevenson, Visual Basic 6: The Complete Reference, Osborne/ McGraw-Hill, 2000.
3. David S. Platt, Introducing Microsoft .NET Microsoft Press, Saarc Edition, 2001.

**GI9254   ELECTRONIC SURVEYING   L T P C
                                                3 0 2 4**

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

UNIT I FUNDAMENTALS 5
Methods of Measuring Distance, Basic Principles of EDM, Historical Development Classifications, applications and comparison with conventional surveying.

UNIT II BASIC ELECTRONICS 10
Oscillators (Crystal controlled and Gunn diode) - Kerrcell / Pockel's modulator- Frequency mixing - modulation and Demodulation - Measurement of phase differences - reflectors (Corner, Antenna) - Transducers and power sources.

UNIT III ELECTROMAGNETIC WAVES 20
Classification and applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting RI, Computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions. Computation of RI for microwaves. 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 and pressure transducers.

UNIT IV TOTAL STATION 10
Electro-optical system: Measuring principle ,Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, Working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system applications. Care and maintenance of Total Station instruments. Modern positioning systems.

UNIT V FIELD WORK 30

Study of different Total Station instruments - Setting out works - Base line Measurement - Total Station traversing: observations and computation of area - Trilateration.

L: 45 + P: 30 TOTAL : 75 PERIODS

TEXTBOOKS:
1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.

REFERENCES:
1. Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1991..
2. Soastamoinen, J.J. Surveyor's guide to Electro-magnetic Distance Measurement, Adam Hilger Ltd., 1997.

GE9261 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

AIM
To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and

make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE
At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I   ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – 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   8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil 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   10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation-central and state pollution control boards- Public awareness.

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT   6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIDOS

TEXT BOOKS

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.

REFERENCES

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

GI9255   **SURVEY PRACTICAL II**   **L T P C**
                                                      0 0 4 2

OBJECTIVE:

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

UNIT I   LEVELLING

   a)   Study of levels and levelling staves
   b)   Taking spot levels
   c)   Fly levelling using Dumpy level
   d)   Fly levelling using Tilting level
   e)   Check levelling

f) Permanent adjustment of levels
g) Contouring
h) LS and CS
i) Computation of volume of earth work from contours

UNIT II   THEODOLITE SURVEYING
a) Study of theodolite and its accessories
b) Measurement of horizontal angles
c) Measurement of vertical angles
d) Traversing

UNIT III   HEIGHTS AND DISTANCES
a) Triangulation problem
b) Single plane method

TOTAL : 60 PERIODS

GI9256   **DIGITAL IMAGE PROCESSING LABORATORY I**   **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 date.

1. Study of image file formats and organisation
2. Loading, import and display image
3. Display, zoom, panning of Image
4. Pixel locators and DN enumeration
5. Enhancement of image
6. Filters & edge enhancement
7. Designing of spatial filters
8. Thresholding and Density slicing
9. Band ratioing and NDVI
10. Principle Component Analysis
11. Look Up Table/PCT Manipulation
12. Bitmap generation & Conversion
13. Vector layer Manipulation
14. Symbol Manipulation
15. Reprojection to different co-ordinate systems

TOTAL : 60 PERIODS

GI9301   **SURVEYING III**   **L T P C**
                                                            3 0 0 3

OBJECTIVE:
The Subject of Surveying, astronomy, and setting out works have also acquired a special significance in the context of an unprecedented explosion of knowledge; thereby making radical changes in the concept of previously acknowledged thinking. The last Chapter deals with modern systems in Surveying and Mapping. It presents

an overview of the latest techniques in the field of instrumentation and methodologies being employed in Geomatics.

UNIT I   ASTRONOMICAL SURVEYING   16
Celestial sphere – Astronomical terms and definitions – Motion of sun and stars – Apparent altitude and corrections – Celestial coordinate systems – Different time systems – Nautical Almanac – Star constellations – Practical astronomy – Field observations and calculations for azimuth, time, longitude and latitude.

UNIT II   ROUTE SURVEYING   4
Reconnaissance – Route surveys for highways, railways and waterways.

UNIT III   CURVE RANGING   10
Horizontal and vertical curves – Simple curves – Compound and reverse curves – Setting out Methods – Transition curves – Functions and requirements – Setting out by offsets and angles – Vertical curves – Sight distances.

UNIT IV   MINE SURVEYING   5
Equipment – Correlation – Weisbach triangle – Underground levelling – Tunnel alignment and setting out – Transfer of azimuth – Gyro Theodolite - Shafts Adits.

UNIT V   MODERN SYSTEMS IN SURVEYING AND MAPPING   10
General – Electronic distance Measurement (EDM) – Digital Theodolite and its accuracy – Total Station and it's inbuilt programs like Co-go, Missing Line Measurement, Remote Elevation Measurement, 3D Coordinate Measurement, Automatic Azimuth Angle Setting, Resection, Setting out measurements and Area Calculation. Automatic total station – Laser Theodolite. Laser alignment instrument and electronic level – Digital level – Instrument for measuring tunnel profiles – Inertial positioning systems – Global Positioning System (GPS) – Digital Terrain Model (DTM) – LIDAR Measurements - Introduction to mapping software – Modern Trends.

TOTAL : 45 PERIDOS

TEXTBOOKS:
1. Kanetkar T.P. Surveying and Levelling, Vols I and II, United Book Corporation, Pune, 1994
2. Punmia V.C. Surveying, Vols I, II and III Laxmi Publications, 1989.

REFERENCES:
1. James M. Anderson and Edward M. Mikhail, Surveying, Theory and Practice, Seventh Edition, Mc Graw Hill 2001.
2. Bannister and S. Raymond, Surveying, Seventh Edition, Longman 2004.
3. S.K. Roy, Fundamentals of Surveying, Second Edition, Prentice' Hall of India 2004.
4. A.M. Chandra, Plane Surveying, New Age International Publishers 2002.
5. Alak De, Plane Surveying, S. Chand & Company Ltd., 2000.

GI9302   **MICROWAVE REMOTE SENSING**   **L T P C**
                                                                        3 0 0 3

OBJECTIVE:

To impart the knowledge in Microwave Remote Sensing and its application

UNIT I   FUNDAMENTALS AND RADIOMETRY   9
Introduction - plane waves - antenna systems – radiometry - microwave interaction with atmosphere constituents - Earth's surface and vegetation - Physical mechanisms and empirical models for scattering and emission - Radiometric systems – Sensors - Data product and applications.

UNIT II   RADAR REMOTE SENSING   9
Radar interaction with Earth surface and vegetation - Surface scattering theory - RADAR equation - Fading concept - Measurement and discrimination - Physical mechanisms and empirical models for scattering - Geometry of RADAR images - Radar return and image signature - Resolution concepts

UNIT III   REAL AND SYNTHETIC APERTURE RADARS   9
Airborne – Spaceborne - different platforms and sensors - Data products and selection procedure - SEASAT, SIRA, SIRB, ERS , JERS, RADARSAT missions.

UNIT IV   APPLICATION OF RADAR REMOTE SENSING   9
Application in Agriculture – Forestry – Geology – Hydrology - ice studies – landuse-mapping and ocean related studies.

UNIT V   SPECIAL TOPICS IN RADAR REMOTE SENSING   9
SAR Interferometry – Basics- Differential SAR Interferomentry - Polarimetry- Radargrammetry- applications - Altimeters.

                                                    TOTAL: 45 PERIODS
TEXTBOOKS:
1. Ulaby, F.T., Moore, R.K, Fung, A.K, Microwave Remote Sensing; active and passive, Vol. 1,2 and 3, Addison – Wesley publication company 2001
2. Woodhouse lain.H, Introduction to Microwave Remote Sensing Taylor & Francis 2005.

REFERENCES:
1. Floyd, M., Handerson and Anthony J.Lewis, Principles and application of Imaging RADAR, Manual of Remote Sensing, Third edition, Vol.2, ASPRS, John Wiley and Sons Inc., 1998
2. Charles Elachi and Jakob Van 2y, Introduction to the Physics and Techniques of Remote Sensing, Wiley Interscience, A John Wiley and sons Inc., 2006

GI9303   **CADASTRAL SURVEYING**   **L T P C**
                                                                          3 0 0 3

OBJECTIVE:
The Objective of this course is to introduce the students to the cadastral survey methods and its applications in generation of Land Information System. Cadastral surveys are those classes of land surveys which are executed for the purpose of systematically recording the land rights, producing register of land holdings or an inventory of land areas, land use and determining land tax.

UNIT I   INTRODUCTION   8
History of cadastral survey – Types of survey – Tax – Real Property – Legal cadastre – Graphical and Numerical Cadastre.

UNIT II   METHODS OF SURVEYING   12
Cadastral Survey Methods – Steps in survey of a village – Instruments used for cadastral survey & mapping – Orthogonal, Polar survey methods – Boundary survey – Rectangulation – Calculation of area of Land.

UNIT III   MAINTENANCE AND MEASUREMENTS   10
Cadastral survey maintenance – Resurveys – Measurement of sub-division – Measurement of obstructed lines – Survey of urban areas – Control requirement for Urban survey

UNIT IV   PHOTOGRAMMETRIC METHODS   5
Photogrammetry for cadastral surveying and mapping – Orthophoto map – GPS for cadastral survey.

UNIT V   MAPPING PROCEDURES AND MODERN TRENDS   10
Cadastral map reproduction – Map projection for cadastral maps – Conventional symbols – map – reproduction processes – Automated cadastral map.   LIS/GIS Organisation of cadastral offices in Tamil Nadu/India – Recent Developments & Modern Trends.
                                                              TOTAL: 45 PERIODS
TEXT BOOKS:
1. James, M. Anderson and Edward N. Mikhail, Introduction to Surveying, McGraw Hill Book Co, 1985
2. Kahmen & Faig, Surveying, Walter de Gruyter, Berlin, 1993.
3. Peter F. Dall, John D. MeLauglin, Land information management, Oxford Press.

REFERENCES:
1. Chain Survey and Land records Manuals I & II of Government of Tamil Nadu.
2. Survey of India, Hand book of Topography

GI9304   **GEODESY**   **L T P C**
                                                                                   2 2 0 4

OBJECTIVE:
To understand the concept of Geodetic Surveying and solve the geodetic problems.

UNIT I   FUNDAMENTALS   5
Definitions, Classifications, and Problem of Geodesy. Historical development and Organization of Geodesy. Reference Surfaces and their relationship. Applications. Engineering, Lunar and Planetary Geodesy.

UNIT II   GEOMETRIC GEODESY   20
Geodetic, Geocentric and Reduced latitudes and their relationship. Ellipsoidal Co-ordinates in terms of Reduced, Geodetic and geocentric latitude. Radius of curvature in the meridian & prime vertical and their relationship. Radius of curvature in any azimuth, Length of the meridian arcs and arcs of parallel and Area of trapezium on the ellipsoid. Curves on the ellipsoid, properties of Geodesic and Everest ellipsoid. Natural or Astronomical Co-ordinate System, Geodetic or Geographical co-ordinate System, Rectangular or Cartesian Co-ordinate System and relationship between them. Curvilinear Co-ordinate System. Deflection of Vertical, Spherical excess. Astro-Geodetic method of determining the reference Spheroid. Geodetic Control (Horizontal and Vertical)- Standards and Methods.

UNIT III   PHYSICAL GEODESY   10
Gravity field of earth, Concept of equipotential, Geopotential and Spheropotential Surface - Normal gravity, The Significance of gravity measurements, Measurements of Absolute and Relative gravity, Reduction of gravity measurements, Isostasy. Gravity networks. Gravity anomaly and Gravity disturbance - Fundamental equation of Physical Geodesy. Determination of Geoid and Deflection of Vertical, Orthometric height, Normal height, Dynamic height and their corrections, Ellipsoidal height and geoidal height.

UNIT IV   GEODETIC ASTRONOMY   15
Horizon, Hour Angle, Right Ascension and Ecliptic co-ordinate System, relationship with Cartesian System, Transformation between them. Special star positions, Major constellations, Rising and setting of Stars with respect to Declination, hour angle and Azimuth, Culmination, Prime Vertical Crossing and Elongation - Variation in celestial co – ordinates, Sidereal time, Universal time, Zone time and Atomic time. Determination of Astronomical Azimuth, latitude and longitude. Star catalogues, Ephemerides and Almanacs.

UNIT V   GEODETIC COMPUTATION   10
Rectangular and Polar Co – ordinates - First and Second geodetic problem - Similarity and Helmert's transformation, Point determination by Intersection - Resection and Arc Section

                                        L: 30 + T: 30 TOTAL : 60 PERIDOS

TEXT BOOK:

1. James R.Smith, Introduction to Geodesy, John wiley&Sons Inc. 1997.

REFERENCES:

1. Wolfgang Torge, Geodesy, Walter De Gruyter Inc., Berlin, 2001.

2. Bomford, G. Geodesy, Clarendon press, Oxford, 1980.
3. Petr Vanicek and Edward J. Krakiwsky, Geodesy: The concepts, North-Holland Publications Co., Amsterdam, 1991.
4. Heribert kahmen and Wolfgang Faig, Surveying, Walter De Gruyter, Berlin, 1988.
5. Schwarze, V.S. Geodesy: The challenge of the 3rd millennium, Springer verlag, and 2002.

GI9305   **GEOGRAPHICAL INFORMATION SYSTEM I**   **L T P C**
                                                                          3 0 0 3

OBJECTIVE:

To introduce the fundamentals of Geographic Information System. To provide details about Spatial data, Spatial data base structures, Data structures and their utility in GIS

UNIT I   FUNDAMENTALS OF GIS   9
Map – Definition – Types of Maps, Characteristics of Maps, Map Projections – GIS – Definition - History of GIS - Basic Components of GIS – Hardware, Software, Data, Methods, People – List of GIS Software: Popular software, Open Source software

UNIT II   DATA AND DATA BASE STRUCTURE   9
Data: Spatial and Non-Spatial Data – Spatial Data: Points, Lines, Polygons/Area and Surface - Non-Spatial Data - Levels of Measurement: Nominal, Ordinal, interval, ratio – Data Base – Functions - Data Base Structures – Hierarchical, Network, Relational- Relational Data Base Management System – Normalisation, E-R Diagram

UNIT III   DATA STRUCTURE/ DATA MODEL   9
Raster Data Model – Grid Cell/Pixel - Tessellations – Regular, Irregular – Geometry of Regular Tessellations: Shape, Adjacency, Connectivity, Orientation - Size of Grid Cell – Data Encoding: Rule of dominance, Rule of importance, Centre of Cell – Data Compression: Run length, Chain, Block and Quadtree coding - Vector Data Model – Topology - Euler Equation, Rules for Topological Consistency – Arc-Node Data Structure – Raster vs. Vector Comparison

UNIT IV   DATA INPUT   9
Vector Data Input – Digitizer: Principles, Co-ordinate transformation – Errors in digitizing – Scanner: Principles, On Screen Digitization, Georeferencing – Raster File Formats, Vector File formats – Import/Export Functionality – Linking Non-spatial data with Spatial data – Linking digital databases: ODBC – GPS data integration

UNIT V   CONTINUOUS SURFACE REPRESENTATION   9
Discrete and Continuous Surfaces – Interpolation Techniques - Digital Elevation Models – Sources of DEM: Ground Survey, Photogrammetry, Stereo Satellite data, Airborne Laser Terrain Mapping- DEM representation – Gridded DEM, TIN structure – Extraction of Topographic Parameters: Slope, Aspect, Delineation of Watershed and Drainage Network - DEM Applications.

                                                            TOTAL : 45 PERIODS

TEXT BOOK:
1. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFERENCES:
1. Peter A. Burrough, Rachael A. McDonnell, Principles of GIS, Oxford University Press, 2000
2. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996
3. Paul Longley, Geographic Information Systems and Science, John Wiley & Sons Inc, 2001

GI9306	SURVEY PRACTICAL III	L T P C
		0 0 4 2

OBJECTIVE:

The objective of this course is to train the students to acquire skill in using the instruments for various applications.

UNIT I   SETTING OUT WORKS
a) Foundation marking
b) Simple curve using chain and tape only
c) Simple curve by Rankine method
d) Transition curve

UNIT II   TACHEOMETRIC SURVEYING
a) Stadia method
b) Tangential method
c) Subtense method

UNIT III   FIELD ASTRONOMY
a) Study of motion of the Sun
b) Determination of azimuth using known latitude
c) Determination of azimuth using hour angle
d) Determination of watch error
e) Determination of latitude

UNIT IV   MEASUREMENT OF BASE LINE

TOTAL : 60 PERIODS

GI9307	GIS LABORATORY I	L T P C
		0 0 4 2

OBJECTIVE:

To provide practical and hands on exercises on Data Input, Data storage, Data Retrieval and Data output capabilities of GIS

1. Data Input – Digitizer, Scanning and On Screen digitization – Creation of Point,

    Line, Polygon and Surface Data - Data Editing – Editing digitizing errors

2. Building Topology – Measurement: Distance, Area

3. Linking Spatial and Non-spatial data – Adding Attribute data

4. Tabular data analysis- SQL, Select, Edit, Delete, Explore, Modify, Merge, Join and Descriptive Statistics from Tables

5. Generating various types of Charts from Tabular data

6. Other Data Base Connectivity: Linking external data base

7. Data Conversion – Vector to Raster, Raster to Vector

8. Data Interchange – Conversion of raster and vector to different interchange formats

9. Generation of DEM: from contours, spot heights

10. DEM display: Gridded DEM and TIN

11. DEM analysis: Derivation of Slope, Aspect Map

12. Data Output: Map compilation for Point, Line and Polygon data

TOTAL : 60 PERIDOS

GE9371   COMMUNICATION SKILLS AND SOFT SKILLS   L T P C
0 0 2 1
AIM:
To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:
- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their jobs.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

A. Viewing and discussing audio-visual materials

1. Resume / Report Preparation / Letter Writing: **2**
    Letter writing – Job application with Resume - Project report - Email etiquette.

2. Presentation skills: **1**
    Elements of effective presentation – Structure of presentation - Presentation tools – Body language.

3. Soft Skills: 1

Time management – Stress management – Assertiveness – Negotiation strategies.

4. Group Discussion: 1

Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.

5. Interview Skills: 1

Kinds of interviews – Interview techniques – Corporate culture – Mock interviews. (Career Lab Software may be used for this section).

NOTE:
Career Lab software may be used to learn the skills, to be applied in the practice session.

B. PRACTICE SESSION:

1. Resume / Report Preparation / Letter writing: Students prepare their own resume and report.   **4**
2. Presentation Skills: Students make presentations on given topics.   **8**
   Group Discussion: Students participate in group discussions.   **6**
4. Interview Skills: Students participate in Mock Interviews   **6**

TOTAL : 30 PERIODS

REFERENCES:

1. Anderson, P.V, Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi 2004.
4. David Evans, Decisionmaker, Cambridge University Press, 1997.
5. Thorpe, E and Thorpe, S Objective English, Pearson Education, Second Edition, New Delhi 2007.
6. Turton, N.D and Heaton, J.B, Dictionary of Common Errors, Addision Wesley Longman Ltd., Indian reprint 1998.

GI9351   **SATELLITE GEODESY**   **LT P C**
                                                        3 0 2 4

OBJECTIVE:
This subject deals with satellites in space, which are used for the geodetic applications. Several satellites launched will transmit the carrier signal, by receiving the ground position are determined.

UNIT I   FUNDAMENTALS   15
Definition – Fundamental goals of Geodesy – Definitions – basic concepts – Historical perspective - development applications in Satellite Geodesy – Geoid and

Ellipsoid satellite orbital motion – Keplerian motion – Keplers Law – Perturbing forces – Geodetic satellite

UNIT II   **DIFFERENT TECHNIQUES**   **15**
Determination of direction by photography – SECOR – Electronic observation techniques – Doppler effect – Positioning concept – Development of TRANSIT satellites.

UNIT III   **SATELLITE SYSTEM**   **15**
GPS – Different segments – space, control and user segments – satellite configuration – GPS signal structure – Orbit determination and Orbit representation Anti Spoofing and Selective availability – Task of control segment – GPS receivers – main receiver components – Example of GPS receivers.

UNIT IV   **GPS DATA PROCESSING**   **15**
GPS observables - code and carrier phase observation – linear combination and derived observables – concept of parameter estimation – data processing – software modules – solutions of cycle slips, ambiguities, RINEX format – Concepts of rapid static methods with GPS semi Kinematic and pure Kinematic methods -basic constellation of satellite geometry & accuracy measures.

UNIT V   **APPLICATIONS OF SATELLITE GEODESY**   **15**
Geodetic control surveys, Cadastral surveying, Photogrammetry & Remote Sensing, Engineering and Monitoring GIS - GLONASS satellite configuration comparison – Satellite Laser Ranging and Applications – Concepts of satellite altimetry.

L: 45 + P: 30 TOTAL: 75 PERIDOS

TEXT BOOK:
1. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 1998

REFERENCES:
1. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
2. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer – Verlag, Berlin, 2003.

GI9352   **SURVEY ADJUSTMENTS**   **L T P C**
      3 0 0 3

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

UNIT I   **MEASUREMENT AND ERROR**   **9**
Concepts of measurement and Error - Types of errors - Elementary concepts in probability - Reliability of measurement – significant figures - Error Propagation – linearisation - Multivariate distribution - Error ellipse - Weights and cofactors - Non-linear stochastic variables.

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

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

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

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

TOTAL: 45 PERIODS

TEXT BOOKS:

1.   Mikhail, E.M. and Gracie G., Analysis and adjustment of Survey measurements, Van Nostrand Reinhold, New York, 1981
2.   Paul.R.Wolf and Charles. D.Ghilani, Adjustment Computations –Statistics and least squares in surveying and GIS, John Wiley and sons inc., 1996.

**GI9353   GEOGRAPHICAL INFORMATION SYSTEM II   L T P C
                                                                                3 0 0 3**

OBJECTIVES:

- To provide exposure to Raster and Vector Analysis Capabilities of GIS.
- To introduce GIS modeling concepts with applications

UNIT I   RASTER DATA ANALYSIS   9
Local operations: Reclassification, Logical and Arithmetic Overlay operations – Neighbourhood operations: Aggregation, Filtering, Slope and Aspect Map – Extended Neighbourhood operations: Statistical Analysis, Proximity and Connectivity operations, Buffering, Viewshed Analysis – Regional Operations: Area, Perimeter, Shape, Identification of Region and Reclassification – Map Algebra.

UNIT II   VECTOR DATA ANALYSIS   9
Non-topological analysis: Attribute database query, Structured Query Language, Summary Statistics, Address geocoding, Calculation of Area, Perimeter and distance, Co-ordinate transformation, Surface interpolation – Topological Analysis: Reclassification, Aggregation, Overlay analysis, Point-in-polygon, Line-in-Polygon, Polygon-on-Polygon: Clip, Erase, Identify, Union, Intersection - Network Analysis, Buffering

UNIT III   SPATIAL MODELLING AND APPLICATIONS   9
Modelling – Definition – Spatial Modelling – External Model, Conceptual Model, Logical Model, Internal Model – GIS applications - Resource Management: – AM/FM Application: Electrical Utility - Land Parcel based application: Land Information System, Tax mapping - Crime Mapping -Business application

UNIT IV   DATA QUALITY AND ERROR PROPAGATION IN GIS   9

Data Quality – Accuracy, Precision, Error – Sources of Error – Components of Data Quality: Lineage, Positional Accuracy, Attribute accuracy, Logical Consistency, Completeness – Assessment of Positional and Attribute Accuracy – Error Propagation, Meta data - Spatial Data Transfer Standards – Interoperability of GIS.

UNIT V   MISCELLANEOUS TOPICS   9

Customisation of GIS: Need, Uses - 3D data visualization - Object Oriented GIS - Web GIS: Web GIS Architecture, Applications, Mobile Mapping

TOTAL : 45 PERIODS

TEXT BOOK:

1. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFERENCES:

1. Peter A. Burrough, Rachael A. McDonnell, Principles of GIS, Oxford University Press, 2000
2. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996
3. Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind, Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999.

GI9354	PHOTOGRAMMETRY II	L T P C
		3 1 0 4

OBJECTIVES:

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

UNIT I   STEREO PLOTTERS AND TECHNIQUES OF ORIENTATION   17

Inner orientation – Relative orientation – Numerical relative orientation – Absolute orientation – Model deformation - Projection – Viewing – Measuring – Tracing system – Optical projection equipments – Mechanical projection equipments – Zeiss parallelogram – Analytical plotters – Automatic image Correlation – Map compilation – Principle of Digital Photogrammetric Plotting.

UNIT II   ORTHOPHOTOGRAPHY   9

Classification of Orthophoto systems – Online and Offline instruments – Automatic Contouring – Instruments for Orthophoto productions – Orthophotos by Digital Image Processing

UNIT III   AERIAL TRIANGULATION PRINCIPLES AND ADJUSTMENTS   15

Basic concepts of strips and blocks photographic aerial triangulation – Analog triangulation – Independent Model Triangulation – Strip formation, graphical strip adjustment – polynomial strip adjustment – Analytical aerial triangulation, adjustment of blocks of aerial photographs – Three-dimensional coordinate transformation

UNIT IV   NON TOPOGRAPHIC PHOTOGRAMMETRY   9

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

UNIT V   DIGITAL PHOTOGRAMMETRY   10

Definitions of Digital Photogrammetric image – Creation of digital images – Automatic measurements of fiducial marks – Automated Photogrammetric point measurement – Creation of digital Photogrammetric image – Automated surface modelling – Digital Photogrammetric Workstation

L: 45 + T: 15   TOTAL : 60 PERIODS

REFERENCES:

1. Paul. R Wolf, Bon A.DeWitt, Elements of Photogrammetry with application in GIS– McGraw Hill International Book Co., 3rd Edition, 2000
2. E.M.Mikhail, J.S.Bethel, J.C.McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2001
3. Gollfried Konecny, Geoinformation: Remote Sensing, Photogrammetry and Geographical Information Systems, CRC Press, 1st Edition, 2002
4. Manual of Photogrammetry, American Society of Photogrammetry, 5th Edition, 2004.

GI9355   **SURVEY CAMP (DURING WINTER)**   **L T P C**
                                                                      0 0 4 2

Two weeks Survey Camp will be conducted during winter in the following activities

1. Triangulation
2. Trilateration
3. Star observation to determine Azimuth
4. Rectangulation
5. GPS Surveying

GI9356   **PHOTOGRAMMETRY LABORATORY II**   **L T P C**
                                                                       0 0 2 1

OBJECTIVE:

To acquire knowledge about Interior, Relative and Absolute Orientation using Analog and Analytical Stereoplotters.

1. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Analog Stereo Plotter

2. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Analog Stereo Plotter

3. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Semi Analytical Stereo Plotter

4. Measurement of model coordinates using Analytical Stereo Plotter

5. Mapping using Analytical Stereo Plotter

TOTAL: 30 PERIDOS

GI9357	GIS LABORATORY II	L T P C
		0 0 4 2

OBJECTIVES:
- To understand raster and vector analytical capabilities of GIS.
- To develop problem-solving skills using GIS

1. Raster Analysis - Local operators: Arithmetic overlaying , Logical Overlaying – Neighbourhood Operators: Sum, Mean, Slope
2. Map Algebra
3. Cost Surface Analysis
4. Vector Analysis – Topological Overlay –– Logical Operators – Union, Intersection, Identity Operations with Point, Line and Polygon
5. Clip, Dissolve, Buffering: - Point, Line and Polygon
6. Network Analysis: Creation of network data - Address Geocoding
7. Network analysis – One origin and One destination - Finding the shortest path to between given origin and destination
8. Network analysis – One Origin and several destination - Determining a garbage collection route/ courier delivery applications
9. Perspective Visualization – DEM – Draping with other themes
10. DEM – Volume calculation, Profile analysis, View shed analysis
11. Demo on Web based GIS applications

TOTAL: 60 PERIODS

GI9358	TECHNICAL SEMINAR	LT P C
		0 0 2 1

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.

SYLLABUS:

The students will work for three 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.

CE9401   **PRINCIPLES OF MANAGEMENT**   **L T P C**
                                                                    3 0 0 3

OBJECTIVE:

To introduce the basic concepts of management needed for a Civil Engineer

UNIT I   BASIC CONCEPTS IN MANAGEMENT   9

Types of business operations -Sole proprietorship – Partnership – Company – Public and private sector enterprises / Joint ventures, collaborations.

Functions of Management -Principles of management – Functions of management – Functions of a manager.

Production Management -Planning – scheduling – procurement – Inventory control – management tools – L.P. – PERT, CPM, etc.

**UNIT II   INTRODUCTION TO MARKETING AND FINANCIAL
                 MANAGEMENT   9**
Market – Marketing, Segmentation, Positioning, Marketing Research, Market Planning, Scope of financial management – Cost accounting Vs Financial accounting, Appraisal of projects, Investment decisions – concept of pay back.

UNIT III   MATERIALS AND EQUIPMENT MANAGEMENT   9
Planning – Identification, Procurement, Schedule and Cost control – systems approach in resource management – ABC analysis, VED analysis, FSN analysis, vendor rating evaluation, buying versus leasing of equipment

UNIT IV   HUMAN RESOURCE MANAGEMENT   9
Scope and objectives of HRM – Man power policy and planning – Recruitment and selection – Training performance appraisal – Wage policy and compensation systems – Company union relationship and collective bargaining – Accidents – Absenteeism and turn over – Grievances / conflicts – Identification and resolution.

**UNIT V   INTRODUCTION TO COMPUTER APPLICATION IN
                CONSTRUCTION MANAGEMENT   9**
Project identification-formulation-Preparation of detailed project report (DPR)-Planning – Scheduling and Resource analysis - Recording and operations- Project accounting, costing and finance – usage of project management software-

TOTAL: 45 PERIDOS

TEXT BOOKS:

1. Konni, Donnel C.O., and Weighnrich, H., "Management" Eighth Edition, McGraw Hill International Book Company, New York, 1997.
2. Philip Kotler, "Marketing Management", Prentice-Hall of India, New Delhi, 1998.

REFERENCES:

1. Momoria, "Personnel Management", Himalaya Publishing Co., New Delhi, 1992.
2. Sharma, J.L., "Construction Management and Accounts", Sathya Prakashan, New Delhi, 1994.
3. Srinath, L.S., "An Introduction to Project Management", Tata McGraw Hill Publications, New Delhi, 1995.

GI9401   THERMAL AND HYPERSPECTRAL REMOTE SENSING   L T P C
**   2 0 2 3**

OBJECTIVE:

To make the undergraduate students understand principles, processed mad applications of thermal and hyper spectral remote sensing for earth resources.

UNIT I   FUNDAMENTALS   5
Radiation science basics - Thermal radiation principles, thermal interaction behavior of terrain elements, thermal sensors and specifications – aerial thermal images

UNIT II   THERMAL IMAGE AND INTERPRETATION   12
Image character, spatial and radiometry- sources of image degradation –radiometric and geometric errors and correction – interpretation of thermal image- applications and case studies.

UNIT III   FIELD SPECTROMETRY   6
Diffraction principles- experimental design and instrumentation – factors affecting the field spectrum – imaging spectrometry – BDRF and hemispherical reflectance - Sensors and platform systems, including field spectroradiometers – data characteristics

UNIT IV   ANALYSIS   12
Virtual dimentionality-statistics for data reduction - data calibration, normalization – Hughes phenomenon –MNF transformation – kalman filters- library matching, spectral angle mapper, BBMLC-spectral mixture analysis – endmember extraction: PPI, PCA, spectral transformation - data compression

UNIT V   APPLICATIONS   10
Application to forestry, agriculture, geology, ecology, atmosphere, environmental and resource management.

L: 30 + P: 15 TOTAL: 45 PERIODS

TEXT BOOKS:
1. John A. Richards and Xiuping Jia , " Remote sensing digital Image Analysis – an introduction" Fourth edition, Springer Verlag, 2005.
2. Chein I Chang, "Hyperspectral Imaging: Techniques for Spectral Detection and Classification", Kluwer Academic/Plenum Publishers, New York, N.Y., 2003. (ISBN: 0-306-47483-2)
3. Chein I Chang, "Hyperspectral Data Exploitation: Theory and Applications, Wiley Inter Science, 2006 (ISBN: 9780470124628)

REFERENCE:

1. Chein I chang , "Recent advances in hyper spectral signal and image processing", Transworld network, 2006 (ISBN: 81-7895-218-1)

WEB REFERENCES:

1. www.oksi.com
2. ccrs.nrcan.gc.ca/optic/hyper

GI9402   **DIGITAL PHOTOGRAMMETRY**   **L T P C**
                                                                        3 0 0 3

OBJECTIVE:

The main objective is focused on the large-scale mapping using the aerial and high-resolution satellite data in digital format. The natural resources of the terrain will also be extracted for developmental planning.

UNIT I   FUNDAMENTALS   9

Evaluation of Digital Photogrammetry – Comparison of Analog, Analytical and Digital – Advantages – Automation – Accuracy – Representation of Digital images B/W – RGB, HIS. Image source – Analog and Digital cameras

UNIT II   DIGITAL CAMERA   9

Digital Camera – CCD Camera – Full frame, Frame transfer, Interline CCD Cameras. Time delay integration – Spectral sensitivity of CCD sensor – Geometry problem of CCD image – line – filter, blooming, warm up effect – trailing - Types of CCD systems. Linear array line scanner – use of CCD scanners in high resolution satellites, SPOT, MOMS, IRS, IKONOS and Quickbird.

UNIT III   SCANNERS   9

Analog to Digital conversion – Types of scanners – flat bed – drum type – sensor characteristics – scanner resolution. Geometric and Radiometric resolution – scanner calibration – Video camera – typical Photogrammetric scanners.

UNIT IV   DIGITAL PHOTOGRAMMETRIC WORKSTATION   9

Merits and Demerits of Digital system – Stereo viewing – spatial – spectral – temporal methods – image measurement – coordinate system – image movement – fixed and moved image – image transformation – geometric and radiometric transformation - Concepts of interior, Relative and Absolute orientation – GCPs – use of GPS in Digital Photogrammetry.

UNIT V   APPLICATIONS   9

Aerial Triangulation (ATM) – block adjustment – DEM generation – image matching – image correlation – Digital Orthophoto generation – Feature extraction – Image enhancement – Integration Remote Sensing, GPS and GIS applications in Terrestrial Photogrammetry

                                                        TOTAL: 45 PERIDOS

REFERENCES:

1. Eilifried Linder, Digital Photogrammetry, Theory & Application, Springer – Verlag, Berlin, 2003
2. Michel Kasse & Yves Egles, Digital Photogrammetry, Taylor & Francies, London & Newyork, 2001.
3. Edward M.Mikhail, Janan S.Bethel & Chris Mc Glone, J Introduction to Modern Photogrammetry, John Wiley & Sons Inc, New York 2000.

GI9403   **GEOGRAPHICAL INFORMATION SYSTEM**   **L T P C**
                                  APPLICATIONS   **3 0 0 3**

OBJECTIVE:

To provide exposure to applications of GIS in various application domains through case studies

UNIT I   NATURAL RESOURCE MANAGEMENT APPLICATIONS   9

Forestry: Resource Inventory, Forest Fire Growth modelling – Land: Change detection studies, Watershed Management studies – Water – Identification of Ground Water Recharge- Resource Information System – Wet lands Management

UNIT II   FACILITY MANAGEMENT APPLICATIONS   9

Utilities – Water utility applications – Electric Utility Application – Telecommunication: Tower Spotting – Other utilities

UNIT III   LOCATION BASED SERVICES APPLICATIONS   9

Vehicle Tracking: Automatic Vehicle Location (AVL), Components of AVL :In Vehicle Equipment, Various Communication Channels, Web Server, Client – Vehicle Tracking- Alarms used in Vehicle Tracking, Fleet Management - Vehicle Navigation – Emergency Call: Distress Calls

**UNIT IV   LAND INFORMATION SYSTEM APPLICATIONS AND ALIGNMENT
                STUDIES   9**

Land Information System (LIS) – Tax Mapping – Other LIS applications – Pipe line routing, Highway alignment

UNIT V   MISCELLANEOUS TOPICS   9

Disaster Management Applications, Web GIS applications, Health applications

TOTAL : 45 PERIDOS

TEXT BOOKS:
1. Laura Lang, Managing Natural Resources with GIS,ESRI Press, 1998.
2. A. Van Dijk M. G. Bos , GIS and Remote Sensing Techniques in Land-And-Water-Management, Kluwer Academic Publishers, 2001
3. Uzair M. Shamsi, U. M. Shamsi GIS Tools for Water, Wastewater, and Stormwater Systems, Asce Press,2002.

REFERENCES:

1. Paul A Longley, Michael F Goodchild, David J Maguire, David W Rhind,Geographical Information Systems, Volume I and II, John Wiley and Sons, Inc., 1999.
2. Alan L., MD Melnick, Introduction to Geographic Information Systems for Public Health, Aspen Publishers, 1st edition,2002.
3. Lisa Godin,GIS in Telecommunications Management, ESRI Press,1st edition 2001.
4. Laura Lang, GIS for Health Organizations, ESRI Press, 2000
5. Amin Hammad, Hassan Karimi, Telegeoinformatics: Location-based Computing and Services, CRC Press, 1 edition, 2004.

**GI 9404   OPERATIONS RESEARCH FOR GEOINFORMATICS   LT P C
                                                                3 0 0 3**

OBJECTIVE:
To impart knowledge in formulating the model and solving problems in Geoinformatics using Linear programming, Dynamic programming, Management tools and simulation Techniques.

UNIT I   BASIC CONCEPTS   7

Origin, Nature and significance - Models and Modeling approach – Methodology – Applications and Scope - Basic operations research models – Computer Packages

UNIT II   LINEAR PROGRAMMING   12

Problem formulation – structure and assumptions - standard form – Graphical solution – solution by simplex method – Sensitivity Analysis – Duality – Formulations of Dual problem – primal and dual relationship - Geoinformatics problems & solutions

UNIT III   DYNAMIC PROGRAMMING   8

Characteristics –models - Deterministic case - Bellman's optimality criteria – problem formulation and solution – Forward and Backward recursive approaches

UNIT IV   PROJECT MANAGEMENT   9

PERT and CPM – Network components and relationships – forward and Backward pass – critical path analysis - problems on crashing, Resource Leveling – Resource allocation

UNIT V   SIMULATION   9

Introduction – Deterministic and Stochastic simulation – simulation of Inventory problems – Queuing problems – Investment – Maintenance – Role of computers in simulation.

TOTAL : 45 PERIDOS

TEXT BOOKS:

1.   Hiller, P.S. and G.I. Lieberman, Operations Research, Holder – day Inc., 2001.

REFERENCES:

1.   Hamdy A Taha, "An Introduction to Operations Research, Prentice Hall, Sixth edition, 2000.
2.   R. Panneerselvam, "Operations Research", Prentice Hall of India, 2002.
3.   Sharma, J.K., Operations Research Theory and Applications, Mac Millan India Limited, 2003.
4.   Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management, All India Traveler Delhi, 1988.

GI 9405   DIGITAL PHOTOGRAMMETRY LABORATORY   L T P C
0 0 4 2

OBJECTIVE:

The objective of this Digital Photogrammetry Lab is to give hands on exercise to practice how to orient the digital data and how to prepare maps, to generate DEM and Digital Orthophotos.

EXERCISES

1.   Digital Photogrammetric Workstation – Data input and Creation of Project
2.   Image import – Image Enhancement
3.   Control point editing
4.   Camera Calibration – Automatic and Manual Interior Orientation

5. Orientation Management – Camera Calibration – Editing the Scheme point file
6. Imagery import – Relative Orientation – Absolute Orientation
7. ATM Adjustment – Automatic Point Measurement
8. DTM creation – Automatic Terrain Extraction
9. Editing the DTM
10. DTM Terrain analysis
11. Mosaic – Generating Orthophoto – Mosaic sheet cutting
12. Planimetric Mapping

TOTAL: 60 PERIDOS

GI 9406   **DIGITAL IMAGE PROCESSING LABORATORY II**   **LT P C**
                                                                          0 0 4 2

OBJECTIVE:
To familiarize the undergraduate level students in the regular IP software with respect to basic processing required to generate thematic maps from Satellite date.

1. To read and display image from CD
2. To Composite and extract sub area from full scene
3. To Georeference image to map
4. To Georeference image-to-image
5. To analysis the transformation errors
6. To mosaic two sub areas – colour balancing
7. To select features (bands) for classification and to form patterns
8. To generate base information using graphic planes (Vector & Raster)
9. To Convert vector information to graphic plane vice versa
10. To create and compute training set statistics
11. To apply classifiers
12. To assess the accuracy
13. To compose thematic map
14. Unsupervised classification
15. Theme merging & GIS data generation

TOTAL: 60 PERIDOS

GI 9451   **PROJECT WORK**   **L T P C**
                                               0 0 12 6

The objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Geoinformatics.

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.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusions. This final report shall be typewritten form as specified in the guidelines.

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

GI 9021   **CLOSE RANGE PHOTOGRAMMETRY**   **LT P C**
                                                                      3 0 0 3

OBJECTIVE:
The objective of this subject is focused how the terrestrial objects can be mapped by taking photographs. This technique is used to study not only in engineering aspects but also in the Medicine, Forensic applications.

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

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

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

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

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

TOTAL: 45 PERIODS

TEXT BOOK:
1. Atkinson, Development in Close Range Photogrammetry-I, Development series 1988

REFERENCES:

1. Bandekar, J.,Photogrammetric surveys of monuments and sites, North Holland Publishing Co.,
   American Elsevier Publishing Co., 1975
2. Karara, H.M., Non topographic Photogrammetry, Second Edition, American Society for Photogrammetry and Remote Sensing, 1989

GI9022   **ADVANCED CARTOGRAPHY**   **LT P C**
                                                                          3 0 0 3

OBJECTIVE:

This subject deals with the recent advancements in the field of digital cartography and the rapid technological development in the electronic dissemination of spatial information.

UNIT I   MANAGING DATA BASES   9
Data organisation – Data compression – Data measurement – Basic statistical processing – Geographical Information System – The measuring of GIS to cartography.

UNIT II   DATA PROCESSING   9
Computer system for the processing of graphic data – Hardware –Software - SICAD –Digitising cartographic presentation – Structuring and storage of data – Cartographic data processing – Output of cartographic presentation – Examples and applications

UNIT III   MODELLING IN DIGITAL CARTOGRAPHY   9
Fundamentals of modelling, graph theory, topology – Digital planimetric modelling – Digital relief modelling – Quality of digital landscape models – Topographic model generalisation, Map revision – Web Cartography – Dynamic and Static Web Maps.

UNIT IV   MAP DESIGN   9
Theory of communication - information and signs - methods of computer assisted design of cartographic expressions, computer assisted evaluation of geo data for thematic maps - Cartographic aspects of GIS.

UNIT V   TECHNIQUES OF MAP PRODUCTION   9
Modern techniques in map production - Dynamic and interactive mapping, animation, navigation system, simulation, interactive cartography, map as interface - Trends for future developments - Expert systems and Web Maps.

TOTAL: 45 PERIDOS

TEXT BOOKS:

1. Menno, Jan Kraak and Ferjan Ormeling, Cartography – Visualization of Geo spatial Data, PEARSON Education Second Edition 2004.
2. Arthur. H. Robinson et al, Elements of Cartography, Seventh Edition John Wiley and sons, 2004.
3. R.W. Anson And F.J. Ormeling, Basic Cartography for Students and Technicians Vol-I, II and III, Elsevier Applied Science Publishers 2nd Edition – 2002.
4. Menno, Jan Kraak and Allan Brown , Web Cartography developments and prospects, Taylor & Franics 2001.

GI 9023   **ADVANCED SURVEY ADJUSTMENT**   **L T P C**
                                                            3 0 0 3

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

UNIT I   PRE ANALYSIS OF SURVEY MEASUREMENTS   9
Pre analysis procedure - Horizontal angle measurement with theodolite - Distance measurement by EDM - elevation difference by Direct leveling – Survey tolerances.

UNIT II   STATISTICAL ANALYSIS OF SURVEY MEASUREMENTS   9
Samples and statistics - The Chi-square distribution - the t-student distribution- common sample statistics - estimation of mean and varianc - Confident interval for the mean and variance - statistical testing-Test or the mean of probability distribution - Test of the variance of a probability distribution. Bivariate normal distribution.

UNIT III   GENERAL LEAST SQUARES ADJUSTMENT   9
Introduction – Derivation - Precision estimation of special cases - Application of least squares adjustment in GIS and GPS.

UNIT IV   APPLICATION IN PLANE COORDINATE SURVEYS   9
Introduction - the distance condition and its linearization - azimuth condition and its linearization - angle condition and its linearization - position fixing by Distance - Two parameter similarity transformation - Four parameter similarity Transformation.

UNIT V   SPECIAL SUBJECTS OF STATISTICS   9
Theory of prediction and filtering - sequential adjustment (static and Kinematic Kalman-filter) Application of Kalman-filter in Geodesy; Goodness of fit - Test of any distribution.

TOTAL : 45 PERIODS

TEXT BOOK:
1. Mikhail, E.M. and Gracie.G. Analysis and adjustment of Survey measurements, Van Nostrand Reinhold, New York., 2002.

REFERENCE:
1. Paul.R.Wolf and Charles. D.Ghilani Adjustment Computations –Statistics and least squares in surveying and GIS, Jhon Wiley and sons inc., 2004.

GI 9024   **AIRBORNE LASER TERRAIN MAPPING**   **L T P C**
                                                                  3 0 0 3

OBJECTIVE:
To introduce the concepts of LASER Terrain mapping and modelling

UNIT I   FUNDAMENTALS   9
Introduction - Principle and properties of LASER, LIDAR- Different LIDAR systems - Applications - Comparison - Airborne LIDAR missions - Typical parameters of a LIDAR system.

UNIT II   LIDAR   9
Laser Altimetry System - Components of the system - GPS, IMU LASER, LIDAR data formats – LIDAR Systems specification and accuracy standards

UNIT III   DATA PROCESSING   9
Data Processing - Strip Adjustment - Geometric Correction - Data quality enhancement - Filtering - Ground Point filtering – Digital Elevation Model

UNIT IV   OVERVIEW OF APPLICATIONS   9
Overview of LIDAR Applications in various domains - Disaster Mitigation and Management - 3D city models - Telecommunication Modelling - Feature extraction, vectorisation - Surface and landuse classification

UNIT V   LIDARGRAMMETRY   9
LIDAR for Orthophoto - Digital Photogrammetry software and LIDAR - Integration of LIDAR DEM with other hyperspectral data

                                                      TOTAL : 45 PERIDOS

TEXT BOOKS:
1. Yves Egels and Michel Kasser, Digital Photogrammetry, Taylor & Francis, 2001.
2. Lee-Leung Fu, Satellite Altimetry and Earth Sciences, A Hand Book of Techniques and Applications, Academic Press, 2000.
3. E.P. Baltsavias, Automatic Extraction Man Made Objects, Taylor & Francis, 1st edition 2001

REFERENCES:
1. ISPRS Journal of Photogrammetry and Remote Sensing, Special Issue on Airborne Laser Scanning and Mapping, Volume 54, Issue 2-3, 15-July-1999
2. Roger Read and Ron Graham, Manual of Aerial Survey: Primary Data Acquisition, Whittles Publishing, 2002.

GI 9025   **REMOTE SENSING AND GIS FOR HYDROLOGY**   **L T P C**
                          AND WATER   RESOURCES   **3 0 0 3**
OBJECTIVE :
To impart knowledge in basics of Remote Sensing and GIS in various applications of hydrology and water resources.

UNIT I   BASICS   9
Hydrologic cycle, estimation of various components of hydrologic cycle – clouds, rainfall – runoff – evaporation – transpiration - evapo–transpiration – interception - depression storage. Spectral properties of water - surface water modelling.

UNIT II   DRAINAGE BASIN   8
Watershed divide, stream networks, Delineation and codification of watersheds morphometric analysis –linear, areal, relief aspects - Rainfall – runoff modelling - Stage discharge relationship – Hydrograph – unit hydrograph – urban hydrology.

UNIT III   AREAL ASSESSMENT   8
Mapping of snow covered area - snow melt runoff - flood forecasting and inundated area - soil moisture area - drought affected area - Drought prone area programme - Applications in aerial assessment.

UNIT IV   GROUND WATER AND WATER QUALITY   10
Origin – classification and properties of aquifer -Ground water potential – surface water indicators –aquifer parameters - Well hydraulics - estimation of ground water potential hydrologic budgeting - Mathematical and GIS modeling - modelling of sea water intrusion - Water quality parameters –. Water quality mapping and monitoring - Correlation model for pollution detection.

UNIT V   IRRIGATION AND WATERSHED MANAGEMENT   10
Project investigation, implementation, maintenance stage - location of storage/diversion works - capacity curve generation - conjunctive use of surface and ground water - Mapping and monitoring the catchment and command area - artificial recharge of groundwater - water harvesting structures - sediment yield, modelling of reservoir siltation - prioritization of watershed - sustainable development.

TOTAL: 45 PERIDOS

REFERENCES:

1. Dr.David Maidment and Dr.Dean Djokic, Hydologic and hydraulic modeling support with GIS, ESRI press New York – 2000.
2. Gert A.Schulitz . Edwin T. Engman, Remote Sensing in hydrology and Water Management, Springer-verlay Barlin Heilelberg Germany – 2000.
3. Andy D. Ward William J. Elliot, Environmental Hydrology, Lewis publisher Bocaroton New York – 1995.
4. Eric C. Barrett, Clare H.Pawer, Satellite Remote Sensing for Hydrology and Water Management, Gordon @Breach Science publications – Newyork-1990

GI9026   REMOTE SENSING AND GIS FOR OCEAN ENGINEERING   L T P C
AND COASTAL ZONE MANAGEMENT   3 0 0 3

OBJECTIVE:
To familiarize the students about the basics and application of Remote Sensing and GIS in the field of Ocean Engineering and Coastal Management.

UNIT I   OCEAN ENGINEERING   9
Coastal processes – Oceanic circulation – Upwelling and sinking – Waves – reflection, diffraction and refraction - wave generated currents - catastrophic waves - Tides – Tidal forces Bathymetry – sediment drift – navigation.

UNIT II   OCEAN GENERAL STUDIES   8
Physical properties of sea water – chemistry of sea water - Biological parameters – Oceanographic instruments – collection of water samples – current measuring devices – deep sea coring devices.

UNIT III   COASTAL ENGINEERING   8
Coastal Hydrodynamic – Coastal erosion - various protection structures - Estuaries and their impact on coastal processes – Hydrodynamic of pollution dispersion- Modelling of suspended sediment.

UNIT IV   REMOTE SENSING APPLICATION FOR OCEAN   10
Various Satellite and sensors for Ocean and Coastal applications- Application of CZCS – chlorophyll and suspended sediment estimation – Retrieval of physical oceanographic parameters – sea surface temperature - significant wave height - wind speed and wind direction - coastal Bathymetry – sea level rise.

UNIT V   COASTAL ZONE MANAGEMENT   10
Introduction – Major issues/problems – Thematic maps on coastal resources - wetland classification - mapping of shore line changes - creation of CZIS - Coastal aquifer modelling - Integrated coastal zone Management –Resolving conflict on resources utilization.

TOTAL: 45 PERIODS

REFERENCES:
1. Vasilis D. Valavanis, GIS in oceanography & Fisheries, Taylor & Francis London & New York, 2002
2. Alasdair J.Edward,   Remote Sensing Handbook for Tropical Coastal Management, UNESCO publishing, 2000.
3. Grant Gross,M., Oceangraphy, Merrill Publishing company, Columbus, U.S.A., 2002.
4. Karsten Manager, Shoreline Management Guidelines, DHI Water & Environment, Denmark, 2004.
5. Dean, R.G. nd Dalrymple, R.A., Coastal Process with Engineering Application, Cambridge university press, Cambridge, 2006.
6. Paul D.Kumar, Beach process and sedimentation. Prentice – Hall Inc., New Jersey, 2002.

GI9027   REMOTE SENSING AND GIS FOR ENVIRONMENTAL   L T P C
MONITORING   3 0 0 3
OBJECTVE:
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   10

Sources and demands of water - Characteristics of water- Point and non-point sources of water pollution – Spectral responses of clear and contaminated water – chlorophyll- biota- Remote Sensing of Water quality assessment - Runoff estimation-flood prediction modeling.

UNIT II   SOIL CONSERVATION AND MANAGEMENT   12

Formation of Soils - land forms – soil erosion –factors influencing soil erosion, soil contamination- distribution and accumulation of contaminants such as toxic metals, synthetic chemicals in soil- disposal of solid waste - 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   8

Conservation and resource management – spectral reflectance from vegetated surface – Stress monitoring – Land cover and Land use mapping - forest conservation – Biodiversity –biomonitoring of the environment - wild life studies – monitoring non point source pollution.

UNIT IV   SENSORS AND DATA FOR ENVIRONMENTAL MONITORING   5

Sensors for environmental monitoring – LIDARS- LASER Remote Sensing -visible and outside visible wave length –absorption spectrometers – selection of ground truth sites – sea truth observation – Radar techniques for sensing ocean surface – thermal measurements – application of remote sensing for oil slicks mapping – Chlorophyll detection – Fisheries resources – Coastal marine studies – determination of temperature and sea state.

UNIT V   AIR POLLUTION AND GLOBAL CLIMATOLOGY   10

Air Pollutants- Dispersion modeling -Air quality monitoring – case studies – climatology – emissivity characteristics – measurements of atmospheric temperature – composition – constituent distribution and concentration – wind flows and air circulation – Hurricane tracking – meteorological satellite systems.

TOTAL : 45 PERIDOS

REFERENCES:

1.   Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc, April 2004,
2.   Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, Second edition, Chapman and Hall, New York, 1993
3.   Lintz, J.and Simonent,D.S.Remote sensing of environment Addision Wesley,Rading mars, 1976.

GI9028	REMOTE SENSING AND GIS FOR URBAN AND	L T P C
	REGIONAL PLANNING	3 0 0 3

OBJECTIVE:

To impart knowledge to the students to understand scope of Remote Sensing and GIS for Urban and Regional planning

UNIT I   FUNDAMENTALS   7

Relevance of Remote Sensing – Scale and Resolution – Scope and Limitations – Characteristics of Settlements – Interpretation from Aerial and Satellite images – Digital Image Processing Techniques – Texture based analysis – Automated Feature extraction.

UNIT II   URBAN AND REGION MAPPING   9

Delineation of urban area – Physical Structure and Composition – Mapping slums, CBD, urban fringe areas – Urban Heat island - Temporal mapping – Use of High-resolution, Hyperspectral Remote Sensing – Regional Mapping

UNIT III   URBAN AND REGIONAL PLANNING   9

Classification of Plans – Regional, Master and Detailed Development – Objectives and Contents – Use of remote sensing and GIS in plan preparation – Urban Information System – Web GIS - Solid Waste Management Planning – Utility Planning - case studies.

UNIT IV   URBAN ANALYSIS   12

Urban Sprawl – Urban Spatial Structure – Housing Typology – Census Estimation – Water Demand Analysis – Urban Safety Analysis – Physical Transformation of City - Urban Renewal – Land Suitability Analysis – Land valuation - Tax assessment - case studies

UNIT V   SYSTEMS AND MODELLING   8

Urban Growth Modelling – Planning Support Systems – Expert Systems in Planning – Urban Environmental Modelling – 3D city models – ALTM

TOTAL: 45 PERIODS

REFERENCES:
1. Jean-Paul Donnay, Mike J Barnsley and Paul A Longley, Remote Sensing and Urban Analysis, Taylor and Francis, 2001
2. Sokhi B S and Rashid S M, Remote Sensing of Urban Environment, Manak Publications Private Limited, 1999
3. William E Huxhold, An Introduction to Urban Geographic Information Systems, Oxford University Press, 1991
4. Robert N Colwell, Manual of Remote Sensing, Volume II, American Society of Photogrammetry and Remote Sensing, 2004.

GI 9029   REMOTE SENSING AND GIS FOR EARTH SCIENCES   L T P C
                                                                           3 0 0 3

OBJECTIVE:

The objective of this course is to impart knowledge to the students about the application potentials of Remote Sensing and GIS in earth science. The contents of this course enable the students to understand the controls of Earth Science on the occurrence and management of natural resources.

UNIT I   REMOTE SENSING APPLICATIONS TO LITHOLOGY   9

Introduction - Lithological mapping using aerial photos and satellite imagery – theory and practicals – Digital analysis for lithological discrimination.

UNIT II   REMOTE SENSING APPLICATIONS TO GEOMORPHOLOGY   9

Introduction - Nature and type of different Landforms such as Structural, Denudational, fluvial, Aeolian, glacial and volcanic landforms – their pattern configuration. Mapping Geomorphic Landforms using satellite data - theory and Practical

**UNIT III   REMOTE SENSING APPLICATIONS TO
                    STRUCTURAL ANALYSIS   9**

Introduction - Different types and Geometry of folds, nature, mode of origin, and mode of occurrence of faults. Structural analysis and mapping using aerial and satellite data, theory and practicals – digital techniques for structural analysis.

UNIT IV   SUB – SURFACE EXPLORATIONS   6

Different types of geophysical surveys, Electrical Resistivity surveys, aeromagnetic and Electromagnetic surveys for subsurface explorations. Planning geophysical field surveys using satellite data.

**UNIT V   REMOTE SENSING AND GIS APPLICATIONS IN GEOLOGICAL
                   INVESTIGATIONS   12**

Surface and Ground Water Resources - Hydrogeological mapping - Mineral resources: Petroleum - Environmental Geology - Engineering Geological studies - Disaster Management studies like Droughts, Floods, Landslides - Integrated surveys using Geological, Geomorphological, Geophysical and Remote sensing based data for Mineral exploration, Groundwater studies.

TOTAL : 45 PERIODS

REFERENCES:

1. Joseph Lintz (Jr) and David Simonett Remote Sensing of environment, Addison Wesley Publishing Company London, 1976.
2. Parbinsingh Geology Katson Publishing House Ludhiana 4th edition 1985.
3. Manual of Remote Sensing Vol II, American society of Photogrammetry falls church Virginia – 1985.
4. Three Dimensional Applications in Geographical Information Systems – by Jonathan Raper, Dept. of Geology, Birkbeck College, University of London – 1989.
5. Remote Sensing for the earth sciences Vol. 3. edited by Andrew Rencz. (American Society of photogrammetry and Remote Sensing John Wiley & Sons inc 2004.
6. Remote Sensing for Geologists by Gary L.Prost Gordon and Breach Science Publishers.
7. Remote Sensing and image interpretation by Thomas M.Lille sand and Ralph W.Kiefer John Wiley & Sons inc 2004

GI9030   REMOTE SENSING AND GIS FOR AGRICULTURE   L T P C
AND FORESTRY   3 0 0 3

OBJECTIVES:

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

UNIT I   CROPS   9
Introduction – leaf optical properties – identification of crops and crop inventorying – crop acreage estimation – vegetation indices – yield estimation – crop production forecasting through digital analysis – microwave and hyper spectral sensing for crop inventory – crop monitoring and condition assessment in command areas – case studies.

UNIT II   SOILS   9
Introduction – soil survey, types of soil surveys – soil genesis and soil classification – soil taxonomy – soil reflectance properties – soil mapping using remote sensing – problem soils – saline, alkali soil characteristics – mapping of saline alkaline soils – soil erosion and sedimentation – assessment of soil erosion – estimation of reservoir capacity.

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

UNIT IV   DAMAGE ASSESSMENT   9
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.

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

TOTAL: 45 PERIODS

REFERENCES:
1. Srinivas, M.G., Remote Sensing Applications, Narosa Publishing House, New Delhi, 2001
2. Andrew Rencz, Manual of Remote Sensing. Vol.3. Edn.3. Remote Sensing for the Earth Sciences, American Society for Photogrammetry and Remote Sensing, John Wiley & Sons, New York, 1999
3. Jensen, J.R., Remote Sensing of the Environment – An Earth Resource Perspective. Dorling Kindersley (India) Pvt. Ltd., New Delhi, 2001
4. Agarwal, C.S. and P.K.Garg, Textbook on Remote Sensing in Natural Resources Monitoring and Management. Wheeler Publishing, New Delhi, 2000
5. Narayan, L.R.A., Remote Sensing and its Applications. Universities Press (India) Ltd., Hyderabad, 2001

GI 9031   REMOTE SENSING AND GIS FOR METEOROLOGY   LT P C
                                                         3 0 0 3

OBJECTIVE:
The main objective of this subject is to give information of the climate, weather forecasting using RADAR and Geo stationary satellites. It deals with weather conditions, sensors, satellites and the data interpretation for various applications.

UNIT I   GENERAL CONCEPTS IN METEOROLOGY   9
Weather and climate – composition of atmosphere – temperature and pressure distribution – Winds over the earth's atmosphere – scales of atmospheric processes - Land / Ocean coupling – Indian monsoons – other major weather systems of seasons – brief introduction to Indian Climatology - Radiative transfer – radiation spectrum – Absorption and emission of radiation by molecules – Radiative laws – scattering principles - Cloud physics – Mechanism of cloud formation – Types of clouds – precipitation processes – warm and cold cloud concepts and processes.

UNIT II   RADIO METEOROLOGY   9
Principles and classifications of Radar – components of Radar – Meteorological applications. Upper air temperature exploration of the atmosphere (Radio Sonde) – Upper air wind estimation through Pilot Baloon – Wind estimation through Radar (Rawin Sonde), Doppler technique - Precipitation estimation through Radar and problems associated with it – Precipitation Radar (PR) on-board satellites such as Tropical Rainfall Measuring Mission (TRMM), Global Precipitation Measurement (GPM) Ozone soundings – general principle and special satellite measurements of ozone – Aerosol soundings - Tracking of weather systems such as Thunderstorms, Tropical cyclones, Tornadoes through Radar – Structure of weather systems as observed by Radars – Hydro meteorological applications of Radar - Application to aviation meteorology.

UNIT III   INTRODUCTION TO SATELLITE METEOROLOGY   9
Orbital dynamics of Satellites – Critical velocities – Polar and Geo stationary weather satellites - Active and passive sensors (Radars/Lidars/Radiometers) – Absorption bands of atmospheric gases -Design and characteristics of different types of sounders and imagers used in Meteorological satellites – Viewing geometry - INSAT Meteorological Data Processing System (IMDPS), IRS series – High Resolution Picture Transmission – APT – AVHRR - Need for Remote Sensing techniques in weather forecasting and Numerical Weather Prediction (NWP)

UNIT IV   SATELLITE METEOROLOGY APPLICATIONS – I   9
Precipitation – Outgoing Longwave Radiation (OLR) and Sea Surface Temperture (SST) estimation and their applications – Normalised Digitised Vegetation Index – Ocean colour monitoring – coastal pollution Image interpretation - Satellite communication systems in operational meteorological application (Cyclone Warning Dissemination system / Automatic Weather stations – Meteorological data dissemination) - Estimation of snow and ice cover – Waterbody boundary mapping – Atmospheric aerosols – Dust storms – Velcanic ash clouds and fires

UNIT V   SATELLITE METEOROLOGY APPLICATIONS – II   9
Identification – Tracking of weather systems – Derivation of cloud motion vector Dvorak's technique of cyclone intensity estimation – T number and current intensity No. – Application to storm surge estimation Satellite soundings – Tiros Operational and Vertical Sounder – Retrieval methods and algorithms.

TOTAL: 45 PERIODS

REFERENCES:

1. Kidder and VonderHarr, "Satellite Meteorology: An introduction", Academic Press, San Diego, CA, 1995
2. Cracknell, "The Advanced Very High Resolution Radiometer (AVHRR)", Taylor and Francis Int. Ltd., Great Britain, 1997
3. Smith and Schreiner, "Advances in Remote Sensing", Deppak Publications
4. Asnani, G.C "Tropical Meteorology", Vol.I and II, 1993
5. Doviak and Zrnic, "Doppler Radar and Weather observations", Academic press, London, 1992
6. Ellingson, "Satellite Data Applications: Weather and Climate",Proc.Of AO ISymp., COSPAR, Birmingham, UK, Elsevier, MD, USA
7. Sauvageot, "Radar Meteorology", Artech House Publishers, Norwood, MA, 1992
8. S.R.Kalsi, "Use of Satellite Image in Tropical Cyclone Intensity Analysis and Forecasting", India Meteorological Department, New Delhi, Meteorological Monograph, Cyclone warning Division No.1/2002.

GI9032   REMOTE SENSING AND GIS FOR TRANSPORTATION   L T P C
**   PLANNING   3 0 0 3**

OBJECTIVE:
- This course intends to prepare students for the following:
- To develop an understanding of the issues and challenges facing mobility in urban areas.
- To understand the utility of Remote Sensing and GIS for transportation planning

UNIT I   ELEMENTS OF TRANSPORTATION SYSTEMS AND
**   PLANNING   12**
Geographical perspective on transportation - Transportation and energy - Equity issues - Urban transportation: policy alternatives - Transportation and the environment - Urban transport planning processes - Transportation agencies - Roles and responsibilities - Socio-demographic data and travel surveys - Transportation modeling - Traffic congestion - Plan evaluation and implementation - Planning and financing - Critiques of transportation modeling and forecasting – Web resources

UNIT II   REMOTE SENSING IN TRANSPORTATION   10
Study of geographic pattern of urban development using remote sensing data products – urban sprawl – parking studies using aerial photos – traffic analysis - accident analysis - site suitability analysis for transport infrastructure – population distribution studies – improvisation of rural road network – regional road network connectivity.

UNIT III   GIS AND TRANSPORTATION ANALYSIS   11
Transportation analysis in GIS: Introduction - network flows - shortest path algorithms - transportation databases: creation and maintenance - transportation analysis in GIS - facility location - vehicle routing – highway alignment – railway alignment

UNIT IV   GIS-T DATA MODELS   6

GIS and Spatial analysis – coupling transportation models with GIS - TRANUS – UPLAN – MetroSIM – Modelling land use transport interaction.

UNIT V   INTELLIGENT TRANSPORTATION SYSTEMS (ITS)   6

ITS development – architecture – integration with GIS – applications – case studies.

TOTAL: 45 PERIODS

REFERENCES:
1. Harvey J. Miller, Shih-Lung Shah, Geographic Information Systems for Transportation – Principles and Applications, Oxford University Press, 2001.
2. John Stillwell, Graham Clarke, Applied GIS and Spatial Analysis, John Wiley & Sons Ltd, 2004.
3. C.S. Papacostas, P.D. Prevedouros, Transportation Engineering and Planning, Prentice-Hall India, 2002.
4. Barry Boots, Atsuyuki Okabe and Richard Thomas, Modelling Geographical Systems – Statistical and computational applications, Kluwer Academic Publishers, 2002.

GI 9033	REMOTE SENSING AND GIS FOR DISASTER	L T P C
	MITIGATION AND MANAGEMENT	3 0 0 3

OBJECTIVE:

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

UNIT I   DISASTER PRINCIPLES   9

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

UNIT II   LONG TERM MITIGATION MEASURES   9

Needs and approach towards prevention – Principles and components of mitigation Disaster legislation and policy – Insurance – Cost effective analysis – Utilisation of resources – Training – Education – Public awareness – Roles of media.

UNIT III   SAFETY RATING OF STRUCTURES   9

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   9

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 9

Information systems management – Spatial and non-spatial data bank creation – Operational emergency management – Vulnerability analysis of infrastructure and settlements – Pre-disaster and post disaster planning for relief operations – Potential of GIS application in development planning – Disaster management plan – Case studies.

TOTAL: 45 PERIDOS

REFERENCES:

1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E & FN SPON Routledge, London. 1999.
2. David Alexander, Natural Disasters, UCL Press, London, Research Press, New Delhi, 1993.
3. Nick Carter. W. Disaster Management – A Disaster Manager's Handbook. Asian Development Bank, Philippines. 1991.
4. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991.
5. George G. Penelis and Andreas J. Kappos – Earthquake Resistant concrete Structures. E & FN SPAN, London, 1997.

GE 9075	INTELLECTUAL PROPERTY RIGHTS (IPR)	L T P C
		3 0 0 3

UNIT I 5

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i). Movable Property ii. Immovable Property and iii. Intellectual Property.

UNIT II 10

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures..

UNIT III 10

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV 10

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V 10

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 PERIDOS

TEXT BOOKS:

1. Subbaram N.R. "Handbook of Indian Patent Law and Practice ", S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.

REFERENCES:

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.   www.ipmatters.net/features/000707_gibbs.html.

GE 9072	**INDIAN CONSTITUTION AND SOCIETY**	L T P C
		3 0 0 3

UNIT I   **9**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II   **9**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III   **9**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV   **9**

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V   **9**

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

REFERENCES:

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

GE 9073	CONTRACT LAWS AND REGULATIONS	L T P C
		3 0 0 3

UNIT I   CONSTRUCTION CONTRACTS   10

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts

UNIT II   TENDERS   10

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – .
World Bank Procedures and Guidelines – Transparency in Tenders Act.

UNIT III   ARBITRATION   5

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs

UNIT IV   LEGAL REQUIREMENTS   10

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

UNIT V   LABOUR REGULATIONS   10

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen's Compensation Act – Indian Factory Act – Tamil Nadu Factory Act – Child Labour Act - Other Labour Laws

TOTAL : 45 PERIODS

REFERENCES:
1. Gajaria G.T., Laws Relating to Building and Engineering Contracts in India, M.M.Tripathi Private Ltd., Bombay, 1982
2. Tamilnadu PWD Code, 1986
3. Jimmie Hinze, Construction Contracts, Second Edition, McGraw Hill, 2001
4. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, Sixth Edition, McGraw Hill, 2000.

GE 9022   **TOTAL QUALITY MANAGEMENT**   **L T P C**
                                                                          3 0 0 3

AIM
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES
- To under the various principles, practices of TQM to achieve quality
- To learn the various statistical approaches for quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems.

UNIT I   **INTRODUCTION**   **9**
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II   **TQM PRINCIPLES**   **9**
Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III   **TQM TOOLS & TECHNIQUES I**   **9**
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 & TECHNIQUES II**   **9**
Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V   **QUALITY SYSTEMS**   **9**
Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

                                                       TOTAL: 45 PERIODS

TEXT BOOK
1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia,Third Edition, Indian Reprint (2006).

REFERENCES
1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.

3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

GE 9021   **PROFESSIONAL ETHICS IN ENGINEERING**   **L T P C**
                                                                3 0 0 3

AIM
To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES
- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one's own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I   ENGINEERING ETHICS   9
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

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

UNIT III   ENGINEER'S RESPONSIBILITY FOR SAFETY   9
Safety and Risk – Assessment of Safety and Risk – Risk Analysis – Reducing Risk – The Government Regulator's Approach to Risk - I Case Studies Chernoby and Bhopal

UNIT IV   RESPONSIBILITIES AND RIGHTS   9
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V   GLOBAL ISSUES   9
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

                                                      TOTAL: 45 PERIODS
TEXT BOOKS
1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)

GE 9023   FUNDAMENTALS OF NANOSCIENCE   L T P C
**   3 0 0 3**

AIM
To make the students understand the importance , relevance and potentialities of this emerging field of study.

OBJECTIVES
- Study the basic nano technology and nano science.
- Understand interdisciplinary nature of this field.
- Understand the importance role of physics, chemistry, biology.
- Recognize that the rules of nano science are fundamentally different than those we experience.
- Study the basic fabrication strategies of nano science.

UNIT I   INTRODUCTION   10
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nano structured 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   PREPARATION METHODS   10
Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III   PATTERNING AND LITHOGRAPHY FOR NANOSCALE
**   DEVICES   5**
Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV　　　**PREPARATION ENVIRONMENTS**　　　**10**

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V　　　**CHARECTERISATION TECHNIQUES**　　　**10**

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL : 45 PERIODS

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES

1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999
2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology, Nanometer Structure", Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd, New Delhi, 2007.