UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO IV SEMESTERS (FULL TIME)

M.E. GEOMATICS

SEMESTER I

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA9105	Probability and Statistical Methods	3	1	0	4
2	GM9101	Decision Support System	3	0	0	3
3	GM9102	GIS and Cartography	3	0	0	3
4	GM9103	Image Processing	3	0	0	3
5	GM9104	Remote Sensing and Photogrammetry	3	0	0	3
PRACTICAL						
6	RS9106	Remote Sensing and Photogrammetry Lab	0	0	4	2
7	RS9105	GIS Lab	0	0	3	2
		TOTAL	**15**	**1**	**7**	**20**

SEMESTER II

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	GM9121	Advanced GIS	3	0	0	3
2	GM9122	Geodesy	2	2	0	4
3	E1	Elective I	3	0	0	3
4	E2	Elective II	3	0	0	3
5	E3	Elective III	3	0	0	3
6	E4	Elective IV	3	0	0	3
PRACTICAL						
7	GM 9123	Seminar	0	0	2	1
		TOTAL	**17**	**2**	**2**	**20**

SEMESTER III

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	GM 9131	Digital Cadastre and Land Management System	3	0	0	3
2	E5	Elective V	3	0	0	3
3	E6	Elective VI	3	0	0	3
PRACTICAL						
4	GM 9132	Practical Training (4 Weeks)	0	0	0	1
5	GM 9133	Project Work Phase I	0	0	6	3
		TOTAL	**9**	**0**	**6**	**13**

SEMESTER IV

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	GM 1941	Project Work Phase II	0	0	30	15
		TOTAL	**0**	**0**	**30**	**15**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 68

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO VI SEMESTERS (PART TIME)

M.E. GEOMATICS

SEMESTER I

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA 9105	Probability and Statistical Methods	3	1	0	4
2	GM 9102	GIS and Cartography	3	0	0	3
3	GM 9104	Remote Sensing and Photogrammetry	2	0	2	3
PRACTICAL						
4	RS 9106	Remote Sensing and Photogrammetry Lab	0	0	4	2
		TOTAL	**8**	**1**	**6**	**12**

SEMESTER II

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	GM 9122	Geodesy	2	2	0	4
2	GM 9101	Decision Support System	3	0	2	3
PRACTICAL						
3	RS 9105	GIS Lab	0	0	3	2
		TOTAL	**5**	**2**	**5**	**9**

SEMESTER III

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	GM 9103	Image Processing	3	0	0	3
2	GM 9121	Advanced GIS	3	0	0	3
3	E1	Elective I	3	0	0	3
		TOTAL	**9**	**0**	**0**	**9**

SEMESTER IV

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	GM 9131	Digital Cadastre and Land Management System	3	0	0	3
2	E2	Elective II	3	0	0	3
3	E3	Elective III	3	0	0	3
PRACTICAL						
4	GM 9123	Seminar	0	0	2	1
		TOTAL	**9**	**0**	**2**	**10**

SEMESTER V

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E4	Elective IV	3	0	0	3
2	E5	Elective V	3	0	0	3
3	E6	Elective VI	3	0	0	3
PRACTICAL						
4	GM9132	Practical Training (4 weeks)	0	0	0	1
5	GM9133	Project work Phase – I	0	0	6	3
		TOTAL	**9**	**0**	**6**	**13**

SEMESTER VI

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	GM9141	Project work Phase – II	0	0	30	15
		TOTAL	**0**	**0**	**30**	**15**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF THE DEGREE = 68

ELECTIVES FOR M.E. (GEOMATICS)

SL. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	GM9151	Internet GIS	3	0	0	3
2	GM9152	Remote Sensing and GIS in Modelling and simulation	3	0	0	3
3	GM9153	Object oriented Information System	3	0	0	3
4	GM9154	Geomatics in Integrated Coastal Zone Management	3	0	0	3
5	GM9155	Geomatics in Meteorology	2	0	2	3
6	GM9156	Geomatics in Environmental Engineering	3	0	0	3
7	GM9157	Radar Image Processing	3	0	0	3
8	GM9158	Operation Research Applications in Geomatics	3	0	0	3
9	GM9159	Digital Photogrammetry	3	0	0	3
10	GM9160	Advanced Soft Computing	3	0	0	3
11	RS9155	Space Geodesy	3	0	2	3
12	RS9122	Electronic Surveying	3	0	0	3

MA 9105 PROBABILITY AND STATISTICAL METHODS L T P C
3 1 0 4

OBJECTIVE:

- To teach about the probability and Random variable of the various functions. It also helps to understand the various statistical methods including the Design of experiments.

UNIT I ONE DIMENSIONAL RANDOM VARIABLES 9+3

Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Functions of a Random Variable.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation.

UNIT III ESTIMATION THEORY 9+3

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of least squares – Regression Lines.

UNIT IV TESTING OF HYPOTHESES 9+3

Sampling distributions - Type I and Type II errors - Tests based on Normal, t, Chi-square and F distributions for testing of mean, variance and proportions – Tests for Independence of attributes and Goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 9+3

Covariance matrix – Correlation Matrix – Multivariate Normal density function – Principal components – Sample variation by principal components – Principal components by graphing.

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

REFERENCES :

1. Richard Johnson. ”Miller & Freund’s Probability and Statistics for Engineers”, Prentice – Hall of India, Private Ltd., New Delhi, 7th Edition, 2007.
2. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, Pearson Education, Asia, 5th Edition, 2002.
3. Gupta, S.C. and Kapoor, V.K. ”Fundamentals of Mathematical Statistics”, Sultan and Sons, New Delhi, 2001.
4. Jay L. Devore, “Probability and statistics for Engineering and the Sciences”, Thomson and Duxbbury, Singapore, 2002.
5. Dallas E Johnson et al., “Applied multivariate methods for data analysis”, Thomson and Duxbbury press, Singapore, 1998.

GM 9101 DECISION SUPPORT SYSTEM

L	T	P	C
3	0	0	3

OBJECTIVE :

- To impart the knowledge of Expert Systems for Geomatics and its Applications.

UNIT I STRUCTURE **6**

Definition – Features, needs, components – characteristics – players - Structure and phases of building ES – Types – Rule based, Frame based & Hybrid – Design, Planning, monitoring.

UNIT II KNOWLEDGE ACQUISITION **9**

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

UNIT III RULE BASED EXPERT SYSTEMS **8**

Evolution – Architecture – Examples – backward and forward chaining - rules and meta rules – rule based systems – Case studies: MYCIN, PROSPECTOR

UNIT IV INEXACT REASONING **10**

Bayesian theory, examples – Certainty theory: overview, uncertain evidence, rule inferencing - certainty factors – Fuzzy sets – Representation, hedges inference & fuzzy logic – Rule base for interpretation of RS data.

UNIT V OBJECT BASED EXPERT SYSTEM **12**

Overview, anatomy of class, sub class, instance, properties, inheritance, Facets methods, encapsulation, rules interaction with object, design methodology for frame based system – domain, classes, instances, rule – communications, design interface.

TOTAL: 45 PERIODS

REFERENCES:

1. Peter Jackson, “Introduction to Expert systems”, Pearson Education, 2004.
2. Turban E., “Expert Systems and Applied Artificial Intelligence”, Macmillan, 2004.
3. Donald A.Waterman., “A Guide to Expert systems”, Pearson Education, 2001.
4. Durkin.J., “Expert Systems Design and Development”, Prentice Hall, 1994
5. Dan.W.Patterson, “Introduction to Artificial Intelligence and Expert systems”, Prentice Hall, 2003.
6. Ermine.J.I, “Expert Systems: Theory and Practice”, Prentice Hall, 2003.

GM 9102 **GIS AND CARTOGRAPHY** **L T P C**
3 0 0 3

OBJECTIVE:

- Expose the students with concept of cartography as major components of input and output relate to cartography to provide exposure to data models and data structure used in GIS and to introduce various Raster and Vector Analysis capabilities of GIS also expose the concept of quality and Low to conceptualise design of cartographic output in open GIS environment.

UNIT I BASICS **9**

Map Types – Characteristics – Coordinate Systems – Principles of Cartography – earth – map relations – scales - 2D transformations and – Map Projections – Definition of GIS – Evolution – Components of GIS – Data : Spatial and Non-spatial – Spatial Data: Point, Line Polygon / Area and surface – Non-spatial Data: Levels of Measurement – Database Structures.

UNIT II DATA MODEL AND INPUT **9**

Sources of data – Ground survey, Remote Sensing data – Census data – Map digitization – Raster Data Model – Grid – Tessellations – Geometry of Tessellations – Data Encoding Data Compression – Vector Data Model – Topology – Topological Consistency – Vector Data Input – Arc Node Data Structure – Raster Vs. Vector Comparison – File Formats for Raster and Vector – Vector of Raster Conversion**.**

UNIT III CARTOGRAPHIC PERCEPTION AND DESIGN **9**

Cartographic visualization - Cartographic design – Color theory and models – Color and pattern creation and specification – color and pattern – Typography and lettering the map – Map compilation – Demography and Statistical mapping.

UNIT IV DATA ANALYSIS AND OUTPUT **9**

Raster Data analysis: Local, Neighbourhood and Regional Operations – Map Algebra – Vector Data Analysis: Non-topological analysis, Topological Analysis, point-in-polygon, Line-in-polygon, Polygon-in-Polygon – Network Analysis – buffering – ODBC.

UNIT V CARTOGRAPHY ABSTRACTION **9**

Selection and Generalisation Principles – Symbolisation – Topographic and thematic maps – Web cartography – Meta Data – open GIS Consortium.

TOTAL: 45 PERIODS

REFERENCES:

1. Wilfried Linder, Digital Photogrammetry: A Practical Course, Springer, 2nd edition 2006.
2. unichi Nakamura, Image Sensors and Signal Processing for Digital Still Cameras, CRC 2005,
3. Zhilin Li, Qing Zhu, Chris Gold, Digital Terrain Modeling: Principles and Methodology, CRC third edition 2004.
4. John A. Richards, Xiuping Jia , Remote Sensing Digital Image Analysis: An Introduction, Springer 4th edition 2005.

GM 9103 **IMAGE PROCESSING** **L T P C**
3 0 0 3

OBJECTIVE:

- To impart knowledge in Image Processing and its Applications

UNIT I IMAGE PROCESSING FUNDAMENTALS 9
Image character – sampling for image formation – Satellite data Acquisition - Data products – Image processing – Image enhancement & filtering – Baye's theorem- Image classifications.

UNIT II IMAGE RESTORATION AND ENHANCEMENT 9
Degradation model, definition, discrete formulation, algebraic approach, inverse filtering, geometrical transformation, other separable image transform, wavelet transform, scale – space transform, image fusion in spectral domain and scale – space domain.

UNIT III IMAGE RECOGNITION AND INTERPRETATION 9
Elements of image analysis, pattern and pattern classes, context classifier, stacked vector approach, decision theory, decision rules, structural method, parametric and non-parametric classification, subpixel classification, feature extraction, classification algorithms, , hyper spectral image analysis, image cube

UNIT IV IMAGE REPRESENTATION, DESCRIPTION AND SEGMENTATION 9
Representation scheme, boundary descriptors, regional descriptors, morphology, relational descriptors, defining discontinuities, edge linking and boundary detection , region oriented segmentation, region growing, use of motion

UNIT V NEURAL NETS IN IMAGE ANALYSIS 9
Fundamental , processing elements , training NN , back propagation, training and testing, Hopfield network, choosing NN parameter, NN for linear and non-linear discrimination problems, exercise, case study.

TOTAL: 45 PERIODS

REFERENCES:

1. Anil K. Jain Fundamentals of Digital Image Processing (Prentice Hall Information and System Sciences Series) Prentice Hall; US edition1988.
2. John.A.Richards, "Remote sensing digital image analysis, An introduction" second revised and enlarged edition, springer, verlog publishers, 1993.
3. Rafael C.Gonzalez and Richard E. Woods, "Digital image processing", Second edition, Addision, Wesley publishers, 1993.
4. Robert A. Schowengerdt, "Remote sensing, models and methods for image processing" second edition, Academic press, 1997.
5. Kenneth R. Castleman, Digital Image Processing, Prentice Hall; 2nd edition 1995.
6. Ioannis Pitas, Digital Image Processing Algorithms and Applications, Wiley-Interscience, first edition 2000.

GM 9104 REMOTE SENSING AND PHOTOGRAMMETRY

L	T	P	C
3	0	0	3

OBJECTIVE:

- An introduction to the remote sensing and photogrammetry techniques are elaborated.

UNIT I INTRODUCTION TO REMOTE SENSING 8

Introduction of Remote Sensing ,Electro Magnetic Spectrum - Effects of Atmosphere-Scattering –Absorption-Atmospheric window- Energy interaction with surface features – Spectral reflectance of vegetation, soil ,and water

UNIT II DATA ACQUISITION IN DIFFERENT PLATFORMS 10

Types of Platforms- Photographic products and characteristics –Opto mechanical electro optical sensors – across track and Along track scanners – multi spectral scanners and thermal scanners –Concepts of Microwave Remote Sensing –types of RADARS-SLAR–ERS-JERS-RADARSAT-Scatterometer, Altimeter –sun synchronize –geo synchronize satellites – characteristics of different types of platforms – LANDSAT, SPOT, IRS, INSAT , IKONOS , QUICKBIRD – Future Missions.

UNIT III DATA ANALYSIS 8

Types of Resolution- data products and their characteristics visual and digital interpretation –geometric correction –Radiometric correction –Image enhancement – different types –Image classification–LIDAR, Aerial Laser Terrain Mapping

UNIT IV INTRODUCTION TO PHOTOGRAMMETRY 9

Principles – aerial photo-aerial camera -Scale – overlaps – stereoscopy – concepts – viewing and measuring systems – image and object co-ordinates – floating mark – parallax equation – height information – Tilt- Flight planning – computation for flight plan – photo control – cost estimation – aerial mosaics - type.

UNIT V ORIENTATION, AEROTRIANGULATION AND SPECIAL SYSTEM 10

Concepts of interior, relative, absolute orientation – object, image relation – linearization – effect of orientation elements – scaling and leveling – analytical procedures – map compilation using stereo plotters -Elements of Aerotriangulation and analytical method – strip deformation, strip and block adjustment – Terrestrial photogrammetry – Geometry & products- introduction to digital photogrametry

TOTAL: 45 PERIODS

REFERENCES:

1. Gottfried Konecny, Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems, Second Edition, CRC; 2nd edition, 2009.
2. Paul R.Wolf, Elements of Photogrammetry, McGraw-Hill Science, 2001.
3. Karl Kraus, Photogrammetry, Vol 1&II , 4th edition, Dümmler, 1997.

GM 9131 DIGITAL CADASTRE AND LAND MANAGEMENT SYSTEM L T P C
3 0 0 3

OBJECTIVE:

- To understand the concepts of coordinate- based digital form of parcel and related Land records, complexities of urban Land records, continuous updating of Cadastre and Land rights; future Land management in general and Urban Land in particular using high resolution current data in 3D environment for efficient functioning of administration, for Disaster management, utility management, coastal zone land management as examples.

UNIT I INTRODUCTION TO CADASTRAL PRACTICES IN INDIA 9

Definition of Cadastre, Historical background, Graphic and Numeric Cadastre, Legal aspects, Land Records and Title Registration, Mutation, Boundary demarcation and Dispute Redressal System, Municipal Cadastral Systems.

UNIT II CONCEPT OF CO-ORDINATE BASED DIGITAL CADASTRE 9

2D Cadastre from Revenue records (review of NIC projects in India); 3D Cadastre-Data generation through Re-survey and Settlement, Use Of Soft Copy Photogrammetry, High Resolution Satellite Imagery and ALTM, Use of GPS and Electronic Total Station; Case Studies of A-N project of Orissa , Bhu-Bharati project of Andra Pradesh and C-STAR programme of Tamil Nadu.

UNIT III MULTI-DIMENSIONAL CADASTRAL SYSTEM FOR THE CITIES 9

3D and 4D Cadastral Systems, Modernization programs in INDIA - Case Studies of Delhi, Chennai, Mumbai & Ahmedabad; Systems in USA, CANADA,SWEDAN,U.K. &GERMANY.

UNIT VI LAND MANAGEMENT AND LIS 9

Concepts of Land Reforms, Land Consolidation, Guarantee of Land Title and Automated Title Registration, e-Governance and LIS; Disaster Management, Coastal Zone Land Management Systems, Emerging systems and future trends.

UNIT V STUDY OF AVAILABLE SOFTWARE PACKAGES 9

NIC software, A-N Software, PEM package of Arc Info – Import/Export of Cadastre Data with various commercially available GIS packages.

TOTAL: 45 PERIODS

REFERENCES:

1. Nancy von Meyer, GIS and Land Records: The Parcel Data Model 2004.
2. Peter F.Dale & John D.Melaugliu; Land information management, Oxford press, 2000.
3. Gerhard Larsson, Land Registration and Cadastral Systems: Tools for Land Information and Management, 1991.
4. A. Rajabifard, I. Williamson, D. Steudler, and Binns; Assessing the worldwide comparison of cadastral systems [An article from: Land Use Policy], 2007.
5. S.M. Cashin and G. McGrath; Establishing a modern cadastral system within a transition country: [An article from: Land Use Policy], 2006.
6. Peter F. Dale and John D. Melaughlin I, Land Administration(spatial information system), Oxford Press, 2000.
7. Proceedings of FIG Congress 2002. (USA) Commission 7 – Cadastral Innovation I (TS7.1), Cadastral Innovation II (TS 7.2), Global Survey of Cadastral Experiences (TS 7.3), Land Consolidation (TS 7.4), GPS for Cadastral Application (JS 2)
8. User Manual of A-N Technology, R&D Directorate, SOI, 2002.

RS 9106 REMOTE SENSING AND PHOTOGRAMMETRY LAB

L	T	P	C
0	0	4	2

OBJECTIVE:

- To provide exposure in handling equipment like stereoscope, parallax bar, analog stereo plotter, analytical stereo plotter and semi analytical stereo plotter.

PHOTOGRAMMETRY EXERCISES

1. Testing stereovision with test card
2. Finding stereoscopic acquity.
3. Mirror stereoscope- base lining and orientation of aerial photographs.
4. Use of parallax bar to find the height of point.
5. Orientations in Double projector
6. Orientations in Planicart
7. Orientation and mapping in semi analytical stereo plotter.
8. Demonstration of stereo metric camera, orthocomp, and analytical plotter.

REMOTE SENSING EXERCISES

1. Spectral reflectance observation of the following using handheld spectro radiometer.
   i) Vegetation. ii) Soil iii) Water
2. Map reading of Survey of India topo sheets.
   Visual interpretation of different satellite data and aerial photographs for the preparation of following;
3. Land use/land cover map.
4. Soil map.
5. Geology and geomorphology maps.
6. Slope maps.
7. Watershed delineation.

TOTAL: 60 PERIODS

RS 9105	GIS LAB	L	T	P	C
		0	0	3	2

OBJECTIVE:

- The exercises are designed to give practical exposure to the students to data input, data storage, data analyses and data output capabilities of a standard GIS software.

1.	Digitization - Point, Line, Polygon and Surface Data	**6**
2.	Building topology – measuring distance and area	**3**
3.	Adding attribute data – querying on attribute data	**3**
4.	Onscreen digitization - Data Conversion – Vector to Raster, Raster to Vector	**6**
5.	Generation of DEM: from contours, spot heights	**3**
6.	Vector Analysis – Buffering, Overlay and Network analysis	**9**
7.	Raster Analysis – Measurement - Arithmetic overlaying, Logical overlaying	**9**
8.	Data Output: Bar charts, Map compilation	**3**
9.	Customisation and scripting	**3**

TOTAL: 45 PERIODS

GM 9121	ADVANCED GIS	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To impart knowledge in Current Trends in GIS and it's Applications

UNIT I COMPUTATIONAL GEOMETRY IN GIS 9

Basic concepts of Algorithm – optimality – Algorithms for : Rectrangular intersection – Sweep line method, Polygon partitioning, Polyline and Polygon intersections, buffering, windowing and clipping

UNIT II SPATIAL DATA MODELS USED IN OPEN AND COMMERCIAL GIS 9

Topology – Topological Consistency – Spatial and Topological information storage in ArcInfo, ArcView, ArcGIS, Small World and GRASS – Oracle extension for handling Spatial data

UNIT III SPATIO-TEMPORAL MODELLING IN GIS 9

Introduction to Temporal Geographic Information System (TGIS) – Spatio Temporal modeling – Space-Time Correlation in Spatial Data handling – Spatio Temporal Mapping - Bayesian maximum entropy (BME) approach of Modern Spatiotemporal Modelling

UNIT IV WEB MAPPING WITH OPEN SOURCE TOOL KITS 9

Introduction to digital mapping – Merits and demerits of web mapping – Different kinds of web mapping – Map Server – Geospatial Data Abstraction Library – Open source tool kits

UNIT V GIS CUSTOMISATION PROGRAMMING 9

GIS Customisation - Needs – Scripting Language – Advantage of Macro Scripting – Sample Case studies.

TOTAL: 45 PERIODS

REFERENCES:

1. Demers, Michael N, Fundamentals of Geographical Information System John Wiley & Sons.
2. George Christakos, Patrick Bogaert, Marc L. Serre, Temporal GIS: Advanced Functions for Field-Based Applications, Springer Publishers, 2002
3. Tyler Mitchell, Web Mapping Illustrated: Using Open Source GIS Toolkits, O'Reilly Publishers, 2005
4. Markus Neteler, Helena Mitasova, Open Source GIS: A GRASS GIS Approach , , Edition, Springer 2007 .

GM 9122 **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 2+3

Definitions,classifications and problems of geodesy. Historical development and organization of geodesy. Reference surfaces and their relationship, applications. Engineering, lunar and planetary geodesy.

UNIT II GEOMETRIC GEODESY 10+10

Basics-Geodetic,Geocentric,Reduced latitudes and their relationship. Spheroidal coordinates in terms of reduced,geodetic and geocentric latitude. Radius of curvature in the meridian &prime vertical and their relationship. Mean Radius of curvature at any azimuth. Length of the meridian arcs and arcs of parallel and area of trapezium on the spheroid. Curves on the spheroid, properties of geodesic and Everest spheroid. Natural or Astronomical coordinate system, Geodetic or Geographical coordinate system, Rectangular or Cartesian coordinate system and relationship between them. Curvilinear coordinate 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 5+5

Gravity field of earth,Concept of equipotential, geopotential and spheropotential surface Normal gravity, The significance of gravity measurements, Measurement of absolute and Relative gravity, Reduction of gravity measurements, Isostasy.Gravity networks, Gravity anomaly and Gravity disturbance. Funtamental equation of physical Geodesy. Determination of Geoid and Deflection of vertical. Orthometric height, Normal height, Dynamic height and their corrections. spheroidal height and Geoidal height.

UNIT IV GEODETIC ASTRONOMY 8+7

Basics-Horizon, hour angle, Right Ascension, Ecliptic co-ordinate systems and relationship with Cartesian co-ordinate system, Transformation between them. Special star positions, Major constellation. 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 5+5

Rectangular and Polar co-ordinates. First and Second geodetic problem. Similarity and Helmert's transformation. Point determination by Intersection, Resection and Arc Section.

TOTAL (L: 30 + T: 30): 60 PERIODS

REFERENCES:

1. George l. Hosmer, Geodesy, Kessinger publishing 2007.
2. J.Howard gore, Elements of Geodesy, Kessinger publishing 2007.
3. Wolf gang torge, Geodesy, Walter De Gruyter Inc.Berlin, 2001
4. Geometrical Geodesy Maarten Hooijberg, Springer verlag 2005.
5. Physical Geodesy Berhard Hofmann-wellenhot & Helmut moritz, springer verlag 2006.
6. Petr Vanicek and Edward J.Kakiwsky, Geodesy, the concepts north Holland publications co, Amsterdam, 1991.
7. Heribert Kahmen and wolf gang faig, surveying, watter De Gruyter, Berlin, 1998.
8. Schwarze, V.S.Geodesy, The challenge of the 3rd millennium, spinger verlag, 2002.

GM 9151	INTERNET GIS	L T P C 3 0 0 3

OBJECTIVE:

- To impart knowledge in internet GIS and its Application

UNIT I BASICS 8

Definition; Impacts, System, Components - Networking; Models, Protocols, LAN, WAN – Client/Server Architecture – Web mapping; Static, Interactive – Internet GIS architecture – Implementation; CORBA/JAVA.

UNIT II OPEN SOURCE GIS CONCEPTS, PLANNING AND CREATION OF A DATABASE 10

Open Source Concepts and Specifications: General GIS Principles-Geospatial Data Models- Organisation of GIS Data- GIS Functionality - Introduction to open source - Installation of Open source Software - Organisation of Database; Command Structure; File Management; Database Management Map Projections and Coordinate Systems- Map projection Principles; Geographic Coordinate System; Working with different Projections in open source ; Coordinate System Transformation; Raster, Vector and Site Data Models, importing, Creating, Exporting, Viewing and Managing GIS Data. Postgres RDBMS and Attribute Data.

UNIT III DATA ANALYSIS 9

Raster, Vector and Site Data Analysis; Raster, Vector and Site Data Transformation. Advanced GIS Data Analysis- Spatial Interpolation, Surface Fitting and 3D Analysis; Introduction to Geostatistical Analysis, Modelling and Simulation.

UNIT IV DISPLAY AND VISUALIZATION 9

2D display, Shaded Elevation Maps, Multiple Frame Display , Animation in 2D; Viewing Multiple Map Layers, 3D Visualization, Line of Sight, Viewshed and animations in 3D; Map generation.

UNIT V IMAGE PROCESSING AND PROGRAMMING 9

Introduction to Remote Sensing Data and Aerial Photo Analysis through open source; Programming Environment, Scripting and Integration; Map server and Web Applications.

TOTAL: 45 PERIODS

REFERENCES:

1. Neteler, M and H.Mitasova, Open Source GIS. A GRASS GIS Approach, Kluwer Academic Publishers, Bostan, USA/London, UK, 2008.
2. Zhong-Ren Peng, Ming-Hsianq Tsou, Internet GIS: Distributed geographic information services for the internet and wireless networks, John Wiley & Sons, 2003.
3. GRASS 5.4 x Reference Manual

GM 9152 REMOTE SENSING AND GIS IN MODELLING AND SIMULATION

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart knowledge in Modeling and Simulation Using Remote Sensing and GIS.

UNIT I CONCEPT OF MATHEMATICAL MODEL 8

Modeling assumptions – choice of equation – phenomena and model geometry – choice of variables and parameters – data and knowledge acquisition – model building – calibration and verification – results presentation.

UNIT II ATMOSPHERIC MODELING 10

Atmospheric modeling – spatial representation of land surface characteristics – Approach to Bridge the Gap between micro scale Land-Surface processes – synoptic – scale meteorological conditions – Weather prediction modeling - Global climate modeling requirements – regional Air Quality model – acid deposition modeling – role for visualization.

UNIT III HYDROLOGICAL MODELING 9

Hydrological modeling and GIS three dimension –,modeling the effects of climate change on the water resources – linkage of a GIS to a distributed rainfall – runoff model, - Different types of Groundwater model, Lumped and distributed ground water model – Finite difference/ finite element model - Interfacing of GIS with groundwater model.

UNIT IV BIOLOGICAL / ECOLOGICAL SYSTEMS MODELING 9

Spatial models of Earth science & processes – Integrating forest growth model with GIS, ecological modeling, GIS & Expert system: Regional Fish species richness model – Introduction to Quantitative Methods – modeling in community Population, - Landscape Ecology.

UNIT V SIMULATION MODEL FOR FOREST MANAGEMENT 9

Empirical approaches to modeling wild land fire – simulating forest fire regimes – simulation of broad -scale fire – Natural forest landscape disturbance –forest fire – timber Harvesting – forest management using decision support system. – Developing Forest management strategies based on fire regimes.

TOTAL: 45 PERIODS

REFERENCES:

1. Georgy .F. Pinder, Groundwater modelling using GIS, John Wiley & Sons, New York, 2002.
2. Michael N. Demers, GIS modelling in Raster, John Wiley & Sons, inc, 2002.
3. Keith C. Clarke. Bradley O. Parks. Michael P. crane, GIS & Environmental modelling, prentice Hall, Inc, New Jersey, 2002.

GM 9153 OBJECT ORIENTED INFORMATION SYSTEM **L T P C**
3 0 0 3

OBJECTIVE:

- This course will facilitate the student to understand the concept of object oriented programming, software reuse, different object oriented methodologies and object oriented systems. This course will help the student to develop software in C++.

UNIT I PRINCIPLES OF OBJECT ORIENTED PROGRAMMING 8

Motivation for OOP-Objects and Classes, Abstraction and Encapsulation,Message passing,Inheritance,Overriding,Multipple inheritance, Dynamic Binding, Virtual Methods,polymorphism,Abstract classes, Virtual classes, Dynamic binding mechanisms in Smalltalk and C++,object oriented notations.

UNIT II PROGRAMMING IN C++ 9

Introduction to C++ - Keywords, Identifiers-Data types –Variables-operators-Manipulators-Classes and Object -Member Functions-Private and Public Member function –Nesting of Member Functions –Array of objects- pointer to members – Constructors-Destructors-Type conversions-Exercises.

UNIT III INHERITANCE AND WORKING WITH FILES IN C++ 10

Inheritance –base class – derived class – visibility modes – single inheritance – multi level inheritance – multiple inheritance – file – opening and closing – file modes – file pointers – random access – error handling – exercises – comparative study of object oriented languages.

UNIT IV OBJECT ORIENTED ANALYSIS AND DESIGN 9

CRC method for defining classes, inter class relationships – introduction to object oriented software engineering, use case analysis, object diagrams, dynamic models – object interaction diagrams and state diagrams, functional models, from analysis to design to relevant topics from various methodologies such as Jacobson, Rum Baugh, Booch and unified methodology. Elements of design reuse – object oriented patterns.

UNIT V DATABASE MANAGEMENT SYSTEM 9

Data – Information – Database – models – database management systems – ypes of DBMS – hierarchical, network, relational data model – E-R, EER Diagram – classification of database based on modeling capability, based on tools/usage, based on server configuration, Knowledge based systems – File organization – Sequential – Index sequential – random – multikey file organization – Concepts of Active database, temporal database, spatial database and multimedia database – object oriented database.

TOTAL: 45 PERIODS

REFERENCES:

1. Ali Bahrami, Advance in object oriented information system, Lecture notes in computer science, Springer verlag, 2002.
2. Balagurusamy.E., Object Oriented Programming with C++, Tata Mc.Graw Hill Publications, 2001.
3. Timothy Budd, Introduction to Object Oriented Programming, Addison-Wesley, 2001.
4. Nilolai Josuttis, Object oriented programming in C++, John Wiley and sons, 2002.
5. Mike O.Docherty, Object oriented analysis and design, John Wiley and sons, 2005.
6. A.R.Harriger & A.R Harriger Jack J.purdum, An information system approach to object oriented programming using Microsoft visual c#.net, Cengage Learning, 2005.
7. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Addision Wesley Longman(Singapore) Pte Ltd. 3rd Indian reprint, 2000.

GM 9154 GEOMATICS IN INTEGRATED COASTAL ZONE MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVE:

- To impart knowledge in Remote Sensing and GIS Applications for Integrated Coastal Zone Management

UNIT I PRINCIPLES OF INTEGRATED COASTAL ZONE MANAGEMENT 8

Basic principles – data base management – ICZM model concept – matrix approach to coastal interactions – solution to the problems.

UNIT II COASTAL WATER QUALITY AND BATHYMETRIC MAPPING 9

Usefulness and limitation of Remote sensing for mapping – sediment loadings – oil pollution and Industrial wastes – sewage discharges – toxic algal blooms – eutrophication – thermal discharge – bathymetry – bathymetry using satellite data.

UNIT III SOCIO ECONOMIC AND LEGAL ASPECTS OF COASTAL ZONE MANAGEMENT 10

Stake holder identification and analysis – role of International convention – protocols in management of ocean – coastal seas & coastal lands – legal controls which affects the use of national coastal zones – laws on costal regulation zone.

UNIT IV COASTAL MANAGEMENT APPLICATION SENSORS / PLATFORMS 9

Use of remote sensing in Costal management – spatial , spectral, radiometric and temporal resolutions, sensors – ETM, IKONOS, SPOT XS, sea WIFS, ERS ,Along track scanning radiometer (ASTER), OCEANSAT,RADARSAT – accuracies with different sensors, limitations.

UNIT V INTEGRATED COASTAL ZONE MANAGEMENT APPLICATIONS 9

The ICZM development process: demonstration, consolidation, extension – Coastal Biodiversity – wetland management – management – mangrove eco system – coastal environmental impact assessment – Coastal Regulation zone mapping – Resource allocation conflict – sustainable development – case studies using Remote sensing and GIS.

TOTAL: 45 PERIODS

REFERENCES:

1. Edwards, A.J. (Ed.) Applications of Satellite and Airborne Image Data to Coastal Management. Coastal Region and Small Island Papers No. 4 (UNESCO, Paris), vi + 185 pp.1999.
2. Green, E.P., Mumby, P.J., Edwards, A.J. and Clark, C.D. (Ed.A.J. Edwards) Remote Sensing Handbook for Tropical Coastal Management. Coastal Management Sourcebooks 3. UNESCO, Pairs. X + 316 pp + 24 colour plates. ISBN 92,3,103736,6 (Pbk).2000.
3. Clark J. Handbook for Coastal Zone Management. NY and London: Lewis Publishers Kenchington R. et al.(Eds.) ICZM Training Manual. Bangkok: UNEP Post J. Lundin CG Guidelines for Integrated Coastal Zone Management. World Bank Environmentally Sustainable Development Series 1996.

GM 9155 GEOMATICS IN METEOROLOGY L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge in Concepts in Meteorology, Radio, and Satellite Meteorology and its 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. Radiation transfer- radiation spectrum – Absorption and emission of radiation by molecules- Radiation laws- scattering principles. Cloud physics- Mechanism of cloud formation- Types of Clouds- Precipitation processes- warm and cloud concepts and processes

UNIT II RADIO METEOROLOGY 9

Principles and classifications of Radar- components of Radar- MeteorologicalApplications. Upper air temperature exploration of the atmosphere(Radio Sonde)-Upper air wind estimation through pilot balloon- 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. Applications to aviation meteorology

UNIT III INTRODUCTION TO SATELLITE METEOROLOGY 9

Orbital dynamics of satellite – Critical velocities – Polar and Geostationary weather satellites. Active and passive sensors (Radar/ Lidar /Radiometers)- Absorption bands of atmospheric gases. Design and characteristic of different types of sounders and imagers used in Meteorological satellites – Viewing geometry. INSAT Meteorology. 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 METEOROLOGICAL APPLICATIONS 9

Precipitation – Outgoing Longwave Radiation (OLR) and Sea Surface Temperature (SST) estimation and their Applications – Normalised Difference Vegetation Index – Ocean Colour monitoring – Coastal pollution. Image Interpretation. Satellite communication systems in operational meteorological Applications (Cyclone Warning Dissemination system / Automatic Weather stations – Meteorological data dissemination). Estimation of snow and ice cover – Waterbody boundary mapping – Atmospheric aerosols – Dust storms – Volcanic ash clouds and fires.

UNIT V APPLICATIONS TO STORM SURGE 9

Identification – Tracking of weather systems – Derivation of cloud motion vector Dvorak's technique of cyclone intensity estimation – T number and current intensity No. – Applications 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", 1995, Academic Press, San Diego, CA
2. Cracknell, "The Advanced Very High Resolution Radiometer (AVHRR)", 1997, Taylor and Francis Int. Ltd., Great Britain.
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", 1992, Academic press, London.
6. Ellingson, "Satellite Data Applications: Weather and Climate",Proc.Of AO I Symp., COSPAR, Birmingham, UK, Elsevier, MD, USA
7. Sauvageot, 1992, "Radar Meteorology", Artech House Publishers, Norwood, MA.

GM 9156 GEOMATICS IN ENVIRONMENTAL ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To understand the various remote sensing and GIS technological applications in the field of Environmental Engineering.

UNIT I REMOTE SENSING APPLICATIONS TO ENVIRONMENTAL STUDIES 9

Introduction ,Environmental satellites GEOS, NOAA, AVHRR, CZCR Monitoring land, water, atmosphere and ocean using Remote Sensing Data, case studies.

UNIT II SOIL DEGRADATION STUDY 9

Taxonomical classification of soils, sampling, soil survey interpretation and mapping, impact of agricultural and industrial activity on soil properties. Soil salinity/alkalinity, erosion studies, Applications of GIS in assessing soil salinity, erosion productivity etc., soil pollution interpretation using GIS.

UNIT III WATER QUALITY MODELLING 9

Classification of water quality for various purposes, Sampling procedure, quality analysis, Data base creation and quality modeling using GIS. Database Creation and designing water supply network, sewerage network using GIS. Case studies. Aquifer Vulnerability Intrinsic and specific vulnerability, DRASTIC, SINTACS MODELS MODFLOW, MT3D, contaminant transport model. Case studies using AHP techniques.

UNIT IV AIR QUALITY MODELLING 9

Atmosphere: meteorology, Sampling, Chemicals, Particulate matters present in the atmosphere, allowable limits, dispersion model – Gaussian Plume model, Remote Sensing technique to monitor atmosphere constituents, air pollution due to industrial activity, modeling using GIS. Mapping of atmospheric pollution using GIS, Case Studies.

UNIT V ENVIRONMENTAL MANAGEMENT 9

Revenue management-environment and ecological concerns- Resource development in remote areas-Impacts of anthropogenic activity- Solid Waste management, Design of collection network using GIS, leachate modeling, case study.

TOTAL: 45 PERIODS

REFERENCES:

1. Ian L.Pepper, charles P.Gerbaand Mark L.Brusseau, Environmental and pollution science 2006.
2. David N.Miclsen, Environmental site characterization and ground water monitoring 2nd edition.
3. Reger D.Griffin, Air Quality assessment and management, second edition 2006.
4. Donald L.Wise, Remediation for Hazardous waste contaminated soils, 1994.
5. Michele Campagna, GIS for sustainable development, 2005.
6. Techobanoglous George, Hilary Theisen, Samuel Vigi, Integrated Solid Waste Management, Mc Graw – Hill Inc, Singapore. 1993.

GM 9157 RADAR IMAGE PROCESSING L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge in Radar Image Processing and its Applications.

UNIT I BASICS 6

Introduction, imaging Radar – Radar systems, Basic instrumentation – System parameters – wave length – polarization – resolution – Radar geometry, Radar equation, image geometry

UNIT II ENVIRONMENTAL AND TARGET PARAMETERS 9

Concept of Roughness, Geometry of targets, dielectric constant, Resonance Backscattering – point targets, surface and volume scattering, Surface scattering models, reflection, Bragg resonance, cross swath variation and surface envelop.

UNIT III IMAGE PROCESSING OF RADAR DATA 9

Spectra and offsets, depth of focus, processor timing and complexity versus resolution, focused electronic processing, unfocussed processing, Optical processing, Speckle and grey scale resolution, Power consideration, Antenna and receiver gain correction for scattering coefficient and Range, Matching system elements, motion effects, synthetic, aperture Radar ambiguity problems, Processing of SAR data, Image Interpretation techniques.

UNIT IV IMAGING RADAR INTERFEROMETRY 12

Basic concept, Interferometry principles, Data selection, Interferogram generation, choosing interferogram pairs, Base line, SAR processing, Registration, Interferometric topographic mapping, velocity mapping, change mapping and geosciences applications, Differential SAR interferometry (D - INSAR), Geometry of D INSAR, Techniques, Comparison, Software for processing, Phase unwrapping, DEM generation, Deformation extraction and analysis, Volcano, earthquake and snow glacier applications.

UNIT V ADVANCED TOPICS 9

Radargrammetry - Introduction, Basic equations, Projection equations, relief displacement, matching radar images and digital terrain models, geometric rectification, stereoscopic radar analysis, parallax radargrammetry, Mosaicing, Digital mosaicing, Applications; Radar polarimetry-basic equations,antenna concepts,Target concepts,optimum polarization for maximum power,co-polarization and cross polarization, geosciences application; scatterometer data processing; Altimeter data processing.

TOTAL: 45 PERIODS

REFERENCES:

1. Giorgio Franceschetti, Riccardo Lanari, Synthetic Aperture Radar Processing, CRC Press, 1999.
2. Floyd.M.Handerson and Anthony,J.Lewis “Principles and applications of Imaging RADAR”, Manual of Remote sensing, Third edition vol.3,ASPRS,Jhumurley and sons, Inc,1998.
3. Ulaby,F.T.,Moore,K.R. and Fung, Microwave remote sensing vol-1,vol-2 and vol- Addision-Wesley Publishing Company,London,2001.
4. Franz W. Leberl, Radargrammetric Image Processing, Published by Artech House Original from the University of Michigan,2007.
5. Roger J Sullivan, Knovel Radar foundations for Imaging and Advanced Concepts, SciTech Publishers, 2004.
6. Ian Faulconbridge Radar Fundamentals, Argos Press, 2002.

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GM 9158 OPERATION RESEARCH APPLICATIONS IN GEOMATICS **L T P C**
3 0 0 3

OBJECTIVE:

- To impart knowledge in Operation Research Applications in Geo Informatics & its Applications

UNIT I BASICS: 7

Origin - Nature and significance - Models and Modeling – Methodology – Applications and Scope, basic operation research models – Computer Packages.

UNIT II LINEAR PROGRAMMING 10

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

UNIT III DYNAMIC PROGRAMMING 9

Characteristic - Bellman's optimality criteria – problem formulation and solution – Forward and Backward recursive approaches – Geomatics applications.

UNIT IV PROJECT MANAGEMENT 9

PERT and CPM – Network components and relationships – forward and Backward pass – critical path analysis – Resource leveling and allocation.

UNIT V SIMULATION 10

Introduction – Deterministic and Stochastic simulation – simulation of Inventory problems – The classical EPQ model– Queuing problems – Investment – Maintenance – Role of computers in simulation

TOTAL: 45 PERIODS

REFERENCES:

1. Hiller, F.S. and G.J. Lieberman, Introduction to Operations Research, Tata Mc Graw – Hill, 2001.
2. Hamdy A Taha "An introduction to Operation Research". Prentice hall, sixth edition, 2000.
3. R.Paneerselvam,"Operation Research". Prentice hall of India, 2002.
4. Sharma, J.K., Operations Research Theory and Applications, Mac Millan India Limited, 1998.
5. Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management, All India Traveler Delhi, 1988.

GM 9159 DIGITAL PHOTOGRAMMETRY L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge in digital camera, scanners, photogrammetric Workstation and its Application with GIS and Remote Sensing.

UNIT I BASICS 9

Evolution of digital photogrmmetry – Phases of Photogrammetry - comparison of analog, analytical &digital systems – advantages – automation – accuracy- representation of digital images B/W – RGB – HIS - image source – analog and digital cameras

UNIT II DIGITAL CAMERAS AND SCANNERS 9

Digital cameras- CCD camera- full frame, frame transfer, interline CCD camera - Time delay integration- spectral sensitivity of CCD sensor – geometric problem of CCD image – line jitter, blooming,warm up effect – tralling – types of CCD systems - Linear array line scanner – use of CCD scanner in high resolution satellites, SPOT,MOMS,IRS,IKONOS and Quickbird.

UNIT III DIGITAL IMAGE HANDLING 9

Image Generation - Data Compression - formats - Data procuring concepts – Georeferencing - Stereo viewing - Display modes - image matching techniques - Image measurements - symbol library - feature coding.

UNIT IV DIGITAL PHOTOGRAMMETRIC PROCEDURES 9

Review of space resection & intersection - interior & exterior orientation - Automatic tie point generation - Automatic Block triangulation, feature collection and plotting annotation - editing – various formats of map data.

UNIT V APPLICATIONS 9

DEM Generation - accuracy of DEMs, Orthorectification - regular & irregular data collection methods - contour generation - watershed delineation - satellite photogrammetry principles – missions - stereo image products - issues - stereo satellite missions.

TOTAL: 45 PERIODS

REFERENCES:

1. Wilfried Linder, Digital Photogrammetry: A Practical Course Springer; 2nd ed. edition 2006.
2. Ghosh, Sanjiv.k, Fundamentals of Computational Photogrammetry, concept publishing, New Delhi, 2005.
3. Junichi Nakamura, Image Sensors and Signal Processing for Digital Still Cameras, CRC, 2005.
4. Zhilin Li, Qing Zhu, Chris Gold, Digital Terrain Modeling: Principles and Methodology CRC; third edition, 2004.
5. John A. Richards, Xiuping Jia Remote Sensing Digital Image Analysis: An Introduction, Springer; 4th ed. edition 2005.

GM 9160	ADVANCED SOFT COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To impart the concepts of the ANN network with the fuzzy logic in the geomatics system.

UNIT I INTRODUCTION 9

Artificial Neural Systems – Perceptron – Representation – Linear separability – Learning – Training algorithm – The back propagation network – The generalized delta rule – Practical considerations – BPN Geomatic applications.

UNIT II STATISTICAL METHODS 9

Hopfield nets – Cauchy training – Simulated annealing – The Boltzmann machine. Associative memory – Bidirectional Associative Memory Network – Geomatic Applications.

UNIT III COUNTER PROPAGATION NETWORK AND SELF ORGANIZING MAPS 9

CPN building blocks – CPN data processing. SOM data processing - Adaptive Resonance Theory network - Geomatic Applications

UNIT IV FUZZY LOGIC 9

Fuzzy sets and Fuzzy reasoning – Fuzzy matrices – Fuzzy mebership functions – Operators Decomposition – Fuzzy automata and languages – Fuzzy control methods – Fuzzy decision making

UNIT V NEURO – FUZZY MODELING 9

Adaptive networks based Fuzzy interface systems – Classification and Regression Trees – Data clustering algorithms – Rule based structure identification – Neuro-Fuzzy controls – Simulated annealing – Evolutionary computation - Geomatic Applications.

TOTAL: 45 PERIODS

REFERENCES:

1. James Freeman A. and David Skapura M.Neural Networks – Algorithms, Applications & Programming Techniques Addison Wesley, 1999.
2. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw Hill, 1997.
3. Yegnanarayana B., Artificial Neural Networks, Prentice Hall of India Private Ltd., New Delhi, 1999.
4. Lqurene Fausett, “Fundamentals of Neural Networks”, Prentice Hall, 1994.
5. Jang J.S.R., Sun C.T. and Mizutani E, “Neuro-Fuzzy and soft computing”, Prentice Hall 1998.

RS 9155 **SPACE GEODESY** **L T P C**
2 0 2 3

OBJECTIVE:

- The objective of this course is to teach the fundamentals of space geodesy, the observation and processing of the GPS data for different applications.

UNIT I BASICS **6**

Definition – fundamentals of geodesy – Basic concepts – Historical perspectives – Development - Applications in space geodesy – Geoid and Ellipsoid - satellite orbital motion – keplerian motion – Keplar's law – perturbing forces – Geodetic satellites.

UNIT II DIFFERENT TECHNIQUES **6**

Determination of Direction By Photography – SECOR – electronic observation techniques- Doppler effect – positioning concept – development of TRANSIT satellites

UNIT III GLOBAL POSITIONING SYSTEM **6**

GPS – different segments – space, control and user segment – satellite configuration – GPS signal structure – orbit determination and orbit representation, Anti spoofing and selective availability – task of control segment – GPS receiver- main receiver component- example of GPS receiver.

UNIT IV GPS DATA PROCESSING **6**

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 and accuracy measures.

UNIT V APPLICATION OF SPACE GEODESY **6**

Geodetic control surveys, cadastral surveying, photogrammetry and remote sensing, engineering applications and monitoring – GIS. GLONASS satellite configuration comparison – satellite laser ranging & applications – concept of satellite altimetry.

FIELD WORK **30**

Study of different GPS – Static, Kinematic observations – Downloading and Processing the GPS data.

TOTAL (L: 30 + P: 30): 60 PERIODS

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.
3. Seeber G.Satellite Geodesy, Walter De Gruyter, Berlin, 1998.
4. Ahmed ei-rabbany, Introduction to GPS, the global positioning system, Artech house publishers, 2002.
5. Mohinder s.Grewal, Lawrence R.Weill, Angus P.Andrews, Global positioning systems, Inertial Navigation and integration, Wiley-Interscience, 2000.
6. Bradford W.Parkinson, James J.Spilker, GPS: Theory & Applications progress in astronautics and aeronautics, American Institute of Aeronautics, 1996.
7. D.Kalpan & christoper hegarthy, Understanding GPS: principles and application, Artech house publishers, 2005.
8. B.Hofmann-wellenhof, H.Lichenegger, J.Collins, Global positioning system theory and practice, Fifth revised edition, Springer wien NewYork, 2001.

RS 9122 ELECTRONIC SURVEYING L T P C
2 0 2 3

OBJECTIVE:

- To understand the working of Electronic Total station equipment and solve the surveying problems.

UNIT I BASICS OF ELECTRONIC SURVEYING 8

Methods of measuring distance – Basic principles – Historical development classifications – Applications and comparison with conventional surveying – Fundamentals of electronics – Oscillators (Crystal controlled and Gunn diode) Kerrcell / Pockels's modulator – frequency mixing, Modulation and demodulation - Measurement of phase differences – reflectors (Corner, parabolic) Transducers and power sources.

UNIT II ELECTROMAGNETIC WAVES 8

Classification and application 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 – and total atmospheric correction – Use of temperature and pressure transducers.

UNIT III ELECTRONIC TOTAL STATION 8

Electro-optical system – measuring principle – working principle – sources of errors – infrared and laser instruments – Microwave system – measuring principle – working principle – sources of errors – Microwave instruments – Comparison between Electro-optical and microwave system – Applications – Care and maintenance of instruments- Modern positioning systems.

UNIT IV SURVEY ERROR ANALYSIS AND ADJUSTMENT 6

Concepts of measurement and error – Elementary concepts in probability – Reliability of measurements – Significant figures – Error propagation and linearization – The concept of adjustment- Simple adjustment methods – The least squares method – Preanalysis procedure – Horizontal angle measurement with a Theodolite – Distance measurement by Total station – Elevation difference by direct levelling and survey tolerances.

UNIT V FIELD WORK 30

Methods of measuring Distance – Study of different Total stations - map compilation – Setting out works – Base line measurement – Traversing - observations and computation of area – Trilateration.

TOTAL (L: 30 + P: 30) : 60 PERIODS

REFERENCES:

1. Burnside, C.D.Electromagnetic distance measurement, Crosby Lock wood staples, 1991.
2. Rueger, J.M. Electronic Distance Measurement, Springer – Verlag, Berlin, 2005.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc 1993.
4. Walter Whyte, Raymond Paul, Basic Surveying, Fourth Edition Laxton's, 1997.
5. James M Anderson, Edward M Mikhail, Surveying: Theory and Practice, McGraw-Hill Science/Engineering/Math; 7th edition 1997.
6. Soastamoinen, J.J.Surveyor's guide to Electro-magnetic Distance Measurement, Adam Hilger Ltd, 1997.