ANNA UNIVERSITY OF TECHNOLOGY MADURAI
MADURAI – 625002

REGULATIONS 2010

CURRICULAM & SYLLABI

M.Tech. REMOTE SENSING (PART TIME)

SEMESTER-I

S.No	Course Code	Course Title	L	T	P	C
1	10211PM101	Probability and statistical Methods	3	1	0	3
2	10211RS102	Principles of Remote sensing	3	1	0	3
3	10211RS103	Photogrammetry	3	1	0	3
Practical						
4	10211RS107	GIS Laboratory	0	0	3	2
					Total	9

SEMESTER-II

S.No	Course Code	Course Title	L	T	P	C
1	10211RS104	Cartography	3	0	0	3
2	10211RS105	Geographic information systems	3	0	0	3
3	10211RS106	Electronics surveying	2	0	2	3
Practical						
4	10211RS108	Photogrammetry Laboratory	0	0	3	2
					Total	13

M.TECH. REMOTE SENSING

SEMESTER I

10211PS101   PROBABILITY AND STATISTICAL METHODS

L T P C
3 0 0 3

UNIT I PROBABILITY AND RANDOM VARIABLES   9
Probability - Random variables - Binomial Poisson Geometric Uniform Normal Exponential distributions - moments - Moments generating functions and their properties - Function of Random variables

UNIT II ESTIMATION THEORY   9
Partial and Multiple correlation - Partial and Multiple regression - Estimation of parameters using maximum likelihood estimator and method of moments.

UNIT III TESTING OF HYPOTHESIS   9
Basic definitions of statistical hypothesis - Tests based on Normal T Chi-square and F distributions for mean variance and proportion.

UNIT IV DESIGN OF EXPERIMENTS   9
Analysis of variance - One way and Two way Classifications - Completely randomized design - Randomized block design - Latin square design - 2_2 factorial design.

UNIT V MULTIVARIATE ANALYSIS   9
An overview of multivariate methods, multivariate normal distribution Eigen values and Eigen vectors.
Total: 45

REFERENCES
1. Gupta, S.C. and Kapoor, V.K., "Fundamentals of Mathematics Statistics", Sultan Chand and Sons, 2001.
2. Johnson, R.J., "Miller and Freund's Probability and Statistics for Engineers" 6th Edition, Prentice Hall of India, 2002.
3. Jay L.Devore, "Probability and statistics for Engineering and the Sciences", Thomson and Duxbbury, 2002.
4. Dallas E. Johnson et al., "Applied Multivariate Methods for Data Analysis", Thomson and Duxbbury press, 1998.

10211RS102   **PRINCIPLES OF REMOTE SENSING**

L T P C
3 0 0 3

UNIT I PHYSICS OF REMOTE SENSING   **9**

Introduction of Remote Sensing, Electro Magnetic Spectrum Physics of Remote Sensing – Effects of Atmosphere - Scattering - Different types - Absorption - Atmospheric window - Energy interaction with surface features - Spectral reflectance of vegetation soil and water - Atmospheric influence on spectral response patterns - Multi concept in Remote Sensing

UNIT II DATA ACQUISITION (SPACE PLATFORMS)   **9**

Types of Platforms - Different types of aircrafts - Manned - Unmanned spacecrafts - Sun synchronize - Geo synchronize satellites - Characteristics of different types of platforms - LANDSAT SPOT IRS INSAT IKONOS QUICKBIRD etc.,

UNIT III DATA ACQUISITION (AERIAL PLATFORM)   **9**

Photographic products, B/W - Colour-Colour IR film and their characteristics - Resolving power of lens and film - Opto mechanical electro optical sensors - Across track and Along track scanners - Multi spectral scanners and thermal scanners - Geometric characteristics of scanner imagery calibration thermal scanners.

UNIT IV DATA ACQUISITION (MICROWAVE)   **9**

Concept of microwave remote sensing - Types of RADARS - SLAR - Resolution - Range and azimuth - Real aperture and synthetic aperture RADARS characteristics of microwave images - topographic effect - Different types of remote sensing platforms - Airborne and space borne
sensors - ERS - JERS - RADARSAT - Scatterometer, altimeter.

UNIT V DATA ANALYSIS   **9**

Resolution - Spatial - Spectral - Radiometric and temporal resolution - Signal to noise ratio - Different types of data products and their characteristics visual and digital interpretation - Basic principles of digital analog geometric correction - Radiometric correction - Image enhancement - different types - Image classification - Different types of classifications - LIDAR aerial laser terrain mapping.

Total: 45

REFERENCES

1. Paul Curran, P.J., "Principles of Remote Sensing", ELBS, 1995.
2. Lillesand. T.M. and Kiefer, R.W., "Remote Sensing and Image Interpretation", 4th Edition
of John Wiley and Sons, 2000.
3. Sabins Jr, F.F., "Remote Sensing Principles and Image interpretation", W.H. Freeman and
Co., 1978.

10211RS103   **PHOTOGRAMMETRY**

L T P C
3 0 0 3

UNIT I BASICS OF PHOTOGRAMMETRY   9

History and development - Principles - Classification of aerial cameras - Optics for photogrammetry, camera calibration - Photographic process.

UNIT II GEOMETRY OF AERIAL PHOTOGRAPHS   9

Scale - Overlaps and sidelap Types of a.p - Factors affecting scale of a.p - Vertical Exageration - Overlap and Sidelap Parallel bar- Stereoscopy - Concepts - Viewing and measuring systems - Image and object coordinates - Floating mark - Parallax equation - Height information -Tilt - Rectification - Displacement.

UNIT III PROJECT PLANNING, GROUND CONTROL AND MOSAIC   9

Flight planning - Computation for flight plan - Photo control - Cost estimation - Aerial mosaics - Types, Construction.

UNIT IV ORIENTATION PROCEDURES   9

Concepts of interior relative absolute orientation - Object image relation - Linearisation - Effect of orientation elements - Scaling and leveling - Analytical procedures - Map compilation using stereoplotters.

UNIT V AEROTRIANGULATION & SPECIAL SYSTEM   9

Elements of aerotriangulation and analytical method - Strip deformation, strip and block adjustment - Terrestrial photogrammetry - Geometry and products - Digital photogrammetry information extraction automated system image correlation matching and orientation - Orthophoto-Mapping.

Total: 45

REFERENCES :

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

10211RS107   **GIS LABORATORY**

1. Digitization - Point, Line, Polygon and Surface Data

2. Building topology - measuring distance and area

3. Adding attribute data - querying on attribute data

4. On screen digitization - Data Conversion - Vector to Raster, Raster to Vector

5. Generation of DEM: from contours, spot heights

6. Vector Analysis - Buffering, Overlay and Network analysis

7. Raster Analysis - Measurement - Arithmetic overlaying, Logical overlaying

8. Data Output: Bar charts, Map compilation

9. Customization and scripting

Total: 45

10211RS104   **CARTOGRAPHY**   **L T P C**
                                                                     3 0 0 3

UNIT I BASICS 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 - Affined transformation.

UNIT III SOURCES OF DATA   **9**

Sources of data - Ground survey and positioning - Remote sensing data collection -GPS Data - Census and sampling - data - Models for digital cartographic information - Map digitizing.

UNIT IV PERCEPTION AND DESIGN   **9**

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 V CARTOGRAPHY ABSTRACTION   **9**

Selection and generalisation principles - Symbolisation - Topographic and thematic maps - Map production and reproduction - Map series.

                                                                     Total: 45

TEXT BOOKS

1. Anson R.W. and Ormeling, F.J., "Basic Cartography for students and Technicians", Vol. I, II and III, 3rd Edition, Elsevier Applied Science Publishers, 2004.
2. Arthur H. Robinson, "Elements of Cartography", 7th Edition, John Wiley and Sons, 2004.
3. John Campbell, "Introductory Cartography" 3rd Edition, Wm.C. Brown Publishers, 2004.
4. Menno-Jan Kraak and Ferjan Ormeling,"Cartography Visualization of Geospatial Data", 2nd Edition, Pearson Education, 2004.

10211RS105   **GEOGRAPHIC INFORMATION SYSTEM S**

L T P C
3 0 0 3

UNIT I BASICS   **9**

Maps: Types - Characteristics - Coordinate systems - 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**

Remote Sensing data as a data source for GIS - Integration of Remote Sensing and GIS - Integration of GPS and GIS - 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 to raster conversion.

UNIT III 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 polygonin-polygon - Network analysis - Buffering - ODBC - Map compilation

UNIT IV SPATIAL MODELLING   **9**

Modelling in GIS - types - GIS Applications - Natural resource management utility applications - Cadastral applications - Business application - Digital elevation models generation - Representation - Applications - ALTM

UNIT V DATA QUALITY AND MISCELLANEOUS TOPICS   **9**

Accuracy, precision - Sources of error - Components of data quality - Meta data - Open GIS - Customisation in GIS - Object oriented GIS - Web GIS

                                                                    Total: 45

REFERENCES
1.Lo, C. P. and Yeung Albert, K, W.," Concepts and Techniques of Geographic information Systems",
Prentice Hall of India, 2002.
2.Robert Laurini and Derek Thompson, "Fundamentals of Spatial Information Systems", Academic Press,
1996.
3.Peter A Burrough, Rachael A Mc. Donnell, "Principles of GIS", Oxford University Press, 2000.

10211RS106   **ELECTRONIC SURVEYING**

L T P C
2 0 2 3

UNIT I BASICS OF ELECTRONIC SURVEYING   8

Methods of measuring distance - Basic principles of EDM - Historical development classifications - Applications and comparison with conventional surveying - Fundamentals of electronics - 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 II ELECTROMAGNETIC WAVES   8

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 III ELECTROMAGNETIC DISTANCE MEASURING SYSTEM   8

Electro-optical system - Measuring principle - Working principle - Sources of error - Infrared and laser EDM instruments - Microwave system - Measuring principle - Working principle - Sources of Error - Microwave EDM instruments - Comparison between Electro-optical and Microwave system - Total station and its applications - Care and maintenance of EDM 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 EDM - Elevation difference by direct levelling and survey tolerances.

UNIT V FIELD WORK   30

Methods of Measuring Distance - Study of different EDM instruments and Total Station map compilation - Setting out works - Base line Measurement - EDM traversing observations and computation of area - Trilateration.

L: 30 P: 30 Total: 60

REFERENCES

1.Burnside, C.D., " Electromagnetic Distance Measurement" Crosby Lock wood staples, 1991.
2.Rueger, J.M., "Electronic Distance Measurement", Springer-Verlag, 1990.
3.Laurila, S.H., "Electronic Surveying in Practice", John Wiley and Sons Inc, 1993.
4.Soastamoinen, J.J., "Surveyor's guide to Electro-magnetic Distance Measurement", Adam Hilger Ltd., 1997.

10211RS108   **PHOTOGRAMMETRY LABORATORY**

L T P C
0 0 3 2

1. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Double Projector.

2. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Analog Stereo Plotter Planicart E3

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

4. Interior Orientation, Relative Orientation and Measurement of model coordinates using Visopret

5. Interior Orientation, Relative Orientation, Absolute Orientation and Mapping using Analytical Stereo Plotter Planicomp P3

Total: 45