SOLAPUR UNIVERSITY, SOLAPUR

REVISED SYLLABUS - M.Sc. II GEOINFORMATICS

To be implemented from year 2011-2012

M.Sc. SEMESTER – III and IV

SCHOOL OF EARTH SCIENCES,

SOLAPUR UNIVERSITY, SOLAPUR.

SYLLABUS OT THE M. Sc . GEOINFORMATICS

STRUCTURE OF THE COURSE

SCHOOL OF EARTH SCIENCES, DEPARTMENT OF GEOINFORMATICS,

SOLAPUR UNIVERSITY, SOLAPUR

SYLLABUS OT THE M. Sc GEOINFORMATICS

STRUCTURE OF THE COURSE

SEMESTER I

COURSE CODE	SUBJECT	Hours/ week	EXTERNAL MARKS	INTERNAL MARKS
GIT 101	INTRODUCTION TO GEOGRAPHY	4	70	30
GIT 102	INTRODUCTION TO GEOLOGY	4	70	30
GIT 103	GEOMORPHOLOGY	4	70	30
GIT 104	COMPUTER APPLICATION IN EARTH SCIENCE	4	70	30
GIP 105	PRACTICAL RELATED TO GIT 101 & GIT 102	6	70	30
GIP 106	PRACTICAL RELATED TO GIT 103 & GIT 104	6	70	30

SEMESTER II

GIT 201	INTRODUCTIONS TO REMOTE SENSING	4	70	30
GIT 202	CARTOGRAPHY AND MAP ANALYSIS	4	70	30
GIT 203	INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEM AND GPS	4	70	30
GIT 204	DIGITAL IMAGE PROCESSING	4	70	30
GIP 205	PRACTICAL RELATED TO GIT 201 & GIT 202	6	70	30
GIP 206	PRACTICAL RELATED TO GIT 203 & GIT 204	6	70	30

SEMESTER III

GIT 301	SPATIAL ANALYSIS	4	70	30
GIT 302	ADVANCED TECHNIQUES IN REMOTE SENSING	4	70	30
GIT 303	ADVANCED TECHNIQUES IN GIS		70	30
GIT 304	INTRODUCTION TO STATISTICAL METHODS	4	70	30
GIP 305	PRACTICAL RELATED TO GIT 301 & GIT 302	6	70	30
GIP 306	PRACTICAL RELATED TO GIT 303 & GIT 304	6	70	30

SEMESTER IV

GIT 401	INFORMATION TECHNOLOGY AND MANAGEMENT	4	70	30
GIT 402	APPLICATIONS OF REMOTE SENSING & GIS (PART I)	4	70	30
GIT 403	APPLICATIONS OF REMOTE SENSING & GIS (PART II)	4	70	30
GIT 404	DISSERTATION	4	70	30
GIP 405	PRACTICAL RELATED TO GIT 401 & GIT 402	6	70	30
GIP 406	PRACTICAL RELATED TO GIT 403 & GIT 404	6	70	30

TOTAL DURATION OF THE COURSE: 2 YEARS

Each semester will have 1 credit (25 marks) for- field training for long tour/ in plant training/remote sensing institute visit or field work, data acquisition related to dissertation.

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PART- II **SEMESTER – III**

GIT 301: SPATIAL ANALYSIS **(Marks: External 70)**

Internal 30

1	Introduction to analysis.	Significance of spatial analysis, overview of tools for analysis.
2	Spatial analysis Vector Based	Overlay operations: point in polygon, line polygon, polygon in polygon, Single layer operations, features identification, extraction, classification and manipulation, Multilayer operations: union, Intersection, difference
3	Spatial analysis raster based	Map algebra, grid based operations, local, focal, zonal and global functions, cost surface analysis, optimal path and proximity search.
4	Network Analysis	Concept of network analysis, Types of network analysis, Evaluation of network complexity using Alpha, Gama indices, Network data model
5	Point pattern analysis	Method for evaluating point patterns, Clustered and random distribution
6	Surface Analysis	Interpolation method, DEM, TIN, variance filter, slope and aspect, relief and hill shading.
7	Spatial modeling	Role of spatial model, explanative, predictive and normative models, Handling complex spatial query, case studies.

INTERNAL EVALUATION 30 MARKS (seminar+term paper+test)

Reference Books:

- GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 1999.
- Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
- Geographical Information Science, vol. I by Roy P.S. Published by IIRS, 2000.
- Fundamentals of Geographic Information Systems, 2nd Edition by Demers M.N. published by John Wiley & Sons 2000.

GIT 302: ADVANCED TECHNIQUES IN REMOTE SENSING **(Marks: External 70)**
Internal 30

1	Satellite Remote Sensing	Active and passive microwave remote sensing. RADAR, SAR, SIR, SEASAT, RADARSAT, IRS, SOPT, OCENSAT – 1 (IRS P4), LIDAR, meteorological satellites.
2	Microwave Remote sensing	introduction, Radar development, Slide Looking Radars, Geometric characteristics of SLAR imagery – Earth surface feature Characteristics influencing radar returns, image signatures and polarisation
3	Photogrammetry	Introduction, History, classification, and organization of Aerial photographs, Stereo Photogrammetry, stereo Photogrammetry stereoscopic parallax, Stereoscopic plotting instruments – analogue and analytical, Aerial Triangulation, digital and soft copy Photogrammetry, Stereoscopic measurement of object height or terrain elevation.
4	Multispectral Remote sensing systems	Digital Multispectral data collection, Multispectral Image using discrete and scanning mirrors, Multispectral image using Linear Arrays Imaging spectrometry using Linear and Area arrays, Digital frame Cameras based on Area Arrays.
5	Thermal Infrared Remote sensing.	History, properties, Thermal radiation laws, Thermal Infrared Data collection and Thermal Infrared Remote sensing Examples

INTERNAL EVALUATION 30 MARKS
(seminar+term paper+test)

Reference Books:

- Remote Sensing: Principles and application by Panda.
- Satellite Remote Sensing in Climatology, Studies in Climatology series CBS publication by Andrew Carleton.
- Remote Sensing & Image Interpretation, Wiley publication by Thomas M.Lillesand, Ralph W.Kiefer and Jonathan W. Chipman.

GIT 303: ADVANCED TECHNIQUES IN GIS **(Marks: External 70)**
Internal 30

1	Recent trends in GIS	Basic concepts, conventional vs. database modeling with Open sources GIS History of network technology, network architecture, internet GIS,wedGIS its components implementation and benefits inter-operability specification
2	Decision support system	Types of problems, efficiency and effectiveness of decision making, Architecture of DSS, tools, significances of DSS, DSS and Expert System
3	Multicriteria Decision Analysis	Spatial MDCA, Evaluation criteria, Decision alternative and constraints, criterion weighing, decision rules, sensitivity analysis
4	Fuzzy logic	Fuzzy logic, operation on fuzzy set Fuzzy vs. Boolean, basic rules of inference, Artificial neural network
5	Spatial data mining	Method of knowledge discovery in spatial database, method of clustering exploring association,National Spatial database infrastructure

INTERNAL EVALUATION 30 MARKS
(seminar+term paper+test)

Reference Books:

- GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 1999.
- Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
- Expert Systems and Applied Artificial Intelligence, E. Turban, Macmillan, 1992
- Introduction to Expert Systems, Peter Jackson, Harlow, England: Addison Wesley Longman, 1999.
- Neural networks: A comprehensive Foundation, Simon Haykins, Prentice Hall Inc., 1999.
- Fuzzy sets, uncertainty and information, Geroge J. Klir, Tina A. Folger, Prentice Hall inc., 2000.
- Genetic Algorithms in Search, Optimization, and Machine Learning, Goldberg, David Edward, Addison-Wesley Pub. Co., 1989
- Genetic Programming: On the Programming of Computers by Means of Natural Selection, J. Koza, The MIT Press, 1992.

GIT 304: INTRODUCTION TO STATISTICAL METHODS **(Marks: External 70)**
Internal 30

1	Geographical Data	Sampling, Data, Types of data, Methods of collection and Recording
2	Statistical methods	Measures of central tendency: Mean, Median, Mode.
3	Measures of Dispersion	Range and Deviations: a)Mean Deviation b) Quartile Deviation and c) Standard Deviation Absolute and Relative measures of dispersion, skewness and kurtosis
4	Correlation	Types of correlation, methods of studying correlation, Karl Pearson coefficient of correlation, T-test, F-Test, Chi-Square test
5	Regression	Lines of regression and properties
6	Probability	Sample space, events, types of events, algebra of events, and probability of an event.
7	Types of hypothesis	level of significance, large sample list for mean, proportions equality of means
8	Introductory Multivariate statistics	Multivariate data structure, PCA, DCA, cluster analysis, CCA, types of analytical algorithms

INTERNAL EVALUATION 30 MARKS
(seminar+term paper+test)

Reference Books:

- Quantitative Techniques in Geography by Hammond, R. and McCullough. P. Clarendon oxford 1991.
- Statistical Methods for Geographers by Gregory, S, Longman 1978
- Statistical: Concept and Applications by frank, Hand Alt S.L. Cambridge University Press 1994.
- Statistics in Geography by Ebdon, D. Basil Blackwell, 1977.
- A text book of agricultural Statistics R. Rangaswamy
- Statistical Method, for Environmental & Agricultural Science Bidgelli Hossien

Practicals

GIP 305: (PRACTICAL RELATED TO SPATIAL ANALYSIS & ADVANCED TECHNIQUES IN REMOTE SENSING)

SPATIAL ANALYSIS **(Marks: External 35)**
Internal 15

1	Overview of ArcGIS	ArcMAP, ArcCatlog,, ArcToolbox
2	Georefrensing	Rectify, Resampling, Coordinate systems & map projections
3	Spatial Data	Linking feature & attributes, Geodatabase, metadata, Querying maps
4	Non-spatial Data	Working with table , join and relates, Reports, Graph
5	Geoprocessing	Symbology, intersect, identity, union, dissolve, clip, mosaic, buffer etc.
6	Network Analysis	Network Utility, Network Model analysis

ADVANCED TECHNIQUES IN REMOTE SENSING **(Marks: External 35)**
Internal 15

1	Open Sources software	Weka, Grass, ENVI,
2	ERDAS IMAGINE	LPS
3	Advance classification Algorithms	Fuzzy, Artificial neural network, knowledge based classification
4	Image Interpretation	RADAR, LIDAR, Hyper spectral

INTERNAL EVALUATION **30 MARKS**
(viva-voce+journal + data evaluation)

GIP 306: (PRACTICAL RELATED TO ADVANCED TECHNIQUES IN GIS & INTRODUCTION TO STATISTICAL METHODS)

ADVANCED TECHNIQUES IN GIS **(Marks: External 35)**
Internal 15

1	Advanced image enhancement techniques	Principle component analysis, Fourier transformation, Texture
2	Interpretation of images	IRS, SPOT, TM, ETM, LISS
3	Ground radiometry	Principle and working of ground radiometer, data collection, data integration and analysis
4	Advanced Spatial Analysis	Multi criteria analysis in Arcgis using fuzzy logic

INTRODUCTION TO STATISTICAL METHODS **(Marks: External 35)**
Internal 15

1.	Data collection and their types.
2.	Measure of central tendency – Mean, Mode and Median
3.	Dispersion
4.	Models
5.	Hypothesis

INTERNAL EVALUATION **30 MARKS**
(viva-voce+journal + data evaluation)

1 credit (25 marks) for- field training for long tour/ in plant training/remote sensing institute visit or field work, data acquisition related to dissertation.

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PART- II **SEMESTER - IV**

GIT 401 INFORMATION TECHNOLOGY AND MANAGEMENT (Marks: External 70)

Internal 30

1	Information Basics	Impact of IT, Information, system, & IS, Classification of IS,IS for knowledge work
2	Managing with Information	Managing in 21st century, Strategic planning & IS, Information needs for strategic planning's. , IS for decision support, Quality & privacy Issues
3	Managing Information Resource	Information Resource management, Strategic planning for IS function, Justification for IS , IT / IS facilities & operations Security control & Audit.
3	Programming	Concept, logic development, history of the programming language. Procedural &object, Oriented languages. Designing software projects, top down, bottom up implementation, compliers, editors, debuggers

INTERNAL EVALUATION 30 MARKS
(seminar+term paper+test)

Reference Books:

- Geoinformatics for Environmental Management, B.S. Publication, by M. Anji Reddy.
- Lets us C by Yashwant kanitkar BPB Publication ,2000
- Lets us C by Yashwant kanitkar BPB Publication ,2001
- Object oriented programming with C++ by Balguruswamy Tata McGraw Hill Publishing co.Ltd New Delhi

GIT 402: APPLICATIONS OF REMOTE SENSING & GIS (PART I) (Marks: External 70) Internal 30

1	Geosciences	Concept geomorphology land form analysis Arial and satellite data, interpretation, drainage basin,morphometry and solpe mapping ,integrated,Approch for landslide hazard zonation mapping
2	Water resources	Watershed hydrology and physical process in watershed, principle of RS in water resources, assessment, River Valley project planning, organization and design of spatial and non- spatial data in water resources in engineering, ground water
3	Agriculture	Spectral characteristic of crop, crop inventory ,crop yield modeling , crop water mangment,agro ecological zoning
4	Soil	Land evaluation, physiographic soil mapping , soil type identification, soil moisture mapping
5	Case study	Review case studies in Geosciences, Water Recourse, Agriculture, Soil

INTERNAL EVALUATION 30 MARKS
(seminar+term paper+test)

Reference Books :

- Remote Sensing of the Environment Earth Resource Perspectives, 2nd Edition, by John R. Jensen.
- Geoinformatics for Environmental Management, B.S. Publication, by M. Anji Reddy.
- Remote Sensing: Principles and application by Panda.
- Satellite Remote Sensing in Climatology, Studies in Climatology series CBS publication by Andrew Carleton.
- Remote Sensing & Image Interpretation, Wiley publication by Thomas M.Lillesand, Ralph W.Kiefer and Jonathan W. Chipman.
- Fundamental of Remote sensing , Jorge Josef

GIT 403: APPLICATIONS OF REMOTE SENSING & GIS (PART II) (Marks: External 70) Internal 30

1	Forest	DIP of forest/ vegetation classification and mapping forest inventory, and sampling techniques, growing stock estimation, forest management, wildlife habit suitability analysis
2	Marine resources	Fundamental of marine ecology, Bio resources, mopping, monitoring, coastal Bathymetry, ocean colour mapping, SST mapping, potential fishing zone mapping
3	Urban mapping	Large scale mapping for cadastral data base, urban land use classification monitoring change detection analysis, urban land conservation
4	Disaster management	Natural and manmade, type, zoning preparedness
5	Geology	Geological mapping, Subsurface structure mapping, interpretation
6	Case studies	Review case studies in Forest, Marine, Urban, Disaster Management

INTERNAL EVALUATION 30 MARKS
(seminar+term paper+test)

Reference Books:

- Subtle Issues in Coastal Management by Sudarshana R, Mishra, Roy P.S., Rao D.P., IIRS 2000.
- Natural Disaster and their Mitigation by P.S.Roy, publishers by IIRS, 2000.
- RS and GIS Application in Urban and Regional studies by Subudhi A.P., Sokhi B.S., Roy P.S, IIRS, 2001.
- Biodiversity characteristics at Landscape level in North East using satellite Remote and GIS by Roy P.S., IIRS, 2002.

GIT 404: Dissertation

Student will submit their independent dissertation work at the end of semester IV. Assessment of the dissertation and internship will be based on the submitted M. Sc. dissertation report, seminar and viva-voice examination for 100 marks.

PRACTICALS:

GIP 405: (PRACTICAL RELATED TO INFORMATION TECHNOLOGY AND MANAGEMENT & APPLICATIONS OF REMOTE SENSING & GIS (PART I))

INFORMATION TECHNOLOGY AND MANAGEMENT

1	Programming:	C programming, C++, Visual Basic, Dot Net
2	Database software	Oracle 10g
3	Customization	VBA in ArcGIS

APPLICATIONS OF REMOTE SENSING & GIS (PART I)

1	Introduction to Arc view
2	Registration, Digitization, Snapping, Geoprocessing
3	Queries, 3DAnalysis, Buffer
4	Joining table Excel to Arcview, Project customization, Script
5	Chart ,layout ,Arcview Project
6	Site Suitability Analysis, Change Detection, Land Evaluation etc

INTERNAL EVALUATION 30 MARKS

(viva-voce+journal + data evaluation)

GIP 406: (PRACTICAL RELATED TO APPLICATIONS OF REMOTE SENSING & GIS (PART II) & DISSERTATION)

APPLICATIONS OF REMOTE SENSING & GIS (PART II)

1	3D analysis small project in Arc map
2	Network analysis small project in Arc map
3	Geostatistics Small project in Arc map
4	Animation small project in Arc map
5	Arc scan small project Arc map
6	Google Earth
5	Case Studies related to Geology, Geography, Environment

INTERNAL EVALUATION 30 MARKS

(viva-voce+journal + data evaluation)

DISSERTATION

The Internship report submitted by the student and the evaluation report by the external supervisor will carry 50 marks.

1 credit (25 marks) for- field training for long tour/ in plant training/remote sensing institute visit or field work, data acquisition related to dissertation.