SOLAPUR UNIVERSITY, SOLAPUR

REVISED SYLLABUS - M.Sc. I GEOINFORMATICS

To be implemented from year 2011-2012

M.Sc. SEMESTER - I and II

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.

SCHOOL OF EARTH SCIENCE,

DEPARTMENT OF GEOINFORMATICS,

SOLAPUR UNIVERSITY, SOLAPUR

PART- I   **SEMESTER - I**

GIT101: INTRODUCTION TO GEOGRAPHY   **(Marks: External 70)**

Internal 30

1	Climatology	Weather and Climate: Atmosphere structure, and composition, Atmosphere and its energy budget- temperature distribution – winds and general circulation-moisture, humidity and Precipitation-climate types – climate and cloud and its type
2	Bio-geography	World distribution of plants and animals Ecosystem ,biodiversity & its depletion through nature and man induced causes natures hazard and man made hazard, soil type and soil profile
3	Agriculture geography	Major type India & world agriculture region & pattern
4	Settlement Geography	Rural settlement: pattern & type, Urban settlement: pattern & type and its function
5	Regional planning	Region concept in geography, regional hierarchy, concept of planning, regional imbalances in India
6	Transport	Types of Transport mode, Accessibility and connectivity

INTERNAL EVALUATION   30 MARKS
(seminar+term paper+test)
Reference Books -

- Physical Geography, Savinder sing, Prayag Pustak Bhawan, 20-A university road, Allahabad-211002

- Systematic Agricultural Geography, Husain M., Rawet Publication, Jaipur, Delhi

- Location Economic Activity, Hoover E. M., New York, McGraw Hill 1948

- A New Approach to functional Classification of Town, Rafillah. S. M., Geographer, New Dehli

- Climatology, A.K. Barua

- K.siddhartha, & S. Mukherjee, Cities urbanization and urban system, Kisalaya publication pvt. Ltd, Dehli

GIT102 INTRODUCTION TO GEOLOGY   **(Marks: External 70)**

Internal 30

1	Mineralogy	Definition, physical properties of minerals, brief introduction to rock forming minerals (silica, feldspar, amphibole, mica, garnate, pyroxene)
2	Introduction to Petrology	Definition – Rocks, their general classification into igneous, sedimentary and metamorphic – Forms and Structures of igneous rocks – Textures – Classification of igneous rocks – An outline of classification of sedimentary rocks – Textures and Structures of sedimentary rocks – Definition – agents and kinds of metamorphism – Zones , Grades Textures and Structures of metamorphic rocks.
3	Structural Geology	Introduction to Structural geology : Topographic maps – Geologic maps- Outcrops and their trends with Reference to slope and topography – Clinometers compass and its uses – Brief Study of Folds – Faults – Unconformities – Joints
4	Classification of Mineral deposits	Brief study of Gold, Iron, Copper, Manganese, Lead & Zinc, Bauxite, Coal and Petroleum
5	Engineering Geology	Role of engineering geology in civil construction and mining industry – Various stages of engineering geological investigation for civil engineering projects – Engineering properties of rocks – Brief study of Geological consideration of Dams and Reservoirs – Tunnels

INTERNAL EVALUATION   30 MARKS
(seminar+term paper+test)
Reference Books:

- Introduction to geology, Sohni Sharma, Sharma, Dixit
- Introduction to geology, Santosh Ray
- Engineering Geology, Davis
- Engineering Geology, Parbeen Singh
- Structural geology, M.P.Billings
- Foundation of Structural geology,R.G.Park

GIT103 GEOMORPHOLOGY   **(Marks: External 70)**

                                                                  Internal 30

1	Fundamental concept in Geomorphology	Define, Nature, concept, Scope of Geomorphology.
2	Weathering	Mechanical, Chemical, Biological, Soil formation
3	Erosion	Cycle of erosion: Davis, Penck, L.C. King, Rejuvenation: & Polycyclic Relief Erosion & Deposional Land form Associated with River, Wind, Glacier, Karst, Marine
4	Drainage	System, Patterns
5	Climatic Geomorphology	Climate & land form, humid, sub-humid, arid &semi-arid nature of weathering
6	Earth Movement	Continental Drift Theory & Plate Tectonic Theory
7	Application of Geomorphology	Settlement, Construction (dam, road, building, tunnel etc.), Disaster management
8	Coastal Geomorphology	Types, Tectonics

INTERNAL EVALUATION   30 MARKS
(seminar+term paper+test)
Reference Books :

- Fundamental of Geomorphology, R.J. Rice
- Geomorphology, R.J. Chorley, S.A.Schumm, D.E. Sugden
- Principle of geomorphology, W.D. Thornbury
- Geomorphology, Majid Husain
- Indian Geomorphology, H.S.Sharma

GIT104: COMPUTER APPLICATION IN EARTH SCIENCE   **(Marks: External 70)**

Internal 30

1	Basics of computers	An introduction to computers, development of computers, Hardware and Software
2	Fundamentals of Computers	Operating systems, Input devices to the computers, Storage devices, central processing unit, Computer output devices
3	Database Management system	Advantage of DBMS conceptual & implementation models. Hierarchical, network & Relational Models, RDBMS :components, concept, database schema, tables relationship –one to one, one to many, many to many database design & normalization data definition &manipulation using SQL. SQL – query processing, operation on tables, Union, intersection, product, natural join, integrity constraints, database security, role of data base Administrator
4	Application of Computer in Earth Sciences	Geoinformatics, Geology, Geography, Environment etc.

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

Reference Books :-

- Principles of GIS for Land Resources Assessment by P.A. Burrough, Oxford : Science publications, 1986.
- Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc, New York, 2002.
- GIS – A computing Perspective by Micheal F. Worboys, Taylor & Francis, 1995
- Introduction to computer and operating system – sharada sahasrabudhe ,pune

- Elmasri R. and Navathe S.B., "**Fundamentals of Database** Systems", Benjamin/Cummings Publishing Co. Inc.(Addison-Wesley world student series), 2002

- Trembley J.P. and Sirenson P.G., "An Introduction to Data Structures with Applications", Tata McGraw-Hill.

- Date C.J., "An Introduction to Database Systems", Vol-I, Addison-Wesley.

- A.Silberschatz, H.F.Korth and S.Sudarshan, "Database System Concepts", McGraw-Hill International Editions, Computer Science Series.

PRACTICAL 105 (INTRODUCTION TO GEOGRAPHY + INTRODUCTION TO GEOLOGY)

HUMAN GEOGRAPHY **(Marks: External 35)**

Internal 15

1	Study of Natural resources	Water, Forest, Minerals, Soil,
2	Study of human resources	Transportation, settlement, agriculture, industries, education facility, cultural places, population
3	Quantitative	Semi average method, leastsqare method, exponential growth rateof population, lorenze curve, rank size rule, nearest neighbor techniques, nelson methods of town classification, accessibility of transport network, crop combination method
4	Climatic Data	Interpretation of Indian daily weather report, Wind Rose diagram, Line Graph, Dispersion diagram

INTRODUCTION TO GEOLOGY **(Marks: External 35)**

Internal

1	Identification and description of Megascopic minerals (rock forming, Industrial and Ore)
2	Study of structural maps.
3	Identification and description of Megascopic rocks.
4	Study of common rocks with reference to their utility in engineering projects.
	Preparation and interpretation of hydrogeological maps.

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

PRACTICAL 106 (GEOMORPHOLOGY + COMPUTER APPLICATION IN EARTH SCIENCE)

GEOMORPHOLOGY (Marks: External 35)

Internal 15

1	Drainage	Drainage basin and morphometry. Basin demarcation Ordering of streams – Strahler's and Horton methods
3	Soils	Textural characteristics, study of representative soil profiles
4	Morphometric analysis	Bifurcation ratio, Drainage density, Stream frequency, constant of channel maintenance
5	Landforms & Slope	Identification of landforms on Toposheets, Relief and slope analysis

COMPUTER APPLICATION IN EARTH SCIENCE (Marks: External 35)

Internal 15

1	MS -Word	Report, typing, files
2	MS-Access	Database management system,
3	MS-excel	Line, Bar, Pie, Scatter,

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.

SCHOOL OF EARTH SCIENCE,

DEPARTMENT OF GEOINFORMATICS,

SOLAPUR UNIVERSITY, SOLAPUR

PART – I   **SEMESTER II**

GIT 201 INTRODUCTIONS TO REMOTE SENSING   **Marks: External 70**

Internal 30

1	Fundamental of Remote Sensing	Introduction, History, development, of Remote sensing in World and India, stages of remote sensing, EMR & EMR spectrum, EMR Quantities, Energy sources and radiation principles, Theories of EMR, Concept of Energy interactions in the atmosphere, energy Black body, atmospheric windows and types of remote sensing interactions with the earth surface features, Spectral reflectance of vegetation, Soil and water,
2	Aerial photography	Types, Geometry, Scale, Height and Process of Aerial Photograph, basic requirement of Aerial Photograph, planning & execution of photographic flight, aerial cameras, relief displacement, stereo vision, stereo model & stereoscope, parallax & parallax measurement
3	Platform, Orbit and sensor	Platform: Ground based, air-borne, space-borne, Orbit: Geostationary satellite and polar orbiting satellite, Sensor: Types of sensor and cameras, processes of sensor & its characteristics, Whiskbroom and Pushbroom cameras
4	Techniques of interpretation	Aerial photo interpretation, satellite image interpretation, Recognition elements: Tone, Color, Texture, Pattern, Shape, Size and associated features

INTERNAL EVALUATION   30 MARKS
(seminar+term paper+test)
Reference Books :

- Fundamentals of Remote Sensing: George Joseph
- Remote Sensing and Image Interpretation: Lillesand & Keifer.
- Manual of Remote Sensing: ASP Falls Church Virginia USA.
- Physical aspects of Remote Sensing: PJ Curran.
- Remote Sensing Principles and Interpretation: F.F. Sabins.
- Introduction to Remote Sensing: J.B. Campbell.
- Remote sensing Models and methods for image processing by Robert A. Schowengerdt, second edition, 1997, Academic Press

GIT 202 CARTOGRAPHY AND MAP ANALYSIS   **Marks: External 70**

Internal 30

1	Cartography	Introduction, Cartography today, Nature and scope of Cartography, History of Cartography, types of map
2	Scale and their functions	Types, reduction and enlargement of scale, Map Scale and generalization concept
3	Map Projections	Geographic Coordinates system, Ellipsoid geoids and datum, types of map projections, constructions of map projections
4	Source of data	Ground survey and positioning, Remote sensing data collection, census and sampling, map digitizing perception and design, cartographic design, color theory and models, color and pattern creation and specification and map compilation.
5	Geographic representation	Map and mapping, map design, symbolization, conventional signs and map layout, map referencing and indexing, scale of maps and map contents, field work techniques, socio – economic survey and attribute data.

INTERNAL EVALUATION   30 MARKS
(seminar+term paper+test)
Reference Books:

- Cartographic Design and production, Keates, J.S., London, Longman
- Fundamentals of Cartography, Ramesh, P. A., Concept Publishing Co., New Delhi.
- Mapping and Compilation, Rampal, K.K.,Concept Publishing Co.,New Delhi.
- Basic Cartography, Vol. 1, 2nd ed., Anson, R.W. & Ormeling, F.J., Elsevier Applied Science, Publishers, London.
- http://www.cnr.colostate.edu/class_info/nr502/lg1/map_projections/form_case_aspect.html
- http://www.cnr.colostate.edu/class_info/nr502/lg1/map_projections/developable_surfaces.html
- Colorado State U. http://www.cnr.colostate.edu/class_info/nr502/lg1/map_projections/
- Kang-tsung Change, 2003, *Introduction to Geographic Information Systems* (2nd Edition), McGraw-Hill Higher Education press.
- Paul A. Longley et al., 2001, *Geographic Information Systems and Science*, John Wiley & Sons press.
- Keith C. Clarke, 2003, Getting Started with Geographic Information System (4th Edition), Prentice Hall press.

GIT 203 INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEM AND GPS
Marks: External 70

Internal 30

1	Introduction to GIS	Introduction, Definition, historical evolution, components, objectives, basic concept, need, scope, overview of GIS application areas
2	Data Structure, Types and Models	Raster and vector data structure, fundamental of data storage: block code, run length code, chain code, quad tree, advanced data model: Grid model, TIN model, Network model, Relational model, Vector data type: point, line, polygon
3	Digital Elevation Model (DEM)	Need, methods, data sources and products of DEM – Digital Terrain Modeling (DTM) – Input verification, storage and methods of data analysis for spatial modeling – Methods of GIS and spatial interpolation.
4	Global Positioning System (GPS)	Main segments, nature and sources of errors in GPS signals, differential GPS.

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

Reference Books :

- Concepts and Techniques of Geographic Information Systems CP Lo Albert K W Yeung, 2005 Prantice Hall of India.
- Principles of GIS for Land Resources Assessment by P.A. Burrough, Oxford : Science publications, 1986.
- Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc, New York, 2002.
- GIS – A computing Perspective by Micheal F. Worboys, Taylor & Francis, 1995.
- Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc., New York, 1994.
- Geographical Information Systems – Principles and Applications, Volume I edited by David J. Maguire, Micheal F Goodchild and David W Rhind, John Wiley Sons. Inc., New York 1991.
- Geographical Information Systems – Principles and Applications, Volume II edited by David J. Maguire, Micheal F Goodchild and David W Rhind, John Wiley Sons. Inc., New York 1991.
- Kang-tsung Change, 2003, *Introduction to Geographic Information Systems* (2nd Edition), McGraw-Hill Higher Education press.
- Paul A. Longley et al., 2001, *Geographic Information Systems and Science*, John Wiley & Sons press.
- Keith C. Clarke, 2003, Getting Started with Geographic Information System (4th Edition), Prentice Hall press.

GIT 204 DIGITAL IMAGE PROCESSING   **Marks: External 70**

Internal 30

1	Introduction to digital image processing	Digital images, sources of errors; Radiometric and geometric, Image rectification; geometric correction radiometric correction, noise removal.
2	Image enhancement techniques	Contrast enhancement: linear and non linear logarithmic contrast enhancement. Exponential contrast enhancement, Gaussian stretch density slicing, spatial filtering, low frequency and high frequency, edge enhancement band rationing, band combination.
3	Digital image classification	Classification Scheme: Supervised classification training sites selection information extraction Discriminate Functions; Maximum Likelihood classifier , Euclidian distance, Mahalanobis distance, Unsupervised classification, Error matrix

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

Reference Books:

- John R Jenson 'Introducing Digital Image Processing" _ Prantice Hall. New Jersy 1986.
- Robert A Schowengergt, 'Techniques for Image Processing and Classification in Remote Sensing'; 1983
- Robert A Schowengergt, 'Remote Sensing – Models and Methods for Image Processing' Academic Press 1997 Hord R M, Academic Press, 1982.

PRACTICAL GIP205 (REMOTE SENSING + CARTOGRAPHY AND MAP ANALYSIS)

REMOTE SENSING   **Marks: External 70**

Internal 30

1	Measurement	Determination of photo scale and height determination from aerial photograph, Testing stereo vision, Use of Lens stereoscope and Mirror stereoscope, Determination of vertical exaggeration, Use of Parallax Bar for height calculation from aerial photographs, Calculation of scale of the photographs
2	Digital Photogrametry	Marking Principal point and conjugate principal point on the stereopairs, Identification of tectonic elements from aerial photographs, Digital photogrammetry – digital image matching and collection of mass points, Construction digital terrain models, Application of DTMs – contour generation; fill; fly though; slope and aspect; view shed, analysis; watershed and drainage extraction; volumetric analysis; preparation of ortho images, interior and exterior orientation
3	Land use/ land cover classification method	First level, Second and Third Level
4	Interpretation	Interpretation of aerial photograph and satellite imagery PAN LISS WiFS, OCM, ETM, TM, MSS
5	Application	Application of various imagery

CARTOGRAPHY AND MAP ANALYSIS   **Marks: External 70**

Internal 30

1	Map Scale	Types and Conversion
2	Map Projection	Types: source of light, developable surface, global properties
3	Representation of statistical data	One dimensional, Two dimensional, Three dimensional,
4	Topographical Map	Numbering, latitude-longitude, Sign and Symbols, color system, interpretation

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

PRACTICAL GIP 206 (Introduction to GIS & GPS +Digital Image Processing)

INTRODUCTION TO GIS & GPS   **Marks: External 70**

Internal 30

1	Software	Introduction to AutoCAD
2	Image registration	Scale, rubber sheeting
	Spatial data input	Drawing tool ,Modify tool, Point, Line, Polygon and Surface Data, Building topology, measuring distance and area, linking attribute data with geographical feature, Data Conversion – Vector to Raster, Raster to Vector
3	Query	Spatial and non-spatial query,
4	Vector Analysis	Buffering, Overlay and Network analysis
5	Data Export	Import in AutoCAD ,Export AutoCAD to other software ,preparing layout ,Text in AutoCAD, Map Menu &its use
6	GPS	GPS handling ,path tracing, location set

DIGITAL IMAGE PROCESSING   **Marks: External 70**

Internal 30

1	Image Rectification	Toposheet and satellite imagery With ERDAS IMAGINE 9.1,
2	Image Enhancement	Contrast enhancement: linear and non linear, Density slicing, Spatial filtering, Band rationing, Edge enhancement, histogram equalization, NDVI, RVI
3	Image Classification	Supervised Classification: Training Sites, Discriminant Function: maximum likelihood classifier, Euclidian distance, Mahalanobis distance Unsupervised Classification, Accuracy Assesment, Error Matrics

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.