SOLAPUR UNIVERSITY, SOLAPUR

M.Sc. I GEOINFORMATICS (Sem -I&II)

Choice Based Credit System Syllabus

(w.e.f. June 2015-16)

SOLAPUR UNIVERSITY
SCHOOL OF EARTH SCIENCES
M.SC Geoinformayics
2015-2016 ONWARDS
STRUCTURE OF THE COURSE

SEMESTER I

SR.NO	SUBJECT	PAPER CODE	TITLE OF THE PAPER	LOAD /WEEK	TOTAL LOAD	CREDITS
1	GEOINFORMATICS	GIT 101	INTRODUCTION TO GEOGRAPHY	04	45	04
2	GEOINFORMATICS	GIT 102	INTRODUCTION TO GEOLOGY	04	45	04
3	GEOINFORMATICS	GIT 103	GEOMORPHOLOGY	04	45	04
4	GEOINFORMATICS	GIT 104	COMPUTER APPLICATION IN EARTH SCIENCES	04	45	04
5	GEOINFORMATICS	GIP 105	PRACTICAL RELATED TO GIT 101 & GIT 102	04	45	04
6	GEOINFORMATICS	GIP 106	PRACTICAL RELATED TO GIT 103 & GIT 104	04	45	04
7	GEOINFORMATICS		SOFT SKILL ICT, SCIENTIFIC ENGLISH	01	07	0.50
			TOUR & TOUR REPORT			0.25
			SEMINAR	01	07	0.25
	TOTAL				284	25

STRUCTURE OF THE COURSE

SEMESTER II

SR.NO	SUBJECT	PAPER CODE	TITLE OF THE PAPER	LOAD /WEEK	TOTAL LOAD	CREDITS
1	GEOINFORMATICS	GIT 201	INTRODUCTIONS TO REMOTE SENSING	04	45	04
2	GEOINFORMATICS	GIT 202	CARTOGRAPHY AND MAP ANALYSIS	04	45	04
3	GEOINFORMATICS	GIT 203	INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEM AND GPS	04	45	04
4	GEOINFORMATICS	GIT 204	DIGITAL IMAGE PROCESSING	04	45	04
5	GEOINFORMATICS	GIP 205	PRACTICAL RELATED TO GIT 201 & GIT 202	04	45	04
6	GEOINFORMATICS	GIP 206	PRACTICAL RELATED TO GIT 203 & GIT 204	04	45	04
7	GEOINFORMATICS		SOFT SKILL ICT, SCIENTIFIC ENGLISH	01	07	0.50
			TOUR & TOUR REPORT	01	07	0.25
			SEMINAR			0.25
	TOTAL				284	25

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 SCIENCES,

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	**09**
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 types and soil profile	**09**
3	Agriculture geography	Major types in India & world agriculture region & patterns, their importance	**09**
4	Settlement Geography	Rural settlement: pattern & type, Urban settlement: patterns and types and their function, distribution.	**09**
5	Regional planning & Transport	Region concept in geography, regional hierarchy, concept of planning, regional imbalances in India. Types of Transport mode, Accessibility and connectivity	**09**

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)	**09**
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.	**09**
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	**09**
4	Classification of Mineral deposits	Brief study of Gold, Iron, Copper, Manganese, Lead & Zinc, Bauxite, Coal and Petroleum	**09**
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	**09**

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 concepts in Geomorphology	Define, Nature, concept, Scope of Geomorphology, Geomorphological features.	**09**
2	Weathering Erosion Drainage	Mechanical, Chemical, Biological, nature of weathering Soil formation Concept of Erosion, Cycle of Erosion, Rejuvenation and Polycyclic relief's, Drainage System and Patterns, Erosional & Depositional Landforms of Fluvial, Karst, Glacial.	**09**
3	Climatic Geomorphology	Climate and land form types, humid, sub-humid, arid and semi-arid regions and their distribution.	**09**
4	Earth Movement	Continental drift theory & concept plate tectonic theory, crustal movements.	**09**
5	Application of Geomorphology	Settlement, Construction (dam, road, building, tunnel etc.), Disaster management.	**09**

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 SCIENCES **(Marks: External 70)**

Internal 30

1	Basics of computers	An introduction to computers, development of computers, Hardware and Software.	**09**
2	Fundamentals of Computers operation	Operating systems, Input devices to the computers, Storage devices, central processing unit, Computer output devices	**09**
3	Database Management system: concept	Advantage of DBMS conceptual & implementation models. Hierarchical, network & Relational Models, RDBMS: components, concept, database schema, table relationship –one to one, one to many, many to many database design.	**09**
4	SQL	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	**09**
5	Application of Computer in Earth Sciences	Examples for Geoinformatics applications in image processing, Geological applications mineral exploration, mapping, exploration Geographical applications related mapping of settlement, agricultures and Environmental applications in biodiversity, wildlife, forestry, Land use land cover.	**09**

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)

INTRODUCTION TO 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 Methods	Semi average method, least sqare method, exponential growth rateof population, lorenze curve, rank size rule,
4	Advanced techniques	Nearest neighbor techniques, nelson methods of town classification, accessibility of transport network, crop combination method
5	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 – surface inclined.
3	Identification and description of Megascopic rocks.
4	Study of common rocks with reference to their utility in engineering projects.
5	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
2	Soils	Textural characteristics, study of representative soil profiles
3	Morphometric analysis	Bifurcation ratio, Drainage density, Stream frequency, constant of channel maintenance
4	Landforms & Slope	Identification of landforms on Toposheets, drainage pattern, 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, Principles of Remote Sensing, History, Stages of Remote Sensing, Remote Sensing In India, Types of Remote Sensing, Types of Resolution: Spectral, Spatial, Temporal, Radiometric, Spectral Signature: Vegetation, Water, Soil	**09**
2	**Electromagnetic radiation**	Electro Magnetic Radiation, Electro Magnetic Spectrum, Energy Interaction with the Atmosphere, Energy Interaction with the Earth Surface.	**09**
3	**Platform, Orbit and sensors**	Types of platform: Ground Based, Airborne, Spaceborne Platform, Types of sensor and cameras, processes of sensor & its characteristics, Whiskbroom and Pushbroom cameras	**09**
4	**Aerial photography(AP)**	Introduction, History, Examples of Aerial Photography, Uses of Aerial Photography, Flying Condition of AP, Aerial Camera, Types of Camera, Marginal Information, Types of AP, Spatial Resolution, Overlapping Stereo Photography, Films, Problems, Problem Associated with Film and Camera, Aerial Photograph Vs Map Scale, Stereoscopic Parallax	**09**
5	**Techniques of Interpretation**	Element of Image Interpretation: : Tone, Color, Texture, Pattern, Shape, Size and associated features Aerial Photo Interpretation, Satellite Image Interpretation,	**09**

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	**09**
2	Scale and their functions	Types of scales, reduction and enlargement of scale, Map Scale functions and generalization concept.	**09**
3	Map Projections	Geographic Coordinates system, Ellipsoid geoids and datum, types of map projections, constructions of map projections	**09**
4	Source of data	Ground survey and positioning, Remote sensing data collection, sampling, map digitizing perception and design, cartographic design, color theory and models, color and pattern creation and map compilation.	**09**
5	Geographic representation	Map and mapping, map design, symbolization, conventional signs and map layout, map referencing and indexing, scale of maps and map contents, socio – economic survey and attribute data.	**09**

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, History, Objectives of GIS, components of GIS, various applications of GIS in areas related to earth sciences.	**09**
2	**Geographical Data**	**Types of Geographical Data**: Raster Data Model, Vector Data Model, **GIS Tasks**: Input, Manipulation, Management, Query, Analysis and Visualization	**09**
3	**How GIS Works**	Layer, Geographic Reference, **Types of data**: Spatial Data, Non Spatial Data, **Level of Measurement**: Nominal, Ordinal, Interval, Ratio	**09**
4	**Concept of Topology**	Definition, Advantages of Topology, Concept of Arc, Node and Vertices, Connectivity, Containment, Contiguity.	**09**
5	**Global Positioning System (GPS)**	Main segments, nature and sources of errors in GPS signals, differential GPS.	**09**

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.

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.	**09**
2	Basic	Contrast enhancement: linear and non linear logarithmic contrast enhancement. Exponential contrast enhancement.	**09**
3	Advanced Image enhancement techniques	Gaussian stretch density slicing, spatial filtering, low frequency and high frequency, edge enhancement band rationing, band combination.	**09**
4	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	**09**
5	Hybrid Classification Approaches	Texture classification approach, Image processing approach using fuzzy logic, machine approach for hybrid classification.	**09**

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	Land use/ land cover classification method	First level, Second and Third Level
3	Interpretation	Interpretation of aerial photograph and satellite imagery PAN LISS WiFS, OCM, ETM, TM, MSS
4	Application	Application of various imageries

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, use of total station for mapping.

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.