



Punyashlok Ahilyadevi Holkar Solapur
University, Solapur

Choice Based Credit System (CBCS)

Syllabus

M.Sc. Part I & II Geoinformatics

To be implemented from the year 2020 onwards

School of Earth Sciences

Solapur University,

Solapur M.Sc

Geoinformatics

School of Earth Sciences
Punyashlok Ahilyadevi Holkar Solapur University, Solapur
M.Sc Geoinformatics (CBCS Syllabus)

SEM	Code	Title of the paper	Semester Exam			L	T	P	Credit
			Theory	IA	Total				
First		Hard core							
	HCT 1.1	Introduction to Geography	70	30	100	4			4
	HCT 1.2	Fundamentals of Geoinformatics	70	30	100	4			4
	HCT 1.3	Computer Applications in Earth Sciences	70	30	100	4			4
			Soft core (any one)						
	SCT 1.1	Principles of Cartography	70	30	100	4			4
	SCT 1.2	Introduction to Geology	70	30	100	4			
			Practical of hard core						
	HCP 1.1	Practical HCP1.1	35	15	50			2	6
	HCP 1.2	Practical HCP1.2	35	15	50			2	
	HCP 1.3	Practical HCP1.3	35	15	50			2	
			Practical of soft core (any one)						
	SCP 1.1	Practical SCP1.1	35	15	50			2	2
	SCP 1.2	Practical SCP1.2	35	15	50			2	
			Short study tour			25		01	
		Total For First Semester	420	180	625				25
SEM		Hard Core	Theory	IA	Total	L	T	P	Credit
Second	HCT 2.1	Digital Image Processing	70	30	100	4			4
	HCT 2.2	Spatial Analysis	70	30	100	4			4
			Soft core (any one)						
	SCT 2.1	Advanced Techniques in GIS	70	30	100	4			4
	SCT 2.2	Statistical Methods in Earth sciences	70	30	100	4			
			Open elective (any one)						
	OET 2.1	SWYAM	70	30	100	4			4
	OET 2.2	Geo-Instrumentation and field survey	70	30	100	4			
			Practical of hard core (any one)						
	HCP 2.1	Practical HCP2.1	35	15	50			2	4
	HCP 2.2	Practical HCP2.2	35	15	50			2	
			Practical of soft core (any one)						

	SCP 2.1	Practical SCP2.1	35	15	50			2	2
	SCP 2.2	Practical SCP2.2	35	15	50			2	
		Practical open elective (any one)							
	OEP 2.1	Practical OEP2.1	35	15	50			2	2
	OEP 2.2	Practical OEP2.2	35	15	50			2	
		Long Tour and tour report			25		1		1
		Total For Second Semester	420	180	625				25

*Fieldwork up to two weeks is compulsory.

HCT 1.1: INTRODUCTION TO GEOGRAPHY**(Marks: External 70)****Internal 30**

1	Climatology	Weather and Climate: Atmospheric structure, and composition, heat budget of the atmosphere. Temperature and its types, winds and its types, precipitation and its types, cloud and its types, cyclone and its types	14
2	Bio-geography	World distribution of plants and animals Ecosystem , natural hazard and man-made hazard, soil types and soil profile	14
3	Agriculture and Settlement geography	Major agricultural types in India & world agricultural region, Rural settlement: patterns & types, functional classification of town	14
4	Economic Geography	Resources based and footloose industries. Types of Transport mode, Accessibility and connectivity.	14

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.

HCT 1.2: Fundamentals of Geoinformatics**(Marks: External 70)****Internal 30**

1	Remote Sensing	Introduction, principles of remote sensing, history, stages of remote sensing, types of remote sensing, types of resolution: spectral, spatial, temporal, radiometric, spectral signature: vegetation, water, soil, electro magnetic spectrum, types of platform: ground based, airborne, space borne platform, types of sensor and cameras, processes of sensor & its characteristics, whiskbroom and pushbroom cameras, element of image interpretation: : tone, color, texture, pattern, shape, size and associated features, aerial photo interpretation, satellite image interpretation	14
2	Aerial photography	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, Stereoscopic Parallax	14
3	Geographical Information System	Introduction, Definition, History, components and objectives of GIS, Raster and vector data model, Concept of point, line, polygon, arc, node and vertices and topology, storing spatial data- block code, run length encoding, chain coding, quadtree. Input, Manipulation, Management, Query, Spatial and Non Spatial Data, Level of Measurement: Nominal, Ordinal, Interval, Ratio Definition	14
4	Global Positioning System (GPS)	Main segments, nature and sources of errors in GPS signals, data linking and transformation, DGPS and total station	14

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.
- 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.

HCT 1.3 : COMPUTER APPLICATION IN EARTH SCIENCES**(Marks: External 70)
Internal 30**

1	Basics of computers and its components	An introduction to computers, development of computers, Hardware and Software. Operating systems, Input devices to the computers, Storage devices, central processing unit, Computer output devices	14
2	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.	14
3	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	14
4	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.	14

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

SCT 1.1 : PRINCIPLES OF CARTOGRAPHY**(Marks: External 70)
Internal 30**

1	Fundamentals of Cartography	Definition, principles, nature, scope and History of cartography, , Scale-definition, types & importance,	14
2	Basics of map projection	The Earth: its shape and size; Concept of datum- vertical and horizontal, Basics of geodesy,Co-ordinate systems- geographical, projected and grid system; Curvature of the Earth and its effect on surveying	14
3	Types of map projection	Choice and classification of map projections; 1) Steriographic Polar Zenithal projection. 2) Orthographic Polar Zenithal Projection. 3)Bonne's Conical Projection.4) Conical Equal Area Projection with one standard Parallel 5)Simple Cylindrical Projection. 6) Cylindrical Equal Area Projection,	14
4	Maps	Map- definition, types and significance, Cartographic methods and techniques for preparation of maps and diagrams; General maps: types and applications; Thematic maps: types and applications, Slope analysis, Trigonometrical surveying; Calculation of height & distance	14

Reference Books:

1. Hofmann-Wellenhof, B.,and Moritz, H. (2006):Physical Geodesy (2nd d.),springer, 420pp.
2. Kimerling, J.,Buckley, A.R., Muehrcke, P.C., and Muehrcke, J.O. (2011):Map Use: Reading, Analysis, Interpretation (7th Ed.), ESRI Press, 620pp.
3. Misra, R.P.,and Ramesh, A. (1999): Fundamentals of Cartography,Concept Publishing, New Delhi.
4. Nathanson, J.A.,Lanzafama, M., and Kissam, P. (2010): Surveying Fundamentals and Practices (6th Ed.),Prentice Hall, 360pp.
5. Robinson, A.H.,Morrison, J.L., Muehrcke, P.C., Kimerling, A.J., and Guptill, S.C. (1995): Elements of Cartography (6th Ed.),Wiley, New York, 688pp.
6. Singh, R.L.,and Singh, R.P.B.(1993): Elements of Practical Geography,Kalyani Publishers, New Delhi, India.
7. Slocum, T.A.,McMaster, R.B., Kessler, F.C., and Howard, H.H. (2008): Thematic Cartography and Geovisualization (3rd Ed.),Prentice Hall, 576pp.
8. Dent, B., Torguson, J., and Hodler, T. (2008):Cartography: Thematic Map Design (6th Ed.),McGraw-Hill, 368pp.

SCT 1.2 : INTRODUCTION TO GEOLOGY**(Marks: External 70)*****Internal 30***

1	Mineralogy and Classification of Mineral deposits	Definition, physical properties of minerals, brief introduction to rock forming minerals (silica, feldspar, amphibole, mica, garnate, pyroxene). Brief study of Gold, Iron, Copper, Manganese, Lead & Zinc, Bauxite, Coal and Petroleum	14
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.	14
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	14
4	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	14

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

Semester II

HCT 2.1 : 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.	14
2	Advanced Image enhancement techniques	Gaussian stretch density slicing, spatial filtering, low frequency and high frequency, edge enhancement band rationing, band combination. Contrast enhancement: linear and non linear logarithmic contrast enhancement. Exponential contrast enhancement.	14
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	14
4	Hybrid Classification Approaches	Texture classification approach, Image processing approach using fuzzy logic, machine approach for hybrid classification.	14

INTERNAL EVALUATION

30 MARKS

(seminar+term

paper+test)

Reference

Books:

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

HCT 2.2 : SPATIAL ANALYSIS**(Marks: External 70)****Internal 30**

1	Introduction to Analysis	Introduction and Significance of Spatial Analysis, its utilization Overview of various tools used for analysis: spatial, network, surface. Geostatistics	14
2	Spatial Analysis Vector and Raster Based	Single Layer Operations: Erase, Split, Update, Dissolve, Eliminate, Proximity analysis, Features Identification, Features Classification Multilayer Operations, Overlay Operations: Point In Polygon, Line in Polygon, Polygon In Polygon, Union, Intersection, Difference, Clip, Spatial join Map Algebra: Grid Based Operations: Local, Focal, Zonal and Global Functions, Cost Surface Analysis, Optimal Path and Proximity Search.	14
3	Network Analysis	Concept of Network Analysis, Network Structure, Evaluation Of Network Complexity Using Alpha, Gama Indices, Network Connectivity: C, C1, C2, C3 Matrix, Network Accessibility	14
4	Point Pattern Analysis & Spatial Modeling	Method For Evaluating Point Patterns: Clustered And Random Distribution Role Of Spatial Model, Types of Spatial Model: Descriptive, Explanatory, Predictive and Normative Models, Handling Complex Spatial Query, Case Studies	14

INTERNAL EVALUATION***30 MARKS*****Reference Books:**

- 1 GIS and Multi-criteria Analysis by Makrewski Jacek, USA, 1999.
- 2 Principals of GIS by Burrough P.A. MacDonneli R.A. published by Oxford University Press, 2000.
- 3 Geographical Information Science, vol. I by Roy P.S. Published by IIRS, 2000.
- 4 Fundamentals of Geographic Information Systems, 2nd Edition by Demers M.N. published by John Wiley & Sons 2000.
- 5 Introduction to Geographic Information System, Knag, Tsung, Chang 5th edition

SCT 2.1 : ADVANCED TECHNIQUES IN GIS

Marks: External 70

Internal 30

1	Surface Analysis & decision making models	Interpolation Method, DEM, TIN, Variance Filter, Slope and Aspect, Relief and Hill Shading. Fuzzy Logic, Operation On Fuzzy Set Fuzzy Vs. Boolean, Basic Rules of Inference, Artificial Neural Network.	14
2	Recent Trends In GIS	Recent Trends: Location Based Services, Virtual Globe, Enterprise Resource Planning, SAP ERP. Internet and GIS: Introduction, History, Services, Open Geospatial Consortium (OGC), Geographic Markup Language (GML), Keyhole Markup Language (KML), Web Map Services. WEB GIS. Open source GIS (Geoserver)	14
3	Spatial Decision Support System (DSS)	Introduction, Process of spatial Decision Making, Types of Problems, Characteristics of spatial DSS, Efficiency and Effectiveness of Decision Making, Architecture of A DSS, Spatial DSS and Expert System.	14
4	Spatial Multicriteria Decision Analysis	Introduction, Components, Estimation of Weights: Trade off Method, Rating Method, Ranking Method, Weighted Summation, Paired Comparison. Spatial Data Mining : Method of Knowledge Discovery in Spatial Database, Spatial Mining Tasks: Spatial Classification, Spatial Clustering, Association Rules	14

INTERNAL EVALUATION**30 MARKS**

(Seminar+Term paper+Test)

Reference Books:

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

SCT 2.2 : STATISTICAL METHODS IN EARTH SCIENCES**Marks: 70****Internal 30**

1	Basics of Statistics	Definitions of statistics, Importance and use of statistical techniques, Sources of statistical data, Types, discrete and continuous series, Scale of measurement: Nominal, Ordinal, Interval and Ratio, population, sample and sampling techniques	14
2	Organisations of Data and Matrices	Frequency distribution, moments of distribution, Measures of central tendency, Dispersion and Kurtosis. Matrices: Matrix Algebra, Types and properties of Matrix, Addition, Subtraction, multiplication and Inverse	14
3	Correlations and Regression	Correlation: concept and method, Regression, Bi variance, Linear, Exponential, Logarithmic	14
4	Probability	Sample space, events, types of events, algebra of events and probability of an events. Principle component analysis (PCA) and Trend surface analysis (TSA)	14

INTERNAL EVALUATION***30 MARKS*****(Seminar+Term
paper+Test)****Reference Books:**

1. Gregory S. (1978), Statistical methods for geographers, Longman, London
2. Hammon R. and McCullagh .P (1991), Quantitative technique in Geography
3. Frank, H. And Althoen, S. C. (1994), Statistics: Concepts Application, Cambridge University, Cambridge
4. Ebdon, D. (1977), Statistics in Geography, Basils Blackwell, Oxford
5. Rogerson, P. A. (2010), Statistical methods for geographer, Sage publication, London
6. Cole, J. P. and King A. M. (1968), Quantitative techniques in geography, John Willey and Son's, Inc. New York
7. Elhance, D. N. (1972), Fundamentals of Statistics, Kitab Mahal, Allahabad 1
8. Gupta, C.B. (1978), An introduction to Statistical methods, Vikas publication house, New Delhi
9. King L. J. (1991), Statistical analysis in geography, princess hall, Englewood cliff N.J.

Paper No: OET 2.1 SWAYAM

Load/week:04
External :70

Credits:04

Marks:

Internal:30

The students should choose any course given on SWAYAM.

OET 2.2 : Geo-Instrumentation and field survey**Marks: External :70
Internal:30**

1	Basic Principles : Definition, objective and fundamental. Classification of Plane of surveying, concept of scale, Conventional Surveying and mapping (Chain survey, Plane Table survey, Surveying with Theodolite), Representative Factor (RF), Types of Map, Plan, Ranging, Chainage, Offsetting, concept of chainage. Concept of bearing, meridian and their types, construction and use of prismatic compass.	14
2	Types of bench Marks, uses of contour maps, study and use of topo-sheets. Study of Theodolite and uses, Surveying using total station – Construction, types, principle features, field equipment, method of use, introduction to various special functions available in a total station such as remote elevation measurements, remote distance measurements and co-ordinate stake out. Cartography: Map Projection, Types of Map projections (Conical, Polyconic, Cylindrical, Equal area or Lamberts cylindrical, Mercators, Zenithal, Gnomonic)	14
3	Sample - Definition, field samples (rock, soil, sediment, water), sampling methods. Sample preparation-laboratory sample. Selection and screening criterion (physical, optical, biological), Preparation of specimen for different geological studies, Types of specimen Thin Section Studies-Etching technique Staining techniques particularly for feldspars, carbonates, dolomite, paragonite and quartz Model analysis and techniques, Calibration of eyepiece micrometer, areas selection and point counting Polished Section Studies-Reflectance (specular and diffusive) and reflectance spectrometry	14
4	Principles, parts, operation mechanism, advantages and limitations of the following: Xray diffraction analysis; X-ray fluorescence analysis; electron probe micro analysis Atomic Absorption Spectrometer- Single and double beam (AAS) Inductively Coupled Plasma - Atomic Emission Spectrometer (ICP-AES), Mass Spectrometry.	14

Books :

1. Surveying and Levelling ---- N. N. Basak, Tata Mc-Graw Hill
2. Surveying Vol. I & II ---- Dr.K. R. Arora
3. Surveying: Theory and Practice --- James M. Anderson, Edward M. Mikhail
4. Surveying theory and practices -- Devis R. E., Foot F. S.
5. Plane and Geodetic surveying for Engineers. Vol. I -- David Clark
6. Principles of Surveying. Vol. I by J.G.Olliver, J.Clendinning
7. Potts, P.J. A Handbook of Silicate Rock Analysis, Blackie, London, 1987.
8. Thompson, M. and Walsh, J.N. A Handbook of Inductively Coupled Plasma Spectrometry, Blackie, London, 1983.
9. Van Loon, J.C. Analytical Atomic Absorption Spectroscopy, Academic Press, London, 1980.

**INTERNAL EVALUATION
(Seminar + Term paper + Test)****(30 Marks)**

PRACTICAL HCP 1.1 + HCP 1.2:**(INTRODUCTION TO GEOGRAPHY + FUNDAMENTALS OF GEOINFORMATICS)****(Marks: External 35 , Internal 15)****INTRODUCTION TO GEOGRAPHY**

1	Study of Natural resources in India	Water, Forest, Minerals, Soil,
2	Study of human resources in India	Transportation – road, rail, air and water ways, Industries, Population density
3	Quantitative Methods	Semi average method, least square method, exponential growth rate of population, lorenze curve, rank size rule, crop combination by Weaver and Doi
4	Analysis of socio economic data	Choropleth map, flow line map, proportional circle and sphere, divided proportional circle, compound and superimposed pyramid
5	Analysis of Climatic Data	Weather sign and symbols, Indian daily weather report – rainy, winter and summer, Wind Rose diagram, Isopleths map – Isotherms, isobars, isohytes, Line and bar graph, temperature and rainfall dispersion diagram

FUNDAMENTALS OF GEOINFORMATICS

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	Image registration	Scale, rubber sheeting in AutoCAD software
5	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
6	Query and Vector Analysis	Spatial and non-spatial query, Buffering, Overlay and Network analysis
7	Data Export	Import in AutoCAD , Export AutoCAD to other software, preparing layout ,Text in AutoCAD, Map Menu &its use
8	GPS	GPS handling ,path tracing, location set

INTERNAL EVALUATION**30 MARKS**

(viva-voce+journal + data evaluation)

PRACTICAL HCP 1.3 + SCP 1.1 / SCP 1.2: (COMPUTER APPLICATION IN EARTH SCIENCE + PRICIPLE OF CARTOGRAPHY/ INTRODUCTION TO GEOLOGY)

COMPUTER APPLICATION IN EARTH SCIENCE

**Marks: External 35
Internal 15**

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

CARTOGRAPHY AND MAP ANALYSIS

**Marks: External 35
Internal 15**

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.

INTRODUCTION TO GEOLOGY

**Marks: External 35
Internal 15**

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 HCP 2.1 + HCP 2.2: (DIGITAL IMAGE PROCESSING + SPATIAL ANALYSIS)

DIGITAL IMAGE PROCESSING

**Marks: External 35
Internal 15**

1	Image Rectification	Toposheet and satellite imagery With ERDAS IMAGINE.
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 Assessment, Error Matrics

GIP 301: SPATIAL ANALYSIS

**Marks: External 35
Internal 15**

1	Overview Of Arc GIS: Arc map, Arc catlog, Arc toolbox
2	Georefrencing
3	Digitization: Point, Line, Polygon Topology: Point, Line, Polygon
4	Data Attachment: Internal Data Attachment, External Data Attachment
5	Data preparation Operation: Clip, Erase, Split, Update, Spatial join, Dissolve, Eliminate, Proximity analysis(Buffer), Map Creation, Layout of Map

PRACTICAL SCP 2.1/2.2 + OEP 2.1/2.2: (ADVANCE TECHNIQUES IN GIS/STATISTICAL METHODS IN EARTH SCIENCES + SWAYAM/GEOINSTRUMENTATION AND FIELD SURVEY)

ADVANCED TECHNIQUES IN GIS

Marks: External 35

Internal 15

1	Overview of Q GIS software (Open source)
2	Interpolation: IDW, Kriging
3	Surface Analysis: DEM, Slope, Aspect, Contour, Hillshade, Viewshade, TIN
4	Google Earth: Layer creation : Point, Line, Polygon
5	Site suitability Analysis using Multi Criteria Analysis In Arc GIS

STATISTICAL METHODS IN EARTH SCIENCES

Marks: External 35

Internal 15

1	Frequency distribution and Measure of central tendency	Histogram, Polygon, O give curve, cumulative percentage curve Mean, mode, median, quartile from grouped and ungrouped data
2.	Measure of Dispersion	Absolute measurement, mean deviation, quartile deviation and standard deviation
3	Relative Measurement	Coefficient of mean deviation, coefficient of quartile deviation, coefficient of variation, index of variability and relative variability, Skews, Karl Pearson's and Bowleys method
4	Correlation Analysis	Karl Pearson's products moments correlation coefficient, Spearman rank order, significance of 't' test on correlation coefficient, Time series: moving average, least square method and drawing of line of best fit.

PRACTICAL OEP 2.2 : SWAYAM

The practical is of OEP 2.1 is as per given in the course schedule.

GEOINSTRUMENTATION AND FIELD SURVEY

Practical

1. Measurement of a magnetic bearing, local attraction and calculation of true bearings.
2. Plane Table traversing.
3. Study of Dumpy level & Theodolite
4. Measurement by Total station.
5. Preparation of thin section, polished section.
6. Preparation of doubly polished section for fluid inclusion study.
7. Modal analysis.
8. Etching techniques for ore samples.

INTERNAL EVALUATION
(Seminar + Term paper + Test)

(30 Marks)