UNIVERSITY OF PUNE
DEPARTMENT OF GEOGRAPHY

Credit System (P. G. B. Sc. (Applied) in GIS and Remote Sensing): Details of the Subjects and Credits – 2019

SEMESTER I				
Core Courses				
Subject Code	**Subject Title**	**Credits Per Subject**	**Credits To Be Completed**	
			Subject-Wise	**Semester-Wise**
GR 101	Fundamentals of Remote Sensing and Photogrammetry	4	4	
GR 102	Fundamentals of GIS and GPS	3	3	
GR 103	Practicals in Spatial Data Processing	4	4	
GR 104	Database Management Systems: Concept and Methods	3	3	
GR109	Concepts in Geography (Non-credit course)			
Elective Courses				
Subject Code	**Subject Title**	**Credits Per Subject**	**Credits To Be Completed**	
			Subject-Wise	**Semester-Wise**
	Any one of the following courses			
GR 105	Open Source GIS	2	2	
GR 106	Applied statistics and computing	2	2	
	Any one of the following courses			
GR 107	Introduction to Python	2	2	
GR 108	Fundamentals of Map & Data representation	2	2	
	Total credits in the semester	**18**	**18**	**18**

SEMESTER II				
Core Courses				
Subject Code	**Subject Title**	**Credits Per Subject**	**Credits To Be Completed**	
			Subject-Wise	**Semester- Wise**
GR 201	Digital Image Processing: Theory	3	3	
GR 202	Geospatial analysis and applications	3	3	
GR 203	Digital Image Processing: Practicals	3	3	
GR 204	Practicals in Geospatial analysis	3	3	
GR 205	Project Assignments	4	4	
GR 206	Application in RS & GIS-I	3	3	
Elective Courses				
Subject Code	**Subject Title**	**Credits Per Subject**	**Credits To Be Completed**	
			Subject-Wise	**Semester- Wise**
	Any one of the following courses			
GR 207	Advance Surveying and field work	3	3	
GR 208	Application in RS & GIS-II	3	3	
	Total credits in the semester	**22**	**22**	**22**

Semester I

Code: GR 101 Fundamentals of Remote Sensing and Photogrammetry		
No. of Credits: 04		**No. of Lectures: 60**
Sr. No.	**Topic**	**Lectures**
1	Introduction to Remote Sensing: Concepts, Definition, History Development, Stages in RS-EMR, EMR Spectrum, Theories of EMR, Types of RS and Laws of Radiation, basic of solar radiation	8
2	Interaction of EMR: Interaction with Earth's Atmosphere and Atmospheric window	10
3	Spectral Signature: Interaction with Soil, Water and Vegetation	8
4	Platforms, Sensors, Orbits: Types of Platform, Types of Sensors, Cameras and Satellite Orbits	10
5	Aerial Photography: Introduction to Aerial Photography and Basic Photogrammetry	9
6	Aerial Photography: Introduction to Aerial Photography and Basic Photogrammetry	4
7	Measurements: Geometry of Aerial Photographs, Determination of Scale, Height on Aerial Photograph	4
8	Aerial Photo and Image Interpretation: Interpretation of Aerial Photos: Single, Vertical Stereo Pairs. Interpretation of Satellite Imagery: Derived From PAN, LISS, Wifs, OCM Sensors. Study and Visual Interpretation of Satellite Images for Physical Features, Urban, Forest and Agricultural Uses	4
9	Field Work: Study Tour: Identification of Features in the Field Using Aerial Photographs and/or Satellite Images	3

Books:

1. Joseph, G. (2004): Fundamentals of Remote Sensing, Universities Press, Hyderabad, India
2. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W. (2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi
3. Sabins, F. F. (1996): Remote Sensing: Principles and Interpretation, W. H. Freeman and Company, San Francisco
4. Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey
5. Drury, S. A. (2001): Image Interpretation in Geology, Blackwell, Oxford
6. Campbell, J. (2002): Introduction to Remote Sensing, Taylor & Francis, London
7. Anji Reddy, M. (2008): Textbook of Remote Sensing and Geographic Information System, B.S. Publication Hyderabad
8. Wolf, P .R. (1974): Elements of Photogrammetry, McGraw Hill Inc., Kogaknscha

Code: GR 102	**Fundamentals of GIS & GPS**	
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction to GIS: Definitions, Evolution, Components and Objectives	3
2	Hardware & Software Requirements: Hardware: Basic Blocks of Computer, Processor, Memory, Secondary Storage Devices, Input/Output Devices, Binary Numbers. Software: Operating System, Application, Compliers, Editors. Overview of GIS Software Packages	5
3	Spatial Data: Types of Geographic Data, Levels Of Measurements. Concepts of Space and Time, Layers Coverage. Spatial Data Models, Representation of Geographic Features in Vector, Raster Data Models. Concept of Arc, Node, Vertices and Topology. Object Oriented Models: Advantages and Disadvantages. Computer Representation for Storing Spatial Data: Block Code, Run-Length Encoding, Chain Coding, Quad tree. Issues Governing Choice of Models.	10
4	Non-Spatial Data: Advantages of Data Base Management System. Conceptual Implementation Models, Hierarchical, Network, Relational Models. RDBMS: Components, Concept, Database Schema, Tables and Relationships. Database Design Normalization (1NF, 2NF, 3NF Forms) Data Definition Manipulation Using SQL, SQL-Query Processing, Operations on Tables, Integrity Constraints, Database Security, Role of Database Administrator (DBA). Metadata	12
5	Spatial Data Input: Digitization, Error Identification. Errors: Types, Sources, Correction. Editing and Topology Building	5
6	Concepts of GPS: History, Types, Navigation Systems and Applications	10

Books:

1. Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W. (2002): Geographical Information Systems and Science, John Wiley & Sons, Chichester
2. Lo, C. P., Yeung, A. W. (2002): Concepts Techniques of Geographical Information Systems, Prentice-Hall of India, New Delhi
3. Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York
4. Korte, G. B. (2001): The GIS Book, Onward Press, Bangalore
5. Demers, M. N. (2000): Fundamentals of Geographic Information Systems, John Wiley and Sons, New Delhi
6. Burrough, P. A. and McDonnell, R. A. (2000): Principles of Geographical Information Systems, Oxford University Press, New York
7. Heywood, I., Cornelisus, S., Carver, S. (2011): An Introduction to Geographical Information Systems, Pearson Education, New Delhi
8. Ahmed, E. L. Rabbany (2002): Introduction to Global Positioning Systems, Artech House, Boston

Code: GR 103 Practicals in Spatial Data Processing

No. of Credits: 04 **No. of Practicals: 20**

Sr. No.	Topic	Practicals
1	Overview of Arcgis: Arcmap, Arccatalog and ArctoolBox	2
2	Attribute Data Input: Creation of Schema, Tables, Data Definition, and Data Input, Data Updating, Queries on Tables, Simple-Complex Query with Two or More Tables Using SQL. Queries Using Union, Intersection, Join Etc Operations. Use of MS-Excel and MS Access	4
3	Spatial Data Input: Vector Data Formats with File Extensions. Scanning, On-Screen Digitization, Editing, Topology Creation, Line and Area Measurements, Data Attribution	4
4	Geodatabase in Arccatalog and Arcmap: Feature Dataset, Feature Classes, Import of Data, Spatial Data Formats, Shape/Coverage Files and Layers, Data Frames, Maps, Managing TOC	2
5	Georeferencing Data: Coordinate Systems, Datum Conversions, Map Projections, Types, Storing- Viewing Projection Information	3
6	Working with Layers in Arcmap: Building Templates, Classification, Displaying Qualitative and quantitative Values, Labeling Features and Map Creation.	2
7	GPS: GPS Survey, Data Import, Processing and Mapping	3

Note: a) For 4 credits 4 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York
2. Environmental Systems Research Institute, Inc. (1998): Understanding GIS: The ARC/INFO Method, ESRI Press, Redland
3. Ahmed, E. L., Rabbany (2002): Introduction to Global Positioning System, Artech House, Boston
4. Kresse, W. and Danko, D. (2002): Springer Handbook of Geographic Information, Springer Drecht, London
5. Bao, J., Tsui, Y. (2005): Fundamentals of Global Positioning System Receivers, John Wiley Sons, Inc., Hoboken

Code: GR 104 Database Management Systems: Concept and Methods		
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Introduction: DBMS, RDBMS, SQL Database Security Concept and Advantages of RDBM Sand ER Modeling.	2
2	Controlling User Access: Control Database Access, Privileges, Creating User, Concept of Role, Creating, Granting Privileges to Role, Revoking Privileges. Changing Password	3
3	Managing Schema Object: Data Types, DDL, DML, DCL Constraints: Types of Constraints, Primary Key, Foreign Key, Check Constraint, Not Null, Altering Constraint, Concept of Backup Recovery. Overview of Index.	3
4	Manipulating Dataset using SQL Statement: Basic Select Statement, Selecting Specific Column, Using Arithmetic Expressions, Defining Column Alias, using Where Clause	2
5	Restricting & Sorting Data: using Comparison Condition (=,<=,>=Etc), Using Logical Operator: AND, OR, NOT, using BETWEEN, LIKE Conditions Rule of Precedence, using Order by Clause	5

Books:

1. SPRS Technical Commission VII (2002): Symposium on Resource Environmental Monitoring, ISRS Annual Convention, IIRS, Dehradun
2. Deekshatulu, B. L. (1990): Description and use of Land use/Landcover, NRSA, Hyderabad
3. Sudershana, R. Mitra, D. Mishra, Roy, P.S., Rao, D. P. (2000): Subtle Issues in Coastal Management, IIRS, Dehradun
4. Harris, J. E. (1990): Earthwatch – The Climate from space, Ellishorwood Ltd., Midsower Norton
5. Lal, D. S. (1998): Climatology, Chaitanya Publishing House, Allahabad
6. Escalante, R. B. (2012): Remote Sensing- Advances techniques and Platforms, Intech, Rijeka Croatia
7. Escalante, R. B. (2012): Remote Sensing Application, Intech, Rijeka Croatia
8. Roy, P.S., Dwivedi, R. S. (2010): Remote Sensing Application www.nrsc.gov.in/Learning- Center, E Book.html
9. NRSA (2002): Symposium Tutorial on Sustainable Agriculture (Volume of Lectures), Hyderabad

Code: GR 105	**Open Source GIS**	
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Open source GIS: basic concepts, Conventional Vs, Database modeling with open source GIS, Introduction to Open source software	4
2	Open Geospatial Consortium, Introduction to QGIS, Generation of vector layers, Retrieving properties of vector and raster datasets, Attribution, Map composition	4
3	Open source GIS platforms, software, Libraries.	3
4	Application of Open source GIS	4

Note: a) For 3 credits 3 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Books:

1. Markus Neteler And Helena Mitasova (2007): Open Source GIS: A GRASS approach, Springer-Verlag Berlin, Heidelberg
2. Andrew Cutts, Anita Graser (2018): Learn QGIS , https://www.packtpub.com/application-development/learn-qgis-fourth-edition

Code: GR 106 Applied statistics and computing		
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Geographic Data: Sources, Types, Discrete and Continuous Series, Scales of Measurements,	3
2	Organization of Data: Frequency Distribution, Moments of Distribution, Measures of Central Tendency	4
3	Matrices: Matrix Algebra: Types and Properties of Matrices. Addition, Subtraction, Multiplication and Inverse	4
4	Correlation and Regression: Correlation: Concepts and Methods Regression: Bi-Variate, Linear, Exponential, Logarithmic, Power-Law.	4

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Hammond, R. and McCullagh, P.(1991):Quantitative Techniques in Geography, ClarendonPress, Oxford
2. Gregory, S.(1978):Statistical Methods for Geographers, Longman, London
3. Frank, H. and Althoen, S.C. (1994): Statistics: Concepts Applications, Cambridge University Press, Cambridge
4. Ebdon, D. (1977): Statistics in Geography, Basil Blackwell, Oxford
5. Rogerson, P.A.(2010): Statistical Methods for Geography, Sage Publications, London

Code No: GE: 107 Introduction to Python		
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Introduction to Python, Python vs. .NET Vs. JAVA	1
2	Data Type Operators: Data Types, Basic Sample Programming Control Flow, Arrays, List and strings. Classes Modules: Creating Modules and Classes.	4
3	GIS data access and manipulation with python. Introduction to GDAL and matplotlib packages.	6
4	Python Geo and data sciences packages and Jupyter notebook	4

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Kernighan, R. (1998): C Programming Language, (ANSI C Version), Prentice Hall, New Jersey
2. Balagurusamy, E. (2002): Programming in ANSI C, Tata McGraw Hill, New Delhi
3. Kanetkar, Y. (2001): Let Us C, BPB Publications, New Delhi

Code: GR108 Fundamentals of Map & Data representation		
No. of Credits: 02		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Map Scale: Types and Conversion, Map Projection: Concept, Classification, Uses and Types of Projections Interpretation of Maps: Study and Interpretation: SOI Toposheet. Concepts of Cadastral and Thematic Maps	3
2	Data and Data Types: Nominal, Ordinal, Interval, Ratio Representation of Statistical Data: Choropleths, Isopleths, Dots Unimodal, Two-Dimensional and Three dimensional diagrams	3
3	Map Generalization: Recent Development in Map Visualization, Animation, Multimedia, Interactive Map	3
4	Representation of Natural Features: Profiles, Identification and Representation of Different. Natural Features Like fluvial, Coastal, Aeolian and Glacial Landforms	3
5	Representation of Different Manmade Features: Settlement, Transportation, Landuse	3

Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Singh, R. L.(1979): Elements of Practical Geography, Kalyani Publishers, New Delhi
2. Croxton, F. E., Cowden, D. J., Klein, S. (1975): Applied General Statistics, Prentice-Hall of India, New Delhi
3. Frank, H. Althoen, S. C.(1994): Statistics Concepts and Applications, Cambridge University Press
4. Yeates, M.(1974): An Introduction to Quantitative Analysis in Human Geography, McGraw-Hill, New York

Code No: GR: 109 Concepts of Geography		
No. of Credits: Non- credits course		**No. of Lectures: 8**
Sr. No.	**Topics**	**Lectures**
1	Introduction: Geography as a discipline: Nature and scope	**2**
2	Natural Resources: Nature and distribution of Biotic and Abiotic resources	**2**
3	Human Resources: Quantitative and Qualitative	**2**
4	Sustainable Development: Resources and development with special reference to India	**2**

Books:

1. Elements of Cartography, Sixth Edition by Robinson A. H. Morrison J. L., Muehacke P.C., Published By John Wiley & sons, 1995.
2. A Complete Course of Certificate Geography, Part I by Nigam V. N., Published by pitambat Publication Comp., 1983
3. Geographical Interpretation of Indian Topographical Maps by Tamaskar B. G., Deshmukh V. M., Orient Longman Ltd, 1974
4. John R. Weeks (1999) : Population- An Introduction to Concepts and Issues, Wadsworth Pub.Co. Ca USA.
5. Knowled R. and Wareing J. (1998): 'Economic and Social Geography', Rupa and Co., N. Delhi
6. Sundaram, K. P. and Dutta, Rudra (2001), Indian Economy.
7. Population Reference Bureau:' World Population data Sheet, 2000', Washington DC.
8. Hudson, R. S. (1970):'A Geography of Settlements', McDonald and Sons, London.
9. Chisholm, M. (1962):' Rural Settlements and Landuse' London.
10. Short, John R. (1984) : ' An Introduction to Urban Geography', Routledge and Regan Paul, London.

Semester II

Code: GR 201 Digital Image Processing: Theory		
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction to Digital Image Processing: Digital Images: Types Sources of Errors: Atmospheric, Radiometric and Geometric. Image Rectification: Geometric Correction, Radiometric Correction, Noise Removal	12
2	Image Enhancement Techniques Contrast Enhancement: Linear, Non-Linear, Logarithmic and Exponential, Gaussian Stretch, Density Slicing. Spatial Filtering: Low Frequency, High Frequency, Edge Enhancement, Band Rationing and Band Combination	15
3	Digital Image Classification: Classification Scheme: Supervised Classification: Training Sites Selection and Statistical Information Extraction, Discriminate Functions. Classifier: Maximum Likelihood, Euclidian Distance, Mahalanobis Distance, Paralellopiped. Unsupervised Classification. Classification Accuracy Assessment and Error Matrix	10
4	Object oriented classification : Segmentation, Object oriented vs. pixel based classification, Algorithms for classification	8

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Richards, J. A, Jia, X. (1999): Remote Sensing and Digital Image Processing, Springer, Verlag Berlin
2. Cha, B., Dattaa, D., Majumdar (2001): Digital Image Processing Analysis, Prentice-Hall of India, New Delhi
3. Nag, P. Kudrat, M. (1998): Digital Remote Sensing, Concept Publishing Company, New Delhi
4. Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey
5. Lillesand, T. M., Kiefer, R. W. Chipman, J. W.(2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi
6. Sabins, F. F. (1996): Remote Sensing: Principles an Interpretation, W. H. Freeman Company, New York

Code: GR 202 Geospatial analysis and applications		
No. of Credits: 03		**No. of Lectures: 45**
Sr. No.	**Topic**	**Lectures**
1	Introduction to Spatial Analysis: Significance of Spatial Analysis. Overview of Tools For Analysis	2
2	Spatial Analysis - Vector Based: Overlay Operations: Point-In-Polygon, Line-In-Polygon, Polygon-In-Polygon. Single Layer Operations: Feature Identification, Extraction, Classification Manipulation. Multilayer Operation: Union, Intersection, Symmetrical Difference, Update, Merge, Append and Dissolve	5
3	Spatial Analysis - Raster Based: Map Algebra, Grid Based Operations, Local, Focal, Zonal and Global Functions, Cost Surface Analysis, Optimal Path and Proximity Search	5
4	Network Analysis: Concepts, Evaluation of Network Complexity Using Alpha-Gamma Indices. C-Matrices for Evaluating Connectivity of the Network. Network Data Model. Path Analysis. Linear Referencing and Segmentation. Types of Network Analysis: Optimum Cyclic Path, Vehicle Routing, Path Determination and Cost-Path Analysis. Geocoding	8
5	Point Pattern Analysis: Methods for Evaluating Point Patterns: Clustered and Random Distribution	5
6	Surface Analysis: Interpolation Methods: Trend Surface Analysis, IDW, Kriging, Measures of Arrangement and Dispersion, Autocorrelation, Semi-Variogram, DEM, TIN, Slope, Aspect, Hillshade and Viewshed	10
7	Spatial Modeling: Role of Spatial Model, Explanative, Predictive and Normative Models. Correlation-Regression Analysis in Model Building. Handling Complex Spatial Query and Case Studies	8
8	Introduction to Spatial Analysis using 'R'	2

Note: a) For 3 credits 3 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Books:

1. Demers, M. N. (2000): Fundamentals of Geographic Information Systems, John Wiley and Sons, New Delhi
2. Burrough, P. A. and McDonnell, R. A. (2000): Principles of Geographical Information Systems, Oxford University Press, New York
3. Makrewski, J. (1999): GIS Multi-criteria Analysis, John Wiley and Sons, New York
4. Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York
5. Longley, P. A., Goodchild, M. F., Maguire, D. J. Rhind, D. W. (2002): Geographical Information Systems and Science, John Wiley & Sons, Chichester
6. Lo, C. P. Yeung, A. W. (2002): Concepts Techniques of Geographical Information Systems, Prentice-Hall of India, New Delhi

Code: GR 203 Digital Image Processing : Practicals

No. of Credits: 03 **No. of Practicals: 15**

Sr. No.	Topic	Practicals
1	Familiarization with Image Processing System: Loading of Image Data, Identification of Objects on Visual Display, Study of Histograms and Layer Information	2
2	Familiarization with Image Processing System: Loading of Image Data, Identification of Objects on Visual Display, Study of Histograms and Layer Information.	2
3	Image Enhancement Techniques: Linear and Non- Linear Contrast Enhancement, Band Rationing, Edge Enhancement, High and Low Pass Filtering, Density Slicing	1
4	Image Registration: Registration of Bases Map/Topomap, Image to Map, Image to Image	2
5	Image Classification: Classification : Supervised, Unsupervised and Use of Different Algorithms, Change Detection	2
6	Accuracy Analysis: Producer, User Accuracy, Overall and Mapping Accuracy, Kappa Coefficient	2
7	Vector Layers: Generation of Vector Layer, Editing and Topology Building, Area and Perimeter Estimation	2
8	Presentation: Map Composition	2

Note: a) For 4 credits 4 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Books:

1. ERDAS (2010): ERDAS field Guide, ERDAS incorporation, Norcross, GA, USA
2. http://geospatial.intergraph.com/Libraries/Tech_Docs/Erdas_Field_Guide.sflb.ashx
3. Gupta, R. P. (2003): Remote Sensing Geology, Springer, Verlag Berlin

Code: GR 204 Practicals in Geospatial analysis		
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Editing Data: Selecting Features, Simple Editing Functions, Creating New Features, Modifying, Schema Changes	2
2	Spatial And Non-Spatial Data: Spatial: Linking Features Attributes, Ways to View Data, Metadata Non-Spatial : Understanding Tables, Field Types, Table Manipulations, Table Relationship, Joins, Relates, Creation of Graphs and Reports	2
3	Spatial Analysis: Query By Attribute and Location, Identifying Spatial and Non-Spatial Data, Geoprocessing Wizard, Spatial Analysis Functions, Multi Criteria Analysis using Boolean Logic	3
4	Network Analysis: Network Utility, Creating Network Model, Shortest Path, Geocoding	3
5	Surface Analysis: DEM	2
6	Presenting Data: Map Design, Map Composition	3
7	Project Work	*

Note: a) For 4 credits 4 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Mitchell, A. (1999):The ESRI guide to GIS analysis, Redlands
2. Zeiler, M. (1999):The ESRI guide to Geodatabase design, Redlands
3. ESRI (2003): Introduction to ArcGIS- I, Course Lectures,GIS Education Solutions
4. Booth, B., Shaner, J., MacDonald, A., Sanchez, P. Pfaff, R. (2004): ArcGIS,Geodatabase Workbook, Redlands
5. Melania, H. M., Rhonda, P., Minami, M., Hatakeyama, A. M. (2004): ArcGIS, Using ArcMap, ESRI Press, Redlands
6. Environmental Systems Research Institute, Inc. (1998): Understanding GIS: The Arc/Info Method, ESRI Press, Redlands

Code: GR 205 Project Assignment	
No. of Credits: 04	**Topics to be covered**
1	Problem identification and literature review
2	Data acquisition / collection
3	Field work
4	Data processing
5	Results and interpretation
6	Report writing and presentation

Code: GR 206 Application in RS & GIS - I		
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Geosciences: Concepts of Geomorphology, Landform Analysis, Drainage Basin Morphometry, Slope Mapping, Integrated Approach for Landslide Hazard Zonation Models and Mapping.	5
2	Water Resources: Watershed Hydrology, Physical Processes in Watershed, Principles of Remote Sensing in Water Resource Assessment, River Valley Project, Planning, Hydrological Modeling	3
3	Forest: Image Processing for Forest, Vegetation Classification Mapping, Forest Inventory, Sampling Techniques, Growing Stock Estimation, Forest Management, , Land Evaluation for Forestry	2
4	Marine and Atmospheric Sciences: Fundamentals Of Marine Ecology, Coastal Bathymetry. Ocean Color Mapping, SST Mapping, Potential Fishing Zone Mapping. Fundamental Principles of Climatology, Structure, Chemical Composition of the Atmosphere, Aerosols, Climate modeling, Meteorological Satellites. Forecasting of Natural Calamities	5

Note: a) For 3 credits 3 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Books:

1. SPRS Technical Commission VII(2002): Symposium on Resource Environmental Monitoring, ISRS Annual Convention, IIRS, Dehradun
2. Deekshatulu, B. L.(1990): Description and useofLand use/Landcover, NRSA, Hyedrabad
3. Sudershana, R. Mitra, D. Mishra, Roy, P.S., Rao, D. P.(2000): Subtle Issues in Coastal Management, IIRS, Dehradun
4. Harris, J. E. (1990): Earthwatch – The Climate from space, Ellishorwood Ltd., Midsower Norton
5. Lal, D. S. (1998): Climatology, Chaitanya Publishing House, Allahabad
6. Escalante, R. B. (2012): Remote Sensing- Advances techniques and Plateforms, Intech, Rijeka Croatia
7. Escalante, R. B. (2012): Remote Sensing Application, Intech, Rijeka Croatia
8. Roy, P.S., Dwivedi, R. S. (2010): Remote Sensing Application www.nrsc.gov.in/Learning- Center, E Book. html

Code: GR 207 Advanced Surveying and field work		
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Introduction to Total Station: Principle and Function. Process of data collection and analysis.	2
2	Use of Total Station in Topographical Survey, Application of Total Station in Various Fields	3
3	Introduction to Differential GPS (dGPS) and UAV: Principle and Functions	3
4	Use of dGPS in Topographical Survey, Application of dGPS Points in DEM Generation from Stereo Images	7

Note: a) For 3 credits3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. Jeff, H. (1995): Differential GPS Explained, Trimble Navigation
2. Satheesh, G., Sathikumar, R. and Madhu, N. (2007): Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education, Delhi
3. Mohinder, S. G., Lawrence, R. W. and Angus, P. A. (2001): Global Positioning Systems, Inertial Navigation and Integration, John Wiley and Sons Inc., New York
4. Lawrence, L. and Alex, L. (2008): GPS Made Easy: Using Global Positioning Systems in the Outdoors, Rocky Mountain Books, Calgary
5. Stinespring, B. M. (2000): The Experimental Evaluation of a DGPS Based Navigational System for the ARIES AUV, Monterey, California: Naval Postgraduate School; Springfield

Code: GR 208 Application in RS & GIS - II		
No. of Credits: 03		**No. of Practicals: 15**
Sr. No.	**Topic**	**Practicals**
1	Disaster Management: Natural and Man-Made Disasters. Types, Zoning and Preparedness	3
2	Urban Planning and Development: Large Scale Mapping for Cadastral Database, Urban Land Use Classification, Monitoring, Change Detection Analysis, Urban Conservation, Transportation Planning and Land Information System	4
3	Agriculture and Soils: Spectral Characteristics of Crop, Crop Inventory, Crop Yield Modelling, Soil Mapping, Crop Water Management, Agro-Ecological Zoning	4
4	Biodiversity: Concept of Ecology and Biodiversity, Biodiversity Management and Conservation. Biodiversity Mapping, Assessment of Biodiversity Hotspots, Anthropogenic Disturbance and Modeling Species Distribution. Landscape Analysis, Wildlife Habitat Suitability Analysis	4

Note: a) For 3 credits 3 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Books:

1. NRSA(2002): Symposium Tutorial on Sustainable Agriculture (Volume of Lectures), Hyedrabad
2. NRSA(2001):National Agricultural Drought Assessment Monitoring System, India, Summary Report, Hyedrabad
3. Roy, P. S. (2000):Natural Disaster their Mitigation, IIRS, Dehradun
4. ISRS and IARI (1990):Proceedings of National Symposium on RS for Agricultural Application, New Delhi
5. Roy, P. S.(2002): Biodiversity Characteristics at Landscape Level in North East using satellite Remote Geographical Information System, IIRS, Dehradun
6. Roy, P. S. (2000):Biodiversity Environment by, IIRS, Dehradun
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