SYLLABUS

MASTER OF SCIENCE
IN
REMOTE SENSING & GIS

UNIVERSITY OF JAMMU
JAMMU

2018-2020

EXAMINATION PROCEDURE
OF
M.Sc REMOTE SENSING AND GIS

i) The duration of course for the Master's degree in Remote Sensing and GIS shall be divided into Four semesters covering two academic sessions. The first academic session will comprise of first and second semesters and the second academic session comprise of third and fourth semesters. Each semester normally comprises of 45 working days.

ii) The minimum attendance required by a candidate will be as per University rules.

iii Each of Ist, IInd and IIIrd Semester shall consist of four theory courses and two laboratory courses. Fourth semester shall have two theory courses, one laboratory course and the Project Work. Further, First and Third semesters shall have Remote Sensing Field Work (GPS Survey) and Remote Sensing Field Work (Ground Truth) respectively.

iv) Each theory university examination shall be of THREE hours duration whereas each laboratory University examination shall be of THREE to FOUR hours. Each theory and laboratory course shall consist of 100 marks. For theory papers 60 marks shall be for major examination and 40 marks for minor examination, while for practicals 50% marks shall be for External Examination and 50% marks for Internal Examination. Besides this, the Remote Sensing field work of respective First and Third semesters shall consist of 30 marks included in the practicals. The evaluation of Remote Sensing Field Work shall be done internally and the marks awarded included in the practicals shall be sent to the University by the Head. The Project Work of IVth semester shall be of 300 marks out of which 200 marks shall be for project report and 100 marks for the viva-voce. The evaluation of the Project report will be done by the External and Internal (Supervisor) examiners including the Viva-voce before a committee consisting of Head and external as well as internal examiners. The marks of the Project Work shall be sent to the university by the Head. The student shall have to pass separately each of the theory courses, laboratory courses, fieldwork, project work and the internal assessments (theory and laboratory).

A candidate for a pass at each semester Examination shall required to obtain:

a. At least 36% marks or requisite Grade (as per CBCS norms) in the aggregate of the paper prescribed for the examination
b. At least 36% marks in the practical's or requisite Grade (as per CBCS norms)

v. Minor & Major Examination:-

a) ***Theory***

Two minor tests of 20 marks for each theory course shall be held on the dates and time specified in the Academic calendar and/or by the Head. The one major test of 60 marks for each theory course shall be held on the dates and time specified in the Academic calendar and/or by the Head.

b) ***Laboratory***

Internal assessment of 25 marks in each laboratory course work will be done on the basis of regularity and proper maintenance of records, test and viva-voce.

Remote Sensing Field Work:-

Remote sensing Field work/training is an integral part of this Course. As such, the students of M.Sc. Ist and IIIrd Semester are required to undergo field work separately in each academic session to acquire comprehensive and detailed field training in various aspects, such as GPS survey, field checking, ground truth studies and visit to various national remote sensing laboratories. At the end of the above field work, each student will be required to submit the field report covering all aspects for evaluation, normally within two weeks after the completion of the field work. The evaluation based on field work report, and viva - voce shall be done by the Teacher In-Charge of the Field Work and Head.

Any student failing to undergo /complete his /her Field Work & Training due to major set back such as severe or prolonged illness/ death of the nearest kith and kin shall be allowed, with the permission of Vice - Chancellor, a second chance. The student shall have to carry out, at his /her own cost, the field work in any of the area /aspect in and around Jammu provinces, as assigned by the Head and submit his /her field report for evaluation and appear at viva - voce examination along with his / her batch of students of the same year.

The attendance required during the field training is 100%. However, the attendance up to 10% may be condoned by the Vice Chancellor on the recommendation of the Teacher In-Charge duly forwarded by the Head. Such condonation shall be granted only in genuine case of severe illness of a student rendering him/her unfit to carry out the fieldwork.

Project Work :-

The subject/topic of the Project Work, related to the problems of Remote Sensing and GIS will be allotted to each student in the beginning of the M.Sc. IVth Semester. The students, in consultation with their respective supervisors, may give their choice of preference of problem /topic / area. However, the decision of the Head shall be final. Each student will be required to work independently on the problem assigned including literature consultation, data collection, fieldwork and/or training, laboratory investigations, report writing etc., under the guidance of his/her supervisor. The students will have to submit to the department three typed (bound) copies of his/her work, in the form of Project Report. After the evaluation, a copy of which will be returned to the concerned supervisor and the student separately.

Theory paper Setting

Minor Test 1: This will be conducted from the 25% of the syllabus and will consist of 10 multiple choice type question and four descriptive choice question (10 marks each)Time allowed: 1 hours

Minor Test 11: This will be conducted from the next 25% of the syllabus and will consist of 10 multiple choice type question and four descriptive choice question (10 marks each)Time allowed: 1 hours

Major Test:

This will be conducted from the rest of the 50% of the syllabus (80% weightage to given for the 50% syllabus not covered in minor 1 & minor 11 and 20% weightage to be given for the syllabus already covered in minor 1 & minor 11, as per the following distribution of questions

Section A: 10 multiple choice type question (Total 15 marks) to be set from the syllabus covered in minor1 & minor11 (06 marks) and from the remaining syllabus (09 marks)

Section B: 5 short answer questions (Total 15 marks) to be set from the syllabus covered in minor1 & minor11 (06 marks) and from the remaining syllabus (09 marks)

Section C: Two long answer type questions (Essay type) with internal choice (15 marks each) to be set from the syllabus not covered in minor1 & minor11

COURSE STRUCTURE OF M.Sc. REMOTE SENSING AND GIS

Course	Title of the Course	Major Examination	Minor Examination	Maximum Marks
Ist Semester				
**PSRSGTC101	Information Technology in Remote Sensing and GIS	60	40	100
PSRSGTC102	Fundamentals of Remote Sensing and Image Interpretation	60	40	100
PSRSGTC103	Aerial Photography and Photogrammetry	60	40	100
PSRSGTC104	Cartography and Global Positioning System	60	40	100
PSRSGPC105	Information Technology, RS and Image Interpretation	50	50	100
PSRSGPC106	Photogrammetry, Cartography and GPS	50	50	100
	Field work: GPS Survey, Remote Sensing data with Field Verification			
			Total	**600**
IInd Semester				
**PSRSGTC201	Applied Statistics	60	40	100
PSRSGTC202	Digital Image Processing (DIP)	60	40	100
PSRSGTC203	Geographical Information System (GIS)	60	40	100
PSRSGTC204	Thermal and Microwave Remote Sensing	60	40	100
PSRSGPC 205	Statistics and Digital Image Processing	50	50	100
PSRSGPC 206	Microwave Remote Sensing and GIS	50	50	100
			Total	**600**
IIIrd Semester				
PSRSGTE301	Remote Sensing and GIS in Geosciences	60	40	100
PSRSGTE302	Remote Sensing and GIS in Water Resources	60	40	100
PSRSGTE303	Remote Sensing and GIS in Agriculture Soil and Land Evaluation Studies	60	40	100
PSRSGTE304	Remote Sensing and GIS in Forestry	60	40	100
*PSRSGTO305	Basics of Remote Sensing	60	40	100
PSRSGPE306	Remote Sensing and GIS in Geosciences, and Water Resources	50	50	100
PSRSGPE307	Remote Sensing and GIS in Agriculture Soil and Land Evaluation Studies and Forestry	50	50	100
	Field Work: Field Work for Ground Truth Verification			
			Total	**600**
IVth Semester				
PSRSGTE401	Remote Sensing and GIS in Human Settlement Analysis	60	40	100
PSRSGTE402	Remote Sensing and GIS in Environmental Science	60	40	100
*PSRSGTO403	Fundamentals of Geographical Information System	60	40	100
PSRSGPE404	Remote Sensing and GIS in Human Settlement and Environmental Sciences	50	50	100
PSRSGDE405	Project Work Project Report – 200 Viva Voce –100	300	-	300
			Total	**600**
			Grand Total	**2400**

*Optional for outside department students and is not available for departmental students.

** This course will be taught by other department faculty

The Syllabi M.Sc Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2018, Dec. 2019 and Dec. 2020

COURSE NO **PSRSGTC101 TITLE: Information Technology in Remote Sensing and GIS

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit-1

1.1 Introduction: Hardware, software and data,

1.2 Software: System, application, enterprise, free ware, open source

1.3 Coding: ASCII, UNICODE,

1.4 DBMS, logical data model, physical and logical views, spatial databases available for natural resources and terrain.

Unit-2

2.1 Communication systems, wired and wireless communication, communication types

2.2 Major types of networks-LAN, WAN, MAN etc, Topologies

2.3 Internet, WWW, web server, client, web browser,

2.4 TCP/IP Protocol Suite, IP Address,

Unit-3

3.1 Introduction to C: keywords, data types, variables, constants, expressions.

3.2 Operators: Mathematical, Unary, Binary, Relational and Logical operators, Operator precedence and associativity

3.3 Conditional Control statements: if statement, if else statement, nested if statement, if else if ladder and Ternary operator, Switch case statement.

3.4 Looping control Statements: While loop, Do while Loop, For loop, Nested loops.

Unit-4

4.1 Functions: Definition, Types of Function, Scope, Call by Value.

4.2 Pointers: Declaration, Definition, Indirection, Arithmetic, Call by Reference.

4.3 Single dimensional arrays: Definition, Declaration, Accessing, Passing to function.

4.4 Double dimensional arrays: Definition, Declaration, Accessing, Passing to function.

Unit-5

5.1 Strings: Declaration, Initialization, Accessing, Passing to function, declaring and accessing array of strings

5.2 Standard and library functions: stringh length, string copy, finding substring, concatenating strings etc

5.3 Structures & Unions: Declaring, Initializing and Accessing structures, passing structures to functions

5.4 Files: File opening modes, Opening and closing a data file, Reading, Writing

Books Recommended

Introduction to Information Technology By EFRAIM TURBAN, R. KELLY RAINER and RICHARD E.POTTER Published by John Wiley & Sons.

Computer Networks by Andrew S. Tanenbaum

Gottrfriield, B.S.: Programming with C, Tata McGraw Hill Publishing Co. Ltd.

Programming in C by Jamwal Shubhnandan, Pearson Publications

E. Balaguruswamy: Programming in ANSIC, Tata McGraw Hill Publishing Co. Ltd.

The Syllabi M.Sc Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2018, Dec. 2019 and Dec. 2020

COURSE NO. PSRSGTC102 TITLE: Fundamentals of Remote Sensing and Image Interpretation

Maximum Marks: 100 **Credit: 4** **Time allowed: 3 hours**

Major Examination: 60
Minor Examination: 40

Unit – 1

1.1 Remote sensing – history & development, definition, concept and principles
1.2 Energy resources, radiation principles, EM Radiation and EM Spectrum
1.3 Black body radiation, laws of radiation
1.4 Interaction of EMR with atmosphere and earth's surface

Unit – 2

2.1 Platforms – types and their characteristics
2.2 Satellites and their characteristics – geo-stationary and sun-synchronous
2.3 Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS satellite series
2.4 Meteorological satellites – INSAT, NOAA, GOES

Unit –3

3.1 Sensors – types and their characteristics, across track (whiskbroom) and along track (pushbroom) scanning
3.2 Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN
3.3 Concept of resolution – spatial, spectral, temporal, radiometric
3.4 Basic concept and principles of thermal, microwave and hyperspectral sensing

Unit – 4

4.1 Basic principles, types, steps and elements of image interpretation
4.2 Techniques of visual interpretation and interpretation keys
4.3 Multidate, multispectral and multidisciplinary concepts
4.4 Instruments for visual interpretation

Unit – 5

5.1 Remote sensing data products and their procurement
5.2 Ground truth collection – spectral signatures
5.3 Commonly used ground truth equipments - use of radiometers
5.4 Display forms – computer printouts, thematic maps, dot density maps

Books Recommended

Campbell, J.B.2002: Introduction to Remote Sensing. Taylor Publications
Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag
Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall.
Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Sabbins, F.F., 1985: Remote Sensing Principles and interpretation. W.H.Freeman and company

The Syllabi M.Sc Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. Dec. 2018, Dec. 2019 and Dec. 2020

COURSE NO. PSRSGTC103 TITLE: Aerial Photography and Photogrammetry
Maximum Marks: 100 Credit: 4 Time allowed: 3 hours
Major Examination: 60
Minor Examination: 40

Unit – 1

1.1	Introduction to aerial photography – basic information and specifications of aerial photographs
2.2	Planning and execution of photographic flights
2.3	Aerial cameras – types and their characteristics
2.4	Aerial film negative and its processing- completion of photographic task

Unit –2

2.1	Introduction – definition and terms in photogrammetry
2.2	Types of aerial photographs
2.3	Geometry of aerial photographs
2.4	Introduction to digital photogrammetry- orthophotos and digital orthophotography

Unit – 3

3.1	Theory of orientation relationship between image and corresponding ground coordinates, collinearlity and coplanarity of aerial photographs
3.2	Aerial mosaics, scale of aerial photographs and its determination
3.3	Stereovision and stereoscopes, stereoscopic exaggeration, concept of omega, phi and kappa
3.4	Stereoscopic parallax and parallax equations

Unit - 4

4.1	Making measurements from aerial photographs, measurement of height from aerial photograph
4.2	Relief displacement of vertical features and its determination
4.3	Vertical exaggeration and slopes – factor affecting vertical exaggeration and its determination
4.4	Elements of photointerpretation, symbols and colour schemes used in photointerpretation

Unit – 5

5.1	Principles of stereo photogrammetry and digital photogrammetry
5.2	Model deformation and rectification
5.3	Simple plotting instruments – simple and stereoplotters
5.4	Aerial triangulation, control and mapping

Books Recommended

Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen, J.R. 2000 : Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Miller, V.C., 1961: Photogeology. McGraw Hill.
Moffitt, F.H. and Mikhail, E.M., 1980. Photogrammetry, Harper and Row,
Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.
Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.
Rampal K.K. 1999: Hand book of Aerial Photography and Interpretation. Concept Publication

The Syllabi M.Sc Remote Sensing and GIS First Semester for the Examination to be held in the year of Dec. 2018, Dec. 2019 and Dec. 2020

COURSE NO. PSRSGTC104 TITLE: Cartography and Global Positioning System

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit – 1

1.1	Introduction to cartography, nature and scope of cartography
1.2	Digital cartography - elements of digital cartography relation between digital cartography, RS & GIS
1.3	Conventional mapping Vs digital mapping
1.4	Scale, reference and coordinate system

Unit – 2

2.1	Cartographic transformations and reasons for transforming cartographic data
2.2	Map projection – concept and classification
2.3	Azimuthal, cylindrical , conical and rectangular projection system
2.4	Choice of map projection – satellite image and map projection

Unit – 3

3.1	Mechanics of map construction - principles of drawing, base materials -instruments
3.2	Cartographic design - map design principles, symbolisation and layout
3.3	Study of different types of maps, Survey of India national series maps, layout and numbering of topographical maps
3.4	Thematic maps and base maps

Unit – 4

4.1	Representation of natural and cultural features, relief representations
4.2	Map digitization and map compilation
4.3	Fair drawing and editing of maps
4.4	Map reproduction process

Unit – 5

5.1	Introduction to Global Positioning System (GPS) – fundamental concepts
5.2	GPS system elements and signals
5.3	Classification of GPS receivers
5.4	GPS measurements and accuracy of GPS

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management.B.S. Publications

Mishra R.P and Ramesh A. 1989: Fundamentals of Cartography. Concept Publishing Company

Nag P. and Kudrat M. 1998: Digital Remote Sensing. Concept Publication

Rampal K.K. 1993: Mapping and compilation. Concept publication

Robinson A., Morrison, J.L., Muehrcke P.C., Guptil S.C. 2002: Elements of Cartography. John Wiley

Taylor,D.R.F. 1985: Education and Training in Contemporary Cartography, John Willey

COURSE NO. PSRSGPC105 TITLES: PRACTICALS RELATING TO COURSE No. **PSRSGTC101 and PSRSGTC102

Maximum Marks: 100 **Credit: 4** **Time allowed: 4 hours**

Semester Examination: 50

Internal Assessment: 50

- i) MS OFFICE
  ii) MS EXCEL
  iii) MS ACCESS
- Internet and HTML
  Elementary C-Programming
- Working knowledge of GIS softwares

- Study of satellite image, border information and marking reference system
- Analysis of spectral reflectance curves
- Visual interpretation of satellite images
- Interpretation of different resolution IRS satellite images – LISS III, PAN and WIFS
- Interpretation of cultural details from IRS image

COURSE NO PSRSGPC106 TITLES: PRACTICALS RELATING TO COURSE No. PSRSGTC103 and PSRSGTC104

Maximum Marks: 100 **Credit: 4** **Time allowed: 4 hours**

Semester Examination: 50

Internal Assessment: 50

- Stereo test and orientation of aerial photograph
- Determination of photo scale
- Use of parallax bar, determination of heights
- Preparation of photo line index
- Identification of features on single vertical aerial photographs
- Visual interpretation of satellite images and aerial photographs
- Study of SOI topographic sheets
- Calculation of map numbering system
- Base map preparation
- Handling of GPS, data collection and integration of GPS data

REMOTE SENSING FIELD WORK (GPS SURVEY)

- Familiarisation with GPS receiver and to know the set up unit
- Initialisation of the system in the field
- To get aquainted with the various functions of the GPS
- Using GPS with map & compass
- Area calculation by GPS
- Navigation by way points
- Navigation by track points
- Transfer of way points
- Map preparation and map upgradation

The Syllabi M.Sc Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2019, May 2020 and May 2021

COURSE NO: **PSRSGTC201 TITLE: APPLIED STATISTICS

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit -1

1.1 Statistical data: types and sources, discrete and continuous series, scales of measurement, measures of location and dispersion.

1.2 Skewness, moments and kurtosis.

1.3 Matrix algebra: types and properties of matrices, addition, subtraction, multiplication, inverse of a matrix.

1.4 Time series – definition, components (trend, seasonal, irregular and cyclical), forecasting based on Moving average, single exponential smoothing, trend fitting (linear and exponential growth)

Unit- 2

2.1 Correlation: introduction, types, properties, product moment and rank Correlation.

2.2 Simple linear regression with examples (using SPSS/Excel software)

2.3 Multiple and partial correlation: concept, computation for three variables only.

2.4 Introduction to sampling, sampling techniques, sample size determination

Unit-3

3.1 Random variable-discrete and continuous, concept of classical probability and probability distribution ,simple applications.

3.2 Mathematical expectation and related elementary results.

3.3 Standard discrete distributions- binomial and poisson with applications.

3.4 Normal distribution with applications of standard normal curve, exponential distribution with examples.

Unit -4

4.1 Concept of sampling distribution and standard error. sampling distribution of mean.

4.2 Concept of Hypothesis - The Elements of a Test of Hypothesis - Basic Concepts – Null and Alternative Hypotheses - Type I and Type II Errors – Test statistic

4.3 Point and interval estimation, hypothesis, two types of error, level of significance and concept of confidence level.

4.4 Small and large sample test –concerning proportions, means, variances (such as Z, t and F test)

4.5 Chi square test for goodness of fit and test of independence

Unit -5

5.1 Concept of analysis of variance(ANOVA), ANOVA with one way and two way classification

5.2 Introduction to design of experiment, CRD and RBD.

5.3 Introduction to multivariate techniques like multiple regression and multiple correlation, MANOVA, PCA, discriminant analysis and factor analysis concepts only

5.4 Case studies on multivariate analysis through SPSS/Excel software.

Books Recommended

1. Paul L. Meyer: Introductory Probability and Statistical Applications, Adsion Wesley.
2. Kapoor and Gupta: Fundamentals of Mathematical Statistics, S Chand and Sons.
3. Kapoor and Gupta: Fundamentals of Applied Statistics, S Chand and Sons.
4. Shanti Narayan: Textbook of Matrices, S.Chand and Co.
5. R.A.Johnson: Applied Multivariate Statistical Analysis, Pearson.

The Syllabi M.Sc Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2019, May 2020 and May 2021

COURSE NO: PSRSGTC202 TITLE: DIGITAL IMAGE PROCESSING
Maximum Marks: 100 Credit: 4 Time allowed: 3 hours
Major Examination: 60
Minor Examination: 40

Unit – 1

1.1 Introduction to digital image processing- concept of digital image, steps in DIP
1.2 Image processing systems –hardware and software considerations
1.3 Digitization of photographic image , converting digital image to visual form image
1.4 Digital image data formats, Image data storage and retrieval

Unit – 2

2.1 Image registration – definition principle and procedure
2.2 Fundamental of image recertification, interpolation, intensity interpolation
2.3 Radiometric & geometric correction of remotely sensed data
2.4 Basic statistical concept in DIP and use of probability methods in DIP

Unit – 3

3.1 Image enhancement techniques - an overview
3.2 Contrast enhancement - linear and non linear, histogram equalisation and density slicing
3.3 Spatial filtering and edge enhancement
3.4 Multi image manipulation – addition, subtraction and band rationing

Unit 4

4.1 Principal Component Analysis (PCA)
4.2 Enhancement by using colours – advantages, types of colour enhancements
4.3 BGR – coding and generation of FCC's
4.4 Image transformation – Intensity Hue Saturation (IHS)

Unit – 5

5.1 Pattern recognition and image classification, unsupervised classification – advantage, disadvantage and limitations, supervised classification - training site selection, classifiers used in supervised
5.2 Fuzzy classifier, hybrid classifier, decision tree classification and data minning classification – minimum distance to mean, parallelepiped, maximum likelihood
5.3 Classification accuracy assessment (error matrix and kappa coefficient)
5.4 High resolution and hyperspectral image analysis

Books Recommended

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gibson, P.J. 2000: Digital Image Processing. Routledge Publication
Gupta, R.P., 1990: Remote Sensing Geology. Springer Verlag.
Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Nag P. and Kudrat M. 1998: Digital Remote Sensing. Concept Publication
Pratt.W.K. 2004: Digital Image Processing. John Wiley
Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and Company

The Syllabi M.Sc Remote Sensing and GIS Second Semester for the Examination to be held in the year of May May 2019, May 2020 and May 2021

COURSE NO: PSRSGTC203 TITLE: GEOGRAPHICAL INFORMATION SYSTEMS

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit - 1

1.1 Introduction to GIS – definition, concept and history of developments in the field of information systems

1.2 Computer fundamentals for GIS

1.3 Hardware and software requirements for GIS

1.4 Coordinate system and projections in GIS – conic, cylindrical and planner

Unit – 2

2.1 Data structure and formats

2.2 Spatial data models – raster and vector, data inputting & GIS

2.3 Spatial data quality and uncertainty

2.4 Data base design - editing and topology creation in GIS, linkage between spatial and non spatial data

Unit – 3

3.1 Spatial data analysis – significance and type, attribute query, spatial query

3.2 Vector based spatial data analysis

3.3 Raster based spatial data analysis- local, neighborhood, regional and global operations,

3.4 Buffer analysis, network analysis

Unit – 4

4.1 Data quality and sources of errors

4.2 Integration of RS and GIS data

4.3 Digital elevation model and derivation of parameters

4.4 Data analysis and modeling in GIS– types of GIS modeling

Unit – 5

5.1 Open sources software, free software and cloud computing

5.2 Decision support systems

5.3 Overview of image processing & GIS Packages – ARC GIS, ERDAS, MAP INFO, ILWIS, GEOMEDIA, IDRISI, GRASS, SAGA, QGIS

5.4 Recent trends in GIS – AM/FM, Virtual 3D GIS, Mobile GIS, OLAP, Internet GIS, Open GIS

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management.B.S. Publications

Chang.T.K. 2002: Geographic Information Systems. Tata McGrawHill

Heywood.I, Cornelius S, CrverSteve. 2003: An Introduction to Geographical Information Systems. Pearson Education

Ram Mohan Rao. 2002: Geographical Information Systems. Rawat Publication.

Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

Tar Bernhardsen. Geographical Information Systems. John Wiley.

Wise S.2002: GIS Basics. Taylor Publications

ESRI Map book: GIS the Language of Geography by ESRI-USA ESRI-2004

Satellite Geodesy: Gunter Seeba

The Syllabi M.Sc Remote Sensing and GIS Second Semester for the Examination to be held in the year of May 2019, May 2020 and May 2021

COURSE NO: PSRSGTC204 TITLES: THERMAL AND MICROWAVE REMOTE SENSING
Maximum Marks: 100 Credit: 4 Time allowed: 3 hours
Major Examination: 60
Minor Examination: 40

Unit 1
1.1 Thermal radiation principles, thermal process and properties
1.2 Characteristics of thermal IR images and factors affecting thermal images
1.3 Interaction of thermal radiation with terrain elements
1.4 Multispectral thermal data

Unit 2
2.1 Thermal image and types of available data products & qualitative interpretation
2.2 Semi quantitative analysis
2.3 Temperature mapping with thermal scanner data, applications of thermal sensing
2.4 Information extraction from thermal mapping

Unit 3
3.1 Introduction to microwave remote sensing – concept and principle, backscattering, cross section wavelength, incidence angle, aspect angle, aircraft radar system.
3.2 Interactions between radar and surface materials - complex dielectric properties, roughness polarization
3.3 Passive & active microwave sensors
3.4 Application of microwave remote sensing and microwave image interpretation

Unit – 4
4.1 Side looking airborne radar (SLAR), geometric characteristics, components, wavelengths range and azimuth resolution.
4.2 Synthetics real aperture radar system
4.3 Transmission characteristics of radar signals and other radar image characteristics
4.4 Radar image interpretation

Unit – 5
5.1 Physics of laser, laser interaction with objects
5.2 Platform of laser scanning (ground, air, space)
5.3 Fundamentals of radar interferometry
5.4 LIDAR – components of LIDAR system, type of LIDAR (topographic, bathymetric)

Books Recommended

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen, J.R. 2000: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Joseph George, 2003: Fundamentals of Remote Sensing. Universities Press
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and company

COURSE NO. PSRSGPC205 TITLES: PRACTICALS RELATING TO COURSE No. **PSRSGTC201 and PSRSGTC202

Maximum Marks: 100 Credit: 4 Time allowed: 4 hours

Semester Examination: 50

Internal Assessment: 50

- Frequency distribution , moments of distribution
- Matrix algebria: types and properties of matrices, addition, subtraction, multiplication, inverse
- Correlation: concepts and methods
- Regression: Bi-variate, linear
- Exponential and power
- Multivariate , principle component analysis
- Normal, binomial, poison
- Introduction to boolean and fuzzy logic
- Pattern analysis, measures of arrangement & dispersion autocorrelation, semivariogram analysis

- Following tasks to be done using ERDAS image processing software:
- Free download Images such as Landsat (ETM^+, OLI/TRS), MODIS, NOAA, IKNOS, IRS downland such as SRTM, GTOPO, ASTER, CARTOSAT
- To load digital data and to convert image data
- Display of B&W and FCC using ERDAS
- File management- raster layer and layer information
- Image enhancements – spectral, radiometric and spatial
- Look up table and histogram manipulation
- Low pass filters, high pass filters, band ratioing, principal component analysis
- Geometric correction and mosaicing of image
- Vector functions – attribute querry
- Data import and export
- Georeferencing and geometric correction
- Unsupervised classification
- Supervised classification
- Use of model maker for band rationing
- Map composition

COURSE NO. PSRSGPC206 TITLE: PRACTICALS RELATING TO COURSE No. PSRSGTC203and PSRSGTC204

Maximum Marks: 100 Credit: 4 Time allowed: 4 hours

Semester Examination: 50

Internal Assessment: 50

- Calculation of at satellite radiance and true surface radiance from thermal imagery
- Computation of brightness temperature from thermal imagery
- Calculation of emissivity fractional vegetation cover
- Calculation of land surface temperature
- Radar Image Interpretation

- Processing of radar image: speckle removal through different filters
- Familiarisation with ARC GIS software
- Georeferencing in ARC GIS
- Digitization and layer creation
- Data input, data editing and topology creation
- Editing the layers (use of snap tolerance, remove over lap, gaps etc.)
- Non spatial data entry
- Linking spatial and non spatial data
  Create new table, add field to table, add record to table, calculate area and perimeter
- Buffer analysis and querry analysis (selection by location and selection by attributes)
- Overlay analysis
- Net work analysis –finding the shortest route between two places, finding the optimum path etc.
- Output map generation

The Syllabi M.Sc Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec.2019, Dec.2020 and Dec.2021

COURSE NO. PSRSGTE301 TITLE: REMOTE SENSING AND GIS IN GEOSCIENCES

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit – 1

1.1 Remote sensing in geology – an overview

1.2 Basic concept of geomorphology, earth surface process and resultant landforms

1.3 Spectral characteristics of rocks and minerals

1.4 Drainage patterns – types and its significance in geologic interpretation

Unit -2

2.1 Interpretation of drainage patterns through aerial photographs and satellite images

2.2 Interpretation of landforms due to folding and faulting, geomorphic indices of active tectonics

2.3 Interpretation of fluvial landforms

2.4 Interpretation of glacial, coastal, eolian and volcanic landforms

Unit - 3

3.1 Interpretation of karst landforms

3.2 Interpretation of structural and denudational landforms – cuesta, hogback , butte, mesa etc.

3.3 Interpretation of landforms related to igneous, sedimentary and metamorphic rocks

3.4 Geomorphological mapping and terrain evaluation

Unit – 4

4.1 Lithological interpretation of igneous, sedimentary and metamorphic rocks

4.2 Structure – definition, types and structural mapping Interpretation of folds, faults, unconformities and lineaments

4.3 Tectonics- active and neotectonics in Northwest Himalaya

4.4 Tectonics landforms mapping and analysis using remote and digital terrain model

Unit – 5

5.1 Remote sensing in mineral exploration - an overview and application of remote sensing in mineral exploration – Indian examples

5.2 Remote sensing in oil exploration – features helpful in detection of target areas for oil exploration

5.3 Engineering geological investigation , alignment studies – roads, tunnels, canals etc site selection studies – dams, bridges, highways, airstrips etc

5.4 Natural disaster mapping and management

Books Recommended

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin

Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.

Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall

Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation , John Wiley.

Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.

Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.

Ray, R.G., 1969: Aerial Photographs in Geologic Interpretations. USGS Prof, Paper 373.

Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and Company

Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

The Syllabi M.Sc Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec.2019, Dec.2020 and Dec.2021

COURSE NO. PSRSGTE302 TITLE: REMOTE SENSING AND GIS IN WATER RESOURCES

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit 1

1.1 Basic concept of water resources: hydrological cycle, Darcy's law

1.2 Porosity, permeability, transmissibility, specific yield, specific retention and hydraulic conductivity

1.3 Issues in water resources development, management and utilization

1.4 Spectral characteristics of water and relevance of RS techniques for hydrological investigations

Unit – 2

2.1 Remote sensing in ground water exploration and factors affecting ground water occurrence

2.2 Types of aquifers , aquiclude, aquitard and aquifuge and location of aquifers

2.3 Drainage mapping and morphometric analysis

2.4 Digital elevation model (DEM) in hydrological modeling

Unit – 3

3.1 Remote sensing in evaluating hydrogeological features and elements

3.2 Ground water targetting in various terrain types - hard rock terrain and in alluvial terrain

3.3 Water harvesting structures and optimum site selection for rain water harvesting

3.4 Significance of geological mapping of rocks and structures and their hydrological properties in groundwater exploration

Unit –4

4.1 Watershed management- introduction, philosophy and concept and role of remote sensing in watershed conservation, planning and management

4.2 Watershed characterisation and mapping

4.3 Runoff estimates from watersheds & GIS database for watershed management

4.4 Groundwater flow, surface and groundwater interaction, control and occurrence of groundwater movement

Unit – 5

5.1 Snow – snow in visible spectrum, middle infrared and microwave regions, snow mapping

5.2 Flood and flood plain mapping, monitoring and zoning

5.3 Water quality monitoring and hydrogeological modeling using RS and GIS

5.4 Groundwater resources estimation and production

Books Recommended

Anji Reddy, M. 2004 : Geoinformatics for Environmental Management.B.S. Publications

Chow, V.T., 1988: Advances in Hydro Science McGraw Hill

Drury, S.A., 1987: Image Interpretation in Geology. Allen and Unwin

Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.

Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall

Karanth, K.R., 1987: Groundwater Assessment-Development and Management. Tata McGraw Hill.

Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.

Miller, V.C., 1961: Photogeology. McGraw Hill.

Paine, D.P.,1981: Aerial Photography and Image Interpretation for Resource Management. John Wiley.

Pandey, S.N.,1987: Principles and Applications of Photogeology. Wiley Eastern,.

Sabbins, F.F., 1985: Remote Sensing Principles and Interpretation. W.H.Freeman and company

Todd, D.K., 1980: Groundwater Hydrology. John Wiley

Rajora, R., 2003: Integrated Watershed Management. Rawat Publication

The Syllabi M.Sc Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec.2019, Dec.2020 and Dec.2021

COURSE NO. PSRSGTE303 TITLE: REMOTE SENSING AND GIS IN AGRICULTURE SOIL AND LAND EVALUATION STUDIES

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60
Minor Examination: 40

Unit -1

1.1 Remote sensing in agriculture – an overview
1.2 Spectral characteristics of crops and factors affecting spectral signatures of crops
1.3 Principles of crop identification and crop acreage estimation
1.4 Crop yield modelling using remote sensing

Unit – 2

2.1 Crop condition and stress assessment using RS techniques
2.2 RS and GIS applications in crop inventory
2.3 Agro-meteorology – its importance and application of RS in agro-meteorology
2.4 Drought assessment and monitoring through remote sensing

Unit –3

3.1 Distribution of soil types in India and introduction of remote sensing in soil survey
3.2 Soil morphology and classification
3.3 Salt affected soil and mapping of salt affected soil using remote sensing
3.4 Wasteland: mapping and management using remote sensing

Unit –4

4.1 Relationship of rock types and geomorphology to soil types
4.2 Soil erosion and erosion hazard assessment through Remote sensing
4.3 Soil moisture assessment using RS
4.4 Soil mapping using aerial and satellite remote sensing data

Unit – 5

5.1 Land degradation -degraded soils, their identification and mapping of degraded lands
5.2 Land use / land cover – basic concept and classification
5.3 Land use / land cover mapping through remote sensing
5.4 Land evaluation for optimal land use planning

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000: Remote Sensing of the Environment: An Earth resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

The Syllabi M.Sc Remote Sensing and GIS Third Semester for the Examination to be held in the year of Dec.2019, Dec.2020 and Dec.2021

COURSE NO. PSRSGTE304 TITLE: REMOTE SENSING AND GIS IN FORESTRY

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60
Minor Examination: 40

Unit – 1

1.1 Forest: introduction and distribution of forests
1.2 Forest types of India
1.3 Forestry: introduction and concept of forestry
1.4 Role of RS and GIS in forestry

Unit – 2

2.1 Interaction of EMR with vegetation and spectral characteristics of vegetation
2.2 Temporal characteristics of vegetation
2.3 Vegetation indices
2.4 Forest cover mapping through RS and GIS

Unit – 3

3.1 Forest types and forest density mapping
3.2 Remote Sensing application in forest cover change detection
3.3 Remote Sensing application in mapping of stressed vegetation
3.4 Study of association between rock and forest types using RS and GIS

Unit – 4

4.1 Role of microwave remote sensing in forest studies
4.2 Biomass estimation by non destructive method
4.3 Growing stock estimation using RS and GIS
4.4 Remote sensing application in formulation of forest working plan

Unit – 5

5.1 Bio diversity studies using RS and GIS
5.2 Wildlife habitat analysis using RS and GIS
5.3 Biological invasion and monitoring of invasive species through RS and GIS
5.4 Forest management information system (FMIS)

Books Recommended

Anji Reddy,M. 2004 : Geoinformatics for Environmental Management.B.S. Publications
Franklin S.E. 2001. Remote Sensing for Sustainable Forest Management. Lewis Publication
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000 : Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.

The Syllabi M.Sc Remote Sensing and GIS Second Semester for the Examination to be held in the year of Dec.2019, Dec.2020 and Dec.2021

COURSE NO. *PSRSGTO305 TITLE: BASICS OF REMOTE SENSING

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

UNIT- 1

1.1.1. Overview of remote sensing: definition, concept, history & scope.

1.2. Satellite characteristics, satellite for earth observation studies and planetary mission.

1.3. Concept of sensor resolution, spatial, spectral, temporal and radiometric resolution.

1.4. Electromagnetic radiation (EMR) and electromagnetic spectrum (EMS). Interactions of EMR with atmosphere, interaction of EMR with earth's surface features; vegetation, water and soil.

UNIT- 2

2.1. Principles of visual image interpretation: elements of visual image interpretation, importance and factors governing the interpretability

2.2. Data reception and data transmission, data quality and sources of remote sensing data

2.3. Spectral signatures: homogeneity/heterogeneity, size, statistical inference

2.4. Ground truth collection: importance, methods, and ground truth details

UNIT- 3

3.1. Digital Image processing (DIP): Introduction and DIP systems

3.2. Digital data and storage formats (BSQ, BIL and BIP)

3.3. Statistics and digital image processing particularly histogram and scatter plots

3.4. Pre-processing of satellite data (radiometric and geometric corrections)

UNIT - 4

4.1. Concept of image classification: supervised, unsupervised classification

4.2. Classification algorithms: maximum likelihood, distance to mean, parallel piped.

4.3. Classification accuracy: error matrix, errors of commission and omissions, kappa statistics

4.4. Advanced classification techniques

UNIT- 5

5.1. Application of remote sensing in disaster management (landslides, flood, draught, earthquake)

5.2. Applications of remote sensing in agriculture sciences (crop acreage estimation, cropping Patterns/monitoring)

5.3. Applications of remote sensing in natural resources management

5.4. Applications of remote sensing in forestry and ecology

Books recommended:

Remote Sensing and Image Interpretation, Lillesand and Kiefer: John Wiley and Sons, Inc.
Remote Sensing Digital Image Analysis, John A. Richards: Springer-Verlag, 1993
Introductory Digital Image Processing, A Remote Sensing Perspective, John *R.* Jensen, Prentice Hall
Digital Image Processing, R.C. Gonzales, R. E. Woods*:* Addison Wesley, 1993
Techniques for Image Processing and Classification in Remote Sensing, R. A. Schowengerdt*:* Academic Press, 1983
International Journal of Photogrammetry and Remote Sensing (ISPRS), Taylor and Francis UK
Photogrammetric Engineering and Remote Sensing, US
Asian Journal of Geoinformatics, Asian Society on Remote Sensing
Indian Journal of Remote Sensing, Indian Society of Remote Sensing

COURSE NO. PSRSGPC306 TITLES: PRACTICALS RELATING TO COURSE No. PSRSGTE301 and PSRSGTE302

Maximum Marks: 100 Credit: 4 Time allowed: 4 hours

Semester Examination: 50

Internal Assessment: 50

- Visual interpretation of satellite images and aerial photographs to study the following : geomorphology, lithology, geology and strcuture
- Digital image processing for the study of geomorphology, structure, and lineaments
- Geomorphic mapping
- Lineament mapping
- Structural mapping
- Route location
- Dam site location studies
- Digital Terrain Modelling
- Drainage mapping
- Morphometric analysis
- Estimation of potential evapotranspiration and water balance through empirical equation
- Hydromorphologeologic interpretation
- Preparation of groundwater potential zone maps

COURSE NO. PSRSGPE307 TITLES: PRACTICALS RELATING TO COURSE No. PSRSGTE303 and PSRSGTE304

Maximum Marks: 100 Credit: 4 Time allowed: 4 hours

Semester Examination: 50

Internal Assessment: 50

- Land use / land cover mapping
- Identification of degraded lands
- Land utilization mapping
- Soil mapping
- Crop estimation studies
- Identification of forest species from aerial photographs
- Vegetation mapping from satellite images
- Digital image enhancements for vegetation/forest
- NDVI analysis
- Digital classification for forest cover mapping
- Forest change detection studies

REMOTE SENSING FIELD WORK (GROUND TRUTH)

Pre field preparations

- Preparation of various thematic maps in the lab
- Unsupervised classification in the lab for land use classes

Field work

- Filed validation of the above mentioned themes and maps in the field
- Study of the different signatures for the different land use classes in the field.
- Ground truth collection
- Any other relevant data collection in the field

Post Field work in the lab

- Training site selection for supervised classification
- DEM generation
- Thematic maps correction after the filed checking
- Report submission

The Syllabi M.Sc Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2020, May 2021 and May 2022

COURSE NO. PSRSGTE 401 TITLE: REMOTE SENSING AND GIS IN HUMAN SETTLEMENT ANALYSIS

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60
Minor Examination: 40

Unit – 1

1.1 Remote sensing in human settlement and urban planning – an overview
1.2 Principles of urban area development planning and land use
1.3 Data requirement for regional planning and urban/sub-urban resolutions considerations
1.4 Large scale mapping for cadastral database in urban areas

Unit – 2

2.1 Settlement patterns – image characterisation and recognition
2.2 Rural settlements - detection, interpretation, delineation and analysis
2.3 Urban settlements - detection, interpretation, delineation and analysis
2.4 Slum, squatter settlement - detection, interpretation, delineation and analysis

Unit - 3

3.1 Urban land use classification
3.2 Urban land use mapping and analysis
3.3 Residential land use, commercial land use and industrial land use
3.4 Urban land conservation using remote sensing

Unit – 4

4.1 Remote sensing in monitoring master plan / new town development area
4.2 Transportation/ road network analysis through RS and GIS
4.3 Site selection and suitability analysis for urban development
4.4 Urban sprawl and change detection studies

Unit – 5

5.1 Methods of population estimation using remote sensing
5.2 Remote sensing applications in regional and district level planning
5.3 Database design & analysis for urban and regional resource mapping
5.4 Urban hazards and risk management through RS and GIS

Books Recommended

Anji Reddy,M. 2004 : Geoinformatics for Environmental Management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen,J.R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.

The Syllabi M.Sc Remote Sensing and GIS Fourth Semester for the Examination to be held in the year of May 2020, May 2021 and May 2022

COURSE NO. PSRSGTE402 TITLE: REMOTE SENSING AND GIS IN ENVIRONMENTAL SCIENCE

Maximum Marks: 100 **Credit: 4** **Time allowed: 3 hours**

Major Examination: 60
Minor Examination: 40

Unit –1

1.1 Ecological, biological aspects of environment
1.2 Environmental pollution and types of environmental pollution
1.3 Change detection studies with the help of multi temporal data
1.4 Remote sensing in pollution monitoring

Unit – 2

2.1 Water quality mapping and monitoring
2.2 Remote sensing in water quality mapping monitoring and management
2.3 Solid waste management – introduction classification and environmental problems
2.4 Remote sensing and GIS in solid waste management & waste water management

Unit – 3

3.1 Man made disasters: introduction and types
3.2 Application of remote sensing & GIS in management of man made disasters
3.3 Nuclear fuel, power plants, nuclear waste management, global and Indian scenario.
3.4 Forest fire and fire risk assessment and management using RS &GIS

Unit – 4

4.1 Natural disasters – introduction and types
4.2 Disaster management cycle and role of remote sensing and GIS in disasters management
4.3 Remote sensing and GIS application in hazard zonation mapping
4.4 Remote sensing and GIS application in post disasters

Unit – 5

5.1 Impact assessment – basic concepts, environmental impact assessment (EIA) methods
5.2 Environmental analysis and environmental monitoring for sustainable development through RS & GIS
5.3 EIA of mining areas and river valley project through remote sensing
5.4 Environmental management plan (EMP), its importance and role of GIS in preparation of EMP

Books Recommended

Anji Reddy, M. 2004: Geoinformatics for Environmental Management.B.S. Publications
Gupta, R.P.., 1990: Remote Sensing Geology. Springer Verlag.
Jensen, J. R. 2000: Remote Sensing of the Environment: An Earth Resource Perspective. Prentice Hall
Lillesand, T.M., and Kieffer, R.M., 1987: Remote Sensing and Image Interpretation, John Wiley.
Skidmore A.2002: Environmental Modeling with GIS and Remote Sensing. Taylor and Francis

The Syllabi M.Sc Remote Sensing and GIS First Semester for the Examination to be held in the year of May 2020, May 2021 and May 2022

Course No.*PSRSGTO403 Title: Fundamentals of Geographic Information System

Maximum Marks: 100 Credit: 4 Time allowed: 3 hours

Major Examination: 60

Minor Examination: 40

Unit –1

1.1 Introduction- definition, historical perspective, components of GIS and types of GIS

1.2 Technology trends in GIS, relationship between geoinformatics, information technology and sensor technology, distributing computing (cloud GIS, SDI)

1.3 Concept of data, geographic data sources (Remote Sensing, GPS, maps and field observations)

1.4 Introduction to spatial decision problem, decision sport system, overview of internet GIS, location based services

Unit -2

2.1 Data models: Concept and types, Raster data model, Vector data model

2.2 Data input: methods, data quality, data errors, data editing

2.3 Databases: Database concepts, development, implementation and design

2.4 Database management system (DBMS): Network DBMS, Hierarchical DBMS, Relational DBMS, object oriented DBMS

Unit-3

3.1 Introduction to interpolation, types of interpolation: thiessen polygons, inverse distance, weighted splines and krigging.

3.2 Geospatial analysis: introduction, vector-based analysis and raster-based analysis

3.3 Digital Elevation Model (DEM): definition, methods of development, and applications of DEM

3.4 Network analysis: concept and models

Unit -4

4.1 Basic concepts of Global Positioning System (GPS), accuracy and error corrections in GPS

4.2 Fundamental of mobile mapping, application of GPS in resources surveys and mapping

4.3 Concept of absolute and differential global positioning system

4.4 Types of GPS receivers, GPS satellite signal, GPS data, error correction techniques in GPS

Unit -5

5.1 Utility mapping using GIS, land suitability analysis

5.2 GIS for environmental impact analysis (EIA)

5.3 Disaster vulnerability analysis (landslide hazard zonation)

5.4 Geospatial modeling: introduction, importance and techniques, land degradation modelling

Books Recommended

Geographic Information Systems for Land Resources Assessment. Burrough, P.A.: Oxford: Oxford University Press.

Fundamentals of Geographic Information Systems, Michael N. Demers*:* John Wiley and Sons, Inc.

Fundamentals of Spatial Information Systems, Laurini, R and Thompson, D.: Academic Press London

Exploring Spatial Analysis In Geographical Information Systems, Chou, Y. H.: Onward Press, New Mexico, US

International Journal of Geographical Information Systems

ESRI Map book: GIS the Language of Geography by ESRI-USA ESRI-2004

Satellite Geodesy: Gunter Seeba

COURSE NO. PSRSGPE404 TITLES: PRACTICALS RELATING TO COURSE No. PSRSGTE401 and PSRSGTE402

Maximum Marks: 100 **Credit: 4** **Time allowed: 4 hours**
Semester Examination: 50
Internal Assessment: 50

- Urban land use mapping
- Determination and delineation of settlement – urban, rural
- Highway, canal, sewage alignment
- Land use change detection
- Forest fire risk generation
- Pollution determination studies
- Identification of land slides
- Hazard zonation mapping
- Mapping of mining areas to identify the overburdens and land degradation
- Impact assessment of road construction and site identification for setting of industries etc.

COURSE NO. PSRSGDE405 PROJECT WORK

- To carry out project work on a problem based on Remote Sensing and GIS application in the available Infrastructures in the their own Institution or one of the national Remote Sensing Institutes/ laboratories /GIS Companies etc. to get aquainted with various image processing and GIS softwares.