PG Diploma in GIS

(P.G. Department of Geography)

Course Structure & Syllabus

DR. SHYAMA PRASAD MUKHERJEE UNIVERSITY

(Following Upgradation of Ranchi College, Ranchi, under RUSA Programme, Component-I)

Ranchi, Jharkhand.

PROSPECTUS- CUM-ADMISSION BROCHURE FOR DIPLOMA COURSE IN GEOGRAPHIC INFORMATION SYSTEM

Aim of the Course:

The aim of the Course is to strengthen the capacity of the Students to apply spatial Information and Earth Observation Techniques Effectively in the identification, mapping and monitoring of the natural hazards and also in the quantification for vulnerability and risk, preventing and reducing damages done to the people, their property and undertaking Field Survey using Geo-Information Technology to contribute substantially to resource-mapping and exploration. The Course also aims to provide Skilled Personnel for Urban and Regional Planning Purposes.

Objective of the Course:

The main Objective of the GIS Course is to develop the manual dexterity and fine spatial skills of the Students. Students completing this Course will have a greater understanding of the maps and the skills needed to manipulate spatiality-oriented data in the map format. Special skills will be acquired by the Students through lectures and lab work.

1. Satellite image processing using different multispectral imageries through Remote Sensing software.

2. Fundamental Cartographic knowledge of Map Projection, Scale, Coordinates, and Mapping accuracy.

3. Recognizing and identifying Geographical Data having four components: Position, Attributes, Spatial Relationship and Time to add in intervening, Manipulating, Analyzing and Displaying Spatially Referenced Data.

4. A working knowledge of Remote Sensing as well as GIS software and associated hardware to determine appropriate use of Spatial and Geo-Informative Technology.

5. To enable the Students with Job- Oriented Skills, to make them compatible to suit the present scenario of the employment market.

6. Applications of RS, GIS and GPS technologies in research, inventory and management in different environmental problems.

Regulations for Post Graduate Diploma in Geographic Information System (GIS)

1. The duration of the course for PG Diploma in Geographic Information Systems shall be of two semesters. Admission fee/ course fee of Rs. 22,000/- for General and BC II and Rs. 21,000 for ST, SC, and BCI shall be charged for the course at one time.

2. The end semester examination shall be held ordinarily in January and May of the academic year.

3. The examination fee for theory and practical shall be decided by DSPMU examination department.

4. The following will be the minimum eligibility criteria for admission to this course.
   (i) science/arts, Graduate in Geography, Geology, Botany, Environmental science, and zoology with at least 45 percent marks and should have working knowledge of computer.
   (ii) Bachelor's degree in civil engineering with at least 45 percent marks.
   (iii) Bachelor's in information Technology having at least 50 percent.

NB. PREFERENCE WILL BE GIVEN TO GEOGRAPHY AND GEOLOGY   STUDENTS.

4. Statutory reservation for Scheduled Tribes/ Scheduled Castes/ BC-1 and BC -2 candidates will be applicable as per Jharkhand Government Reservation policy and notified by Dr. Shyama Prasad Mukherjee University.

5. A student, who satisfies the conditions laid down in Regulation, shall be eligible for appearing in the examination provided he/she produces the following certificates, signed by the Chairperson/ Head of the Geography Department.
   (a) of good character
   (b) of having been on the rolls of the Department of geography/ during the course preceding the examination; and
   (c) of having attended not less than 75 percent of the lectures delivered to the class in theory, practical and training, separately.

7. A deficiency in the required number of lectures may be condoned up to 10% by the Department Council in the department of Geography, DSPMU.

8. The examination shall be held in accordance with the prescribed syllabus.

9. The medium of examination shall be English/ Hindi

10. Each theory paper, along with the practical work associated with it, will have a component of Internal Assessment. Internal assessment will carry 30 percent marks.

11. The minimum marks required to pass the examination shall be 45% in each

(i) Theory paper (ii) Practical work (iii) field/ project report, and 50% in Aggregate

12. Department of examination Dr. Shyama Prasad Mukherjee University shall make arrangements for the conduct of the examination. This shall include preparation of the date- sheet, holding of examination, evaluation of the answer books and preparation of the result. The Controller of examinations intimate the date and programme of examination to the students.

13. (a) The Controller of examinations shall get the question papers/ set in by the external paper setter.

(b) The external and internal paper setters would examine the answer books independently.

14. The field report shall be prepared by the student on the basis of work done or experiences gained by visit(s) to Remote Sensing Centre(s) Institute(s) in India. The Departmental Council shall assign a candidate to a faculty member for supervision of his/ her report on an approved topic. The student shall prepare three copies of his / her field report and submit in the concerned teacher. The report shall have to be submitted 15 days before the commencement of the theory examination of the concerned Semester.

15. (a) The topic and the supervisor for the project report will be assigned by the Board of Control. There will be two – components for this appraisal: (i) presentation on project proposal including the research objectives, methodology and the chapter scheme, after three weeks of assigning the project title, (ii) presentation of data analysis and tentative findings, six weeks after the assigning of the project title.

(b) The project report shall be required to be sent to an external examiner for evaluation in terms of numerical marks. The examiner, as mentioned above, shall be appointed by the Controller of Examinations, in consultation with the supervisor. The project report shall incorporate the findings arrived at on the basis of the data/ information collected from the field and processed, analyzed and mapped in the GIS lab. The marks awarded by the examiner shall be finalized after a comprehensive viva voce, to be conducted by the external examiner and internal examiner.

16. A candidate, who has failed in a particular course of the semester, shall be allowed to reappear in the subsequent semester with a maximum of three consecutive chances.

17. This course is not open to private candidates.

18. A candidate who fails to secure minimum pass marks in project work, shall be required to submit a project report on a fresh topic to be assigned by the Department, in consultation with the concerned Supervisor. The candidate shall pay the tuition fee for the whole period till he gets through in the project report.

19. Successful candidate shall be classified as under:

(a) Those who obtain 75% or more of the aggregate marks ....first Division with Distinction

(b) Those who obtain 60% or more but less than 75% of the aggregate marks ....First Division

(c) Those who obtain 45% or more but less than 60% of the aggregate marks of the aggregate marks ....Second Division

20. The Examination shall be conducted as per Rules and Regulations of Dr. Shyama Prasad Mukherjee University.

Scheme of Examination for PG Diploma in Remote Sensing and GIS:

Sr No.	Paper Code	Name of the Paper	Max. Marks	Internal Assessment	End Sem. Exam	Duration of Exam.
		SEMESTER-I				
1.	GIS-01	Basic Computer Information and Statistics	100	30	70	3 Hours
2.	GIS-02	Principles of Aerial Photographs and Photogrammetry	100	30	70	3 Hours
3.	GIS-03	Principles of Remote Sensing	100	30	70	3 Hours
4.	GIS-04	Digital Image Processing	100	30	70	3 Hours
5.	GIS-05	Earth Positioning System	100	30	70	3 Hours
6.	GIS-06	Practical	Distribution of marks Lab Work Test: 50 Record Book: 25			2 Hours
		SEMESTER-II				
7.	GIS-07	Geographic Information System	100	30	70	3 Hours
8.	GIS-08	Computer Cartography	100	30	70	3 Hours
9.	GIS-09	Advanced Remote Sensing & GIS	100	30	70	3 Hours
10.	GIS-10	Research Methodology and Application of Remote Sensing and GIS Techniques in	100	30	70	3 Hours
11.	GIS-11	Practical	Distribution of marks Lab Work Test: 50 Record Book: 25			2 Hours
12.	GIS-12	Project Oriented Dissertation	Distribution of marks Evaluation of Report :50 Presentation: 25			

Pattern of Question Paper:

Theory paper would be of 100 marks and each paper will have 70:30 pattern. 30 marks will be for internal evaluation through Assignment, seminar and internal test and 70 marks for final examination. In final examination, the theory question paper will be having following pattern.

Question No.	Type of Question	No of questions to be asked	Number of questions to be answered.	Marks for each question	Total marks
1	Objective Type	12	10	1 mark	10
2	Short answer type	6	5	3 marks	15
3	Short note type	6	5	5 marks	25
4	Long questions	3	2	10 marks	20
Total marks					70

Basic Computer Information and Statistics

Term End Exam:70 Marks

Internal Assessment: 30 Marks

Marks Total: 100

Unit I:

Computer Components

Computers and its Generations, Hardware Components of a Computer Processor, Main memory, Secondary Memory, Input Devices, Output devices, Storage Devices.

Unit II:

Software Component

Software/Program, Application Software; Operating System - OS Functions, Types of OS – Windows, Unix/Linux, Solaris. Local Area Network, File Management,

Unit III:

Internet

Information Technology**,** Communication and its Types, Significance of Communication in the Modern World, Global Village and Information Revolution, Internet and World Wide Web, Browsing, Advantage and Limitation in Information Revolution, Computer Viruses and Management.

Unit IV:

DBMS

Introduction; databases, database management system - structure, types of DBMS; application of DBMS in GIS; data management using MS-Excel, SQL.

Unit V:

Basics of Statistics

Introduction to Statistics; Characteristics of Statistical Data; Statistical Methods; Collections of data-primary and secondary data sources, Measurement of Central Tendency- Mean, Mode, Median, Geometric mean and Harmonic Mean; Measures of variations - Range, Quintile deviations, Mean deviation, Standard deviation and variance, Coefficient of variations, Theory of Sampling, Hypothesis; Correlation Analysis; Regression Analysis.

Books Recommended

- Dennis P. Curtin, Kim Foley, Kunal Sen & Cathleen Morin, Information Technology- The Braking Wave, Tata McGraw Hill Ed., 1999.
- Rajaraman Y., Fundamentals of Computer, Prentice Hall of India, New Delhi, 1999.
- Alex Leon., Fundamentals of Information Technology, Leon Techno Publications, Chennai, 1999.
- Subhash Metha, Understanding and Using Internet, Global Business Press, New Delhi, 1996

Semester: I

Paper Code: GIS 02

Principles of Aerial Photographs and Photogrammetry

Term End Exam:70 Marks

Internal Assessment: 30 Marks

Marks Total: 100

Unit I:

Aerial photography

Introduction to aerial photography – Basic information and specifications of aerial photographs; Planning and execution of photographic flights Basic; Geometric Characteristics of Aerial Photographs- Types of Aerial Photograph, Flight Strips, Nadir Line, End Lap; Side Lap, Stereoscopic Coverage and Stereopairs, Intervalometer, Air Base and Base Height Ratio; Types of Aerial Camera.

Unit II:

Photogrammetry

Definitions and Development of Photogrammetry; Classifications of Photogrammetry; Uses of Photogrammetry; Soft-Copy Photogrammetry- Interior Orientation, Exterior Photogrammetry, Aero-Triangulation.

Unit III:

Photographic Scale

Concept of Photographic Scale; Methods for Determining Photo Scale; Scale of a Vertical Photograph over Flat Terrain; Scale of a Vertical Photograph over variable Terrain; Other methods for determining scale of Vertical Photographs; Scale of Tilted Photograph.

Unit IV:

Stereo Photogrammetry

Stereo Photogrammetry: Model deformation & Rectification, Relief displacement, vertical exaggeration, Triangulation, Control & Mapping.

Books Recommended

- American Society of Photogrammetry, 1983: Manual of Remote Sensing (2nd Edition), ASP Falls Church, Virginia.
- Aerial photographic interpretation, Lueder, D.R., McGraw Hill Book Co., 1959 Elements of Photogrammetry, Paul R. Wolf, McGraw-Hill, 2000
- Digital Elevation Model Technologies and Applications: The DEM user Manual,
- David F. Maune (ed), American Society for Photogrammetry and Remote Sensing, Bethesda, MaryLand, USA, 2001.
- Drury S.A, 1990: A Guide to Remote Sensing - Interpreting Images of Earth, Oxford Science Publications, Oxford.
- Lecture notes, 1st module, PRS division IIRS Dehradun.2007
- Leica Photogrammetry Suite – Orthobase and Orthobase Pro User Guide, Leica Geosystems, GIS & Mapping, Atlanta, USA, 2003.
- Lillisand, T.M. And P.W.Kiefer, 1986: Remote Sensing And Image Interpretation, John Wiley & Sons, New York
- Manual Photogrammetry, McGlone, C., Edward, M. and Bethel, J, American Society For
- Photogrammetry and Remote Sensing, Bethesda, MaryLand, USA. 2005.
- Paul R.Wolf, Elements of Photogrammetry, McGraw-Hill Science, 2001.

Principles of Remote Sensing

Term End Exam:70 Marks

Internal Assessment: 30 Marks

Marks Total: 100

Unit I:

Concepts of Remote Sensing:

Introduction; Definition and Scope; Stages of Remote Sensing data acquisition; Process of Remote Sensing data analysis; Type of Remote Sensing- Active and passive remote sensing; Advantages and Limitations of Remote Sensing.

Unit II:

Electromagnetic energy:

Introduction; Electromagnetic energy- Electromagnetic spectrum, Radiation Principal's; EMR interaction with Atmosphere- scattering, Absorption and Atmospheric Windows; EMR interaction with earth surface features - reflection, absorption, emission and transmission; Spectral response pattern - vegetation, soil, water bodies.

Unit III:

Remote Sensing Platforms and Sensors:

Platforms – Types and their characteristics; Satellites and their characteristics – Geo-stationary and sun-synchronous; Earth Resources Satellites- LANDSAT, SPOT, IRS, IKONOS, QUICKBIRD satellite series; Meteorological satellites – INSAT, NOAA, GOES; Sensors – Types and their characteristics, Across track (whiskbroom) and Along track (pushbroom) scanning; Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN; Concept of Resolution – Spatial, Spectral, Temporal, Radiometric

Unit IV:

Image Interpretation

Introduction; Fundamental of Visual Image Interpretation; Elements of Image Interpretation; Image Interpretation strategies; Image Interpretation keys.

Unit V:

Remote Sensing Data Requirement and Ground Investigation

Remote Sensing Data Products and their procurement, Ground Truth Collection –Spectral Signatures, Commonly used Ground Truth equipment's - use of Radiometers, Display Forms – Computer printouts, Thematic maps.

Books Recommended

- 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

- American society for Photogrammetry and Remote Sensing, 1999, Remote Sensing for the Earth Sciences,Manual of Remote Sensing,3rd ed.,vol. 3, Wiley,New York.

- Avery, T.E., and G.L. Berlin,1992, Fundamentals of Remote Sensing and Airphoto Interpretation,5th ed.,Macmillan, New York.

- Avery, T.E., and G.L. Berlin,1992, Fundamentals of Remote Sensing and Airphoto Interpretation,5th ed.,Macmillan, New York.

- Campbell, J.B., 1996, Introduction to Remote Sensing, 2nded., Guilford, New York.

- Curran, Paul J., (1985); Principles of Remote Sensing, Longman, London & New York.

- Drury, S.A., Images of the Earth: A Guide to Remote Sensing,2nd ed.,Oxford University Press,Oxford.

- Elachi,C., 1987, Introduction to the Physics and Techniques of Remote Sensing, Wiley, New York.

- Jensen, J.R., (2004); Remote Sensing of the Environment: An Earth Resource Perspective,Pearson Education.

- Joseph, G., 2003: Fundamentals of Remote Sensing, Universities Press, Hyderabad.

- Lillesand, T. and Kiefer, R., 1999: Remote Sensing and Image Interpretation, Wiley, London.

- Mather, P.M. (1999). Computer processing of remotely sensed images: an introduction, Wiley, Chichester.

- Sabins, F.F,Jr., (1997): Remote Sensing: Principles and Interpretation,3rd ed., W.H. Freeman, New York.

- Star, J.L., J.E. Estes, and K.C. McGwire,1997, Integration of GIS and Remote Sensing, Cambridge University Press.

Digital Image Processing

Term End Exam:70 Marks

Internal Assessment: 30 Marks

Marks Total: 100

Unit:1

Fundamentals of Digital Image

Concepts about digital image and its characteristics, Spectral, Spatial, Radiometric and Temporal resolution, Visual vs. Digital methods, Image data storage and retrieval, Visual and Digital Satellite Image Interpretation, Elements of Image Interpretation, Development of Interpretation Keys, Image restoration and Noise removal, Radiometric and Geometric correction technique, Interpolation methods – linear and nonlinear transformation for geometric corrections. Image file types: BIP, BSQ, BIL, etc.

Unit: II

Image Enhancement

Image histogram, Enhancement by using colours – advantages, Types of colour enhancements; BGR – coding and generation of FCC's; Image Transformation-Intensity Hue Saturation (HIS), LUT Table. Image pre-processing, Geometric radiometric and atmospheric correction, Image enhancement Techniques and overview, radiometric spectral and spatial image enhancement techniques and its types, Multivariate image statistics image transformations band rationing, spatial filtering and edge enhancement. Density slicing; Multi image manipulation – addition, subtraction; Principal Component Analysis;

Unit: III

Image Classification

Principles of Image Classification-Image space, Feature space, Image classification; Image Classification process- Preparation for image classification, supervised image classification, unsupervised image classification, classification algorithms; Fuzzy classification; classification based on Object-oriented Image Segmentation

Unit: IV

Accuracy Assessment

Concept of Accuracy Assessment; Source of Errors in remote sensing derived thematic products; Error Matrix; Sampling consideration; Evaluation of Error Matrices; Kappa Analysis;

Books Recommended

- Jahne, B. 1991 Digital Image Processing New York: Springer-Verlag.
- Jain, A.K. 1989, Fundamentals of Digital Image Processing, Englewood Cliffs, NJ, Prentice Hall.
- Jonson, J.R. 1996, Introductory Digital Image Processing, Printice-Hall, Inc.
- Lillsand, R.M. and R.W. Kiefer, 1999, Remote Sensing and Image Interpretation, 4th Ed., New York: Wiley.
- Mathur, P.M. 1999, Computer Processing of Remotely Sensed Images: an introduction, Wiley, Chichester.
- Mullar J.P. 1986, Digital Image Processing in Remote Sensing, Taylor & Francis.
- Pratt, W.K., 1991, Digital Image Processing 2nd ed., New York Wiley.
- Richards, J.A, 1986, Remote Sensing Digital Image Analysis, New York: Springer-Verlag.
- Russ, J.C. 1992, Image Processing Handbook. Boca Raton, FL: CRC Press.
- Schowengerdt, R.A., 1983, Techniques for image processing and classification in Remote Sensing, New York: Academic Press.

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Semester: I

Paper Code: GIS 05

Earth Positioning System

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Term End Exam: 75 Marks

Internal Assessment: 25 Marks

Total: 100 Marks

Unit: I

Introduction

Introduction; History of Navigation and Positioning; Objectives, Types of Earth's, Positioning System- GPS, GALILEO, GLONASS and GAGAN; Comparison of Main Parameters for GPS, GLONASS GALILEO and GAGAN.

Unit: II

Datum, Coordinate Systems and Map Projections

Basics Geodesy, Geoid/ Datum/Ellipsoid-Definition and Basic Concepts; Datum, Transformations; Map Projections.

Unit: III

Fundamentals of Positioning Systems

GPS Components – space segment, control segment, user segment; GPS Receiver and its Types -; GPS Errors. GPS Positioning Modes: GPS point positioning, GPS relative positioning; RTK GPS, Factor

affecting GPS accuracy

Unit: IV

Differential Positioning System (DGPS):

Components, Function and applications. Differential RTK, Differential Real Time, Wide Area Augmentation System (WAAS).

Unit: V

Applications of GPS

Route Navigation, Forestry and Natural Resources, GPS Tracking, Utility, Mapping, Civil Engineering, Cadastral Surveying and Seismic Applications

Books Recommended

- N.K. Agrawal, (2004), Essentials of GPS, Spatial Network Pvt. Ltd.
- Sathish Gopi, (2000) , GPS and Surveying using GPS
- Leica A., (2003), GPS Satellite Surveying, John Wiley & Sons, Use New York
- Terry- Karen Steede, (2002), Integrating GIS and the Global Positioning System, ESRI Press

PRACTICAL   100 Marks

Practical Examination will be taken on the following topics:

1. Familiarization with Image Processing software.

2. Visualization; Import and export of Toposheet and satellite data to various formats.

3. Georeferencing of data- image to image, image to maps

4. Layer Stacking of Multispectral Imagery

5. Creating subset of image.

6. Resolution merge and Mosaic.

7. Displaying individual pixel value and image information.

8. Image enhancement techniques- image contrast, histogram equalization and density slicing.

9. Band Rationing; Filtering techniques; Principal Component Analysis.

10. Classification – supervised and unsupervised.

11. Recoding of Pixels

12. Accuracy Assessment

13. Change detection.

14. Determination of Latitude, Longitude and height by GPS.

15. Collection of Waypoints through GPS.

16. Tracking through GPS.

17. Downloading handheld GPS data into software.

Distribution of Marks of Practical Examination

    (i) Mid-term Lab work………………………25 Marks

    (ii)Annual Lab Work…………………………25 Marks

    (iii)Record Book……………………....……25 Marks

    (iv)Viva –Voice………………………………25 Marks

Geographic Information System

Term End Exam: 75 Marks

Internal Assessment: 25 Marks

Total: 100 Marks

Unit: I

Introduction to GIS

Basic concepts: Definition and history, Components of GIS, Recent trends and applications of GIS; Data structure and formats, Spatial data models – Raster and vector, Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Data inputting in GIS. Rectification, Transformation Methods; Root Mean Square (RMS) Error.

Unit: II

Data Types and Data Models

Data Types; Spatial Data; Non-Spatial Data, Data Input; Existing GIS Data, Metadata; Conversion of Existing Data, Creating New Data, Data Models; Vector Data Model; Raster Data Model; Integration and Comparison of Vector and Raster Data Models.

Unit: III

Spatial Data Editing

Types of Digitizing Errors, Causes for Digitizing Errors; Topological Editing and Non-topological Editing; Other Editing Operations; Editing Using Topological Rules.

Unit: IV

Attribute Data and Data Exploration

Attribute Data in GIS, Attribute Data Entry, Manipulation of Fields and Attribute Data, Data Exploration; Attribute Data Query, Raster Data Query, Map- Based Data Manipulation,

Unit: V

Spatial Analysis

Spatial Data: Definition, Analysis, Processes & Steps, Software and Tools, Geodatabase Model, Role of Databases in GIS, Creating, Editing and Managing, Classification scheme of Vector- Based and Raster- Based GIS Operation Raster- Based Techniques: Methods of reclassification, overlay analysis, Digital Terrain Analysis and Modeling- TIN and DEM, Surface representation and analysis, Slope and Aspect, Geographic Visualization Data Classification, Map Comparison,

Unit: V

Geo Statistical Analysis Techniques:

Introduction to Spatial Interpolation: Control Points, Global Method- Trend surface analysis, regression model, local methods- Thiessen polygons, density estimation, Inverse Distance weighted Interpolation, Kriging- Ordinary Kriging and Universal Kriging, GIS and decision support system, Introduction to AHP, basic principal of AHP. Principal and components of multiple criteria decision making

Books Recommended

- kang-tsung Chang (2007), 'Introduction to Geographic Information Systems' Tata MCGraw Hill, New Delhi.
- C.P.Lo and Albert K.W. Yeung (2006) "Concepts and Techniques of Geographic information Systems" Prentice Hall of India, New Delhi
- Burrough, Peter A. and Rachael McDonnell, (1998), 'Principles of Geographical Information Systems' Oxford University press, New York.
- Magwire, D.J. Goodchild, M.F. and Rhind, D.M., (2005), 'Geographical Information Systems: Principles and Applications', Longman Group, U.K.
- Burrough, P.A., 1986, Geographical Information System for land Resources System, Oxford Univ. Press, UK.
- Fotheringham, S.; Rogerson, P. (ed.), 1994. Spatial analysis and GIS. Taylor and Francis, London, UK.
- Laurini, Robert and Dierk Thompson, 1992, Fundamentals of Spatial Information Systems, Academics Press, ISBN 0-12-438380-7.
- Maguire,D.J.; Goodchild, M.F.; Rhind,D.W. 1991.Geographical information System, Longman, London,UK
- Siddiqui, M.A.; 2006, Introduction to Geographical Information System, Sharda Pustak Bhavan, Allahabad.
- Siddiqui, M.A.; 2011, Concepts and Techniques of Geoinformatics, Sharda Pustak Bhavan, Allahabad.

Term End Exam: 75 Marks

Internal Assessment: 25 Marks

Total: 100 Marks

Unit: I

Introduction

Introduction to cartography: nature and scope, Significance of Computer Mapping, Mapping in a Digital Age. Categories & Characteristics of maps, Study of different types of maps, Basics of Map scales, Component of Map, Conventional mapping VS Digital Mapping

Unit: II

Toposheet

Survey of India national series maps Interpretation of topographic maps, Indexing and Numbering of topographical maps,

Unit: III

Map Generalization

Concepts and Definition of Map Generalization, Factors Influencing, Generalization, Different operation in Generalization; Semantic Generalization; Geometric Generalization.

Unit: IV

Map Design

Fundamentals of Cartographic Design, Colour, Pattern, lettering, compilation, border information, aesthetics, Generalization: Semantic & Geometric, Symbolization, dot, isopleth and choropleth mapping, Multivariate and dynamic mapping, Map production, methods of map printing

Books Recommended

- ➤ Robinson, A. H., 1995. Elements of Cartography, 6th ed. New York: Wiley
- ➤ Jones, Christopher. 1997. Geographical Information Systems and Computer Cartography, Addison Wesley Longman Limited, Edinburgh Gate, England

➢ Dent, Borden, D., Torguson, Jeff, and Thomas W. Hodler, 2008. Cartography, Thematic Map Design, 6th ed., McGraw-Hill Higher Education, Toronto.

➢ Peterson, Gretchen N. 2014. GIS Cartography, A Guide to Effective Map Design, 2nd ed., CRC Press, Taylor & Francis Group, New York.

➢ Keates, J.S., (2008) : Cartographic Design and Production, London, Longman

➢ Ramesh, P.A., (2004): Fundamentals of Cartography, Concept Publishing Co., New Delhi

➢ Rampal, K.K., (2004): Mapping and Compilation, Concept Publishing Co., New Delhi.

➢ Anson, R.W. & Ormeling, F.J., (2008), Basic Cartography, Vol. 1, 2nd ed., Elsevier Applied Science Publishers, London.

➢ Robinson A.H. & Morrison J.L. \, (1995) Elements of Cartography, John Wiley & Sons

➢ Singh, R.L & Dutt. P.K., (2008), :Elements of Practical geography", Students Friends Allahabad

➢ Peterson, M.P., (1995) "Interactive and Animated Cartography" Upper Sadde River, NJ: Prentice Hall.

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Semester: II

Paper Code: GIS 09

Advanced Remote Sensing & GIS

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Term End Exam: 75 Marks

Internal Assessment: 25 Marks

Total: 100 Marks

Unit: I

Thermal Remote Sensing, Microwave Remote Sensing, Radar Environment Considerations, LIDAR, Hyperspectral, Application of Advance Remote Sensing.

Unit: II

Web GIS

Concepts and Principles of Web GIS; Definition and History of Web GIS; Significance of Web GIS; Transferred Geo data, Interactive Web Maps, Internet Map Services, Web GIS Architectures, Web GIS development, Requirement Analysis, Conceptual design, Web GIS system Integration, Open Source GIS; Web Based Geo Portal, India Geoportal; State Geoportal and District Geoportal. Vehicle Tracking System, Mobile mapping, Location Based Services, Intelligent transportation systems

Unit: III

GIS Modeling

Concepts and Principles of GIS Model, Types of GIS models, Modeling Process, Application of GIS Molding.

Unit: IV

Mobile GIS

Mobile GIS- Concepts, Portable PCs Personal digital assistance (PDAs) or Palm Top, Mobile Phone, Arc GIS Mobile, Characteristics of Mobile GIS, Benefits of Mobile GIS, Mobile Applications.

BOOKS RECOMMENDED

- ➢ Richards, J. A., Jia, X. (2000): Remote Sensing and Digital Image Processing, Springer, Verlag Berlin

- ➢ Chand, B., Majumdar, D. D. (2001): Digital Image Processing Analysis Prentice- Hall of India, New Delhi

- ➢ Jensen, J. R. (2005): Introductory Digital Image Processing, Prentice Hall, New Jersey

- ➢ Lillesand, T. M., Kiefer, R. W., Chipman, J. W. (2008): Remote Sensing and Image Interpretation, John Wiley & Sons, New Delhi

- ➢ Sabins, F. F. (1996): Remote Sensing: Principles Interpretation, W.H. Freeman Company, New York

- ➢ Navalgund, R. R. Ray, S. S. (2011): Hyperspectral Data, Analysis Techniques Application, Indian Society of Remote Sensing, Dehradun

- ➢ Demers, M. N. (2000): Fundamentals of Geographic Information Systems, John Wiley & Sons, New Delhi

- ➢ Burrough, P. A. and McDonnell, R. A. (2000): Principles of Geographical Information Systems, Oxford University Press, New York

- ➢ Malczewski, J. (1999): GIS Multi-criteria Analysis, John Wiley & Sons, New York

- ➢ Chang, K. T. (2008): Introduction to Geographic Information Systems, Avenue of the Americas, McGraw-Hill, New York

- ➢ Williams, J. (1995): Geographic Information from Space: Processing Applications of Geocoded Satellite Images, John & Wiley Sons, New Delhi

- ➢ Environmental Systems Research Institute, Inc. (1998): Understanding GIS: The ARC/INFO Method, ESRI Press, Redlands

Research Methodology and Application of Remote Sensing and GIS Techniques in Research

Term End Exam: 75 Marks

Internal Assessment: 25 Marks

Total: 100 Marks

Unit: I

Brief description of research,

Concepts and Principles of research, Objectives of research; Types of research; Significance of research; Definition of research problem, Technique involved in defining a problem; Identification of problems of regional and local level.

Unit: II

Research and Sampling Design

Meaning of Research Design; Basic Principles of Experimental Designs; Important Concepts Relating to Research Design; Implications of a sample design; Basic step of sample design; Type of sample design.

Unit: III

Data Collection

Collection of primary data; collection of secondary data; Types of data collection; Advantage and limitation of case study; Reporting of results, References.

Unit: IV

Research Project Proposal and Report Writing

Writing of proposals, Objectives of project, Research questions, Scope of project, Brain storming sessions, Review of similar studies and present level of research, Time scheduling (PERT), Financial estimates, Submission of proposal; Significance of Report Writing; Mechanics of Writing a Research Report

Unit: V

Fundamental Remote Sensing Application in Land and Water Resources

Emergence of Remote Sensing technology in application areas; Remote sensing in mapping Land use / land cover classification and monitoring; Forest resources management; Principles and approaches of crop inventory and crop production forecasting; Soil classification as per soil taxonomy; Hydrological Cycle-Types of precipitation and the analysis.

Unit: VI

Application in Climate Change and Disaster Management

Concept of climate and weather, Climatic classification, Mapping of landslide hazards, Floods, Cyclones, Forest fire and Drought.

Unit:VII

Principles of Urban and Rural Area Development and Planning

Principles of urban/rural area development planning and land use; Urban/Rural area planning and resource development; Data requirement for Urban and Rural Planning; Large scale mapping for cadastral/RS database in urban/rural areas. Transportation/ road network analysis through RS and GIS; Site selection and suitability analysis for rural/urban development; Urban Sprawl and change detection studies.

Unit: VIII

Application in Environmental Management

Selection of disposal sites for industrial and municipal wastes, Solid waste management, Environmental Impact Assessment (EIA) and Auditing.

Books Recommended

➢ W.E. Huxold & A.G. Lerinsons Aronoft.S.(1989) Managing Geographic Information Projects

➢ CR Kothari, 2004, "Research Methodology Methods and Technique, New Age International Pvt Ltd. New Delhi

➢ S L Gupta and Hitesh Gupta, 2011 "Research Methodology Text and Cases with SPSS Applications, International book House Pvt Ltd., New Delhi.

➢ Earickson, R, and Harlin, J. (1994) Geographic Measurement & Quantitative Analysis Macmillan, N.York.

➢ Bennet P. Lientz & Kathryn P. (1995) Project Management for the 21st Century Academic Press, California

➢ Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, German.

➢ Lillisand, T. M. and Keifer, R. W. 1994. Remote Sensing and Image interpretation', John Willey and Sons, New York, Third Edition.

➢ Jenson, J.R. 2000.Remote Sensing of the environment-An Earth Resource Perspective, Prentice Hall Inc.

- Srivastava P., Pandey P.C., Kumar P., Raghubansi A.S., Han D. 2015. Geospatial Technology for Water Resource Development. CRC Press, Taylor and Francis
- P.K. Joshi, P. Pani,S. .N. Mohapartra and T.P. Singh, Ed 2010 "Geoinformatics for Natural Resource Management", Nova Publishers,India
- P.K. Joshi and T.P. Singh (2011). Geoinformatics for Climate Change Studies, TERI Press, New Delhi.
- P. S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS), 2000.
- Spatial Technologies for Natural Hazard Management. Proceedings of ISRS National Symposium, Nov. 21-22, 2000, IIT, Kharagpur.

Practical Examination will be taken on the following topics:

1. Geodatabase creation
2. Spatial data Integration (Digitization) – point, line, polygon.
3. Non-Spatial Data Integration.
4. Editing of Spatial & Non-Spatial data.
5. Building Topology; Data Query.
6. Texture & Object based classification & Modeling.
7. Raster Data calculations.
8. Accuracy assessment.
9. Mapping and editing.
10. Cartographic Symbolization, Generalization of Maps.
11. Types of Maps.
12. Map Design or Layout, Map Production.

Distribution of Marks of Practical Examination

(i) Lab Work…………….............…………50 Marks (Time-2 hours)

(ii) Record Book………………………...……25 Marks

(iii)Viva –Voice………………………………25 Marks

Project Oriented Dissertation

1. Project Evaluation: 25

2. Project Presentation: 25

3. Project Viva Voice: 50

The Subject/ topic of the project work, related to the problems will be allotted to each student in the beginning of the 2nd 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/ Course Coordinator shall be final. Each stufent 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 a which will be returned to the concerned supervisor and the student separately.

The Project topic should consist of the following:

➢ Relevance of the problem to be studied and its aims and objectives,

➢ Review of Literature

➢ Methodology adopted to study such problem

➢ Data acquisition / collection

➢ Field work

➢ Data processing

➢ Results and interpretation

➢ Limitation of work

➢ Finding and Conclusion

presentation: -

On satisfactory completion of the Project, each student is required to defend his/ her thesis through a power point presentation in front of an external expert and faculty and students

which will be followed by Viva- Voce. This should be a substantial piece of research work, which both reinforces the skills learned in the taught component of the course and provides a genuine opportunity to undertake valuable- research.