

# **FACULTY OF ENGINEERING & TECHNOLOGY**

## **SYLLABUS**

**FOR**

**Post Graduate Diploma in Remote Sensing (RS)  
and Geographical Information System (GIS)  
(P.G. Dip. In RS GIS)  
(Semester: I – II)**

**SESSION: 2014-15**



---

# **GURU NANAK DEV UNIVERSITY AMRITSAR**

---

- Note:** (i) **Copy rights are reserved.**  
**Nobody is allowed to print it in any form.**  
**Defaulters will be prosecuted.**
- (ii) **Subject to change in the syllabi at any time.**  
**Please visit the University website time to time.**

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester System)

**SCHEME**

**SEMESTER-I:**

<b>S. No.</b>	<b>Course Code</b>	<b>Name of Course</b>	<b>Theory</b>	<b>Practical</b>
<b>1</b>	<b>RSD001</b>	Fundamentals of Remote Sensing	<b>100</b>	
<b>2</b>	<b>RSP001</b>	Lab. Fundamentals of Remote Sensing		<b>50</b>
<b>3</b>	<b>RSD002</b>	Fundamentals of Geographical Information System	<b>100</b>	
<b>4</b>	<b>RSP002</b>	Lab. Fundamentals of Geographical Information System		<b>50</b>

**Grand Total = 300**

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – I)

**RSD001: Fundamentals of Remote Sensing (Theory)**

**Time: 3 Hrs**

**Pass Marks: 40**

**Max. Marks: 100**

**Note: Eight questions are to be set. Candidates are required to attempt any five questions.**

**Unit – 1: Introduction to Remote Sensing**

1. Historical Development of Remote Sensing from past, present to future programmes
2. Principle of Energy Radiation: Electromagnetic Radiation (EMR), Transmission of Energy from the Sun to the Surface of the Earth as well as Absorption and Scattering
3. Interaction mechanism and Atmospheric Effects: Reflection and Emission, Transmission of Energy from the Surface to the Remote Sensor
4. Image Characteristics and Remote Sensing System: Sensor Data Output, Data – Transmission, Processing and Analysis; Spectral Signatures, Resolutions: Spectral, Spatial, Temporal and Radiometric Corrections
5. Aerial Photograph: Types of Aerial Photographs and its Application
6. Photogrammetry (Elements of Photo Interpretation):  
Elements of Object Identification, Interpretation techniques and Photo Mosaic, Geometry, Measurement of Scale, Height and Slope

**Unit – 2: Data Acquisition through Remote Sensing and Field based Sensors**

1. Satellites: Geo–stationary and Sun Synchronous Satellite
2. Remote Sensing Satellites: Landsat, Indian Remote Sensing Satellites (IRS), SPOT, European Remote Sensing Satellites (ERS)
3. Weather Sensors: Thermal and Microwave Sensor and there application
4. Field based Sensors: Global Positing System (GPS), Total Station, RADAR and SLAR

**Unit – 3: Remote Sensing: Data interpretation and its Application**

1. Elements and techniques of Image Interpretation
2. Visual Image Interpretation and Digital Image Processing
3. Pattern Recognition in Remote Sensing Data
4. Applications of Remote Sensing: Land Use/Land Cover Mapping, Desertification Monitoring, Forestry Mapping, Geological mapping, Drainage mapping, Urban mapping and Agricultural Mapping.

**Unit – 4: Basics of Digital Cartography**

1. Concepts of Cartography and Map Projections
2. Interpretation of Topographic Maps, Map Use as Communication
3. Conceptualization, measurement and Symbolization of Geographic data.
4. Maps types – Choropleth Maps and Proportional Symbol Maps, Isopleth Maps and Dot Maps
5. Maps and Attribute Data – Data Analysis and Classification, Principle of Symbolization
6. Map Designing and Map Layout
7. Map Reproduction

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – I)

**Recommended Text Book (Theory and Practical):**

1. Lillesand, T. M. and Kiefer, R. W. 2000. Remote Sensing and Image Interpretation. 4th Edition, John Wiley and Sons, New York.
2. Jensen, J. R. 2002. Remote Sensing of the Environment – An Earth Resource Management. Pearson Education, Singapore, First Indian Reprint (Low Price Edition).
3. Joseph, G 2003. Fundamentals of Remote Sensing”, Universities Press Pvt. Ltd., Hyderabad.
4. Panda, B. C. 2005. Remote Sensing Principles and Applications. Viva Books Pvt. Ltd., New Delhi.
5. Gopal singh, Map work and Practical Geography

**Recommended Reference Books (Theory and Practical):**

1. Rampal, K.K., Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi, 1999
2. George Joseph, Fundamentals of Remote Sensing, second edition
3. J. B. Campbell, Introduction to Remote Sensing, Third Edition
4. Thomas Eugene Avery, Graydon Lennis Berlin – 1992, Fundamentals of remote sensing and airphoto interpretation.
5. A. M. Chandra and Santi Kumar Ghosh, Remote Sensing and Geographical Information System
6. John R. Jensen, 2005, Introductory digital image processing: A remote sensing perspective,
7. Robinson A. H., Morrison, J. L, Muehrcke, A. C., Kimerling, A. J. and Guphill, S.C. 1995. Elements of Cartography. 6th Edition (Student Edition), John Wiley & Sons, New York.
8. Singh, R.L and Singh R. P. B. 1992. Elements of Practical Geography. Reprint 2002, Kalyani Publishers, New Delhi.

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – I)

**RSP001: Lab. Fundamentals of Remote Sensing (Practical)**

**Pass Marks: 25**

**Max. Marks: 50**

- i. Image Enhancements, Image rectification, subset of new image, site selection
- ii. Visual and Digital image interpretation for drainage cum land use mapping, forestry mapping, Crop estimation, vegetation index, Urban Mapping
- iii. Geomorphological mapping using Satellite data product and GIS Techniques  
Drainage basin morphometric analysis using RS data product and GIS techniques

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – I)

**RSD002: Fundamentals of Geographical Information System (GIS) (Theory)**

**Time: 3 Hrs**

**Pass Marks: 40**

**Max. Marks: 100**

**Note: Eight questions are to be set. Candidates are required to attempt any five questions.**

**Unit – 1: Concept and Definition**

- Geographical Information system (GIS); Definition and development from past to future
- Basic requirement for GIS: Computer hardware and software environment

**Unit –2: Database: Design, Structure and Management**

- Spatial and Aspatial database; Point, Line and Polygon and Attribute data
- Database management System; Purpose and structure
- Classification of Database ; Hierarchical, Network and Relational database
- Data structure use in GIS; Raster, Vector and Quad tree data model;
- Simple and hierarchical data structure, Polygon and Dual Independent Map encoding (DIME)/ Topological Structures
- Vector and Raster Data Query in GIS; Geographical Visualization,
- Overlay operations; Buffers, Interpolation Methods.
- Overview of Spatial Data Analysis: Vector and Raster Based Analytical Technique, Hybrid Model.
- Data Modelling, Digital Elevation Model (DEM)
- Geo–referencing; Map Projections and Transformations, Layers and Coverage’s, Spatial Relationships and Generalization.

**Unit – 3: Fundamental Elements: Data input, Analysis and Product generation**

- Data acquisition input, editing, data manipulation
- Data Analysis and Query
- Symbolization and product generation

**Unit – 4: Data Integration, Management and Overview of Current GIS Packages**

- GIS and Remote Sensing Data Integration
- Thematic Mapping
- Network Analysis –Network Data Model,
- GIS and Integration of Other Types of Data
- Overview of GIS Packages – ARC/INFO, ILWIS, Map Info, Intergraph MGE, Intergraph Geo–media and ENVI– Other GIS Interfaces: HTML, Web GIS, 3D GIS

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – I)

**Recommended Text Books:**

1. D. Ian Heywood, Sarah Cornelius, Steve Carver 1998, An introduction to Geographical Information Systems, New Delhi
2. Kang–tsung Chang 2006. Introduction to Geographic Information System. Tata McGraw Hill, New Delhi.
3. Keith C. Clarke 2001, Getting Started With Geographic Information Systems
4. Burrough, Peter A. and Rachael McDonnell 1998. Principles of Geographical Information Systems. Oxford University Press, New York.

**Recommended Reference Books:**

1. Wilpen L. Gorr and Kristen S. Kurland , 2010, GIS Tutorial Basic Workbook Arc GIS 10
2. Robinson A. H., Morrison, J. L, Muehrcke, A. C., Kimerling, A. J. and Guphill, S. C. 1995. Elements of Cartography. 6th Edition (Student Edition), John Wiley & Sons, New York
3. Singh, R.L and Singh R. P. B. 1992. Elements of Practical Geography. Reprint 2002, Kalyani Publishers, New Delhi
4. Nag, P and Sengupta, S 2007. Geographical Information System – Concepts and Business Opportunities. Concept Publishing Company.
5. Maguire, D. J., Goodchild, M.F. and Rhind, D. M. Ed. 1991, 'Geographical Information Systems: Principles and Applications', Longman Group, U. K.
6. DeMers, M. N. 2000. Fundamentals of Geographic Information systems. Second Edition, John Wiley & sons, Inc., New York.
7. Stanley Aronoff, Remote sensing for GIS managers
8. Kali Charan Sahu, Textbook of Remote Sensing and Geographical Information System.

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – I)

**RSP002: Lab. Fundamental of Geographical Information System (GIS) Practical**

**Pass Marks: 25**

**Max. Marks: 50**

- i. Designing of GIS data base: Coverage, Shapefile, Personal Geo–database
- ii. Scanning, Rectification and Geo referencing of the Spatial database
- iii. Cleaning, editing and adding attribute data to Spatial database
- iv. Mapping of Dot, line and Area Symbols using different GIS techniques such as Dot Method, Choropleth Mapping, Proportionate Circles, Multiple layer mapping, Labeling etc.
- v. GIS Analysis : Buffer analysis, Spatial and non–Spatial Query's
- vi. Map designing: Layout and generation of Report

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester System)

**SCHEME**

**SEMESTER–II:**

<b>S. No.</b>	<b>Course Code</b>	<b>Name of Course</b>	<b>Theory</b>	<b>Practical</b>
<b>1</b>	<b>RSD003</b>	Application of Remote Sensing and GIS in Physical Geography	<b>100</b>	
<b>2</b>	<b>RSP003</b>	Lab. Application of Remote Sensing and GIS in Physical Geography		<b>50</b>
<b>3</b>	<b>RSD004</b>	Fundamentals of Geographical Information System	<b>100</b>	
<b>4</b>	<b>RSP004</b>	Lab. Fundamentals of Geographical Information System		<b>50</b>
<b>5</b>	<b>RSP005</b>	<b>Project Work</b>		<b>200</b>

**Grand Total = 500**

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**RSD003: Application of Remote Sensing and GIS in Physical Geography (Theory)**

**Time: 3 Hrs**

**Pass Marks: 40**

**Max. Marks: 100**

**Note: Eight questions are to be set. Candidates are required to attempt any five questions.**

**Unit – 1: Concept and Definition**

- Fundamentals Concept of Physical Geography
- Endogenetic and Exogenetic Forces of earth:
- Environment: Definition and Components
- Man Environment Relationship and man induced environmental changes
- Environmental geography and its role in environmental management and planning

**Unit – 2: Applied Geomorphology**

- Mapping and identification of different type of landforms
- Analysis of Landform
- Terrain Evaluation and classification
- Natural Hazards
- Morphometric analysis of drainage basin
- Watershed management
- Water resource management at regional and local level

**Unit – 3: Applied Climatology**

- Weather analysis and forecasting: Remote sensing of atmosphere, Satellite Data application in meteorology
- Global Climatology: Earth and atmosphere energy radiation budget

**Unit – 4: Environmental Management and Application of Remote Sensing and GIS**

- Management of land water and air quality
- Solid waste management
- Pollution monitoring and detection

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**Recommended Text Books:**

1. Darrel Hess, Physical Geography Laboratory Manual (10th Edition). Mcknight publisher
2. Savindra Singh, Physical Geography, Prayag Pustak bhawan, Allahabad
3. Savindra Singh, Enviornmental Geography, Prayag Pustak bhawan, Allahabad
4. Eric Charles Barrett and L.F. Curtis, 1999, Introduction to environmental remote sensing, fourth edition, stanely thornes , U.K.
5. Lillesand, T.M. and Kiefer, R.W. (2000): *Remote Sensing and Image Interpretation*. 4<sup>th</sup> ed. John Wiley and Sons, New York.

**Recommended Reference Books:**

1. Thornbury, W.D., 2001, Principles of Geomorphology, John Wiley, NY.
2. Wooldridge, S.W. and Morgan, R.S., 1959 The Physical Basis of Geography, Longman, London.
3. Curran, P.J. (1985): *Principles of Remote Sensing*, Longman, London.
4. Floyd, F., Sabins, Jr. (1986): *Remote Sensing : Principles and Interpretation*, W.H. Freeman, New York.
5. Hallert, B. (1960): *Photogrammetry*, McGraw Hill Book Co. Inc.
6. Harry, C.A. (ed.) (1978): *Digital Image Processing*, IEEE Computer Society.
7. Leuder, D.R. (1959): *Aerial Photographic Interpretation: Principles and Application*. McGraw Hill, New York.
8. Reeves, R.G. (ed.) (1983): *Manual of Remote Sensing*, Vols. 1 & 2, American Society Photogrammetry & Remote Sensing, Falls Church, Virginia.
9. Spurr, R. (1960): *Photogrammetry and Photo Interpretation*, The Roland Press Co., London.
10. Survey of India, (1973): *Photogrammetry*, Survey of India, Dehradun.

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**RSP003: Lab Application of Remote Sensing and GIS in Physical Geography (Practical)**

**Pass Marks: 25**

**Max. Marks: 50**

- i. Major landform analysis using RS data product and GIS techniques
- ii. Geomorphological mapping using RS data product and GIS Techniques
- iii. Drainage basin morphometric analysis using RS data product and GIS techniques
- iv. Study of aerial photograph and satellite imageries for detection of river channel shift and buried channels
- v. Digital Image processing for landscape, geomorphological mapping and terrain evaluation
- vi. Land use/land cover mapping
- vii. Natural Hazard zonation and mapping

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**RSD004: Fundamentals of Geographical Information System (Theory)**

**Time: 3 Hrs**

**Pass Marks: 40**

**Max. Marks: 100**

**Note : Eight questions are to be set. Candidates are required to attempt any five questions.**

**Unit – 1: Concept and Definition**

- Planning – Definition and type
- Role of Remote Sensing and GIS in regional Planning, tourism and business management

**Unit – 2: Regional Planning**

- Creation of database for regional planning
- Land use/Land cover mapping
- Land use suitability evaluation
- Updating of land use land cover maps
- Resources analysis for district/block planning
- Location of amenities and facilities

**Unit – 3: Urban Planning**

- Creation of database for urban planning
- Updating of urban land use maps
- Classification of residential areas, estimation of population concentration, urban growth monitoring and urban change detection
- Route location and site planning, urban development planning
- Location of facilities and amenities in the urban planning
- Slum Identification and improvement

**Unit – 4: Tourism and Business management**

- Creation of database for tourism planning
- Creation of database for Business management
- Location of tourist spot and business activities

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**Recommended Text Books:**

1. Maik Netzband, William Louis Stefanov, Charles L. Redman, Applied Remote Sensing for Urban Planning, Governance and Sustainability, Springer
2. Tarek. Rashed, Carsten Jürgens, Remote sensing of urban and suburban areas, springer
3. Timothy L. Nyerges, Regional and urban GIS: a decision support approach
4. Michael F. Goodchild, Louis T. Steyaert, Bradley O. Parks, Carol Johnston, GIS and Environmental Modeling: Progress and Research Issues
5. L. R. A. Narayan, Remote Sensing and Its Applications, University Press Publication
6. R.P. Misra, 2002, Regional Planning: Concepts, Techniques, Policies and Case Studies, New Delhi

**Recommended Reference Books:**

1. Manishika Jain, GIS and Remote Sensing Techniques: A Case Study of a Developing Urban Center, 2009, Himanshu Publication.
2. R.P. Misra, 2002, District Planning: A Handbook
3. Campbell, J. B. (2002): Introduction to Remote Sensing. 5<sup>th</sup> ed. Taylor & Francis, London.
4. Cracknell, A. et al. (1990): Remote Sensing Year Book, Taylor and Francis, London.
5. Curran, P.J. (1985): Principles of Remote Sensing, Longman, London.
6. Floyd, F., Sabins, Jr. (1986): Remote Sensing: Principles and Interpretation, W.H. Freeman, New York.
7. Guham, P. K. (2003): Remote Sensing for Beginners. Affiliated East–West Press Pvt. Ltd., New Delhi.
8. Hallert, B. (1960): Photogrammetry, McGraw Hill Book Co. Inc.
9. Harry, C.A. (ed.) (1978): Digital Image Processing, IEEE Computer Society.
10. Leuder, D.R. (1959): Aerial Photographic Interpretation: Principles and Application. McGraw Hill, New York.
11. Reeves, R.G. (ed.) (1983): Manual of Remote Sensing, Vols. 1 & 2, American Society of Photogrammetry & Remote Sensing, Falls Church, Virginia.

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**RSP004: Lab. Fundamentals of Geographical Information System (Practical)**

**Pass Marks: 25**

**Max. Marks: 50**

- i. Image/photo interpretation: recognition and detection of objects, preparation of land use maps
- ii. Digital image processing techniques in preparation of land use and urban mapping
- iii. Urban growth monitoring and change detection
- iv. Preparation of base map and its updating
- v. Grid cell data processing
- vi. Site planning of business activities and tourist spots

*Post Graduate Diploma in Remote Sensing (RS) and Geographical Information System (GIS)*  
(Semester – II)

**RSP005: Project Report**

**Pass Marks: 100**

**Max. Marks: 200**

To be assigned at the end of First Semester based on laboratory or field work of semester II to be submitted within 45 days after the last theory/practical examination.