

SYLLABUS

Certificate Course in Geographical Information System (GIS)

Objectives:

- 1) To instruct the students in knowing how GIS facilitates the analysis of RS data.
- 2) Develop skills pertaining to mapping in open-source GIS software

Marks and Evaluation:

Total Marks: 100

Multiple Choice Questions (MCQs): 50 (Each question carries 2 marks)

Module

Unit I: Introduction to GIS

- Definition, Philosophy & Historical evolution of GIS
- Components of GIS, Function of GIS
- GIS Operations
- Use and applications of GIS

Unit II: Spatial Data Models & Non-Spatial Data Models

- Basic Concepts about Spatial Information, Spatial vs. Non-spatial data
- Spatial data models – Raster and Vector
- Raster and Vector data representation; Data Conversions
- Comparison between Raster and Vector Data
- Concepts of DBMS in Context of GIS, Hierarchical, Network, and Relational Models

Unit III: GIS Data Input, and Geo-Correction

- Sources of Spatial Data (Raster and Vector)
- Data Acquisition Through Scanners and Digitizers, Methods of Digitization (Manual vs. Automated)
- Geometric Transformations of Raster and Vector Data (Affine Transformation and Transformation Coefficients), RMS Error
- Spatial Data Accuracy and Sources of Errors
- Difference between Accuracy and Precision
- Basics of Geodatabase Model, Role of Databases in GIS, Creating, Editing, and Managing Geo-databases
- Topology building & Editing

- Map composition

Unit III: Practical

- Interpretation of satellite imagery of different temporal scales
- Preparation of land use/ land cover; image Classification techniques – Unsupervised and Supervised
- Preparation of fluvio-geomorphic maps
- Digitization of different layers of spatial information (Point, line, and polygon) and their thematic representation
- Study of changing land use and river course using remote sensing and GIS techniques
- Digital Image Processing – Enhancement principles and techniques

Course Outcomes:

- Gaining the basic knowledge of mapping the earth and its features.
- Understand how GIS methodologies can be used to address spatial analysis from the theoretical perspective.

Suggested Readings:

- 1) Burrough, P.A.,1986: Principles of Geographical Information Systems in Land Resources Assessment, Clarendon Press, Oxford.
- 2) Burrough, P.A., and Mc Donnel, R.A.,1998: Principles of Geographical Information Systems, Oxford University Press.
- 3) Colwell, R.N., 1983: Manual of Remote Sensing, Vol. I & II, American Society of Photogrammetry.
- 4) Curran, Paul, J., 1985: Principles of Remote Sensing, Longman Group Ltd.
- 5) Gautam, N.C., 1970: Urban Landuse Study through Aerial Photo- interpretation Techniques, Pink Publishing House, Mathura.
- 6) Star, J. and Ester, J., 1990: Geographic Information System, Prentice-Hall.
- 7) Liles and, T.M. and Kiefer, R.W., 1987: Remote Sensing and Image Interpretation, John Wiley.
- 8) Hord, R. Michael., 1986: Remote Sensing: Methods and Applications, John Wiley.
- 9) Maguire, D. J., Goodchild, M. and Rhind, D. J.,1990: Geographical Information Systems: Principles and Applications, Longman Science and Technology Publications. Robinson,
- 10) A. H., et al., 1995: Elements of Cartography, John Wiley.
- 11) Sabins, Floyd F., 1987: Remote Sensing Principles and Interpretation, W.H. Freeman and Company, New York.

SYLLABUS

Certificate Course in Global Positioning System (GPS)

Objectives:

- 1) To provide hands-on training on GPS and its applications,
- 2) To understand the basics of GPS

Marks and Evaluation:

Total Marks: 100

Multiple Choice Questions (MCQs): 50 (Each question carries 2 marks)

Module

Unit I: Introduction to GPS

- Definition and History
- Functions and Working Principles
- Segments of GNSS: Space, Ground, and Control segment
- Types of GNSS receivers and Antennas, Receiver pre-amplifier
- DGPS concept, Various DGPS survey techniques
- GPS equipment
- GNSS errors and accuracy
- GNSS applications
- Fundamentals of Mobile Mapping, Mobile Mapping Application

Unit II: Practical

- GPS data collection (Point, Line, and Polygon) and plotting
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Course Outcomes:

At the successful completion of this course, students will be able to:

- get a clear understanding of the functioning and the working principles of GPS
- learn the practical applications of GPS in data collection from the field

Suggested Readings:

- 1) Park, C.1997: The Environment, Routledge, London
- 2) Pickering, K.T. & L.A., 1994: An Introduction to Global Environmental Issues, Routledge, London

- 3) Goudie, A., 1984: *The Nature of Environment*, Basil Blackwell, London
- 4) Newson, M., 1992: *Land, Water and Development*, Routledge, London
- 5) Cantledge, B. (ed.), 1992: *Monitoring the Environment*, Oxford University Press, Oxford
- 6) Singh, S., 1991: *Environmental Geography*, Prayag Pustak Bhawan, Allahabad
- 7) Strahler, A.N., & Strahler, A.H., 1976: *Geography and Man's Environment*, John Willey, New York