

NGEOG. 203 FUNDAMENTALS OF GIS

Course Brief:

The course aims to equip students with an understanding of GIS, evolution and applications of spatial data. In this class, students will be introduced to the study and design of maps, primarily through the application of a specialized computer mapping software program known as a Geographic Information System (GIS). GIS is a map-based computer decision support system that allows for the investigation of geographic data relationships. People that are trained in GIS are in high demand today, both in government and private industry.

Course Learning Objectives:

This study will focus primarily on GIS-based mapmaking techniques, including map design, symbology, map coordinates and georeferencing systems. Students will cover many important aspects of mapmaking, including map data collection and processing, field methods and GPS, cartographic communication, topographic map reading and analysis, and qualitative and quantitative mapping techniques.

Course Contents:

I- Introduction to GIS:

- i. Definition
- ii. Components of GIS

II- Spatial Data:

- i. Introduction
- ii. Types
- iii. Sources

III- GIS Data Structures:

- i. Introduction
- ii. Digital file structures: Simple lists, Ordered Sequential Files, Indexed Files
- iii. Digital database structures for Managing Data: Hierarchical Data Structures, Network systems, Relational Database Management Systems
- iv. GIS Data Models for Multiple Coverages: Raster Models, Compact storing of Raster Data, Vector Models, Compacting Vector Data Models, Hybrid and Integrated Systems

IV- Spatial Data Modeling:

- i. Introduction
- ii. Spatial data models
- iii. Spatial data structures
- iv. Modeling surfaces
- v. Modeling networks
- vi. Modeling third and fourth dimensions

V- Attribute Data Management:

- i. Introduction
- ii. Creating a database

- iii. Integrating database
- iv. Development in database
- v. GIS database applications

VI- Spatial Data Input and Editing

- i. Introduction
- ii. Methods of Data Input
- iii. Data Editing
- iv. The Importance of Editing GIS Database
- v. Detecting and Editing Errors
- vi. Projection Changes
- vii. Edge Matching
- viii. Conflation and Rubber Sheeting
- ix. Integrated databases

VII- Spatial Analysis: Techniques of spatial analysis

VIII- GIS Output:

- i. Display of Analysis
- ii. Cartographic output
- iii. Map design controls
- iv. Non-traditional Cartographic output
- v. Technology and GIS output

IX- GIS Project Design and Management:

- i. Introduction
- ii. Problem identification
- iii. Designing a data model
- iv. Project management
- v. Implementation problems
- vi. Project evaluation

Books Recommended:

- Environmental Systems Research Institute (ESRI) 1993: Understanding GIS: The ARC/INFO method. John Wiley & Sons, New York.
- Found, W. C. 1971: A theoretical approach to rural land-use patterns. Edward Arnold London.
- Garnett, A. 1945: The interpretation of topographical maps, Ltd., George G. Harrap & Co. London.
- Huxhold, W.E. 1991: An Introduction to Urban Geographic Information Systems, Oxford University Press. Oxford.
- Johnson et al. 1992: Geographic Information System and Mapping, American Society for Testing and Materials.
- Lillesand, T. M. & Kiefer, R. W. 1994: Remote Sensing and Image Interpretation, John Wiley & Sons, New York.
- Lo, C. P. 1976: Geographical Applications of Aerial Photography, Crane Russak, New York
- Lyon J. G. & McCarthy J. (edit) 1995: Wetland and Environmental Applications of GIS, CRC Press Inc, USA.
- Masser, I. & Blackmore, M. 1991: Handling Geographic Information, Longman, London.

- Mather, A. S. 1986: Land Use, Longman, London.
- Mather, P.M. 1993: Geographical Information Handling - Research and Applications, John Wiley & Sons, New York.
- Peuquet, D. J. & Marble, D. F. 1990: Introductory Readings in Geographic Information Systems Taylor & Francis London.
- Rhind, D. W., Googchild, M. F. and Maguire, D. J. (edit) 1991: Geographical Information Systems: Principles and Applications, Longman Group UK.
- Rhind, D. W., Googchild, M. F. and Maguire, D. J. (edit) 1991: Geographical Information Systems: Principles and Applications, Longman Group, UK.
- Scholten, H.J. & Stillwell, C.H. 1990: Geographic Information Systems for Urban and Regional Planning, Kulwer Academic Publications.