BSE 4344 – Geographic Information Systems for Engineers

Credit / contact hours: 3 credits, 5 contact hours

Course instructor: V. Sridhar

Textbook / materials:
suggested textbook:  

Catalog description:
The objectives of this course are to develop necessary skills and knowledge related to the applications of Geographic Information Systems (GIS) in pre- and post-processing of model inputs and outputs, spatial analysis and interpretation; real-world water resource problems and integration of external models

Co-requisites: NA

Pre-requisites: BSE 3324

Course type: elective in the program

Specific outcomes of instruction:
1. Identify types of products and applications of GIS
2. Discuss the nature and characteristics of spatial data and objects
3. List and define GIS operations.
4. Describe and evaluate methods of data capture and sources of data
5. Describe the characteristics, advantages and disadvantages of different models
6. Discuss factors affecting errors, accuracy, and data quality
7. Categorize and describe spatial analysis functions
8. Demonstrate spatial analysis operations using sample data sets and GIS software
9. Describe and demonstrate applications of GIS
10. Implement GIS models to solve engineering problems using available software

Student outcomes addressed by course:
Outcome 1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Outcome 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Outcome 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
List of topics covered:

• Basics of GIS
  Components of a GIS
  Geospatial Data
  GIS operations

• Coordinate Systems
  Map projections
  Projected and Predefined Coordinated systems
  On-the-Fly Projections

• Vector Data Model
  Representation of simple features
  Topology
  Representation of composite features
  Geodatabase

• Raster Data Model
  Elements of the Raster Data Model
  Types of Raster Data
  Data structure, data conversion and integration
  Integration of raster and vector data

• Data Exploration
  Remotely sensed data
  Descriptive Statistics
  Attribute and spatial data query

• Raster Data Analysis
  Local and neighborhood operations
  Zonal operations

• Vector Data Analysis
  Buffering and overlay
  Pattern Analysis

• Hydrological Modeling
  ArcSWAT, HEC-GEOHMS and other suitable models