ESM 263 - Geographic Information Systems - Spring 2014

ESM 263 is a one-quarter introduction to geographic information systems (GIS). The course is intended for MESM students who need to acquire a working knowledge of GIS theory and practice in a single quarter.

**Instructor:** James Frew (office hours by appointment)
- NB: I often leave the door closed when I’m in my office. It’s OK to knock!

**TAs:**
- Ty Brandt (office hours Fri 09:00-12:00 in the GIS lab)
- Eric Fournier (office hours Fri 13:00-16:00 in the GIS lab)

**Labs** (all in Bren Hall 3035; attend only the lab you are enrolled in):
1. Mon/Wed 09:00-11:00 (code: 20487)
2. Mon/Wed 14:30-16:30 (code: 20495)

**Textbooks:**
  - NOTE: be sure to get the fourth edition.
  - NOTE: Be sure to get the third edition.

**More info:**
- Grading criteria
- ArcGIS background
- Windows & ArcGIS setup procedures

**Assignments:**
- Assignment 1: Cartography
- Assignment 2: Sea Level Rise in Santa Barbara
- Assignment 3: Site suitability analysis for wind power subsidies
March 31 - April 6

Week 1: Introduction to GIS & cartography

- **Lecture**
  - slides: Geographic Information Systems: Introduction

- **Reading**
  - textbook: Bolstad: ch 1: An Introduction to GIS
  - article: Geographic information science and systems for environmental management

- **Lab**
  - notes
    - Windows file system
    - Windows setup
    - ArcGIS setup, part 1
    - ArcGIS setup, part 2
  - textbook: Law
    - ch 3a: Displaying map data & 3b: Navigating a map
    - ch 10: Making maps for presentation

April 7 - April 13

Week 2: Coordinate systems and map projections

- **Lecture**
  - slides: Coordinate Systems and Map Projections
  - data: projections

- **Reading**
  - textbook: Bolstad: ch 3: Geodesy, Datums, Map Projections, and Coordinate Systems
  - video: "Are you saying the map is wrong?"
  - ArcGIS help
    - What are map projections?
    - What is geocoding?
  - reference
    - Understanding Map Projections
    - An Album of Map Projections

- **Lab**
  - slides: Cartography Basics
  - notes
    - Using ColorBrewer with ArcMap 10
    - Classifying numeric data that includes a "No Data" code

April 14 - April 20
Week 3: Vector data

- **Lecture**
  - slides: Vector Data
  - data: vector formats

- **Reading**
  - textbooks
    - Bolstad
      - ch 2: Data Models
      - ch 9: Basic Spatial Analysis
    - Law
      - ch 15: Querying data
      - ch 17: Selecting features by location

- **Lab**
  - notes: spatial analysis

*(Frew gone Wed 16 Apr)*

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April 21 - April 27

Week 4: Attribute data

- **Lecture**
  - slides: Attribute Tables and Tabular Data
  - example:
    - data: USGS BGN State and Topical Gazetteer
    - Download Files
    - ArcGIS help
      - Adding a Microsoft Excel table to ArcMap
      - Adding an ASCII or text file table
      - Schema.ini file format
      - Adding x,y coordinate data as a layer

- **Reading**
  - textbooks
    - Bolstad: ch 8: Attribute Data and Tables
    - Law
      - ch 16: Joining and relating data
      - ch 18c: Exporting data
      - ch 3: Relational databases

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April 28 - May 4

Week 5: Raster data

- **Lecture**
  - slides: Raster Data
  - data: raster formats
  - data: raster operations demos

- **Reading**
textbooks
- Bolstad: ch 10: Topics in Raster Analysis
- Law
  - ch 7d: Symbolizing rasters
  - ch 8: Classifying features
  - ch 18d: Running tools in a model
- ArcGIS Help 10.1: ModelBuilder
  - from What is ModelBuilder?
  - through Tutorial: Executing tools in ModelBuilder

Lab
- notes
  - ArcGIS setup, part 3
  - using Spatial Analyst and Model Builder with raster data
    - data: Lab 5
  - self-study: ArcGIS Spatial Analyst tutorial
    - data: Stowe.gdb

SURVEY: mid-course evaluation

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May 5 - May 11

Week 6: GIS models

- Lecture
  - slides: GIS Models (with a side of ArcCatalog)

- Reading
  - textbook: Bolstad: ch 13: Spatial Models and Modeling
  - book chapters
      - ch 3: Introduction to Multicriteria Decision Analysis
      - ch 35: Multi-criteria evaluation and GIS
      - ch 1: How to Make a Decision

- Lab
  - notes
    - ArcGIS environment settings: precedence and persistence
    - ModelBuilder notes
    - HW3 tools
    - Finding and ranking contiguous areas in a raster

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May 12 - May 18
Week 7: Terrain and watershed analysis

- **Lecture**
  - slides: Terrain and Watershed Analysis
  - demos:
    - terrain data
    - watershed modeling
- **Reading**
  - textbook: Bolstad: ch 11: Terrain Analysis
    - ch 9: Representation of terrain
  - article: Rapid calculation of terrain parameters for radiation modeling from digital elevation data
- **Lab**
  - (work day for assignment 3)

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**May 19 - May 25**

Week 8: GIS data sources and data capture

- **Lecture**
  - slides
    - GIS Data: Sources and Capture
    - GIS Data Online
- **Reading**
  - textbook: Bolstad
    - ch 4: Maps, Data Entry, Editing, and Output
    - ch 5: Global Navigation Satellite Systems and Coordinate Surveying
    - ch 6: Aerial and Satellite Images
    - ch 7: Digital Data
  - book chapter: Data Source Handbook
    - Locations
- **Lab**
  - notes: NDVI and MCA
  - data: Lab 8

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**May 26 - June 1**

Week 9: Interpolation and uncertainty

- **Lecture**
  - slides: Interpolation and Uncertainty
  - example: Snow's cholera map
    - data
    - source
    - UCLA Dept of Epidemiology's John Snow website
    - the Broad Street pump
- **Readings**
  - textbook: Bolstad
- ch 12: Spatial Estimation: Interpolation, Prediction, and Core Area Delineation
- ch 14: Data Standards and Quality
  - ch 34: Spatial interpolation
  - ch 13: Models of uncertainty in spatial data

Lab
  - (work day for assignment 4)

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**June 2 - June 8**

**Week 10: bonus topics (TBD)**

Lab
  - (work day for assignment 4)