Course Number and Title: GIS 110 Spatial Data Analysis/Modeling

Campus Location:
Stanton

Effective Date:
2022-51

Prerequisite:
ENG 101, (MAT 180 or MAT 183 or higher), GIS 101, SSC 100 or concurrent

Co-Requisites:
None

Course Credits and Hours:
3.00 credits
2.00 lecture hours/week
3.00 lab hours/week

Course Description:
This course introduces students to problem solving and decision- making using geospatial analysis techniques applicable to a range of disciplines. It focuses on both vector and raster data analysis and applicable workflows and includes introductory scripting to improve workflow.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
This course requires the use of a windows computer capable of running ESRI ArcMap and ESRI ArcGIS Pro Software. Please review ESRI's website to learn more about the system requirements for ESRI ArcMap and ESRI ArcGIS Pro

Schedule Type:
Classroom Course
Hybrid Course
Online Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Employ an approach appropriate to solving a geospatial problem. (CCC 2, 4; PGC GIS 1, 3, 4, 5, 6, 7, 8; EET 1, 3)
2. Prepare and organize data for use in analysis. (CCC 2, 4, 5; PGC GIS 1, 4, 5, 7; EET 1, 3)
3. Analyze vector data. (CCC 2, 4, 6; PGC GIS 1, 2, 4, 5, 7, 8; EET 1, 3)
4. Analyze raster data. (CCC 2, 4, 6; PGC GIS 1, 2, 4, 5, 7, 8; EET 1, 3)
5. Illustrate results of analysis using appropriate terminology and visualizations. (CCC 1, 3, 4, 6; PGC GIS 1, 2, 7; EET 1, 3, 4)
6. Demonstrate professional and ethical conduct as expected in industry. (CCC 3, 4, 5; PGC GIS 2, 7, 8; EET 1, 3, 4, 6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Employ an approach appropriate to solving a geospatial problem.
    1. Identify the characteristics and the importance of statistical relationships in spatial data.
    2. Define the elements in a geospatial problem.
    3. Identify techniques for exploratory spatial data analysis.
    4. Define geoprocessing.
    5. Identify criteria for selection of geoprocessing operations.
    6. Describe the basic elements of geoprocessing models.
    7. Discuss methods of customizing geoprocessing functions, including but not limited to ArcGIS ModelBuilder, Python scripting, and ArcObjects.
    8. Discuss how scripting can improve workflow.
    9. Explain various programming languages available to create and/or customize geoprocessing applications.
    10. Distinguish data models from process models.
    11. Employ application criteria for selection of geoprocessing operations.
    12. Produce a workflow with outlined steps, procedures, and data necessary to solve a geospatial problem.
    13. Create geoprocessing models using a graphical scripting tool to build a geoprocessing workflow.
2. Prepare and organize data for use in analysis.
    1. Identify vector and raster data and their grouping as spatial objects and spatial fields.
    2. Identify and maintain principal metadata standards.
    3. Discuss object models and topology using geodatabases.
    4. Discuss common problems in the statistical analysis of geographic information, including data integrity, the effects of scale, autocorrelation, the modifiable areal unit problem, and edge effects.
    5. Produce new information from existing data through geoprocessing and spatial data model operations.
3. Analyze vector data.
    1. Describe the applications and methods for overlay and buffering.
    2. Discuss pattern analysis.
    3. Employ a buffering and overlay.
    4. Apply measuring tools to determine distances between points and lines.
    5. Compute general and local statistics.
    6. Demonstrate the use of networks in data modeling and analysis.
    7. Produce point pattern analysis.
    8. Employ interpolation methods, and create contours.
    9. Utilize operations common to vector data analysis.
4. Analyze raster data.
    1. Identify applications and different operations for raster data analysis.
    2. Describe neighborhood and zonal operations.
    3. Describe physical and distance measure operations.
    4. Describe raster data management and extraction.
    5. Compare and contrast raster-based and vector-based analysis.
    6. Utilize operations common to raster data analysis.
    7. Produce surface visualization and analysis.
    8. Apply Boolean map overlay.
    9. Apply physical and distance measure operations.
5. Illustrate results of analysis using appropriate terminology and visualizations.
    1. Identify proper symbology, color, and classification of map elements.
    2. Discuss options in map presentation media and methods.
    3. Apply the concepts of visual hierarchy and color theory to create a visually appealing map for print and web.
    4. Demonstrate the use of map labeling variables (type size, weight, and font) to label map features effectively for print and web.
    5. Employ cartographic design principles, such as proper map projections, to produce a meaningful map in print and web.
    6. Appraise the cartographic design principles, such as design, layout, functionality, and symbology of a peer's map in print and/or web.
6. Demonstrate professional and ethical conduct as expected in industry.
    1. Identify the need for self-discipline and time management in technical industries.
    2. Communicate and function effectively as a member of a team.
    3. Apply professional and ethical responsibilities under the GIS Certification Institute's Code of Ethics and Rules of Conduct.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

90	–	100	=	A
80	–	89	=	B
70	–	79	=	C
0	–	69	=	F

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:
Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Final Project Proposal (Summative)	10%
Final Project Process Summary/Workflow Document (Summative)	10%
Final Project Map (Summative)	10%
Final Project Presentation (Summative)	10%
Final Project Presentation Peer Critique (Summative)	10%
Assignments - GIS Labs, Homework, In-Class Activities, Discussion Boards (Formative)	50%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):
GISAASGIS:

1. Apply knowledge, techniques, and skills of geography and geospatial technologies such as geographic information systems (GIS), Global Navigation Satellite System (GNSS), and remote sensing (RS).
2. Employ cartographic design principles to develop effective visual representations of geospatial data, including maps, graphs, and diagrams.
3. Design and implement GIS systems using common geospatial software and hardware to acquire, store, manage, analyze, and visualize spatial data for a variety of disciplines.
4. Utilize geospatial techniques and common analytical methods to solve problems.
5. Evaluate and employ effective data management and database design techniques.
6. Apply fundamental concepts of programming, application development, geospatial information technology, and related technologies.
7. Integrate a commitment to address professional and ethical responsibilities, including a respect for accuracy standards and diversity.
8. Recognize the need for and an ability to engage in self-directed continuing professional development.

ENVAASEET:

1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering activities, including but not limited to site development, hydraulics and hydrology, grading, water and wastewater treatment, pollution prevention and treatment, and sustainable design.
2. Conduct standardized field and laboratory testing.
3. Demonstrate a commitment to quality, timeliness, professional development, and continuous improvement.
4. Use graphic techniques and productivity software to produce technical documents.
5. Explain the major aspects of the normal ecology of the planet and risks associated with polluting the environment.
6. Apply current federal, state, and local environmental and safety regulations and industry best management practices.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.