SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE: Advanced Analysis in GIS

CODE NO. :   GIS417   **SEMESTER:**   W2005

PROGRAM: Geographic Information Systems Applications Specialist

AUTHOR: Kevin Weaver

DATE: Dec. 2004   **PREVIOUS OUTLINE DATED:**   Jan. 2004

APPROVED:

_____   _____
                DEAN   **DATE**

TOTAL CREDITS: 4

PREREQUISITE(S):   GIS415 – Acquiring and Building Spatial Data using ARC/INFO GIS

HOURS/WEEK: 5

Advanced Analysis in GIS   GIS417

I.   COURSE DESCRIPTION:

GIS software and applications develop rapidly. The most recent software (ArcGIS 9.0) will be reviewed with attention given to the changed GIS environment. Specifically, the following topics will be covered: the ArcGIS environment, Geodatabases, three-dimensional analysis, raster GIS analysis (including surface, spatial interpolation and proximity analyses), network analysis and geocoding.

II.   LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1.   Use ArcMap, ArcCatalog and ArcToolbox (ArcGIS)

       Potential Elements of the Performance:
       - Create map layouts using ArcMap
       - Edit and input data using ArcMap
       - Perform data conversion, projection and analysis operations using ArcToolbox
       - Perform GIS file management using ArcCatalog

2.   Develop GIS applications using a Geodatabase

       Potential Elements of the Performance:
       - Describe and design a Geodatabase
       - Construct and edit a Geodatabase using ArcCatalog
       - Explore the relational database behind a Geodatabase
       - Understand the geometry inherent in a Geodatabase
       - Import and export other GIS formats to a Geodatabase

3.   Perform raster GIS analysis

       Potential Elements of the Performance:
       - Use the ArcGIS Spatial Analyst extension
       - Describe the sources, formats, data types and structures of raster GIS data
       - Describe potential raster GIS analyses
       - Use Map Algebra to perform complex spatial analyses
       - Ability to use Model Builder for spatial modeling / analysis
       - Working with GRIDs within ArcInfo Workstation
       - Exposure to the geostatistical analyst extension

4.   Perform 3-Dimensional Analysis

Potential Elements of the Performance:
- Use the ArcGIS 3-D Analyst extension
- Describe TIN and Lattice data structures, data sources and surface concepts
- Perform slope, aspect, analytical hillshading, visibility and surface profiling analyses
- Perform 3-D surface area and volumetric analyses
- Work with TINs using ArcInfo Workstation

5. Perform Network Analysis and Geocoding / Address Matching

Potential Elements of the Performance:
- Use the ArcGIS Network Analyst extension
- Describe network analysis theory
- Perform network analysis (e.g., fastest route, service areas)
- Describe and perform Geocoding and Address Matching analyses

III.   TOPICS:

1.   ArcGIS – ArcMap, ArcCatalog and Toolbox

- ArcCatalog - creating a Geodatabase, GIS file management
- ArcMap – data editing, digitizing, topology and map production
- ArcToolbox – data conversion, projections and spatial analysis

2.   Geodatabases

- Geodatabase theory
- Designing a Geodatabase
- Geodatabase geometry and topology
- Relational databases and geodatabases
- Coverage, shapefile and projection import and export

3.   Raster GIS Analysis

- Raster GIS theory
- Map algebra and spatial modeling
- Topographic analysis
- Density rasters
- Model Builder
- Surface hydrology tools (flow direction and accumulation, basin and stream delineation)
- Creating a raster, importing and exporting rasters
- ArcGIS Spatial Analyst and Geostatistical analyst extensions

- Exposure to Arc/Info Workstation's GRID module

4. 3-Dimensional Analysis

- Triangular irregular network (TIN) theory
- ArcGIS 3-D analyst extension
- Creating a TIN, importing and exporting elevation data
- Elevation and viewshed modeling
- Surface profiling
- Creating lake bathymetry surfaces
- ArcInfo Workstation and TINs

5. Network analysis and Geocoding / Address Matching

- ArcGIS Network Analyst Extension
- Network analysis Perform network analysis (e.g., fastest route, service areas)
- Geocoding / Address Matching

IV. SUGGESTED RESOURCES/TEXTS/MATERIALS:

Zeiler, M. 1999. Modeling our World, The ESRI Guide to Geodatabase Design. ESRI Press.

V. EVALUATION PROCESS/GRADING SYSTEM:

Lab 1 - Using ArcGIS	15%
Lab 2 - Geodatabases	15%
Lab 3 - Spatial and 3D Analysis	15%
Lab 4 - Network Analysis and Geocoding	15%
Theory and Practical Test 1 - Using ArcGIS and Geodatabases	20%
Theory and Practical Test 2 - Network, Raster and 3D Analysis	<u>20%</u>
Total	100%

The following semester grades will be assigned to students in post-secondary courses:

Grade	Definition	Grade Point Equivalent
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00

D	50 – 59%	1.00
F (Fail)	49% and below	0.00

CR (Credit)	Credit for diploma requirements has been awarded.
S	Satisfactory achievement in field /clinical placement or non-graded subject area.
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.
NR	Grade not reported to Registrar's office.
W	Student has withdrawn from the course without academic penalty.

VI.   SPECIAL NOTES:

Special Needs:
If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your professor and/or the Special Needs office. Visit Room E1101 or call Extension 493 so that support services can be arranged for you.

Retention of Course Outlines:
It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:
Students should refer to the definition of "academic dishonesty" in *Student Rights and Responsibilities*. Students who engage in "academic dishonesty" will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course Outline Amendments:
The professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

VII.   PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII.   DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.