

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

COURSE OUTLINE

COURSE TITLE: Advanced Analysis in GIS

CODE NO. : GIS4170 **SEMESTER:** W2003

PROGRAM: Geographic Information Systems Applications Specialist

AUTHOR: Kevin Weaver

DATE: Jan. 2003 **PREVIOUS OUTLINE DATED:** Dec. 2001

APPROVED:

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|--|-------------|-------------|
| | _____ | _____ |
| | DEAN | DATE |

TOTAL CREDITS: 4

PREREQUISITE(S): GIS4150 – Acquiring and Building Spatial Data using
ARC/INFO GIS

LENGTH OF COURSE: 5 hrs/wk x
13 wks **TOTAL CREDIT HOURS:** 65

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For additional information, please contact the Dean
School of Technology and Natural Resources
(705) 759-2554, Ext. 405

I. COURSE DESCRIPTION:

GIS software and applications develop rapidly. The most recent software (ArcGIS 8) will be reviewed with attention given to the changed GIS environment. Specifically, the following topics will be covered: the ArcGIS 8 environment, Geodatabases, three-dimensional analysis, raster GIS analysis (including surface, spatial interpolation and proximity analyses), geostatistical analysis, 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 Network Analysis and Geocoding / Address Matching

Potential Elements of the Performance:

- Use the ArcGIS Network Analyst extension
- Describe network analysis theory
- Describe and perform Geocoding and Address Matching analyses
- Create a Business Geographics ArcGIS project

4. Perform raster GIS analysis

Potential Elements of the Performance:

- Use the ArcGIS Spatial Analyst and Geostatistical analyst extensions
- Describe the sources, formats, data types and structures of raster GIS data
- Describe potential raster GIS analyses
- Understand and use color wrapping, shadesets and colormaps
- Use GRID Map Algebra to perform complex spatial analyses
- Perform command-line analyses within ArcWorkstation GRID

5. 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
- Perform command-line analyses within ArcWorkstation TIN

III. TOPICS:

1. ArcGIS – ArcMap, ArcCatalog and Toolbox (15 hours)

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

Assignment #1 – Using ArcGIS

2. Geodatabases (10 hours)

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

Assignment #2 – Geodatabases**Practical / Theory Test #1 – Using ArcGIS and Geodatabases**

3. Network analysis and Geocoding / Address Matching (15 hours)
 - ArcGIS Network Analyst Extension
 - Network analysis
 - Geocoding / Address Matching

Assignment #3 – Network Analysis and Geocoding

4. Raster GIS Analysis (15 hours)
 - Raster GIS theory
 - GRID map algebra, managing a GRID session, colour control
 - ArcGIS Spatial Analyst and Geostatistical analyst extensions
 - Surface hydrology tools (flow direction and accumulation, basin and stream delineation)
 - Creating a GRID, importing and exporting GRIDs
 - ArcWorkstation GRID

Assignment #4 – Raster GIS Analysis

5. 3-Dimensional Analysis (10 hours)
 - Triangular irregular network (TIN) theory
 - ArcGIS 3-D analyst extension
 - Creating a TIN, importing and exporting elevation data
 - Elevation and watershed modeling
 - Surface profiling
 - ArcWorkstation TIN

Assignment #5 – 3-Dimensional GIS Analysis**Practical / Theory Test #2 – Network, Raster and 3-Dimensional Analysis**

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IV. SUGGESTED RESOURCES/TEXTS/MATERIALS:

ESRI. 1999. Modelling Our World, The ESRI Guide to Geodatabase Design by Michael Zeiler.

V. EVALUATION PROCESS/GRADING SYSTEM:**Grading System:**

| | |
|----------------------------|------------|
| Assignments (5) | 60% |
| Practical Theory Tests (2) | <u>40%</u> |
| Total | 100% |

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

| <u>Grade</u> | <u>Definition</u> | <u>Grade Point Equivalent</u> |
|--------------|---|-------------------------------|
| A+ | 90 – 100% | 4.00 |
| A | 80 – 89% | 3.75 |
| B | 70 – 79% | 3.00 |
| C | 60 – 69% | 2.00 |
| R (Repeat) | 59% or below | 0.00 |
| CR (Credit) | Credit for diploma requirements has been awarded. | |
| S | Satisfactory achievement in field placement or non-graded subject areas. | |
| X | A temporary grade. This is used in limited situations with extenuating circumstances giving a student additional time to complete the requirements for a course (see <i>Policies & Procedures Manual - Deferred Grades and Make-up</i>). | |
| NR | Grade not reported to Registrar's office. This is used to facilitate transcript preparation when, for extenuating circumstances, it has been impossible for the faculty member to report grades. | |

Course Name

Code No.**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 instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493, 717, or 491 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 post-secondary institutions.

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 instructor. Credit for prior learning will be given upon successful completion of the following:

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.