

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



Sault College

COURSE OUTLINE

COURSE TITLE: Introduction to GIS

CODE NO. : GIS419

SEMESTER: F2005

PROGRAM: Geographic Information Systems Applications Specialist

AUTHOR: Kevin Weaver

DATE: June, 2005 **PREVIOUS OUTLINE DATED:** May, 2004

APPROVED:

DEAN

DATE

TOTAL CREDITS: 3

PREREQUISITE(S): None

HOURS/WEEK: 8 hours x 8 weeks

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For additional information, please contact C. Kirkwood, Dean

School of Technology, Skilled Trades & Natural Resources

(705) 759-2554, Ext. 688

I. COURSE DESCRIPTION:

Geographic Information Systems (GIS) provide decision-making data and maps in the natural resources, planning and urban services fields. Through lectures, student seminars/projects and hands-on experience, the student will gain an understanding of GIS theory and practical working ability in the ArcView 3.3 and ArcGIS 9.x environments. Theory topics to be covered include: GIS fundamentals, cartography, projection, data models, programming, data quality issues, and GIS data analysis and modeling. Practical GIS topics include: file management, querying spatial data, working with tabular data, spatial analysis, working with projected data and creating professional quality maps.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Describe current and historical Geographic Information Systems (GIS) and their components

Potential Elements of the Performance:

- Describe current GIS, their uses and components
- Describe the history of cartography and GIS
- Explain the generalized GIS process
- Understand various applications of GIS

2. Describe the fundamentals of cartography

Potential Elements of the Performance:

- Describe the elements of good map design
- Explain the use of colour and element positioning in cartography
- Outline the stages of map production

3. Create and modify ArcView projects

Potential Elements of the Performance:

- Work with ArcView projects
- Modify views and tables and create layouts
- Save data as shapefiles
- Practice good file management
- Query data to answer questions

4. Describe georeferencing and work with georeferenced data

Potential Elements of the Performance:

- Describe the use of different Earth models (datums)
- Understand coordinate systems and map projections as they apply to GIS
- Apply and change projections using ArcView

5. Describe GIS data models

Potential Elements of the Performance:

- Describe how features are organized and displayed in a GIS
- Explain raster, vector and object-oriented data models
- Describe the role and types of relational databases used in GIS
- Describe the role of programming in GIS

6. Describe data analysis methods in GIS

Potential Elements of the Performance:

- Describe the various levels of GIS analysis
- Explain the integration of attribute data, map overlays, queries, buffers, intersections and unions
- Perform spatial analysis of GIS data

7. Produce high-quality maps, charts, and reports

Potential Elements of the Performance:

- Add attributes and external databases to ArcView tables
- Create charts and reports
- Add graticules, scales, legends and north arrows to layouts
- Work with different projections
- Work with external GIS, GPS and remote sensing data

8. Explain methods of GIS data input, and issues regarding data quality and errors

Potential Elements of the Performance:

- Describe the collection, input and output of GIS data
- Explain the importance of precision and accuracy in a GIS
- Describe sources of positional and data accuracy error in a GIS
- Describe spatial and temporal variations in earth surface features and the nature of boundaries
- Understand and apply proper shapefile management in ArcView
- Ability to digitize Earth surface features in ArcView
- Understand the applications of event themes

9. Explore ArcView extensions

Potential Elements of the Performance:

- Describe the role of classification and interpolation
- Understand and apply raster analysis
- Use the ArcView 3D Analyst and Spatial Analyst extensions to perform GIS operations
- Understand how to query rasters and perform map algebra
- Perform 3D elevation modeling in ArcView

10. Explore ArcGIS

Potential Elements of the Performance:

- Describe the applications that comprise ArcGIS
- Ability to display and query spatial data
- Understand the major differences between the two environments

III. TOPICS:

1. History, Components and Capabilities of Geographic Information Systems
 - History of GIS development and current GIS software
 - GIS system components, capabilities and trends
 - The GIS process
 - Applications of GIS analyses
2. Cartography
 - Map purpose, design, concepts and components
 - Cartographic use of shapes and colours
 - The map production process
3. ArcView Projects
 - Projects, views, tables and layouts
 - Shapefiles
 - ArcView file management
 - Querying data
4. Georeferencing
 - Datums
 - Coordinate systems
 - Map projections
 - Changing map projections in ArcView

5. GIS Data Models
 - Vector, raster, DEM, TIN, and object-oriented GIS models
 - Topology
 - Data Storage
 - Relational databases
 - Attribute tables
 - GIS programming
6. Data Analysis
 - Levels of analysis
 - Integration of attribute data
 - Map overlays and queries
 - Buffering
 - Spatial analysis in ArcView
7. Producing Maps, Tables and Charts
 - Presenting analysis results
 - Creating charts and reports
 - Adding graticules, scales, legends and north arrows to layouts
8. Data Input, Quality and Errors
 - Collection and input of GIS data
 - Precision and accuracy
 - Data quality issues / sources and types of GIS errors
 - Natural variations in Earth-surface features (boundaries)
 - Changes with time in Earth-surface features (temporal changes)
 - Managing Shapefiles
 - Digitizing in ArcView
 - Event themes
9. ArcView Extensions
 - Interpolation and classification
 - Raster GIS analysis
 - Introduction to Spatial Analyst
 - Querying rasters
 - Map Algebra
 - Introduction to 3D Analyst
 - 3D elevation modeling in ArcView
10. ArcGIS
 - Navigate through the applications
 - Display and query data
 - Look at differences between ArcGIS and ArcView

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Clarke, K.C. 2003. Getting Started with Geographic Information Systems, Fourth Edition. Prentice Hall.

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

Assignments (3)	35%
Mid-Term Test	20%
Report	15%
Final Exam	<u>30%</u>
	100%

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
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 instructor and/or the Special Needs office. Visit Room E1204 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.