

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



Sault College

**COURSE OUTLINE**

**COURSE TITLE:** Introduction to Remote Sensing (ENVI Software)

**CODE NO. :** GIS 405                      **SEMESTER:** F2001

**PROGRAM:** Geographic Information Systems Applications Specialist

**AUTHOR:** Dennis Paradine

**DATE:** June, 2001      **PREVIOUS OUTLINE DATED:** June 1999

**APPROVED:**

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<b>DEAN</b>	<b>DATE</b>

**TOTAL CREDITS:** 4

**PREREQUISITE(S):**

**LENGTH OF COURSE:** 4 hrs/wk x  
10 wks                      **TOTAL CREDIT HOURS:** 60

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*For additional information, please contact Kitty DeRosario, Dean*  
*School of Engineering, Technology and Trades*  
*(705) 759-2554, Ext. 642*

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Course Name

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Code No.

**I. COURSE DESCRIPTION:**

This course introduces the student to remote sensing using ENVI (Environment for Visualizing Images) software. It is designed to provide the student with a sound understanding of the fundamentals of remote sensing and a practical working ability within the ENVI software environment. Topics to be covered include: image enhancement; filtering; projections; vector overlay; multispectral classification; data import and export and GIS integration.

**II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

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

1. Visual interpretation of remote sensing imagery (6 hours)

Potential Elements of the Performance:

- Explain the appearance of features on remote sensing images
- Locate Earth-surface features on different band combinations
- Explain the importance of the colour mixing process in remote sensing image analysis

2. Perform interactive analyses within ENVI

Potential Elements of the Performance:

- Work within the ENVI environment (windows, displays, menus)
- Load and save imagery
- View different band combinations
- Locate and understand georeferencing information
- Zoom in and out of imagery and link image windows

3. Filter and enhance remotely sensed imagery

Potential Elements of the Performance:

- Apply filters to remote sensing imagery
- Enhance remote sensing imagery

4. Review the statistical nature of remotely sensed imagery

Potential Elements of the Performance:

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Course Name

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Code No.

- Perform and analyze data views, image histograms, scatterplots and low-level classifications
- Apply band mathematics and image transformations (band ratios, vegetation indices and principle component analyses) to imagery

5. Perform image classifications

Potential Elements of the Performance:

- Collect regions of interest as classification training data
- Complete a supervised classification
- Complete an unsupervised classification

6. Assess the accuracy of image classifications

Potential Elements of the Performance:

- Collect ground reference data for accuracy assessment
- Create and explain contingency tables, kappa statistics and planimetric accuracy tables

**III. TOPICS:**

1. Visual interpretation of remote sensing imagery (6 hours)
  - The rationale for the appearance and location of features on remote sensing images
  - Interpreting different band combinations
  - Colour-mixing and remote sensing
2. Introduction to ENVI (8 hours)
  - ENVI file formats
  - The ENVI environment (windows, displays, menus)
  - Loading, saving and creating sub-sets of imagery
  - Zooming in and out of imagery
  - Linking image windows
  - Image georeferencing data
3. Filtering and Enhancing Remotely-Sensed Images (4 hours)
  - Filtering imagery
  - Enhancing imagery

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Course Name

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Code No.

### **Laboratory #1. Viewing and presenting remote sensing imagery**

#### **Practical Test #1. Preliminary functions within ENVI – Units 1 & 2**

4. Performing Statistical Analysis on Remote Sensing Imagery (8 hours)
  - Image histograms
  - Scatterplots
  - Low-level classifications
  - Band mathematics
  - Image transformations

### **Laboratory #2. Image transformations and statistics**

5. Performing Image Classifications (12 hours)
  - Regions of interest
  - Supervised classification
  - Unsupervised classification

### **Laboratory #3. Image classification**

6. Accuracy Assessment (6 hours)
  - Collecting accuracy assessment ground reference data
  - Contingency tables, Kappa statistics and planimetric accuracy

### **Laboratory #4 – Presenting classification results**

#### **Practical and Theory Test #2 – Topics covered during the whole term**

Course Name

Code No.

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

Required:

Lillesand, L.M. and R.W. Kiefer. 1999. Remote Sensing and Image Interpretation (fourth edition). John Wiley and Sons.

Optional:

ENVI Version 3.0 User's Guide. Better Solutions Consulting, December, 1997 Edition.

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

Laboratories (4)	60%
Practical Tests (2)	<u>40%</u>
	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 &amp; 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	

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Course Name

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Code No.

circumstances, it has been impossible for the faculty member to report grades.

**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.