SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

Sault College

COURSE OUTLINE

COURSE TITLE: Image Analysis using PCI Geomatica

CODE NO. :   GIS410   **SEMESTER:**   W2008

PROGRAM: Geographic Information Systems Applications Specialist

AUTHOR: Heath Bishop

DATE: Jan. 2008   **PREVIOUS OUTLINE DATED:**   Jan. 2007

APPROVED:

_____   _____
                        Chair   **DATE**

TOTAL CREDITS: 4

PREREQUISITE(S):   GIS420 – Introduction to Remote Sensing

HOURS/WEEK: 4

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I.   COURSE DESCRIPTION:

PCI Geomatica Prime is an advanced remote sensing software package. Using Geomatica Prime, students will apply principles learned in previous courses to create GIS data products from remote sensing data. Emphasis will be placed on understanding this software, atmospheric and radiometric correction, hyperspectral, high resolution, multi-scale and radar image analysis, georeferencing and mosaicing aerial photographs and ordering satellite imagery.

II.   LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1.   Georeference and mosaic aerial photographs

     Potential Elements of the Performance:
     ▪ Describe georeferencing, mosaicing and orthorectification theory
     ▪ Scan, transfer, georeference and mosaic aerial photographs
     ▪ Use OrthoEngine

2.   Understand photogrammetric analysis

     Potential Elements of the Performance:
     ▪ Describe photogrammetric procedures and perform analyses
     ▪ Describe available photogrammetric software and hardware
     ▪ Perform DEM extraction from stereo images

3.   Order aerial photographs, satellite imagery and maps

     Potential Elements of the Performance:
     ▪ Understand the process for finding and ordering aerial photographs, satellite imagery and maps
     ▪ Determine appropriate images and maps for a given application

4.   Work within the PCI Geomatica environment

     Potential Elements of the Performance:
     ▪ Perform image analysis operations in PCI Geomatica Focus
     ▪ Atmospherically and radiometrically correct imagery
     ▪ Exchange image and vector data between remote sensing and GIS software packages
     ▪ Create a cartographically correct image-based map composition
     ▪ Use the EASI, Modeler, and Algorithm Librarian interfaces

5.   Perform multi-scale, multi-temporal, and high resolution image analysis

Potential Elements of the Performance:
- Explain multi-scale image analysis and fusion theory
- Explain multi-temporal image analysis theory
- Perform a multi-scale or multi-temporal image merge and classification
- Work with high resolution satellite imagery and large scale photography

6.   Perform hyperspectral image analysis

Potential Elements of the Performance:
- Describe hyperspectral image analysis theory
- Work with hyperspectral imagery
- Perform a hyperspectral image classification

7.   Perform radar image analysis

Potential Elements of the Performance:
- Describe radar image analysis theory
- Perform radar image analysis, including textural measures and classifications

III.   TOPICS:

1.   Georeferencing and Mosaicing Aerial Photographs

- Georeferencing and mosaicing aerial photographs and satellite imagery
- Orthorectification theory
- Orthoengine

2.   Photogrammetry

- Photogrammetry theory, hardware, software and techniques
- Interpreting an stereo aerial photographs
- DEM extraction from stereo images

3.   Order satellite imagery, aerial photographs and maps

- Determine the cost and availability of, and order satellite imagery, aerial photographs and maps

4.   Working in the PCI Geomatica environment

- The PCI Geomatica Focus environment
- Image analysis functions
- Atmospheric, and radiometric correction theory and practicum
- Creating a map composition in Geomatica Focus
- EASI, Modeler and the Algorithm Librarian

5.   Multi-Scale, Multi-Temporal, and High Resolution Image Analysis

- Multi-scale image analysis theory and practicum
- Multi-temporal image analysis theory and practicum
- High resolution imagery

6.   Hyperspectral Image Analysis

- Hyperspectral image analysis theory and classification
- Spectroradiometers and collecting spectral curves
- Spectral Libraries
- Airborne lasers

7.   Radar image analysis

- Radar image analysis theory
- Understanding and processing radar imagery

IV.   REQUIRED RESOURCES/TEXTS/MATERIALS:

Lillesand, L.M., R.W. Kiefer, and J.W. Chipman. 2004. Remote Sensing and Image Interpretation (fifth edition). John Wiley and Sons Inc.

V.   EVALUATION PROCESS/GRADING SYSTEM:

Lab 1 Georeferencing, Mosaicing, and Photogrammetry	20%
Lab 2 Map and Image Ordering / Business Proposal	10%
Lab 3 Change Detection	15%
Lab 4 Hyperspectral and High Spatial Resolution Image Analysis	15%
Lab 5 Radar Image Analysis	10%
Practical and Theory Test	30%
Total	100%

Note: Students much achieve a mark of at least 50% on the Test component of the course in order to pass the course.

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 2493 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.

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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.