



RED RIVER COLLEGE
OF APPLIED ARTS, SCIENCE AND TECHNOLOGY

Geographic Information Systems Technology

Curriculum Validation – Program Renewal

Final Report

June 2004

Submitted to:

Robert Friesen, Chair, Civil/CAD Technology

Submitted by:

Robert Zakaluk, Curriculum Validation Facilitator, Civil/CAD Technology

Robert Richard, Curriculum Consultant, Program & Curriculum Development

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Representatives from the community:

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The Geographic Information Systems Technology Advisory Committee:

Mark Brooker	Atlis Geomatics
Dr. Ed. Cloutis	Dept. of Geography, U of W
Rob Gerry	Manitoba Hydro
Roy Dixon	Manitoba Natural Resources
Henry Dyck	Assoc. of MB Land Surveyors, MTS Communications
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The Geographic Information Systems Technology faculty:

Gaylen Eaton	Instructor
Drew Evans	Instructor
Bruce Goulsbra	Instructor
Mark Shymanski	Instructor
Robert Zakaluk	Instructor

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Geographic Information Systems Technology

Curriculum Validation - Program Renewal Final Report

Introduction:

The Curriculum Validation – Program Renewal for the Geographic Information Systems Technology program was carried out between October 2003 and March 2004. The purpose of the Curriculum Validation – Program Renewal process was to assess the current status of the program and to develop a 5 – year plan for program renewal.

The Curriculum Validation – Program Renewal process utilizes a structured format that identifies the current status of industry expectations, a description and vision for a desired future state, and a plan for creating it. The process normally requires the completion of a series of seven activities that result in the deliverables outlined below.

However, to address concerns over a pattern of low student and graduate satisfaction rates that had been reported for the program, the process followed for the GIS program included an additional activity - a focus group discussion with graduates from the program to clarify their dissatisfaction and to solicit suggestions for improvement.

Curriculum Validation – Program Renewal Deliverables:

The Geographic Information Systems Technology program Curriculum Validation – Program Renewal process resulted in 8 interrelated deliverables:

1. Environmental Scan and Key Findings
2. Industry Occupational Analysis (DACUM)
3. Graduate Skills and Abilities Chart
4. Graduate Profile
5. Graduate Focus Group Discussion Summary
6. Program Renewal Plan
7. A 5-year Program Renewal Plan Timelines
8. Final Report

Outcomes from the Deliverables:

1. Environmental Scan and Key Findings (Appendix A)

The Environmental Scan provides the faculty and chair with information on similar programs offered in colleges across Canada. The Curriculum Validation Facilitator gathered information on similar programs and trends influencing their development and direction. The information was gathered through web sites, email and telephone contact. The following information was gathered:

- Name of institution, location, contact person
- Size of program
- Credential offered
- Program features
- Curriculum Model
- Curriculum Content
- Student Assessment
- Current and Coming Challenges
- Curriculum Renewal
- Partnerships
- Additional Information (Other and comments)

For the Geographic Information Systems Technology program Curriculum Validation – Program Renewal 8 programs were scanned. These included programs currently being delivered by:

British Columbia Institute of Technology (BCIT)

College of New Caledonia

Niagara College

Nova Scotia Community College

Red River College (RRC)

Sir Sandford Fleming College

Southern Institute of Applied Technology (SAIT)

Key findings from the Environmental Scan

Enrolment, retention, and attrition:

- Some academic programs require a GIS course or related work experience as part of the entrance requirement.

- Nova Scotia Community College requires an undergraduate degree as part of the entrance requirement.
- Student enrolment varied from 18 to 51.
- Sir Sandford Fleming has two intakes a year

Delivery:

- Programs varied in length from 30 to 36 weeks.
- Red River College has the longest program at 36 weeks.
- Two of the programs offer some courses using internet technology.
- BCIT and SAIT award degrees in GIS.

Technology:

Software tools used in the academic programs are from software developers with high market penetration (e.g. ESRI, ERDAS, or PCI).

Course Content / Curriculum:

Curriculum content is similar throughout all the programs scanned and requires that graduates demonstrate competency in computer programming, GIS, database, remote sensing and cartography.

Experiential Component:

All academic programs, with the exception of Nova Scotia Community College (NSCC) have an experiential component, requiring students to complete either a final capstone project or complete a co-op/internship placement. NSCC is currently reviewing implementation of a project component. NSCC does not have a co-op/internship placement due to a lack of industry in close proximity to the college. The College of New Caledonia's project course is based on a group assignment (no more than 5 students per group).

Student Assessment/Requirement for Graduation

In general, students are assessed using a variety of techniques including: written tests, practical tests, assignments, presentations, group work, reports, and/or an oral review by the instructor.

Completion of an experiential component is a requirement for graduation for 7 of the 8 programs that were scanned.

Additional Challenges/Opportunities:

The main challenge faced by colleges was keeping up with the rapid changes in GIS technology. The rapid changes to GIS technology require that the college programs:

1. maintain operating budgets that allow them to remain current with the technology used in industry, and
2. provide instructional staff with sufficient professional development opportunities to remain current with these new technologies.

Summary

There is an emerging trend to offer Applied Degrees at the college level. BCIT offers both an Advanced Diploma program and Bachelor of Technology degree program. SAIT transformed their Advanced Diploma program into an Applied Degree program.

The environmental scan has confirmed that RRC's Geographic Information Systems Technology program's curriculum content consisting of an experiential component and coursework either meets or exceeds what other colleges offer in similar programs across Canada.

2. Industry Occupational Analysis (DACUM) Chart (Appendix B)

The DACUM occupational analysis is a familiar component of the curriculum development process at Red River College. Based on regional needs, the DACUM provided the program with a description of the skills required for a GIS technology practitioner. Included in this process is the identification of emerging and retiring trends for this occupation.

The DACUM occupational analysis took place over two full days (September 24th and October 1st, 2003). A total of twelve people from government and industry participated in the DACUM occupational analysis. Participants were employed in a variety of areas that utilize GIS technology including forestry, geology, urban, national defense, hydro power generation, and national park management.

Participants were asked to identify the major competencies required by entry-level GIS technology practitioner. At the end of the two days, the resulting DACUM occupational analysis chart identified 12 general areas of competencies broken down into 127 skills and abilities.

The GIS technology occupational analysis identified several emerging and retiring trends.

Emerging Industry Trends:

- Open non-proprietary standards for software, metadata standards and data formats
- Dissemination of geographic data over web-based platforms
- Replacement of people with new software, methods and technologies
- Introduction of computerized, digital stereo plotters for 3 dimensional viewing and analysis
- Increased potential for GIS analysis resulting from higher adoption rate across a variety of non-resource based industries (e.g. business geographics)
- GIS technicians are now required to be programmers familiar with XML and other programming languages
- Increased demand for “near” real-time GIS applications
- Recognition of GIS as a decision support tool
- Sharing and changing copyrights on spatial data
- Movement from spatial analysis to enterprise GIS and database management

Retiring industry trends:

- Analog or "pencil and paper" analysis
- Digitizing tablets, drafting tables
- Use of analytical machine
- Simple digital line files without database information
- Paper mapping archiving and libraries
- Propriety database formats
- Two dimensional data storage

3. Faculty Graduate Skills and Abilities Chart (Appendix C)

The Faculty Graduate Skills and Abilities workshop was conducted to identify a composite graduate profile for all graduates of the GIS program. This workshop was held on November 26th, 2003 and involved all program faculty.

The outcome of this one-day workshop was a single, composite chart that outlines the graduate skills and abilities. The chart is an integration of: 1) the competencies identified in the DACUM occupational analysis chart, 2) the College Wide Learning Outcomes/Essential Employability Skills, and 3) any additional skills and abilities that are based on the faculty's assessment of what would constitute realistic learning expectations of students in the program. This chart served as the basis for the development of program learning outcomes.

4. Graduate Profile (Appendix D)

The Graduate Profile was developed by converting the skills and abilities identified in the Graduate Skills and Abilities Chart into learning outcomes expected of graduates in the program. The learning outcomes were written by the Curriculum Validation Facilitator and a Curriculum Consultant in consultation with the program faculty and the department Chair. This draft Graduate Profile was then vetted by the entire faculty before finalizing. The Graduate Profile is an outline for the development of curriculum and serves as a baseline to measure student learning.

5. Graduate Focus Group Discussion (Appendix E)

The Graduate Focus Group Discussion was facilitated by Program and Curriculum Development staff on November 12, 2003. Eight former students who graduated from the program between 1999 and 2003 participated in the discussion. The Focus Group questions were developed by the Curriculum Consultant in collaboration with the department Chair and the Dean of the division. The questions that were asked of the graduates attempted to:

1. learn more about the academic goals and employment aspirations of students enrolling in the program, and
2. solicit suggestions on how to improve student and graduate satisfaction with the program.

The summary of the graduate responses to the questions does not include those comments made on the quality of instruction that could identify an individual instructor. However, these comments were given to the Dean and program Chair and will assist in the development of appropriate strategies to address the student and graduate dissatisfaction with instructor issue as part of the program renewal plan.

6. Program Renewal Plan (Appendix F)

The program renewal plan is the result of translating the preceding 5 deliverables into a coherent plan for the renewal of the program.

For the Geographic Information Systems Technology program Curriculum Validation – Program Renewal, a half-day workshop was held with faculty, the Chair, and an Advisory Committee representative to identify a program vision and goals for program renewal. Utilizing results of the vision and goals workshop, the Curriculum Consultant in collaboration with the Curriculum Validation Facilitator and program Chair created a final vision statement along with six goals that will guide the program renewal process over the next five years.

These goals are:

1. Student and Graduate Satisfaction
 - Ensure that students and graduates are satisfied with all aspects of the teaching – learning process.
2. Partnership involvement
 - Strengthen existing partnerships with industry, government and other groups to ensure that the program graduates continue to meet current and future industry requirements.
3. Curriculum
 - Deliver a comprehensive and up-to-date advanced diploma program that will appeal to technologists and persons holding other post-secondary qualifications.
4. Program marketing
 - Develop a comprehensive marketing strategy to ensure that the program maintains a positive image and high profile in Manitoba and beyond.
5. Laptop delivery
 - Use laptops in the delivery of the program.
6. Co-Operative Education component
 - Adopt the Co-operative education delivery model as an integral part of the renewal of the GIS program.
7. Applied degree option
 - Asses the viability of offering an applied degree option (Subject to COPSE approval for the College to award Applied Degrees).
8. Resources
 - Ensure that the facilities, staffing and other resources that are available to the program are sufficient to achieve its vision.

7. 5-Yr Program Renewal Plan Timelines (Appendix G)

The Program Renewal Plan will serve as the basis for the improvement of the Geographic Information Systems Technology program. The Department Chair, faculty, and Advisory Committee are committed to renewing the program over the next 5-year period.

Nine tasks were identified for completion by the end of 2009.

1. Increase student/graduate satisfaction with the program (March/04 – June/09)

Steps will be taken to raise student/graduate satisfaction. An intervention plan will be developed to manage the existing student dissatisfaction issue. The information provided by the Mid-Program Student Feedback of Instructors, the Student Evaluations of the Program, and the Student Evaluations of Instructors surveys will be used by the Chair to provide direction for ongoing staff development.

2. Increase partner involvement (May/04 – June/09)

Partnerships are a critical success factor for the Geographic Information Systems Technology program. As a result, expanding the number of partners across a variety of industries that utilize GIS technology will be significant to the future success of the program. In addition, involving current and future partners through groups such as the Advisory Committee and Curriculum Committee will be undertaken.

3. Renew the curriculum (May/04 – June/09)

Curriculum content will be evaluated against the learning outcomes expected of all program graduates to ensure that the program meets all learning requirements. Course outlines will be updated on an as needed basis. Steps will be taken to ensure that all course outlines meet the RRC standard format. A curriculum committee composed of faculty and industry will be formed to ensure that the Geographic Information Systems Technology program maintains pace with technological changes in industry.

4. Market the program (July/04 – June/09)

To increase student enrolment would require that more potential students become aware of the program and take an interest in applying. The program is currently promoted through the College's website and through "word of mouth." There is a need to develop and implement more effective strategies to market the program to industry and potential students.

5. Develop a comprehensive website (July/04 – June/05)

Improvements to the program's website will be made to assist current and prospective students gain a clearer understanding of the program.

Introduce laptop delivery (July/04 – July/07)

The introduction of laptop delivery is based on feedback from program graduates. Graduates requested more independence from the computing lab.

6. Adopt the Co-op Education delivery model (July/05 – July/07)

Based on the environmental scan of other colleges across Canada, a work experience component will be considered as part of the delivery model. The Chair will seek SAC approval if a co-op education delivery model is found to be suitable. If approved by SAC, the current delivery model will be converted to 8-week blocks to coincide with the Civil/CAD Technology programs schedule.

7. Assess the viability of offering an applied degree option (July/07 – May/09)
(Subject to COPSE approval for the College to award Applied Degrees)

The trend in Canada to grant degrees in GIS at the college level and the renewal plan calls for an analysis to assess the feasibility of offering an Applied Degree option. Findings on both student and industry demand for an Applied Degree would be included as part of a submission to SAC for approval.

8. Resources (May/04 – June/09)

Resources will be managed to provide appropriate equipment, classroom and lab space. Faculty will be provided with sufficient and ongoing professional development opportunities. The program will liaise with the Library to ensure that the students have access to sufficient resources to be successful learners.

Conclusions:

The Curriculum Validation - Program Renewal process has provided a benchmark against which the renewal of the Geographic Information Systems Technology program can be tracked and measured. The program renewal goals that were identified will ensure that the program is recognized as a leader in the provision of training that prepares graduates for a variety of career opportunities in industry. The program renewal plan will serve to guide the Chair with the assignment of resources to accomplish the renewal goals within a 5-year timeframe.

Appendix A - Environmental Scan and Key Findings

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>British Columbia Institute of Technology</p> <p>Post graduate GIS Program</p> <p>3700 Willingdon Avenue, Burnaby, British Columbia, Canada, V5G 3H2</p> <p>Website: http://programs.bcit.ca/9100FA DVDIP</p> <p>Contact person: Ross Miller Program Head Post graduate GIS Program</p> <p>Phone: 604-432-8737</p> <p>Fax: Email: ross_miller@bcit.ca</p>	<p>Number of faculty: 5 and one person half time from another department.</p> <p>Number of students: 39 full time, 10-15 part time.</p>	<p>Advanced Diploma</p>	<p>Length: Terms - 35 weeks (includes 10 weeks supervised work experience). 9 months full time, part time available (must be completed in 5 years).</p> <p>Entrance requirements: Diploma of Technology or university/college degree in a related field.</p> <p>Students must possess good communication, teamwork and technical problem-solving skills</p> <p>Fundamental computer literacy and computer programming skills.</p> <p>Selection Process: Applicants submit a resume and a letter of intent explaining their reasons for wanting to take the program.</p> <p>Graduation requirements: Completion of coursework and work experience</p>	<p>Learning outcomes vs. instructional objectives vs. competency based:</p> <p>Learning outcomes based instruction</p> <p>Experiential component:</p> <p>Supervised work experience - this may be either an industry project or an industry practicum. The practicum may be taken in a block of time after the completion of all other courses.</p> <p>Unique delivery features:</p> <p>WebCT Some distance ed.</p>	<p>Course Titles & (Hours)</p> <p>Level 5 - Fall Term - 15 wks</p> <p>Technical Programming 1 (4) Database Applications (3) Fundamentals of Geographic Information Systems (3) Fundamentals of Mapping (3) Mapping Using Microstation (3) Project Planning (3) ArcGIS 1: Introduction (3) Technical Topics in Computer Systems (3) Remote Sensing (3) ArcGIS 2: Data Management and Analysis (3)</p> <p>Level 6 - Winter Term -10 wks</p> <p>Technical Programming 2 (2.5) Graphic System Management (2) Component Programming (1.5) Technical Issues in GIS (3) Spatial Analysis (1.5) GIS Database Systems 2 (3) ArcGIS 3: Customizing with ArcObjects (3) Autodesk Map or Digital Mapping (3)</p> <p>Level 6 - Spring Term - 10 wks</p> <p>Management Issues in GIS (3) And Industry Project or Industry Practicum (12)</p>

STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>British Columbia Institute of Technology</p> <p>Post graduate GIS Program</p> <p>Content theory assessment: written tests, assignments, presentations, group work, reports, portfolio, and exams.</p> <p>Skills assessment: practical tests.</p> <p>Experiential assessment: oral assessment by manager/supervisor.</p>	<p>Content including employability skills, inclusiveness, global orientation: changes in technology require continuous skill expansion.</p> <p>Delivery of the program: software costs.</p> <p>Assessment practices: experiential component – difficult to measure practical skills.</p> <p>Instructional technology: taking on new educational technology.</p>	<p>Process:</p> <p>Curriculum validation process</p> <p>Frequency: every five years.</p>	<p>Course transfer – in agreements with Universities.</p>	<p>Tuition & student fees - \$4,216.95 per year</p> <p>Books and Supplies: \$1060.00</p> <p>International students \$13,000 for two terms.</p>	<p>.</p>

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>British Columbia Institute of Technology</p> <p>Geomatics/GIS Bachelor of Technology Program</p> <p>3700 Willingdon Avenue, Burnaby, British Columbia, Canada, V5G 3H2</p> <p>Website: http://www.construction.bcit.ca/degrees/geogis/</p> <p>Contact person: Maryann Newmeyer, Program Assistant, Geomatics/GIS Bachelor of Technology Program</p> <p>Phone: 604-451-7001</p> <p>Fax:</p> <p>Email: maryann_newmeyer@bcit.ca</p>	<p>Number of faculty: 5 and one person half time from another department.</p> <p>Number of students: 6 full time</p>	<p>Bachelor of Technology in Geomatics</p> <p>Major in either Survey/Mapping or GIS</p>	<p>Length: 2 Terms - 15 weeks each. Remaining coursework taken part-time</p> <p>Entrance requirements: A recognized Diploma of Technology, or equivalent, in an engineering or science discipline, or a related field or a degree in Engineering, Science, Applied Science or related field.</p> <p>Selection Process: Applicants submit a resume and a letter of intent explaining their reasons for wanting to take the program.</p> <p>Graduation requirements: Completion of coursework and 2 years work experience.</p>	<p>Learning outcomes vs. instructional objectives vs. competency based:</p> <p>Learning outcomes based instruction</p> <p>Experiential component: 2 years work experience</p> <p>Unique delivery features: WebCT Some distance ed.</p>	<p>Course Titles</p> <p>Full Time Program (Survey/Mapping option)</p> <p>Level 7 Fall Term – 15 wks</p> <p>Spatial Database System 1 Satellite Positioning 1 Cadastral Surveys and Land Registration Systems Geodesy 2 Fundamentals of GIS Remote Sensing</p> <p>Level 8 Winter Term – 15 wks</p> <p>Project Planning Advanced Digital Mapping Land Use Planning Spatial Database System 2 Satellite Positioning 2 Hydrographic and Oceanographic Surveying Survey Law Advanced Topics in Adjustments and Statistical Testing</p> <p>Part Time Program</p> <p>Mandatory</p> <p>Management Skills and Applications Critical Reading and Writing Applied Ethics Geomatics Projects</p> <p>Suggested electives</p> <p>Business Law Economics Engineering, Technology and Management Principles of Finance The Media: News Makers and Culture Shapers The Social Foundations of Canada</p> <p>Full Time Program (GIS option)</p>

<p>British Columbia Institute of Technology</p> <p>Geomatics/GIS Bachelor of Technology Program</p>					<p>Level 7 Fall Term – 15 wks</p> <ul style="list-style-type: none"> Technical Programming 1 Database Applications Fundamentals of Mapping Technical Topics in Computer Systems Desktop Geographics Fundamentals of GIS ArcGIS 1: Introduction Mapping Using Microstation Project Planning Remote Sensing ArcGIS 2: Data Management and Analysis <p>Level 8 Winter Term – 15 wks</p> <ul style="list-style-type: none"> Project Planning Advanced Digital Mapping Land Use Planning Spatial Database System 2 Satellite Positioning 2 Hydrographic and Oceanographic Surveying Survey Law Advanced Topics in Adjustments and Statistical Testing <p>Part Time Program</p> <p>Mandatory</p> <ul style="list-style-type: none"> Management Skills and Applications Critical Reading and Writing Applied Ethics Geomatics Projects <p>Suggested electives</p> <ul style="list-style-type: none"> Business Law Economics Engineering, Technology and Management Principles of Finance The Media: News Makers and Culture Shapers The Social Foundations of Canada
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STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>British Columbia Institute of Technology</p> <p>Geomatics/GIS Bachelor of Technology Program</p> <p>Content theory assessment: written tests, assignments, presentations, group work, reports, portfolio, and exams.</p> <p>Skills assessment: practical tests.</p> <p>Experiential assessment: oral assessment by manager/supervisor.</p>	<p>Content including employability skills, inclusiveness, global orientation: changes in technology require continuous skill expansion.</p> <p>Delivery of the program: software costs.</p> <p>Assessment practices: experiential component – difficult to measure practical skills.</p> <p>Instructional technology: taking on new educational technology.</p>	<p>Process:</p> <p>Curriculum validation process</p> <p>Frequency: every five years.</p>	<p>University course transfer-in agreements.</p>	<p>Tuition & student fees:</p> <p>Canadian Students - \$4,216.95 per year</p> <p>International students - \$13000.00 for two terms.</p> <p>Books and Supplies: \$1060.00</p> <p>The program is divided into four components: 27 credits of technical studies, 9 credits of management courses, 12 credits of liberal education, 12 credits for industry projects. In addition to these four academic components, the two-year geomatics industry work experience requirement is another essential component to complete this degree program.</p>	

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>College of New Caledonia</p> <p>Geographic Information Systems</p> <p>Vanderhoof Building Office 2-348 Prince George, BC R3H 0J9</p> <p>Website: www.cnc.bc.ca/gis/</p> <p>Contact person:</p> <p>Wayne Giles, Coordinator, Geographic Information Systems</p> <p>Telephone: (250) 562-2131, Local 517</p> <p>Fax: (205) 561 5816</p> <p>E-mail: giles@cnc.bc.ca</p>	<p>Number of faculty: 2 F/T 4 drawn from other depts.</p> <p>Number of students: 25</p>	<p>Advanced Diploma</p>	<p>Length: 4 terms - 32 weeks with optional 12 week work co-op.</p> <p>Program starts in September.</p> <p>Entrance requirements:</p> <p>Minimum entry level is the successful completion of:</p> <p>1) A two year technology or career diploma in an appropriate field such as forestry, wildlife management, municipal engineering/planning, mining, or as evaluated by the program or a College Counselor. Or An Associate Degree or equivalent.</p> <p>2) Computer science or computer information systems course at the Grade 12 level or equivalent as evaluated by the program. 3) Math 12, Math 050 or equivalent as evaluated by the program. 4) Resume outlining experience especially as it relates to GIS and computer skills</p> <p>Special Selection Process:</p> <p>In the event that the programme is oversubscribed the following guidelines for the selection of students to fill half the available seats will be used:</p> <p>1) Applicants with a strong background in Computer Application and Statistics or Mathematics will be given first priority for selection. 2) Number of years of field experience related to GIS as outlined in the</p>	<p>Learning outcomes vs instructional objectives vs. competency based:</p> <p>A combination of learning outcomes, objectives and competency-based instruction.</p> <p>Experiential component:</p> <p>Summer co-op work term (optional for students with a 3.0 GPA after mid-terms in the first semester and who attend a 12-hour job search seminar).</p> <p>Unique delivery features:</p> <p>All courses delivered within the college</p>	<p>Course Titles & (Hours)</p> <p>Term 1 (Sept. to Dec.)</p> <p>Introduction to Spatial Data Analysis and Presentation (6)</p> <p>Database Management Systems (4)</p> <p>Introduction to Programming (6)</p> <p>Data Acquisition & Remote Sensing (5)</p> <p>Coordinate Geometry (4)</p> <p>Application Tools I (6)</p> <p>Term 2 (Jan. to April)</p> <p>Tool Analysis, Design, and Construction (6)</p> <p>Emerging and Specialized Technologies in GIS (4)</p> <p>Cartography (5)</p> <p>Application Tools II (6)</p> <p>Image Processing and Analysis (5)</p> <p>GIS Seminar (2)</p> <p>Project Management and System Development (2)</p> <p>GIS Project (2)</p> <p>course outlines available on website</p>

<p>College of New Caledonia Geographic Information Systems</p>			<p>resume. The remainder of students will be chosen according to College policy for over-subscribed courses.</p> <p>Graduation requirements:</p> <p>If a student obtains a failing grade (D or less) in any courses in the Spring semester he/she should not be allowed to register in any course in the Fall for which the failed course is a prerequisite.</p> <p>If a student fails two or more courses in the Spring semester they cannot continue full-time in the Advanced Diploma Programme. The student will be asked to continue on a part-time basis or withdraw from the GIS Advanced Diploma Programme.</p> <p>If a student obtains a C minus in any course in the Spring semester he/she can register in any course in the Fall semester of the programme. Such a student will be assigned probationary status in the follow-up course/courses.</p> <p>Students will be informed of their probationary status and the requirements that must be fulfilled to have the probationary status designation removed. (Note: Probationary status means that you must maintain a B grade in the course at the mid-term in order to continue in the course.)</p>		
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STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>College of New Caledonia</p> <p>Geographic Information Systems</p> <p>Content theory assessment: written tests, assignments, and exams.</p> <p>Skills assessment: labs, assignments, and projects.</p> <p>Grading scale: A+ - 4.33 - Excellent A - 4.0 A- - 3.67 B+ - 3.33 - Good B - 3.0 B- - 2.67 C+ - 2.33 - Satisfactory C - 2.0 - The lowest standing on which to base further study in a discipline unless specifically noted in a course description C- - 1.67 D - 1.0 - Marginal F - 0.0 - Failure</p>	<p>Content including employability skills, inclusiveness, global orientation: none at this time</p> <p>Delivery of the program: none at this time.</p> <p>Assessment practices: none at this time.</p> <p>Instructional technology: keeping faculty updated on new technologies.</p>	<p>Process: Curriculum validation process.</p> <p>Frequency: approx. 5 years</p>	<p>Course transfer agreements with in-province Universities</p>	<p>Tuition & student fees: Canadian students - \$2,636 International students - \$14,480 Books & Supplies - \$1,050</p>	

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>Niagara College of Applied Arts and Technology</p> <p>Post graduate GIS Program</p> <p>135 Taylor Rd, R.R. #4 Niagara On the Lake, Ontario, L0S 1J0</p> <p>Website: www.niagarac.on.ca/gis/</p> <p>Contact person: Ian D. Smith Coordinator, Post graduate GIS Program</p> <p>Phone: 905-641-2252 ext. 4083 1-800-565-4723 Fax: 905-988-4309</p> <p>Email: ismith@niagarac.on.ca</p>	<p>Number of faculty: 1 full time 7 part time</p> <p>Number of students: 50</p>	<p>Ontario College Graduate Certificate in Geographic Information Systems</p>	<p>Length: 2 Semesters - 15 weeks each.</p> <p>Program starts in September.</p> <p>Entrance requirements: College diploma, or University degree, or Three years of directly related career experience, as determined by the College, PLUS an Ontario Secondary School Diploma, or Grade 12 equivalency, or mature student status, along with a Grade 12 English at any one of the general, advanced, C, U, or M levels.</p> <p>Selection Process:</p> <p>A test and/or portfolio may be required.</p> <p>A background with some computer programming, mathematics, and statistics is recommended.</p> <p>If a student does not have an introductory course in GIS, completion of Geog 113 Introduction to GIS is required.</p> <p>Graduation requirements: completion of coursework</p>	<p>Learning outcomes vs. instructional objectives vs. competency based:</p> <p>A combination of learning outcomes and competency-based instruction.</p> <p>Experiential component:</p> <p>Applied thesis project completed over 8 months.</p> <p>Unique delivery features: none at this time.</p>	<p>Course Titles & (Hours)</p> <p>First Semester Level 1</p> <p>GIS Project Management (3) GIS Database Concepts (3) Introduction to ARC/GIS (3) Computers and GIS Programming (3) Foundations of Mapping (3) Introduction to Remote Sensing (3)</p> <p>Second Semester Level 2</p> <p>Spatial Analysis (3) Applications in GIS (3) Advanced Arc/GIS (3) Digital Image Processing (3) Applied GIS Thesis/Project (3)</p> <p>Applied Thesis Project (0)</p>

STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>Niagara College of Applied Arts and Technology</p> <p>Post graduate GIS Program</p> <p>Content theory assessment: Trying to remove exams and make learning authentic.</p> <p>Skills assessment: Professional Reports. (Final reports with project milestones and covering letter).</p> <p><i>Oral questioning while observing practical operations and observing the procedures and outcomes.</i></p> <p>Experiential assessment: Professional Report. (Final report with project milestones and covering letter).</p>	<p>Content including employability skills, inclusiveness, global orientation: Constant updating of content due to changes in technology.</p> <p>Delivery of the program: difficulties with integrating new hardware.</p> <p>Assessment practices: none at this time.</p> <p>Instructional technology: none at this time.</p>	<p>Process: Focus group with industry and academia.</p> <p>Frequency: Every three months.</p>	<p>Transfer agreement with Brock University. Completion of diploma fulfills first year of a B.Sc. at Brock.</p>	<p>Tuition & student fees: Canadian Students - \$3,528.82 per year International students \$8,900 for two terms.</p>	

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>Nova Scotia Community College</p> <p>Post graduate GIS Program</p> <p>Nova Scotia Community College, Annapolis Valley Campus 50 Elliott Road Lawrencetown, NS BOS 1M0</p> <p>Website: http://www.nscs.ca/learning_programs/programs/geographic_information_systems.asp</p> <p>Contact person: Bruce Hicks Department Head, Computer Tech DH Post graduate GIS Program</p> <p>Phone: 902 584-2056 Fax: 902 584-7211 Email: Bruce.Hicks@nscs.ca</p>	<p>Number of faculty: 4 full time, 1 from another department</p> <p>Number of students: 51</p>	<p>Advanced Diploma</p>	<p>Length: Semesters - 35 weeks (includes 5 weeks work experience).</p> <p>Entrance requirements: Undergraduate degree in one of the following areas: geography, forestry, geology, resource management, science, engineering, or a related technology.</p> <p>Appropriate related work experience can also be a significant asset.</p> <p>Selection Process:</p> <p>Graduation requirements: Fulfillment of coursework, minimum grade 60%</p>	<p>Learning outcomes vs. instructional objectives vs. competency based:</p> <p>A combination of learning outcomes.</p> <p>Experiential component: Work experience</p> <p>Unique delivery features: The NSCC experience includes a portfolio development process as an integral part of every program of study. Students are expected to complete the required components during the course of study at NSCC and demonstrate an understanding of the benefits of ongoing portfolio development as a career-management tool.</p>	<p>Course Titles & (Hours)</p> <p>Fundamentals of Geographic Information Systems () Fundamentals of Remote Sensing/ Digital Image Processing* () Introduction to Programming* () Introduction to Geomatics* () Advanced Geographic Information Systems* () Information Systems* () Remote Sensing Systems and Applications () Advanced Digital Image Processing ()</p> <p>Directed Studies Students choose from several possible directed studies options. Typical options may include:</p> <p>Applied Geomatics Research () ArcView () Data Mining () Spatial Analysis & Modelling () Digital Image Processing Using ERDAS I () Digital Image Processing Using ERDAS II () Serving Maps on the Internet() MapInfo Professional/Vertical Mapper () Avenue Programming () MapObjects Programming ()</p> <p>Related Technologies</p> <p>Visual Basic for Applications () Spatial Analysis and Geostatistics () Managing GIS Projects ()</p> <p>Other</p> <p>LIDAR Systems and Modelling () Introduction to WHMIS () Occupational Health & Safety ()</p>

STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>Nova Scotia Community College</p> <p>Post graduate GIS Program</p> <p>Content theory assessment:</p> <p>Written tests, assignments and exams</p> <p>Skills assessment:</p> <p>Assignments, online computer lab testing.</p> <p>Experiential assessment:</p> <p>Learning logs.</p>	<p>Content including employability skills, inclusiveness, global orientation: GIS penetration in new markets requires awareness of new applications that need to be taught.</p> <p>Delivery of the program: software/hardware costs.</p> <p>Assessment practices: project component under review.</p> <p>Instructional technology: equipment costs.</p>	<p>Process: Framework informed decision making. Consists of internal staff review, industry review, and past student review.</p> <p>Frequency: every five years.</p>	<p>COGS has established joint graduate programs with St. Francis Xavier University, Acadia University, and Dalhousie University.</p> <p>These joint programs are designed to allow graduates of the COGS GIS and RS programs advanced standing in the university's MSc program by recognizing COGS courses as substitutes for university credits. GIS and RS graduates that meet the entrance requirements of the university should be able to complete their graduate studies within one year.</p> <p>Students in the GIS and RS program who are continuing on with graduate studies through one of these joint arrangements, can select COGS courses that allow them to begin studies that can be carried on at the partnering university.</p>	<p>Tuition & student fees:</p> <p>Canadian Students - \$3,000 per year</p> <p>International students \$10,000 for two terms.</p> <p>Books and Supplies: \$1000.00</p>	<p>.</p>

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>Red River College Geographic Information Systems Technology</p> <p>2055 Notre Dame Avenue, Winnipeg, Manitoba, R3H 0J9</p> <p>Website: www.rrc.mb.ca</p> <p>Contact person: Robert Friesen</p> <p>Telephone: (204)632-2221</p> <p>Fax: (204) 633-6075</p> <p>Email: rfriesen@rrc.mb.ca</p>	<p>Number of faculty: 1 full time, 4 part time from other programs.</p> <p>Number of students: 18</p>	<p>Advanced Diploma</p>	<p>Length: 4 terms - 36 weeks including 6 week thesis project.</p> <p>Program starts in September of each year.</p> <p>Entrance requirements:</p> <p>A) Graduation from a 2-year Technical Diploma program at a recognized technical institute or community college in a field of study related to engineering, geography or other land-based occupation or graduation from a 3-year or 4-year Degree program at a recognized university or polytechnical school in a field of study related to engineering, geography or other land-based occupation and</p> <p>B) Demonstration of basic PC computer skills may be required prior to registration acceptance.</p> <p>Graduation requirements:</p> <p>Students must have a minimum pass mark of 60% in each course.</p>	<p>Program uses traditional delivery style of instruction</p> <p>Experiential component:</p> <p>A compulsory 6-week thesis project in the final term of the program. Students work with industry to develop a cohesive real world application of a geographic information system.</p> <p>Unique delivery features:</p> <p>None at this time</p>	<p>Course Titles & (Hours)</p> <p>Technical Communications (4) Surveying (5) GIS Basic Principles (6) Computer Fundamentals (4) Programming 1 (6) Digital Photogrammetry (5)</p> <p>Project Management Fundamentals (4) Cartography (5) GIS Fundamentals (6) AutoCAD 1 (4) Remote Sensing (5) Programming 2 (6)</p> <p>Principles of Management (4) GIS Modeling (5) Managing Spatial Databases (6) AutoCAD 2 (4) Applied Remote Sensing (5) Programming (6)</p> <p>Thesis Project (30)</p> <p>Course outlines available at website</p>

STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>Red River College Geographic Information Systems Technology</p> <p>Content theory: written tests.</p> <p>Skills assessment: labs, assignments and projects.</p> <p>Grading scale: A+ - 4.5 - Outstanding A - 4.0 - Excellent B+ - 3.5 - Very Good B - 3.0 - Good C+ - 2.5 - Above Average C - 2.0 - Average D - 1.0 - Marginal F - 0.0 - Failure</p> <p>Experiential assessment: thesis requires written report and peer reviewed presentation.</p>	<p>Content including employability skills, inclusiveness, global orientation: none at this time</p> <p>Delivery of the program: none at this time</p> <p>Assessment practices: none at this time</p> <p>Instructional technology: none at this time</p>	<p>Process: Curriculum validation process</p> <p>Frequency: Every five years</p>		<p>Tuition & student fees: Canadian Students - \$2308 International students; \$6600 Books & Supplies - \$1000</p>	

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>Sir Sandford Fleming College</p> <p>Post Graduate Certificate in GIS</p> <p>School of Environmental and Natural Resource Sciences Albert Street South, P.O. Box 8000, Lindsay, ON, K9V 5E6</p> <p>Website: http://www.flemingc.on.ca/Full-time/ProgramDisplay.cfm?ProgramCode=GA</p> <p>Contact person: Lawrie Keillor-Faulkner Coordinator</p> <p>Phone: (705) 749-5520 ext 3237 Fax: (705) 878-9312</p> <p>Email: Lkeillor@flemingc.on.ca</p>	<p>Number of faculty: 1 FT, 5 PT</p> <p>Number of students: 50</p>	<p>Post Graduate Certificate</p>	<p>Length: Semesters - 32 weeks (optional 15 week internship).</p> <p>September and January intake.</p> <p>Entrance requirements:</p> <p>A university degree or college diploma in a related discipline, or equivalent education or work experience.</p> <p>Related fields include, but are not limited to forestry, natural resource sciences, environmental studies, geology, surveying, geography, business, municipal planning, law enforcement, emergency services, and health care.</p> <p>Students entering the GIS-Applications Specialist program must be familiar with computers and have a reasonable mathematical and statistical background.</p> <p>Students must have taken some introductory-level GIS courses. Students may be accepted to the program without any prior GIS education or training; however, they would be required to take the "Fundamentals of Raster GIS".</p> <p>Also, Students without computer skills must complete Introduction to Spreadsheets and Introduction to Databases.</p> <p>Selection Process: Need a diploma or degree in a related field.</p> <p>Graduation requirements: complete courses and thesis</p>	<p>Learning outcomes vs. instructional objectives vs. competency based:</p> <p>Mostly learning outcomes, some competency based.</p> <p>Experiential component:</p> <p>Optional 15 week internship</p> <p>Unique delivery features:</p> <p>WebCT</p>	<p>Course Titles & (Hours)</p> <p>Semester 1 – 15 weeks Database Issues for GIS (45) Presentation of Geographic Information (45) Spatial Data Acquisition (45) Spatial Statistics (45) Problem Solving and Programming(90) Fundamentals of Vector GIS (45)</p> <p>Semester 2 – 17 weeks Technical Issues in GIS (90) Applied Co-operative Project (thesis) (60) Advanced Database Programming (45) Customization and Interface Development (45) GIS Project Design and Development (45) Web-Based Applications in GIS (45)</p> <p>Optional Course* Advanced Topics In GIS Internship** (45)</p> <p>* These courses are not required. Either one is available to graduating students upon completion of the standard curriculum and with the approval of the program co-ordinator. ** This course is a 15-week time block (one semester) with renewal up to six consecutive semesters. Internships are planned and directed with faculty support and implemented under the supervision of an appropriate faculty. Learning outcomes would be developed on an individual basis prior to the commencement of the internship by the supervising faculty in consultation with the intern.</p>

STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>Sir Sandford Fleming College</p> <p>Post Graduate Certificate in GIS</p> <p>Content theory assessment: Projects and tests</p> <p>Skills assessment: Projects and in-lab tests</p> <p>Experiential assessment: Faculty and employer meeting for optional internship.</p> <p>Thesis requires a final report and presentation. Students are also evaluated on how they present themselves at the open house meeting with prospective organizations interested in a student thesis.</p>	<p>Content including employability skills, inclusiveness, global orientation: changing technology requires constant updating of teaching materials.</p> <p>Delivery of the program: changing technology requires constant upgrading of instructor skills.</p> <p>Assessment practices: none at this time</p> <p>Instructional technology: none at this time</p>	<p>Process: Advisory committee</p> <p>Frequency: Once a year.</p>	<p>Special Emphasis Degree. The Trent-Fleming GIS program leads to a Trent Honours degree in either Geography or Environmental and Resource Studies with an emphasis in Geographical Information Systems. Students completing the program will receive a GIS Applications Specialist post-graduate certificate from Fleming College.</p>	<p>Tuition & student fees: Canadian Students - \$3,490.50 per year</p> <p>International students - \$11,000 for two terms.</p> <p>Books and Supplies: \$1000.00</p>	

COLLEGE	SIZE OF PROGRAM	CREDENTIAL ISSUED	PROGRAM FEATURES	CURRICULUM MODEL	CURRICULUM CONTENT
<p>Southern Alberta Institute of Technology</p> <p>GIS Applied Degree Program</p> <p>Construction Department K115, Senator Burns Building Southern Alberta Institute of Technology 1301-16th Avenue NW Calgary, AB T2M 0L4</p> <p>Website: http://www.sait.ab.ca/academic/construction/gis/default.htm</p> <p>Contact person: Reg Laternal Academic Coordinator</p> <p>Phone: (403) 210 4408 Fax: (403) 284 8812 Email:</p>	<p>Number of faculty: Unknown Number of students: Unknown</p>	<p>Bachelor of Applied Geographic Information Systems (B.App.GIS).</p>	<p>Length: Semesters - 2 x 8 months each. Entrance requirements: Two-years post-secondary training from a recognized Canadian college, technical institute or equivalent. Letter of Intent: Explain how you can combine your personal background with GIS training, and sufficient explanation of why you wish to participate in the GIS Applied Degree program. Two (2) letters of reference: personal, professional or academic Resume Official transcripts Selection Process: Graduation requirements: Students must successfully complete all courses. Students must attain a GPA of 2.0 or better in each semester.</p>	<p>Learning outcomes vs. instructional objectives vs. competency based: Unknown Experiential component: The second year of the GIS Applied Degree is a work practicum. Unique delivery features: Unknown</p>	<p>Course Titles & (Hours) First Year (8 months) GIS Major Project (6.0) GIS Project Management (2.0) GIS Spatial Database Applications (6.0) GIS Digital Cartography (6.0) GIS Spatial Statistics (2.0) GIS Data Fundamentals 4.0) Computer Programming for GIS (6.0) Advanced GIS Technology (4.0) Geodesy for GIS (4.0) GIS Remote Sensing (6.0) GPS and Location Services for GIS (4.0) Internet GIS Mapping (4.0) GIS Interpersonal Communications (2.0) Total 56.0 Second Year (8 months) GIS Work Experience Practicum (6.0) Option (2 courses required) GIS Case Study Project (2.0) First Nations GIS (2.0) Environmental GIS (2.0) Oil & Gas GIS (2.0) A Working Case Study in GIS (2.0) Business Geographics (2.0) Proposal Writing for GIS (2.0) ArcObjects for GIS (2.0) Total 4.0 Total Credits: (66.0)</p>

STUDENT ASSESSMENT	CURRENT and COMING CHALLENGES	CURRICULUM RENEWAL	PARTNERSHIPS	OTHER	COMMENTS
<p>Southern Alberta Institute of Technology</p> <p>GIS Applied Degree Program</p> <p>Content theory assessment: Unknown</p> <p>Skills assessment: Unknown</p> <p>Grading scale: A – 4.0 (90-100) – Excellent A+ – 3.67 (86-89) B+ – 3.33 (82-85) B – 3.0 (78-81) – Good B- – 2.67 (74-77) C+ – 2.33 (70-73) C – 2.0 (66-69) – Satisfactory C- – 1.67 (62-65) D+ – 1.33 (58-61) – Marginal D – 1.0 (50-57) – Minimal Pass F – 0.0 (<50) – Failure</p> <p>Experiential assessment: 960 hour GIS Work Experience Practicum</p>	<p>Content including employability skills, inclusiveness, global orientation: Unknown</p> <p>Delivery of the program: Unknown</p> <p>Assessment practices: Unknown</p> <p>Instructional technology: Unknown</p>	<p>Process: Unknown Frequency: Unknown</p>	<p>No formal articulation agreements in place at this time. Discussions are underway with several academic organizations including: Yukon College; BCIT; Selkirk College; Mount Royal College; Olds College; University of Calgary MGIS program; NAIT; and the University of Lethbridge.</p>	<p>Tuition & student fees: Canadian Students - \$4,537 per full-time academic year and \$1,253 total for the second-year practicum Books and Supplies: \$500.00 International students: Unknown Although there are no formal accreditation arrangements at this time discussions are pending with several national level accreditation agencies. Please contact the department for more information.</p>	<p>.</p>

Appendix B – Industry Occupational Analysis (DACUM) Chart

Geographic Information Systems (GIS) Technology

Facilitated by Mike Stuhldreier, Pam MacAskill and Gene Semchych
 September 24th and October 1st, 2003

COMMUNICATE
 A

Write reports A1	Write proposals A2	Write technical specifications A3	Write e-mail A4	Write business correspondence A5	Write instructions/manuals A6	Write documentation A7	Make presentations - with verbal, visual and audio elements A8	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	
Translate technical information across disciplines A9	Teach A10	Lead meetings A11	Participate in meetings A12	Ask questions A13	Promote change A14	Interview domain experts A15	Facilitate information sharing A16	
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	
Evaluate applicability of technical information A17	Create/draft data licence agreements A18	Solve problems A19						
1 2 3 4	1 2 3 4	1 2 3 4						

MANAGE PROJECTS
 B

Formulate research questions B1	Formulate research methodology B2	Work in teams B3	Acquire resources B4	Manage time B5	Manage budgets B6	Mitigate risk B7	Manage resources B8
1 2 3 4a	1 2 3 4a	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Develop contingency plans B9	Delegate tasks B10	Evaluate B11	Plan B12	Provide updates B13			
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4			

MANAGE DATA
 C

Apply data structure concepts to solve problems C1	Convert data formats C2	Apply data security protocols C3	Use a variety of online data sources C4	Locate and access data sources C5	Model data C6	Design databases C7	Manage data bases C8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Create databases C9	Edit databases C10	Normalize databases C11	Query databases C12	Manage metadata C13	Create and use ERD Diagram C14	Administer data storage C15	Use a variety of data structure formats C16
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Create metadata C17	Create data back-ups C18	Recover Data C19					
1 2 3 4	1 2 3 4	1 2 3 4					

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

- 1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
- 2 - Can perform this skill satisfactorily but requires periodic assistance and/or supervision

- 3 - Can perform this skill satisfactorily without assistance and/or supervision
- 4 - Can perform this skill satisfactorily with more than acceptance speed and quality.

CREATE DATA
D

Collect field data D1	Work with GPS D2	Create land survey data D3	Use total station D4	Collect attribute data D5	Create/determine needed accuracy D6	Check for accuracy D7	Select and use base data D8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4a	1 2 3 4	1 2 3 4
Use photogrammetry to produce vector data sets D9	Acquire remote sensing data D10	Determine data resolution required D11	Create data dictionary D12	Employ QA and QC D13	Follow standards and guidelines D14	Perform heads up digitizing D15	Use tablet digitizers D16
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use photogrammetry to produce digital orthophoto imagery D17							
1 2 3 4							

PROCESS DATA
E

Post-process E1	Geo-reference spatial data E2	Use CAD technology E3	Interpolate/extrapolate data E4	Create topology E5	Clean data E6	Export data E7	Transform projections E8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Apply geodesy E9	Apply standards E10						
1 2 3 4	1 2 3 4						

ANALYZE DATA
F

Identify the problem F1	Perform statistical analysis F2	Perform spatial analysis F3	Apply GIS methodology to various domains F4	Make recommendations F5	Interpret intermediate values F6	Create rules for modelling data F7	Model objects F8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Establish database connectivity F9	Think outside the box F10	Perform remote sensing analysis F11	Classify data F12	Create predictive models F13	Summarize data F14		
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4		

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

- 1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
- 2 - Can perform this skill satisfactorily but requires periodic assistance and/or supervision

3-Can perform this skill satisfactorily without assistance and/or supervision.

4- Can perform this skill satisfactorily with more than acceptance speed and quality.

MAKE MAPS
G

Apply cartographic design principles G1	Choose the appropriate scale to reflect the resolution of your data G2	Choose colours to create effects G3	Identify sources G4	Build a legend G5	Design map to audience needs G6	Select map type to best reflect data G7	Publish the map to a variety of formats G8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Create static and dynamic maps G9	Create visualizations (animations) G10						
1 2 3 4	1 2 3 4						

USE PROGRAM LANGUAGES
H

Develop applications for users H1	Develop automations H2	Write scripts H3	Write computer code H4	Use visual basic H5	Use HTML H6	Use XML H7	Apply computer coding concepts to solve new problems H8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Configure Web applications H9	De-bug H10						
1 2 3 4	1 2 3 4						

PERFORM BASIC SYSTEMS ANALYSIS
I

Analyze connectivity issues I1	Perform needs assessment I2	Design software and hardware architecture I3	Build a business case I4	Develop solutions I5	Test solutions I6	Implement solutions I7	Create QA and QC metrics I8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Facilitate change I9							
1 2 3 4							

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

- 1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
- 2 - Can perform this skill satisfactorily but requires periodic assistance and/or supervision

- 3 - Can perform this skill satisfactorily without assistance and/or supervision.
- 4 - Can perform this skill satisfactorily with more than acceptance speed and quality.

USE TECHNOLOGY
J

Be Internet literate J1	Use operating systems J2	Navigate LANS AND WANS J3	Use wireless technologies J4	Use scanners J5	Use digital camera J6	Use hand-held computers/data loggers J7	Troubleshoot J8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Upgrade hardware J9	Use and maintain plotters/printers J10	Access and use manuals (help support) J11					
1 2 3 4	1 2 3 4	1 2 3 4					

DISPLAY PROFESSIONALISM
K

Apply code of ethics K1	Build and maintain professional network K2	Follow copyright law/guidelines K3	Follow regulatory rules/law/ guidelines K4	Present data with integrity K5	Cite contributors K6	Be a team leader K7	Treat people with respect K8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Display positive work ethic K9	Resolve conflict K10	Mentor K11	Share knowledge K12	Maintain objectivity K13	Identify personal biases K14	Develop professionally K15	Participate in GIS community K16
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Manage stress K17	Dress appropriately K18	Accept and respond to criticism K19	Adapt to the business culture K20	Exercise due diligence K21	Learn continuously K22	Be culturally/ethnically aware/sensitive K23	Work independently K24
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

USE SOFTWARE
L

Maintain currency in applications/software/ languages L1	Use wordprocessing applications L2	Use desktop publishing applications L3	Use spreadsheet applications L4	Use Vector and Raster graphic applications L5	Use database applications L6	Use presentation software L7	Install software L8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use GIS application software L9	Use Data Translation/ Manipulation software L10	Use compression software L11	Use remote sensing applications L12	Use GPS software L13	Manage software change L14	Use project management software L15	Perform Raster to Vector conversion L16
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Download L17	Apply metadata standards L18	Use metadata software L19					
1 2 3 4	1 2 3 4	1 2 3 4					

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

- 1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
- 2 - Can perform this skill satisfactorily but requires periodic assistance and/or supervision

- 3 - Can perform this skill satisfactorily without assistance and/or supervision.
- 4 - Can perform this skill satisfactorily with more than acceptance speed and quality.

Appendix C – Graduate Skills and Abilities Chart

GIS Graduate Skills and Abilities

Facilitated by Robert Richard and Robert Zakaluk
November 26th, 2003

COMMUNICATE
A

Write reports A1*	Write proposals A2	Write e-mail A3	Write documentation A4	Prepare a resume A5*	Make presentations - with verbal, visual and audio elements A6*	Translate technical information across disciplines A7	Participate in meetings A8
1 2 3 4	1 2 3 4a	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Ask questions A9	Interview experts A10	Share knowledge, data and information A11*	Evaluate applicability of technical information A12	Solve problems A13			
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4			

MANAGE PROJECTS
B

Work in teams B1	Manage time B2	Manage budgets B3	Prepare Gantt and CPM charts B4*	Manage resources B5	Develop contingency plans B6	Produce progress reports B7*	Prepare work breakdown structure (W.B.S.) B8*
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

MANAGE DATA
C

Apply data structure concepts to solve problems C1	Convert data formats C2	Validate data C3*	Locate and access a variety of data sources C4*	Create data dictionary C5*	Design databases C6	Manage databases C7	Create databases C8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Edit databases C9	Normalize databases C10	Query databases C11	Manage metadata C12	Create and use E.R.D. C13	Establish database connectivity C14*	Apply metadata standards C15	Create metadata C16
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Create data back-ups C16							
1 2 3 4							

PROCESS DATA
E

Post-process GPS data E1*	Geo-reference spatial data E2	Use CAD technology E3*	Extrapolate data E4*	Create topology E5	Create surrogate data E6*	Export data E7	Reproject data E8*
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Perform raster to vector conversion E9*							
1 2 3 4							

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.

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NOTE: Black fill indicates the rating that was given at Industry DACUM workshop

* Denotes a skill and/or ability that was added or amended at the Graduate Skills and Abilities workshop

ANALYZE DATA
F

Perform statistical analysis F1	Perform spatial analysis F2	Apply GIS methodology to various domains F3	Mine data F4*	Create rules for modelling data F5	Model data F6	Perform remote sensing analysis F7	Summarize data F8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Interpolate data F9*							
1 2 3 4							

MAKE MAPS
G

Apply cartographic design principles G1	Choose the appropriate scale for the resolution of data G2	Use colours to communicate effectively G3*	Build a legend G4	Design map to meet audience needs G5	Select map type to best reflect data G6	Publish the map to a variety of formats G7	Create static and interactive maps G8*
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Classify data G9*	Adhere to an acceptable cartographic style G10*						
1 2 3 4	1 2 3 4						

USE PROGRAM LANGUAGES
H

Develop applications for users H1	Develop automations H2	Write program solutions H3*	Use visual basic H4	Use XML H5	De-bug H6
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

CONDUCT RESEARCH
I*

Identify the problem I1*	Formulate research questions I2*	Formulate research methodology I3*	Perform literature review I4*	Identify primary and secondary data sources I5*
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

USE TECHNOLOGY
J

Use operating systems J1	Navigate LANS and WANS J2	Work with GPS J3*	Use hand-held computers/data loggers J4	Troubleshoot J5	Use plotters/printers J6*	Access and use manuals (help support) J7
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.

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NOTE: Black fill indicates the rating that was given at Industry DACUM workshop

* Denotes a skill and/or ability that was added or amended at the Graduate Skills and Abilities workshop

DISPLAY
PROFESSIONALISM
K

Behave ethically K1*	Build and maintain professional network K2	Follow copyright law/guidelines K3	Obtain WHMIS K4*	Present data with integrity K5	Cite contributors K6	Be a team player K7*	Treat people with respect K8
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Display positive work ethic K9	Resolve conflict K10	Mentor K11	Maintain objectivity K12	Identify personal biases K13	Develop professionally K14	Participate in GIS community K15	Manage stress K16
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Dress appropriately K17	Accept and respond to criticism K18*	Adapt to the business culture K19	Learn continuously K20	Be culturally sensitive K20*	Work independently K21		
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4		

USE SOFTWARE
L

Maintain currency in applications/software/languages L1	Use wordprocessing applications L2	Use spreadsheet applications L3	Use database applications L4	Use presentation software L5	Install software L6	Use GIS application software L7	Use data translation/manipulation software L8*
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Use compression software L9	Use remote sensing applications L10	Use GPS software L11	Use project management software L12				
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4				

DACUM Skill Rating Scale:

Ratings on this scale are based on industrial performance standards.

- 1 - Can perform some parts of this skill satisfactorily but requires assistance and/or supervision to perform the entire skill.
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- 3 - Can perform this skill satisfactorily without assistance and/or supervision.

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NOTE: Black fill indicates the rating that was given at Industry DACUM workshop

* Denotes a skill and/or ability that was added or amended at the Graduate Skills and Abilities workshop

Appendix D – Graduate Profile

A. The graduate has reliably demonstrated the ability to communicate effectively with a variety of audiences.

Elements of performance:

A.1 Write correspondence, proposals, presentations, and technical reports using a variety of technologies, writing styles and formats, applying correct grammar and spelling.

A.1.1 Write Reports

A.1.2 Write Proposals

A.1.3 Prepare a resume

A.1.4 Make presentations with verbal, visual and audio elements

A.2 Speak clearly and listen actively to exchange ideas with others.

A.2.1 Participate in meetings

A.2.2 Ask questions

A.2.3 Interview experts

A.3 Simplify information for easier explanation and problem solving.

A.3.1 Translate technical information across disciplines

A.3.2 Share knowledge, data, and information

A.3.3 Evaluate applicability of technical information

A.3.4 Solve problems

B. The graduate has reliably demonstrated a working knowledge of project management.

Elements of performance:

B.1 Identify tasks, sequence of events, timelines, and project risks.

B.1.1 Develop contingency plans

B.1.2 Prepare W.B.S. (work breakdown structure)

B.2 Manage the use of time, budgets, and other resources to attain project-related goals.

B.2.1 Manage time

B.2.2 Manage budgets

B.2.3 Manage resources

B.3 Use available software related to project management.

B.3.1 Prepare Gantt and CPM charts

B.3.2 Produce progress reports

B.4 Identify one's own role and role of other team members in the project.

B.4.1 Work in teams

C. The graduate has reliably demonstrated the ability to apply problem-solving skills, critical-thinking skills, and perform database administration as required for database management.

Elements of performance:

- C.1 Collect, analyze, and synthesize information through observation, research, and consultation.
 - C.1.1 Locate and access a variety of data sources
- C.2 Use current database software functions to access information for problem solving.
 - C.2.1 Query databases
 - C.2.2 Convert data formats
 - C.2.3 Establish database connectivity
 - C.2.4 Apply data structure concepts to solve problems
- C.3 Effectively design new databases, monitor and make changes to databases, and record database history.
 - C.3.1 Design databases
 - C.3.2 Create and use an Entity Relationship Diagram (E.R.D.)
 - C.3.3 Create databases
 - C.3.4 Manage databases
 - C.3.5 Edit databases
 - C.3.6 Create data dictionary
 - C.3.7 Create metadata
 - C.3.8 Manage metadata
 - C.3.9 Apply metadata standards
 - C.3.10 Create data backups
 - C.3.11 Normalize databases

D. The graduate has reliably demonstrated the ability to identify horizontal and vertical accuracies for spatial data collection and perform in-situ spatial data collection that will meet project requirements and data collection standards.

Elements of performance:

D.1 Apply an understanding of in-situ geomatics data collection.

- D.1.1 Collect field data
- D.1.2 Use land survey data
- D.1.3 Plan data collection

D.2 Interpret project for data requirements and data collection standards.

- D.2.1 Select map projection
- D.2.2 Check for accuracy
- D.2.3 Follow standards and guidelines
- D.2.4 Determine data resolution required

D.3 Use and create geomatics data from georeferenced raster imagery and maps, and analog data sources.

- D.3.1 Use photogrammetry to produce vector data sets
- D.3.2 Use photogrammetry to produce digital orthophoto imagery
- D.3.3 Acquire remote sensing data
- D.3.4 Perform digitizing

E. The graduate has reliably demonstrated the ability to apply problem-solving and critical-thinking skills as required to process data.

Elements of performance:

E.1 Perform geocoding on raster and vector spatial data formats.

- E.1.1 Post-process GPS data
- E.1.2 Geo-reference spatial data

E.2 Use other sources of spatial data and transform spatial data in vector formats to create topological relationships.

- E.2.1 Use CAD technology
- E.2.2 Create topology

E.3 Use data formats, map projections, and file formats to perform data reprojection, data format conversion, and software file format conversion.

- E.3.1 Export data
- E.3.2 Reproject data
- E.3.3 Perform raster to vector conversion
- E.3.4 Extrapolate data
- E.3.5 Create surrogate data

F. The graduate has reliably demonstrated the ability to apply critical thinking and problem solving skills in combination with GIS analysis tools and geomatics data to produce accurate results.

Elements of performance:

F.1 Develop appropriate methodologies for a GIS project.

- F.1.1 Create rules for modeling data
- F.1.2 Apply GIS methodology to various domains

F.2 Use appropriate mathematical, statistical, and spatial functions related to analyzing geomatics spatial data.

- F.2.1 Perform statistical analysis
- F.2.2 Perform spatial analysis
- F.2.3 Model Data
- F.2.4 Summarize data
- F.2.5 Perform remote sensing analysis
- F.2.6 Mine data

G. The graduate has reliably demonstrated the ability to produce effective communication solutions using cartographic design principles and GIS technologies.

Elements of performance:

G.1 Apply design theories and principles to develop effective visual communication solutions.

- G.1.1 Apply cartographic design principles
- G.1.2 Choose the appropriate scale to reflect the resolution of your data
- G.1.3 Use colours to communicate effectively
- G.1.4 Design map to audience needs
- G.1.5 Select map type to best reflect data
- G.1.6 Adhere to an acceptable cartographic style

G.2 Use a variety of advanced technologies to display, capture and manipulate geomatics data to produce a final product.

- G.2.1 Build a legend
- G.2.2 Publish the map to a variety of formats
- G.2.3 Classify data
- G.2.4 Create static and interactive maps

H. The graduate has reliably demonstrated the ability to develop, debug, and modify program code to design specifications using programming languages.

Elements of performance:

H.1 Use software programming languages to develop, debug, and modify program code that meets project requirements.

- H.1.1 Use visual basic
- H.1.2 Use XML De-bug
- H.1.3 Write program solutions

H.2 Analyze project requirements and develop software applications.

- H.2.1 Develop applications for users
- H.2.2 Develop automations

I. The graduate has reliably demonstrated the ability to conduct background research by collecting and organizing relevant and necessary information from a variety of sources for a GIS project.

Elements of performance:

I.1 Think and read critically.

I.1.1 Identify the problem

I.1.2 Formulate research questions

I.2 Locate, gather, organize, and assess information using appropriate technology and information systems.

I.2.1 Perform literature review

I.3 Identify relevant data and create research methods.

I.3.1 Formulate research methodology

I.3.2 Identify primary and secondary data sources

J. The graduate has reliably demonstrated the ability to use computing hardware and equipment involved in GIS projects.

Elements of performance:

J.1 Ensure that computing equipment and associated hardware are used according to manufacturer's recommended directions.

J.1.1 Work with GPS

J.1.2 Use hand-held computers/data loggers

J.1.3 Use plotters/printers

J.2 Use primary software functions relating to the operation of computer workstations and computers on networks.

J.2.1 Use operating systems

J.2.2 Navigate LANS and WANS

J.3 Identify and resolve technical problems that occur in the operation of computing hardware and equipment.

J.3.1 Troubleshoot

J.3.2 Access and use manuals (help support)

K. The graduate has reliably demonstrated the ability to act professionally.

Elements of performance:

K.1 Uphold professional standards of practice, ethics, and integrity.

- K.1.1 Behave ethically
- K.1.2 Follow copyright law/guidelines
- K.1.3 Display positive work ethic
- K.1.4 Present data with integrity
- K.1.5 Cite contributors

K.2 Practice continuous learning.

- K.2.1 Build and maintain professional network
- K.2.2 Participate in GIS community

K.3 Assess personal and professional strengths and areas for development.

- K.3.1 Learn continuously
- K.3.2 Develop professionally

K.4 Practice health and safety to comply with industry standards of practice and personal wellness.

- K.4.1 Obtain WHMIS
- K.4.2 Manage Stress

K.5 Respect, be open to and supportive of the thoughts, opinions, and contributions of others.

- K.5.1 Be a team player
- K.5.2 Treat people with respect
- K.5.3 Identify personal biases
- K.5.4 Maintain objectively
- K.5.5 Resolve conflict
- K.5.6 Be culturally sensitive
- K.5.7 Accept and respond to criticism
- K.5.8 Mentor
- K.5.9 Dress appropriately
- K.5.10 Adapt to the business culture
- K.5.11 Work independently

L. The graduate has reliably demonstrated the ability to use software tools involved in GIS projects.

Elements of performance:

L.1 Integrate the need for self-evaluation and commitment to lifelong learning.

L.1.1 Maintain currency in applications/software/languages.

L.2 Operate common office software tools appropriate for the task.

L.2.1 Use word processing applications

L.2.2 Use spreadsheet applications

L.2.3 Use database applications

L.2.4 Use presentation software

L.2.5 Use project management software

L.3 Resolve new and upgrade software version issues.

L.3.1 Install software

L.4 Select and operate geomatics and file handling software.

L.4.1 Use GIS application software

L.4.2 Use data translation/manipulation software

L.4.3 Use compression software

L.4.4 Use remote sensing software

L.4.5 Use GPS software

Appendix E – Graduate Focus Group Discussion

**GIS Technology
Curriculum Validation – Program Renewal**

Graduate Focus Group – November 12/03

Summary

1. What did you like best about the GIS Technology program?

- Length of the program
- Program has the latest software
- Hands – on, practical approach to learning
- Support received from other students

2. What did you like least about the program?

- Little apparent communication among the instructors
- Inconsistent/unpredictable access to computer lab
- Inappropriate focus on preparation for GIS junior management positions - focus should be on GIS entry level positions.
- Not enough time spent on core curriculum and too much spent the (related courses)
- Poor organization for the thesis project
- Some of the most current software was not being used
- Little or no connectivity among courses (e.g. Project Management and Technical Writing courses were not taught in a GIS context)
- Program curriculum similar to other GIS programs that are being delivered in a 2-year time frame
- Program does not seem to have strong links with industry

3. What was your educational standing prior to taking the program?

and/or

- B.A. double major – Natural Science and Biology
- B.A. - ? Studies
- Diploma in Natural Resources and B.A.
- B.A. - Geography
- B.A. triple major – Urban Studies, Geography and History
- B.A. – Geography
- B.A. – major – Anthropology; minor – Geography
- B.Sc. – Environmental Studies + 5 years unrelated work experience in airline industry
- “Most people come with a Geography degree, but many with Forestry or Agriculture backgrounds – the variety of people who have taken this course is unbelievable”

4. What was your most recent employment prior to taking the program?

- Environmental scientist
- Natural resources
- Geography
- Worked completely out of my field

5. What was your reason for taking the program?

- Couldn't get jobs using their educational background and thought that the GIS program would build on their previous education and give them practical skills to work in their area of interest.
- To learn how to use the software

6. Name one thing we can do to increase student satisfaction with the program?

- All entering students should have basic level competence in working with computers and software applications.
- Change the overall structure of the program
 - even out the course load,
 - increase communication among instructors,
- Revamp the program so that the courses are interconnected and lead to a (capstone activity) that uses all the skills that were developed in the program.
- Use industry standards for what is expected of student work (e.g. cartography)
- Make this a laptop program
- Keep up-to-date with industry. Getting assignments from industry and focus assignments on what industry can use.
- A (committed) Advisory Committee is a key element.
- Look at similar quality programs and consider adopting their method of delivery and curriculum.
- Extend the Project Thesis to 6 months
- Introduce a Co-op component

7. Is there anything that you would like to add before we end the discussion?

- There are some really good instructors in the program
- There is a lot of potential for this program
- Graduates of the program have a decent reputation and there are close ties among them
- The majority of students who enroll in the program have a university degree and are motivated to succeed. Those with weaker academic backgrounds have difficulty with the programs shortcomings
- Students relied on each other to succeed
- The curriculum should contain a basic programming course
- Program should move away from teaching “Avenue” scripting and focus on “BBA and Fabrication”
- Even though there were personality differences that effected group dynamics the one thing that students shared (and bound them together) was the common goal to get through the program

Appendix F – Program Renewal Plan

Geographic Information Systems Technology Program Program Renewal

Vision Statement

In the next five years, the Geographic Information Systems Technology program will be recognized as a leader in the provision of training that prepares graduates for a variety of careers in the industry.

Goal statements

The Geographic Information Systems Technology program has developed the following goals to realize its vision:

1. Student and Graduate Satisfaction

Ensure that students and graduates are satisfied with all aspects of the teaching - learning process. To achieve the overall goal of increasing graduate satisfaction to levels comparable to that reported by all respondents to the College's *Graduate Satisfaction and Employment Survey* (89% for 2000/2001 graduates) the program will:

- Follow/monitor all relevant procedures (e.g. *Student Evaluation of Program*, *Student Mid-Course Feedback of Instruction* and *Student Evaluation of Instruction*) for ensuring high quality instruction to all learners,
- Provide direction for on-going staff development based on survey results, and
- Develop/implement an intervention plan to manage the existing student dissatisfaction issue.

2. Partner involvement

Strengthen existing partnerships with industry, government and other groups to ensure that the program graduates continue to meet current and future industry requirements. The program will:

- Review the current Advisory Committee membership, frequency of meetings, meeting agendas etc... with the goal of renewing the Advisory Committee so that it is better able to provide on-going support to the program renewal process, and
- Cultivate close relationships with employers to increase the opportunities for students to address "real-world" questions during the final project component of the program.

3. Curriculum

Deliver a comprehensive and up-to-date advanced diploma program that will appeal to technologists and persons holding other post-secondary qualifications. The program will:

- Establish a faculty curriculum committee to guide the ongoing curriculum renewal process,
- Implement curriculum renewal strategies identified in Curriculum Validation process,
- Expand and diversify the GIS applications that are presented in the program to meet a wide variety of industry needs,
- Update course outlines to reflect program renewal objectives, and
- Deliver the program following Civil/Cad schedule.

4. Program marketing

Develop a comprehensive marketing strategy to ensure that the program maintains a positive image and high profile in Manitoba and beyond. The program will:

- Implement strategies to market the program to prospective students and industry. One strategy will be the development of a comprehensive website that will include program learning outcomes and course outlines.

5. Laptop delivery

Use laptops in the delivery of the program. The program will:

- Determine the suitability of introducing laptops in the delivery of the program, and
- If found to be suitable, request SAC approval to use laptops in the delivery of the program.

6. Co-Operative Education component

Adopt the Co-operative education delivery model as an integral part of the renewal of the GIS program. The program will:

- Determine the suitability of adopting the Co-operative education in the delivery of the program,
- Assess industry support for the work placement component of the model, and
- If found to be suitable and supported by industry seek SAC approval to adopt the Co-operative education delivery model.

7. Applied Degree option (Note: this goal is conditional on COPSE approval for the College to award Applied Degrees)

Determine the viability of expanding the GIS program to include an Applied Degree option. The program will:

- Determine industry demand and support for an Applied Degree option in GIS,
- Determine student demand for an Applied Degree option in GIS,
- Identify the resources (curricular, faculty, classroom/lab and technology) required to add an applied degree option, and
- Report on findings to Advisory Committee and SAC.

8. Resources

Ensure that the facilities, staffing and other resources that are available to the program are sufficient to achieve its vision. The program will:

- Provide appropriate equipment, classroom and lab space for use by students in the program,
- Liaise with the Library to ensure that the faculty and students have access to sufficient online resources (e.g. e-journals specific to GIS technology), and
- Provide faculty with sufficient professional development opportunities and resources to ensure that they maintain high teaching standards and remain current with the latest technology and the requirements of industry.

Appendix G – 5 -Year Program Renewal Plan Timelines

GIS Technology Program

Program Renewal Tasks

ID	Task Name	2003	2004	2005	2006	2007	2008
1	Increase student/graduate satisfaction with program		[Task bar]				
2	Implement/monitor the mid-program student feed-back of instructor process		[Task bar]				
3	Administer/monitor/follow-up on the Student Evaluation of Program survey		[Task bar]				
4	Administer/monitor/follow-up on the Student Evaluation of Instruction survey		[Task bar]				
5	Provide direction for staff development based on survey results		[Task bar]				
6	Develop/implement an intervention plan to manage the existing student dissatisfaction issue		[Task bar]				
7	Increase partner involvement		[Task bar]				
8	Hold regularly scheduled Advisory Committee meetings		[Task bar]				
9	Obtain Advisory Committee endorsement for major program renewal initiatives		[Task bar]				
10	Increase number of employers available for in-industry student projects		[Task bar]				
11	Renew the curriculum		[Task bar]				
12	Establish/maintain a curriculum committee to direct on-going program renewal		[Task bar]				
13	Implement curriculum renewal strategies identified in Curriculum Validation		[Task bar]				
14	Expand the number/diversity of applications for the GIS program		[Task bar]				
15	Update course outlines to reflect program renewal objectives		[Task bar]				
16	Deliver program following Civil/Cad schedule		[Task bar]				
17	Market the program		[Task bar]				
18	Implement strategies to promote the program to industry		[Task bar]				
19	Implement strategies to promote the program to prospective students		[Task bar]				
20	Develop a comprehensive website		[Task bar]				
21	Make the program learning outcomes available on the website		[Task bar]				
22	Make the course outlines available on the website		[Task bar]				
23	Introduce laptop delivery		[Task bar]				
24	Assess suitability and impact of adopting laptop delivery		[Task bar]				
25	If found to be suitable seek SAC approval to adopt laptop delivery		[Task bar]				
26	If approved, implement laptop delivery		[Task bar]				
27	Adopt the Co-op Education delivery model		[Task bar]				
28	Assess suitability of adopting Co-op Ed. model		[Task bar]				
29	If found to be suitable, seek SAC approval for adopting Co-op delivery model		[Task bar]				
30	If approved, make necessary program adjustments to conform to the Co-op delivery model		[Task bar]				
31	Implement Co-op delivery model		[Task bar]				
32	Asses the viability of offering an applied degree option (Subject to COPSE approval for College to award Applied Degree)		[Task bar]				
33	Assess industry demand for an applied degree in GIS		[Task bar]				
34	Assess student demand for an applied degree in GIS		[Task bar]				
35	Report on findings of industry/student demand to Advisory Committee and SAC		[Task bar]				
36	Resources		[Task bar]				
37	Provide on-going staff development opportunities		[Task bar]				
38	Liaise with Library to ensure sufficient on-line resources		[Task bar]				
39	Provide appropriate equipment, classroom and lab space		[Task bar]				

