



# GIS Advanced Diploma

## Program Orientation

# September 2020

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Questions? Please contact us [acc.gis@assiniboine.net](mailto:acc.gis@assiniboine.net) 204.725.8700 / 800.862.6307

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# *Start Here ...*

# **What is Geospatial Technology & GIS ?**

Geospatial technology is a field of information technology that focuses on the geographical, temporal, and spatial context of data. This is accomplished by using tools such as Geographic Information Systems (GIS), Remote Sensing (RS), Global Positioning System (GPS), and other allied technologies.

**... a career in GIS can take you  
where you want to go**



Natural Resource Management. Environmental Management. Land Use Planning. Engineering. Transportation. Real Estate. Utilities. Business & Marketing. Mineral Exploration. Health and Social Services.

The potential uses of GIS technology are numerous and diverse, and are found everywhere - from local government to the United Nations, from community organizations to global corporations, in the public and private sectors.

Geospatial technology use is growing at a rapid pace around the world and exciting opportunities for well educated and trained people are increasing.

This **Advanced Diploma in GIS** is aimed at university or college graduates who seek an intensive technical education that will prepare you for a career in GIS.

This advanced diploma program is ideal for people who want to expand their marketable skills. This program will build on your existing skillset and education. This program is well-suited for those who:

- ✓ Use a variety of thinking skills to anticipate and solve problems.
  - ✓ Have an aptitude for computer technology.
  - ✓ Have a strong sense for big picture thinking with attention to detail.
  - ✓ Are able to analyze, evaluate and apply relevant information from a variety of sources.
  - ✓ Effectively work in a teamwork environment.

# Your Instructors

You will have 2 primary GIS Instructors:



**Steven Hills, GISP**

Office: Main Campus Room 443 (call in extension 7003)

Office Hours: Mon to Fri 10:30— 11:30 am or by appointment

Phone: 204-725-8700 extension 7003

Email: Hillssc@assiniboine.net

Teaches GPS, Database, Project Management and Advanced Analysis courses



**Ben Horne**

Office: Main Campus Room 443 (call in extension 6680)

Office Hours: Mon to Fri 10:30— 11:30 am or by appointment

Phone: 204-725-8700 extension 6680

Email: Horneba@assiniboine.net

Teaches Introductory GIS Analysis, Cartography, Remote Sensing and Program-

## Required Courses – GJS Advanced Diploma

### First Semester

- GEOS-0018 Cartography
- GEOS-0026 GIS Analysis
- GEOS-0021 GIS Database Management
- GEOS-0023 GPS Applications
- GEOS-0024 GIS Project Management

### Second Semester

- GEOS-0016 Programming for GIS
- GEOS-0017 Advanced Spatial Analysis
- GEOS-0019 Geomatics Applications
- GEOS-0020 GIS Server & Web
- GEOS-0025 Remote Sensing & Image Analysis

*Course Syllabi will be available for each course and on the Learning Management System. It communicates important information about a course such as learning outcomes, topics, assessments, class expectations, and grading structures. Common elements include institutional policies on academic honesty, such as plagiarism, examination policies and classroom conduct are also outlined.*

# **Program Learning Outcomes**

## **GJS Advanced Diploma**

*Graduates of Assiniboine Community College's **GIS Advanced Diploma** will be expected to gain foundational expertise and characteristics of the Geospatial Core Competencies that comprise the geospatial industry. These Geospatial Core Competencies are program-wide and specify **21 essential skills** in **4 competency areas** that characterize the work required in the geospatial industry.*

### **Planning**

*Graduates should be able to demonstrate various planning strategies when commencing a GIS project.*

- Demonstrate understanding of the conceptual foundations and trends in Geographical Information System (GIS) technology and applications
- Clarify the scope of a project
- Prepare and coordinate resources
- Develop spatial data requirements
- Evaluate project progress

### **Data**

*Graduates should be able to create and manage spatial and non-spatial data.*

- Discuss the elements of geospatial data quality, including geometric accuracy, thematic accuracy, resolution, precision, and appropriateness for use
- Demonstrate data organization principles including metadata, data standards and infrastructure
- Demonstrate a working knowledge of GIS hardware and software capabilities, including Global Navigation Satellite Systems
- Acquire and integrate a variety of field data, image data, vector data, and attribute data to create, update, and maintain GIS databases
- Assess the nature of standard spatial data models, including vectors, rasters, and object-oriented models, in the context of spatial data used in the workplace
- Evaluate data quality and integration problems associated with geospatial and attribute data

### **Analysis**

*Graduates should be able to use geospatial software tools to perform spatial analysis.*

- Conduct GIS analysis and techniques to spatial problem solving, support planning, and decision making
- Evaluate the accuracy of geospatial data using statistical principles
- Achieve efficient spatial analysis workflows using geospatial algorithms that automate GIS tasks
- Assess the validity of spatial analysis results

### **Products**

*Graduates should be able to produce diverse geospatial information products that can be presented & shared in various media.*

- Demonstrate familiarity with codes of professional ethics and rules of conduct for geospatial professionals
- Employ cartographic design principles to create and edit visual representations of geospatial data
- Prepare technical reports of the spatial and non-spatial data, including symbolized cartographic maps, tables, charts, and diagrams for targeted audiences
- Create interactive web mapping solutions and products
- Create end-user applications that leverage positioning technologies
- Develop a variety of spatial support materials such as help files, training manuals, and processes to assist in troubleshooting

*\*Note: Each required course that makes up the diploma will have 8-12 specific learning outcomes and elements of performance*

# **Q & A**

*Approximately how much time should I plan to spend per week per class?*

*Students can expect to devote approximately eight to twelve hours of effort per week per class.*

*Do I have to complete a course within a certain amount of time?*

*Yes, GIS courses have specific start and end dates. Assignments must be completed at certain times. Please see your course syllabus for specific dates.*

*Where will I find employment?*

*GIS software is being used widely in almost all fields. It is used by almost every sector including research institutions, environmental agencies, health organizations, land use planners, businesses, and government agencies at all levels. As GIS has such flexibility, graduates can find employment in many different fields.*

*The majority of GIS graduates are working for either private industry (agriculture, emergency services, environmental, forestry, GIS vendors, business, retail and real estate), consulting companies (environmental, engineering, forestry, and mapping) or government agencies (municipal, provincial, federal).*

*What kind of work do GIS employees do?*

*GIS staff use GIS software and hardware, customize GIS software, develop and design GIS databases, analyze GIS data, write programs to convert data, use image analysis software and integrate a variety of information. Your skills will allow you to discuss and use GIS theory to make decisions concerning GIS implementation, manage a GIS, train GIS users, implement and complete a GIS project. A significant field component may be involved in your job such as collecting data, completing assessments or surveying or engineering type tasks. Specifics duties will vary depending on the industry and organization where you are employed.*

*Where do I purchase my books?*

*There are only a few “required” textbooks, most of the reference material is found online and in Open Educational Resources. Visit the [college bookstore’s website](#) to learn more about required and purchasing tetbooks or ask your instructor.*

*Do I need a GPS?*

*Possibly, recreational and advanced GPS devices will be available for use in our on-campus program. Additionally, learners can use variety of software and smart phone apps can be used as a substitute. However many who work in the industry do have their own recreational grade GPS device.*

*Do I need to purchase my own computer? What are the technology requirements?*

*On-campus students will have access to the college’s computer labs which will be equipped with all the required software.*

*We encourage students to have access to a suitable computer and high speed Internet access to view and retrieve course content, activities, assignments, and communication tools. Assiniboine does provide access through its Remote Desktop Services for students to access some required software.*

*Due to limitations on computer labs many GIS students do purchase their own computers suitable of running the required GIS software to complete schoolwork outside of the class environment. In terms of technology requirements please refer to the [Technical Requirements](#) in this document.*

*How do I obtain the software that is required for many of the courses?*

*As a registered student, you have access to the current version GIS Software (ArcMap, ArcPro) as a free Student Trial editions (one year). It will include all necessary extensions. It is important to note that ArcGIS is a commercial software package that is restricted to personal use by the student. It is unlawful for anyone to use this software package to generate personal or corporate profit or revenue.*

*All other software will either be trial versions or Open Source and can be downloaded and installed as required. Specific instructions will be provided in the courses.*

*Students will need access to some office type software (Microsoft Office, Office 365 or another Open Source office suite). Students can access Microsoft Office Suite through the college's IT Services.*

*Are there final exams and how will I complete them?*

*Much of our course work is project based. In general, final exams and tests are limited. Many courses have in-course quizzes and tests which are completed through the Learning Management System. All GIS exams are online exams and may need to be written at the ACC Test Centre if they cannot be written as scheduled. For more details on the testing procedures please refer to the testing section in this document.*

*How will my instructor communicate with me?*

*Please note it is IMPORTANT to use your **ACC email account** when communicating with your instructor. Often other email addresses get caught in our college spam filter and aren't viewed on a regular basis. Once the course has begun, all written correspondence regarding the courses are required to be submitted through ACC email. Each course outline will include the instructors contact information, including email and phone number along with their set office hours.*

*Do I need prior experience in agriculture or using GIS or GPS technology?*

*No, prior experience isn't required. It's helpful if you have it, but not required. This advanced diploma program is ideal for people who want to expand their marketable skills. This program will build on your existing skillset and education. This program is well-suited for those who:*

- Use a variety of thinking skills to anticipate and solve problems.
- Have an aptitude for computer technology.
- Have a strong sense for big picture thinking with attention to detail.
- Are able to analyze, evaluate and apply relevant information from a variety of sources.
- Effectively work in a teamwork environment.

*What does the ideal student look like?*

*Students should be*

- Well-rounded, tech-savvy individuals with a wide range of skills
- Multi-tasking, multi-disciplinary and fast-on-their-feet
- Comfortable with writing, math and statistics in order to prepare reports, perform research and give a professional opinion
- Critical thinking and problem-solving skills
- Initiative, agility and adaptability
- Curiosity and creativity

# Technical Requirements – GIS Advanced Diploma

## Operating System Requirements:

- 64-bit version of Windows 7, Windows 8.1, or Windows 10 is required to run most GIS software
- Mac OSX (may require special configuration in order to run GIS software <http://edcommunity.esri.com/software-and-data/mac-os-support>)
- At present, NO tablets or smart phones are recommended for use to access GIS Software or the online material through Moodle – some features may work but others may not (quizzes or flash)

## GIS Software & Hardware Requirements:

### ArcGIS Desktop:

<https://desktop.arcgis.com/en/system-requirements/latest/arcgis-desktop-system-requirements.htm>

- Hyperthreaded dual core or Quad core processor,
- 8 GB or higher RAM (16 GB is optimal),
- Hard drive with at least 60 GB free disk space,
- Video /Graphics DirectX 11 feature level 10, Shader 4.1 or better or an Open GL-video card with 2GB graphics memory is recommended,
- 1 terabyte portable drive (for on-campus students).
- sound card and speakers or head phone
- Internet access: *High speed* (T1, DSL telephone or cable)

Check your computers ability to run ArcGIS Desktop with “Can You Run It?” You can check your computer against the system requirements with this program <http://www.systemrequirementslab.com/CLIENT/STANDARD/?APIKEY=50F41142-39B0-4061-97C2-BA7B7FE43D0E&REFID=1186&ITEM=10913>

### ArcGIS Pro:

<http://pro.arcgis.com/en/pro-app/get-started/arcgis-pro-system-requirements.htm>

Check your computers ability to run ArcGIS Pro with “Can You Run It?” You can check your computer against the system requirements with this program <http://www.systemrequirementslab.com/Client/Standard/?apikey=50F41142-39B0-4061-97C2-BA7B7FE43D0E&refid=1186&item=12433>

## Video Card/Screen Resolution:

Be sure to use the latest available drivers

DirectX	Minimum: DirectX 11, feature level 10.1, Shader Model 4.1 Recommended: DirectX 11, feature level 11.0, Shader Model 5.0
OpenGL	Minimum: OpenGL 3.3 with the ARB_viewport_array, EXT_texture_filter_anisotropic, and EXT_texture_compression_s3tc extensions. Recommended: OpenGL 4.5 with the ARB_shader_draw_parameters, ARB_viewport_array, EXT_swap_control, EXT_texture_compression_s3tc, and EXT_texture_filter_anisotropic extensions.
Dedicated (not shared) graphics memory	Recommended: 2 GB or more

## **Basic Software Recommendations:**

- Access to 1 of the following:
  - MS Office (2003 or later)
  - Microsoft Office 365 Cloud Based Solution
  - OpenOffice/Libre Office (Opens Source)
- Adobe Reader
- ArcGIS Desktop/ArcGIS Pro (Instructor to provide download, install instructions & activation key)
- Anti-virus software
- Most recent version of Chrome, Firefox or Edge (Note that ANY version of Internet Explorer is NOT recommended)
- Adobe Flash
- Java Enabled
- Some courses may require the latest versions of 1 or more of the following:
  - Flash Player
  - Shockwave Player
  - Windows Media
  - RealPlayer
  - QuickTime Player

## **Moodle:**

Assiniboine Community College uses Moodle Campus Edition as the Learning Management System to deliver all courses. You will receive your personal Moodle Log in information from the college registration department and the course enrollment keys from your instructor. All GIS related courses will be under the **GIS** Section of the **School of Agriculture and Environment** Moodle Page.

## **MyACC and Your User ID and Password Information**

Assiniboine Community College now offers students the flexibility of access to their financial accounts and academic records via the Internet. Please enter the following URL into your Internet browser: <http://myacc.assiniboine.net>

You should now be on the MyACC login home page. If you have never accessed MyACC before, please go to “I’m New to MyACC” in the lower right-hand corner of the page. The initial password for all student accounts is your birth date entered as a string of 6 digits: YYMMDD (i.e. November 2, 1978 is 781102). The first time you enter this password you will be asked to change it. Passwords must be between 6 and 9 characters and contain both letters and numbers. Passwords will expire every 90 days.

If you experience difficulties with your username or password, please go to “Contact Us” on the MyACC homepage.

## **Policies**

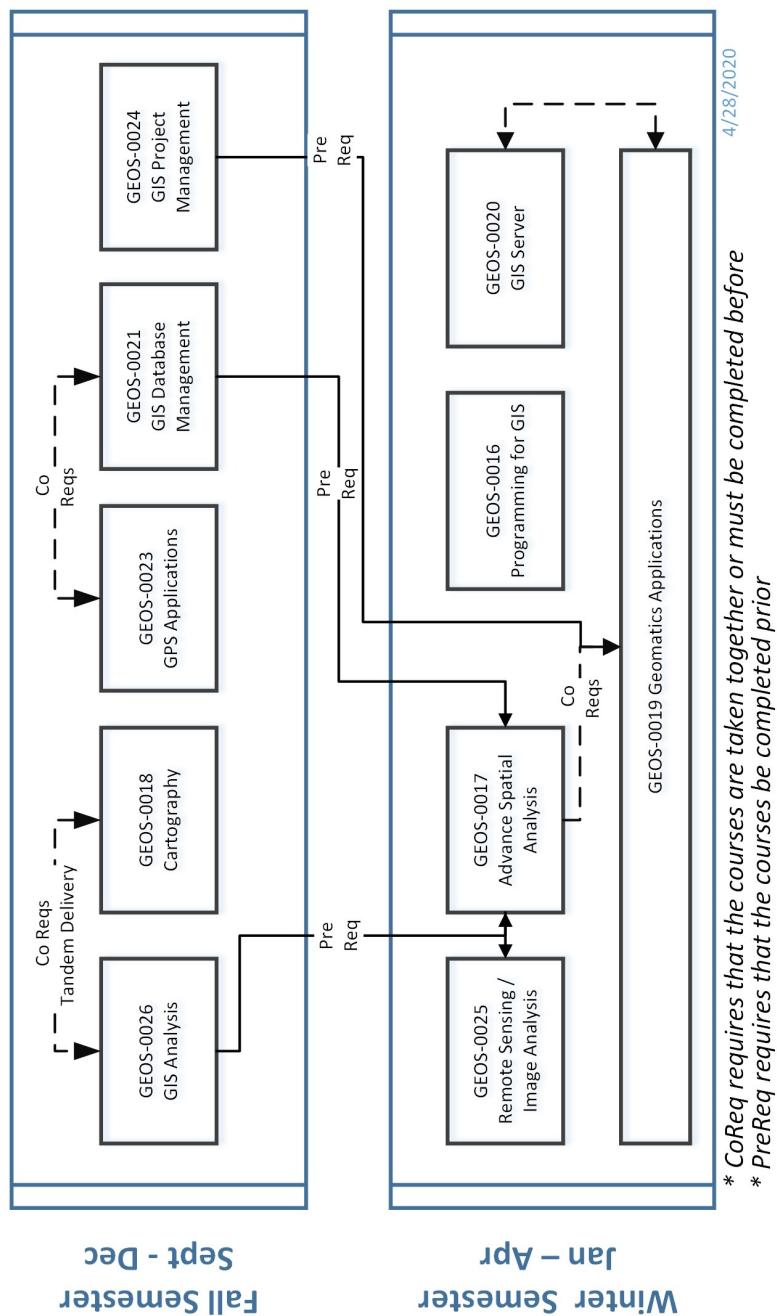
Refer to the current Academic Policy Handbook regarding policies that affect you as a student. The current Academic Policy Handbook can be found on the college website [www.assiniboine.net](http://www.assiniboine.net) under Students/Academic Policies

[https://assiniboine.net/students/academic-policies](http://www.assiniboine.net/students/academic-policies)

# Program & Course Flowchart



## Assiniboine Community College GIS Advanced Diploma 1 Year On Campus Full-Time



4/28/2020

\* CoReq requires that the courses are taken together or must be completed before

\* PreReq requires that the courses be completed prior

# *Course Descriptions & Rationale*

GEOS-0018 Cartography	The course introduces students to computer-assisted cartographic methods and processes. Emphasis is on map design and cartographic communication using computer-assisted cartographic techniques. Students will examine multimedia cartographic visualization prospects. Cartographic ethics are observed and adhered to during the various cartographic products generated.	GIS technicians require a sound theoretical and practical foundation in the fundamentals of thematic map design and methods of cartography. A comprehensive knowledge of thematic mapping, cartographic design, and map projections are expected in the GIS industry. As well, industry expects a thorough understanding of the application of traditional and computer generated mapping.
GEOS-0026 GIS Analysis	Students will explore the basic principles and theories related to Geographic Information Systems (GIS) applications. Students apply these principles to different industry management situations using a variety of GIS software packages. Using fundamental GIS concepts, students explore the vector and raster data analysis geoprocesses. Various methods of spatial data manipulation and interpolation are implemented along with grid cell analysis.	GIS Analysis provides a comprehensive understanding of GIS concepts that are needed and practiced in industry. Geoprocesses are used every day in the professional community and students will analyze when, where, how, and why we use them. Focus is spent on both vector and raster geoprocesses. Students will be able to apply geographic principles and geographical information systems to new and innovative situations using critical thinking skills to determine practical solutions. External data sources, map algorithms, and elementary geostatistical analy-
GEOS-0016 Programming for GIS	This course introduces students to GIS programming software to create applications using the graphical user interface (GUI). Students develop visual and object-oriented approaches to programming. Instruction covers the development interface, the use of most available controls and their properties, cutting-edge interface design methods, debugging techniques, and general programming tips. This course will integrate GIS programming skills in a variety of different situations such as custom geoprocess analysis and web integration.	Basic computer programming skills are essential for success in the GIS profession. These skills can be implemented in other programming languages to build web or program applications. Material will be rudimentary in nature and delivered in mainly hands on format. Basic programming skills are useful when creating code, communicating with a programmer who is building code, and when trying to read code to understand a program. Students will be well equipped to communicate with other team members in the programming community.

GEOS-0017 Advanced Spatial Analysis	<p>The course builds on the foundational GIS knowledge and skills acquired at the introductory level and guides students in the development of increasingly sophisticated spatial and geostatistical analyses. Students will learn how to perform different types of spatial analyses, identify the types of questions different analysis approaches can answer, critically evaluate the advantages and limitations of different approaches, and gain a better understanding of the use of capabilities of spatial analysis. Students will apply model building tools to advanced geostatistical methods. Spatial modelling and analysis techniques like spatial interpolation, multi-criteria decision making, Fuzzy Logic, predictive modelling, regression, network analysis, routing, site selection and data mining skills will be explored.</p>	<p>GIS is essential to understand spatial information and manage many organizations. This approach is transforming the way organizations operate and advanced geospatial skills are required. GIS professionals typically employ GIS to examine selected geographic datasets in detail, which are combined for the comprehensive study, and analysis of spatial problems. Advanced analytical skills are required by businesses and organizations who managed geospatial information. Skills are needed to identify problems, constraints, opportunities and alternatives required to complete complex analysis and use predictive modeling in order to solve problems and make better decisions within organizational settings.</p>
GEOS-0019 Geomatics Applications	<p>Learners will apply foundational knowledge and skills acquired in previous courses to complete a wide range of geospatial applications using data from areas such as forestry, resource management, agriculture, civil/infrastructure, disaster management, land reclamation, mining, water management, LiDAR, site selection, UAV/Drone analysis, and/or open source geospatial software among others. Learners will develop an industry based GIS Capstone Proposal, work plan and complete a GIS analysis report for a user defined GIS Project. Learners will design and build a comprehensive Geomatics Skills Portfolio which will serve as a resource for demonstrating skills to employers and can continue to grow as your career progresses. This course acts as a culminating experience of the GIS Advanced Diploma Program.</p>	<p>The GIS industry requires employees to be well versed in a variety of spatial analysis techniques, geomatics applications, and the ability to self-learn new software, applications, and methodology. Organizations require staff to adapt quickly in fields such as resource management, agriculture, infrastructure, disaster management, LiDAR, site selection, UAV/Drone, image analysis, and open source geospatial software. Employees are required to exercise and hone their leadership skills. As well, they are encouraged to complete self-guided continual learning to keep up to date on geospatial technology while working to expand and enhance problem solving and software skill sets.</p>

GEOS-0020 GIS Server & Web	This course familiarizes students to the use of GIS cloud and server resources. Students will evaluate and implement systems using three cloud service models (infrastructure, platform, and software services). The setup of server and cloud services for creating maps, managing information needed to exercise the critical spatial data, and processing spatial data will be thinking skills, and technical knowledge need-accomplished. Students will explore a range of ed to evaluate and develop successful cloud open source and close source (proprietary) GIS GIS projects is essential in the GIS profession. industry service systems. This course will integrate GIS programming skills in a variety of different situations such as custom geoprocess analysis and web integration.	Many organizations use a server for spatial data organization and presentation. This course will demonstrate how to set up cloud services for creating maps, and for managing and processing spatial data. The background
GEOS-0021 GIS Database Management	In this course, students will explore how geo-spatial data is created, shared, and stored. Topics will focus on data management, conversion, and manipulation within a geospatial context. Initial focus is on data transfer, sources of digital geographic data, and geographic data formats. Students will progress into advanced database solutions, including theory and design of a relational database. Interface design principles of data input, complex queries, relationship classes, topological rules, hierarchical geospatial data layers, domains, and classes are applied to spatial and non-spatial data.	A thorough knowledge and use of database design, structure, and management across a range of architectures and file systems is required in the geospatial industry. An understanding of data compatibility issues, as well as the methods and tools used in converting spatial data to a suitable format, is an asset. Much of the information that exists today is stored in databases. A GIS Analyst must understand how the structure, use, and capabilities influences the efficiency of GIS for editing, manipulating, and managing data.
GEOS-0023 GPS Applications	This course introduces students to the application of tools related to Global Navigation Satellite Systems (GNSS). Decision-making as it relates to Global Positioning System (GPS) implementation is stressed. Students will learn proficiency in operating a variety of GPS equipment, mission planning, data collection, data accuracy, documentation, processing, and field techniques. Students will be exposed to innovative GPS equipment and mapping techniques. Emphasis will be placed on data collection, quality, and management.	Advanced knowledge and skills in GPS mapping equipment is required for many industries. These include precision agriculture, forestry, mining, utilities, resource management, business, emergency planning, and surveying. Resource managers and geospatial technicians work constantly with GPS data and must understand planning, data collection, processing, quality, documentation and management techniques. GPS data often becomes the backbone for integration into other mapping and analysis functions.

<p><b>GEOS-0024</b> <b>GIS Project Management</b></p>	<p>This course takes a systematic approach to explore the management issues, methods, ethics and professionalism necessary for developing a successful geospatial technology business, organization and/or project. Students will be introduced to the issues faced by managers responsible for implementing GIS projects in businesses and organizations. Topics explored in detail include: project scope, developing project support, planning, budgeting, pilot projects, project control, tracking and reporting, request for proposals, contract management and staffing. Students learn to apply financial analysis principles to improve profitability of GIS based business and organizations. Students will explore, through case studies and discussions, ROI analysis, ethics and professionalism in geospatial technologies along with the consequences of choosing open source vs. proprietary software solutions, geospatial standards, spatial data infrastructures, web-based geoprocessing services, data sources and use to geospatial project workflows.</p>	<p>GIS is a leading innovation in a knowledge-based economy. As a result, project, financial, and business management skills are required by employees responsible for implementing GIS projects in government and private sector organizations. The implementation of project management procedures and development of business skills will improve project performance. As well, it can provide valuable products and services in a cost effective manner to achieve critical business objectives. Professionalism in the geospatial sector requires a commitment to ethical practice. This is achieved by a more sophisticated understanding of the ethical implications of geographic technologies.</p>
<p><b>GEOS-0025</b> <b>Remote Sensing &amp; Image Analysis</b></p>	<p>This course implements the fundamental skills and principles involved in acquiring, manipulating, analyzing, interpreting, and presenting remotely sensed data. The data is presented or integrated with other data forms for direct implementation within a GIS. The students learn to manipulate digital and non-digital images using a variety of software packages. An overview of digital image processing techniques for commercial and research-based remotely sensed earth resource monitoring systems is provided. Emphasis is on the use and interpretation of passive (optical) satellite imagery using both automated and semi-automated information extraction. Learners are introduced to microwave sensing (radar). Various standard image enhancements, formats and analysis procedures are practiced.</p>	<p>An understanding of GIS related remote sensing concepts - including satellite systems and computer classification of images is critical in the GIS industry. Image manipulation using the GIS software is useful to decipher digital and non-digital remotely sensed data. GIS staff will be required to have at least a basic knowledge and understanding of how remotely sensed data is collected and analyzed for usage. These skills are utilized in a variety of industries to decipher who, what, where, when, why, and how questions about a spatial situation photographed of the earth.</p>