

Area of Interest: Advanced Technology

Geographic Information Systems (Co-op and Non Co-op Version)

Ontario College Graduate Certificate

Program Code: 1588X03FPM

1 Year

Pembroke Campus

Our Program

Specialize your career path - explore geographic science and information systems technology.

The one-year Geographic Information Systems Ontario College Graduate Certificate program provides you with knowledge and skills relating to geographic and cartographic science, with a focus point on information systems technology.

In this program, you use both hands-on and theoretical approaches to explore topics such as:

- field data collection
- programming
- remote sensing
- enterprise geo-database design and management
- cloud-based services
- application development
- 2D and 3D cartographic design
- spatial analysis and project management

A key part of this program is the independent project that you begin in your first semester and complete throughout your studies. You identify an area of interest, develop a project proposal, and then implement and complete your project, all in collaboration with an industry or government sponsor.

Students also have the option to gain real-world experience through a paid co-operative education (co-op) work term (see Additional Information for more details). Please note that places in the co-op work term are subject to availability and academic eligibility. Please note admission to the co-op program does not guarantee a co-op placement.

The use of GIS in various business environments is growing. Graduates may find work in:

- natural resource (forestry and environmental) management
- utility/resource management companies
- survey/engineering/environmental companies
- software companies
- municipal, provincial or federal agencies

Graduates may also seek employment in jobs where GIS is a tool used within the discipline of their previous degree or diploma.

SUCCESS FACTORS

This program is well-suited for students who:

- Have the ability to summarize and present technical topics both orally and in written formats.
- Have the aptitude for computer technology and/or computer programming.
- Are able to analyze, evaluate and apply relevant geographic information from a variety of sources.
- Have a strong sense for spatial relationships.
- Use a variety of thinking skills to anticipate and solve problems.
- Can work effectively in a teamwork environment.

Employment

Graduates may find employment in organizations, such as forestry and environmental resource management companies, utility management companies, survey/engineering/environmental firms, software companies, or municipal, provincial or federal agencies. They may seek employment in jobs where GIS is a tool used within the discipline of their previous degree or diploma. Graduates may also find employment where information technology is the primary focus.

The implementation of GIS in various governmental and business environments is growing rapidly, enhancing employment opportunities for GIS graduates in this sector.

Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Create digital geographic data sets and services to given specifications suitable for use in GIS applications and digital mapping.
- Use GIS software and applications in various situations to create required documents and applications.
- Organize, manipulate, summarize and analyze spatial and aspatial data by utilizing statistical and database design concepts.
- Analyze complex geographic data sets according to given specifications and parameters.
- Create programs for specific tasks or purpose by applying software programming concepts and techniques.
- Plan and execute a GIS project according to stakeholder requirements.
- Communicate complex geographic information in visual and verbal forms, to stakeholders.
- Interpret, georeference, correct, and classify remotely-sensed imagery for use in GIS.
- Apply cartographic design principles to create hard-copy maps and/or digital displays.
- Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

Program of Study

Level: 01	Courses	Hours
GIS7107	Introduction to Programming	56.0
GIS7110	GIS Foundation Skills	84.0
GIS7111	Spatial Data and Data Collection	56.0

GIS7112	Statistics and Data Representation	42.0
GIS7113	Database Design and Management	56.0
Level: 02	Courses	Hours
GEP1001	Cooperative Education and Job Readiness	18.0
GIS7204	Introduction to Remote Sensing	56.0
GIS7205	Digital Map Compilation	56.0
GIS7207	GIS Programming 1	56.0
GIS7210	Cartographic Design and Visualization	42.0
GIS7211	Geospatial Analytical Methods	56.0
GIS7212	GIS Applications and Project Planning	28.0
Level: 03	Courses	Hours
GIS7304	Remote Sensing 2	56.0
GIS7307	GIS Programming 2	56.0
GIS7308	Web GIS Applications	56.0
GIS7309	GIS Project	84.0
Co-op: 01	Courses	Hours
WKT7004	Cooperative Education Work Term	

Fees for the 2023/2024 Academic Year

Tuition and related ancillary fees for this program can be viewed by using the Tuition and Fees Estimator tool at <https://www.algonquincollege.com/fee-estimator>.

Further information on fees can be found by visiting the Registrar's Office website at <https://www.algonquincollege.com/ro>.

Fees are subject to change.

Additional program related expenses include:

- Books and supplies cost approximately \$2,096 for the program and can be purchased from the campus store.
- For more information visit <https://www.algonquincollege.com/coursematerials>.

Admission Requirements for the 2024/2025 Academic Year

Program Eligibility

- Ontario College Diploma, Ontario College Advanced Diploma, Degree or equivalent in a related field, or equivalent with departmental approval.
- Applicants may be required to complete the Assessment for Advanced Programs (ELAAP-IT) administered through the Test Centre, and pay an exam fee.
- Applicants with international transcripts must provide proof of the subject-specific

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- IELTS-International English Language Testing Service (Academic) Overall band of 6.5 with a minimum of 6.0 in each band; OR TOEFL-Internet-based (iBT)-overall 88, with a minimum of 22 in each component: Reading 22; Listening 22; Speaking 22; Writing 22; OR Duolingo English Test (DET) Overall 120, minimum of 120 in Literacy and no score below 105.

Programming experience is not a requirement for this program of study; however, applicants are encouraged to acquire basic programming experience prior to the start of the program of study.

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Application Information

GEOGRAPHIC INFORMATION SYSTEMS (CO-OP AND NON CO-OP VERSION) Program Code 1588X03FPM

Applications to full-time day programs must be submitted with official transcripts showing completion of the academic admission requirements through:

ontariocolleges.ca
60 Corporate Court
Guelph, Ontario N1G 5J3
1-888-892-2228

Applications are available online at <http://www.ontariocolleges.ca/> .

Applications for Fall Term and Winter Term admission received by February 1 will be given equal consideration. Applications received after February 1 will be processed on a first-come, first-served basis as long as places are available.

International applicants applying from out-of-country can obtain the International Student Application Form at <https://algonquincollege.force.com/myACint/> or by contacting the Registrar's Office.

For further information on the admissions process, contact:

Registrar's Office
Algonquin College in the Ottawa Valley
1 College Way
Pembroke, ON K8A 0C8
Local: 613-735-4700
Toll-free: 1-800-565-4723
TTY: 1-866-620-3845

Fax: 613-735-4739

<https://www.algonquincollege.com/pembroke>

Additional Information

CO-OP INFORMATION:

All applicants apply directly to the co-op version of this program through <http://www.ontariocolleges.ca/> or our International Application Portal. Applicants not wishing to pursue the co-op version will have the opportunity to opt-out after being admitted to the program but prior to the first co-op work term.

Co-operative education (Co-op) allows students to integrate their classroom learning with a real-world experience through paid work terms. Two academic terms prior to the cooperative education work term, students are required to actively participate in and successfully complete the self-directed co-op course, readiness activities and workshops.

Students must actively conduct a guided, self-directed job search and are responsible for securing approved program-related paid co-op employment. Students compete for co-op positions alongside students from Algonquin College and other Canadian and international colleges and universities. Algonquin College's Co-op Department provides assistance in developing co-op job opportunities and guides the overall process, but does not guarantee that a student will obtain employment in a co-op work term. Co-op students may be required to relocate to take part in the co-op employment opportunities available in their industry and must cover all associated expenses; e.g., travel, work permits, visa applications, accommodation and all other incurred expenses.

Co-op work terms are typically 14 weeks in duration and are completed during a term when students are not taking courses. For more information on your program's co-op level(s), visit the courses tab on your program's webpage.

International students enrolled in a co-op program are required by Immigration, Refugees and Citizenship Canada (IRCC) to have a valid Co-op/Internship Work Permit prior to commencing their work term. Without this document International students are not legally eligible to engage in work in Canada that is part of an academic program. The Co-op/Internship Work Permit does not authorize international students to work outside the requirements of their academic program.

For more information on co-op programs, the co-op work/study schedule, as well as general and program-specific co-op eligibility criteria, please visit <https://www.algonquincollege.com/coop>.

Course Descriptions

GEP1001 Cooperative Education and Job Readiness

Students are guided through a series of activities that prepare them to conduct a professional job search and succeed in the workplace. Through a detailed orientation students learn the cooperative education program policies and procedures related to searching and securing a work term opportunity. Students identify their strengths and transferable skills and participate in workshop-style sessions that focus on cover letter and resume development, interview techniques and job search strategies. Students learn how to navigate a web-based resource centre, which is used to post employment and cooperative education job opportunities. Students reflect on workplace success, ethics and responsibilities.

Prerequisite(s): none

Corerequisite(s):none

GIS7107 Introduction to Programming

Programming skills are required to customize GIS software and to automate geoprocessing. Students explore programming fundamentals including data types (strings, numbers, lists and dictionaries), flow control structures (looping and branching), file access and program design concepts (breaking larger programs into separate code modules and functions). Students code, test and debug using industry standard integrated development environments (IDEs). Students begin to explore Object Oriented programming concepts (classes, objects, inheritance).

Prerequisite(s): none

Corerequisite(s):GIS7113

GIS7110 GIS Foundation Skills

Students learn and develop foundation skills using desktop and online GIS software. They learn to select suitable formats for storage of spatial information including geo-relational vector data models, raster data models and specialized data models. Students access and explore open data sources, and examine the linkage between spatial entities and attribute tables. They organize and access data using local, network and internet service architectures. Students create spatial and attribute-based queries, including spatial and attribute-based joins. Students execute basic geoprocessing through a variety of approaches, and develop basic data editing skills.

Prerequisite(s): none
Corerequisite(s):GIS7113

GIS7111 Spatial Data and Data Collection

Knowledge of map interpretation, projections and coordinate systems is essential in GIS. Students examine global geometry and coordinate systems, ellipsoids, horizontal and vertical datums. Students examine the properties and classes of map projections, and develop skills in projection selection. Students examine means of collecting geographic data including GPS and develop data collection protocols for data verification and field checking. Students also explore a variety of methods for data conditioning and preparation. They work in teams to collect data in the field. Students investigate various sources of online geographic data and map services, and create web-based reports using HTML and CSS.

Prerequisite(s): none
Corerequisite(s):none

GIS7112 Statistics and Data Representation

An understanding of data characteristics is required to create effective geographic representations and analyses. Students explore the relationship between statistics and geographic data. Students also explore various data measurement classes. Students investigate basic bivariate, multivariate and spatial statistics commonly used with spatial data. The focus is on appropriate usage of techniques rather than mathematical derivation. Topics and techniques include spatial/nonspatial summary measures, and basic regression analysis. Students explore the concept of spatial autocorrelation, and apply basic statistical techniques to geographic data sets using appropriate software. Students explore basic cartographic design using their understanding of data statistics. Colour theory and symbology are also explored.

Prerequisite(s): none
Corerequisite(s):none

GIS7113 Database Design and Management

Database design and management is an integral part of GIS. Students are introduced to database design and management concepts. Students gain experience in data modelling, database design, and database management along with database access, integrity and security. They investigate both relational and object-relational approaches. Students program database queries using database manipulation languages. The links between conventional databases and spatial databases used in GIS are examined. Students gain experience with open source and commercial database management software including multi-user client-server architectures.

Prerequisite(s): none
Corerequisite(s):none

GIS7204 Introduction to Remote Sensing

Remote sensing is a major component of GIS. Students explore the principles of image acquisition from airborne and space sensors. Topics include the characteristics of the electromagnetic spectrum, geometric and radiometric correction, image interpretation and image classification. Students gain experience using remote sensing software.

Prerequisite(s): GIS7111 and GIS7112
Corerequisite(s):none

GIS7205 Digital Map Compilation

Awareness of the characteristics of CAD data formats is important when working in the GIS field. Using CAD software, students construct, manipulate and edit graphic elements suitable for mapping and GIS applications. They work to mapping specifications for optimal feature representation and positional accuracy. Students transform CAD data into various GIS data formats and work in teams for some assignments. Students gain awareness of conventional survey methods.

Prerequisite(s): GIS7110 and GIS7111
Corerequisite(s):none

GIS7207 GIS Programming 1

Programming skills are required to customize GIS software and to automate geoprocessing. Students automate geoprocessing tasks and build custom GIS tools using industry standard application frameworks and class libraries. Students use object-oriented, event-driven programming concepts to modify GIS application GUIs and to integrate their own application extensions. They explore more complex application architecture using advanced integrated development environments (IDEs).

Prerequisite(s): GIS7107 and GIS7110 and GIS7113
Corerequisite(s):none

GIS7210 Cartographic Design and Visualization

Knowledge of design principles is integral to the presentation of geographic information. Students investigate design issues in thematic mapping. They apply generic design concepts to cartography. Thematic mapping topics explored include classification, simplification and generalization. Students select and design cartographic representations most appropriate to the data. Students explore various approaches to visualization. They create dynamic web displays of cartographic information. Students also explore the history of cartography.

Prerequisite(s): GIS7110 and GIS7111 and GIS7112
Corerequisite(s):none

GIS7211 Geospatial Analytical Methods

Students examine various analytical principles and techniques for spatial problem solving. Students transform spatial data using various approaches including advanced interpolation. Multi-criteria analysis is explored. 3D analysis is explored, including DEM derivation from LiDAR and other sources, as well as interactive display of 3D visualization. Temporal analysis and interactive display options are introduced. Students use GIS network analysis to model transportation scenarios. The use of scripts and models to document analytical methods is emphasized.

Prerequisite(s): GIS7110 and GIS7111
Corerequisite(s):none

GIS7212 GIS Applications and Project Planning

Awareness of the various approaches to GIS project design and applications of GIS technology helps students prepare for their own independent project. Students investigate various GIS case studies in order to explore a range of GIS applications. Students discuss solutions to GIS problems and scenarios, and prepare for their GIS Project by exploring project management concepts and creating a written and oral project proposal.

Prerequisite(s): GIS7110 and GIS7111 and GIS7112
Corerequisite(s):none

GIS7304 Remote Sensing 2

Remote sensing is a major component of GIS. Students investigate advanced classification procedures, texture measures, change detection, colour space transforms and principal component analysis. They examine the detailed characteristics of images from various sensors. Students explore the integration of Remote Sensing and GIS. The integration of advanced statistical tools with imagery datasets is explored.

Prerequisite(s): GIS7207 and GIS7211
Corerequisite(s):none

GIS7307 GIS Programming 2

Programming skills are required to customize GIS software and to automate geoprocessing. Students customize GIS software and build various software components. Students develop geospatial analysis methodologies using programming languages and extensions, large data sets and web services. Application deployment is also covered.

Prerequisite(s): GIS7207
Corerequisite(s):none

GIS7308 Web GIS Applications

The web is an increasingly important platform for analyzing and viewing geographic data. Students learn to serve geographic information using the Internet and are introduced to web architecture, protocols and the request-response cycle. Students develop web applications using HTML, JavaScript and extensions, server-side scripting and a web server, as well as web applications that access databases and integrate tabular data into web applications. Open-source and commercial map server technology are introduced and students also develop dynamic map services that are integrated within web applications. Cloud-based GIS-content management systems and templates are also introduced. Issues explored include accessibility, standards and geographic communication using web GIS applications.

Prerequisite(s): GIS7207 and GIS7210
Corerequisite(s):none

GIS7309 GIS Project

Executing an independent GIS project builds soft skills and provides students with an opportunity to showcase their abilities to the wider GIS community. Students carry out an independent GIS project in consultation with external project sponsors. Evaluation is based on project organization and scheduling throughout the term, as well as the final products. Students give oral presentations about the project and produce a variety of project deliverables, documentation and presentation materials.

Prerequisite(s): GIS7211 and GIS7212
Corerequisite(s):none

WKT7004 Cooperative Education Work Term

Students complete a cooperative work term, and submit a written report which documents the location of employment and the duties performed.

Prerequisite(s): none
Corerequisite(s):none