Area of Interest: Advanced Technology

Photonics Engineering Technology

Ontario College Advanced Diploma Program Code: 6422X01FWO

3 Years

Ottawa Campus

Our Program

Develop advanced skills in photonics, AI-enabled vision systems, optical communications, sensing, and automation technologies used in telecommunications, healthcare, aerospace, autonomous, and defense applications.

The three-year Photonics Engineering Technology Ontario College Advanced Diploma prepares you to design and build technologies powered by light. Photonics drives today's fastest-growing industries including telecommunications, healthcare, autonomous systems, and advanced manufacturing. You combine optics, electronics, and programming to develop versatile, future-ready skills. Learn using advanced equipment including optical communication systems inspired by industry leaders. Build practical experience that adapts across multiple sectors and aligns with evolving industry needs.

Explore exciting and fast-growing fields at the heart of modern innovation. Work with lasers, optical fibers, and intelligent sensors while discovering how technologies like LiDAR, machine vision, and artificial intelligence transform industries. Work with optical telecommunication networks and high-speed data systems in hands-on lab environments. Learn by doing in labs, simulations, and real-world projects. Design optical systems, analyze data, and build smart sensing and communication solutions. Work in teams, solve complex problems, and bring ideas to life using industry-relevant equipment and techniques.

Graduates find opportunities in a wide range of industries and environments, including:

- telecommunications and optical network infrastructure
- autonomous systems, robotics, and smart mobility
- healthcare technologies and biomedical imaging
- advanced manufacturing and laser-based processing
- environmental monitoring and remote sensing systems
- defence, surveillance, and advanced sensing technologies
- aerospace and airborne optical systems
- digital media, immersive imaging, and entertainment technologies

Additional program advantages include hands-on applied learning, exposure to industry-standard technologies, and opportunities to work on real-world projects. The program supports career readiness in high-demand sectors, helping you contribute to innovative technologies that shape how the world connects, sees, and communicates.

Employment

Graduates may find employment as Optical Communications Technologists, Fibre Optic Network Technologists, Optical Network Operations Specialists, Optical Transmission Technologists, Photonics Systems Technologists, Optical Systems Integration Technologists, Optoelectronics Technologists, Optical Testing and Characterization Technologists, Optical Assembly and Packaging Technologists, Laser Systems Technologists, Electro-Optical Systems Technologists, LiDAR and Remote Sensing Technologists, Optical Sensor Systems Technologists, Machine Vision

Technologists, Computer Vision and Imaging Technologists, Intelligent Sensing Systems Technologists, Embedded Sensing Systems Technologists, Photonics Manufacturing Technologists, Silicon Photonics Technologists, Integrated Photonics Technologists, Optical Design Technologists, Photonics Simulation and Modeling Technologists, Optical Metrology Technologists, Imaging Systems Technologists, Biomedical Imaging Technologists, Automation and Smart Systems Technologists, Photonics Applications Specialists, Technical Support Specialists - Optical Systems, Optical Network Testing Specialists, Field Service Technologists - Photonics Systems, Photonics Software and Data Systems Technologists, or Optical Security and Sensing Technologists.

Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Analyze and solve technical problems related to photonics, optoelectronics and intelligent sensing systems to improve photonics system performance and operational efficiency.

- Develop and evaluate photonics, optoelectronics, and intelligent sensing systems to ensure functionality, performance and compliance with industry standards.

- Build, assemble, align and integrate photonics, optoelectronics, and embedded sensing systems to support product development and operational performance.

- Support continuous improvement initiatives in photonics to meet client requirements.

- Perform work related to photonics systems in compliance with applicable legislation, codes, standards, safety regulations, and ethical practices.

- Develop and interpret tests and measurements to contribute to quality control and assurance programs in photonics and optoelectronics.

- Collect, process and analyze experimental data to support photonics system evaluation, diagnostics, and applied research activities.

- Coordinate tasks and resources to support the completion and evaluation of photonics engineering technology projects within established timelines.

- Diagnose, maintain, and troubleshoot photonics-based systems and optoelectronic devices to ensure optimal performance and reliability.

- Develop strategies to enhance professional growth and lifelong learning in the photonics engineering field.

- 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
DAT8921	Introduction to Programming	42.0
ENL1004	Professional Communication Essentials	42.0
MAT8100P	Essential Mathematics	70.0
PHY0003	Applied Physics	70.0
PLT0002	Trends in Photonics Technology	42.0
Level: 02	**Courses**	**Hours**
MAT8101	Differential Calculus	42.0
PLT0003	Introduction to Optics	70.0

PLT0004	Circuits and Signals	56.0
PLT0005	Systems Modeling and Simulation	56.0
Choose one from equivalencies:	**Courses**	**Hours**
GED6422	General Education Elective	45.0
Level: 03	**Courses**	**Hours**
CST0012	Scientific Programming and Data Processing	56.0
ENL2019T	Communicating Technical Information	42.0
MAT8102	Integral Calculus	42.0
PLT0006	Light Sources and Laser Fundamentals	56.0
PLT0014	Integrated Circuits	56.0
Choose one from equivalencies:	**Courses**	**Hours**
GED6422	General Education Elective	45.0
Level: 04	**Courses**	**Hours**
PLT0007	Design of Optical Components and Systems	70.0
PLT0008	Photonics Component Fabrication	56.0
PLT0015	Microcontrollers for Sensing Applications	70.0
PLT0016	Laser Systems and Applications	56.0
Choose one from equivalencies:	**Courses**	**Hours**
GED6422	General Education Elective	45.0
Level: 05	**Courses**	**Hours**
PLT0009	Optical Fibres and Waveguides	56.0
PLT0010	Photonics Project 1	42.0
PLT0011	Lidar and Advanced Optical Sensing Systems	70.0
PLT0017	Medical Imaging and Biosensors	56.0
PLT0026	Optoelectronic Devices and Sensor Systems	56.0
Level: 06	**Courses**	**Hours**
ENL0200	Engineering Report and Presentation	42.0
PLT0012	Computer VIsion and Artificial Intelligence	56.0
PLT0013	Machine VIsion and Optical Imaging	42.0
PLT0019	Fibre Communications	70.0
PLT0020	Photonics Project 2	84.0

Fees for the 2026/2027 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.

Books and supplies total approximately $1200 in the first year, $750 in the second year and $400 in the third year.

Admission Requirements for the 2027/2028 Academic Year

College Eligibility

- Ontario Secondary School Diploma (OSSD) or equivalent;

- Mature Student status (19 years of age or older and without a high school diploma at the start of the program). Eligibility may be determined by academic achievement testing, for which a fee will be charged.

Program Eligibility

- English, Grade 12 (ENG4C or equivalent).

- Mathematics, (Grade 12 MCT4C) or (Grade 11 MCR3U) or equivalent; or (Grade 12 MAP4C with a grade of 65% or higher) or (Grade 11 MCF3M with a grade of 65% or higher).

- Applicants with international transcripts must provide proof of the subject specific requirements noted above and may be required to provide proof of language proficiency. Domestic applicants with international transcripts must be evaluated through the International Credential Assessment Service of Canada (ICAS) or World Education Services (WES).

- IELTS-International English Language Testing Service (Academic) Overall band of 6.0 with a minimum of 5.5 in each band; OR TOEFL Internet-based (iBT) tests taken prior to January 21, 2026 overall 80, with a minimum in each component: Reading 20; Listening 20; Speaking 20; Writing 20; OR TOEFL Internet-based (iBT) tests taken after January 21, 2026 overall 4, with a minimum in each component: Reading 4; Listening 4; Speaking 4; Writing 4; OR Duolingo English Test (DET) Overall 110, minimum of 110 in Literacy and no score below 95.

- Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English and mathematics.

Application Information

PHOTONICS ENGINEERING TECHNOLOGY
Program Code 6422X01FWO

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

Students currently enrolled in an Ontario secondary school should notify their Guidance Office prior to their online application at https://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 please visit this link for application process information: https://algonquincollege.my.site.com/myac360/s/

For further information on the admissions process, please visit:
Admissions - Registrar's Office https://algonquincollege.com/ro/admissions/

Course Descriptions

CST0012 Scientific Programming and Data Processing

Analyzing engineering data requires a strong foundation in scientific programming. Students develop skills in data processing, visualization, and basic algorithm design. They explore how software tools interface with measurement systems and support data-driven decision-making. Through coding exercises and applied projects, students apply their knowledge to process and interpret technical data.

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

DAT8921 Introduction to Programming

Programming provides opportunities to solve problems and innovate solutions in the engineering field. Students are introduced to structured programs in a high-level language and develop the ability to write appropriate user functions, code control structures and supported data-types. They explore problem-solving strategies, program design, debugging methods and program documentation. Students are also introduced to available standard (std) library resources for a particular programming language. Through lab exercises, students apply programming language skills to solve engineering problems.

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

ENL0200 Engineering Report and Presentation

Engineering technology projects leverage communication strategies to support project execution as well as accurate translation of the process and results to various audiences. Students develop project-related documentation strategies to support the implementation of their project plan. Through technical reports and project presentations, students articulate the objectives, design, method, and outcomes of photonics engineering technology projects.

Prerequisite(s): ENL2019T
Corerequisite(s):PLT0020

ENL1004 Professional Communication Essentials

Communication remains a fundamental skill regardless of discipline or field of study. Using an applied approach, students focus on writing, oral communication, and accessing and using information targeting different audiences in both workplace and academic settings. Students develop and strengthen professional communication skills through a combination of lectures, in-class exercises, and independent learning.

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

ENL2019T Communicating Technical Information

The ability to communicate effectively in a technically-oriented interdisciplinary workplace is a foundational skill in an innovation-driven economy. Students are exposed to exercises and assignments designed to foster independent and collaborative critical thinking, research, writing, visual communication and presentation skills related to technical topics.

Prerequisite(s): ENL1813T or ENL1004
Corerequisite(s):none

GED6422 General Education Elective

Students choose one course, from a group of general education electives, which meets one of the following five theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, Personal Understanding, and Science and Technology.

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

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

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

MAT8100P Essential Mathematics

The study of algebraic and transcendental functions is an essential prerequisite to Calculus. Students manipulate algebraic expressions, solve algebraic equations and linear systems, and learn the properties of algebraic and transcendental functions. Students graph a variety of functions and solve problems involving complex numbers, trigonometry and vectors. Delivered in a modular format, this course is equivalent to the completion of all of the following math modules MAT8100 - A, B, C, D, E, F, G, H, and I.

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

MAT8101 Differential Calculus

Differential Calculus is the mathematical study of rates of change. Students study derivative, its definition and interpretation and its applications. Study limits and use first principles to find simple derivatives. The product, quotient and chain rules are used to find derivatives of algebraic functions. Students use differentiation rules to find derivatives of transcendental functions. A variety of applications of derivatives, such as curve sketching, finding the tangent to a curve and finding an approximate solution to an equation using Newton's method, are also studied.

Prerequisite(s): MAT8100 or MAT8100P or MAT8050 and MAT8051 or MAT8050P and MAT8051
Corerequisite(s):none

MAT8102 Integral Calculus

Integral calculus is the study of the definitions, properties and applications of two related concepts, the indefinite integral and the definite integral. Students find the area under a curve and the area between two curves. Students calculate both indefinite and definite integrals, and use the Trapezoidal Rule and Simpson's Rule to perform numerical integrations. Students integrate polynomial, exponential, logarithmic and trigonometric functions by substitution. Integration by parts and partial fractions are employed to perform complex integrations.

Prerequisite(s): MAT8101
Corerequisite(s):none

PHY0003 Applied Physics

Fundamental physics principles drive the analysis and design of photonics subsystems. Students discuss and analyze Newton's laws of motion, kinematics, dynamics, energy and work, power, and the conservation of momentum. Students examine Newton's law of gravitation, and the essentials of vibrations, waves and simple harmonic motion. Through experiments, demonstrations, and applied exercises, students develop the skills required to interpret and analyze physical phenomena in photonics engineering contexts.

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

PLT0002 Trends in Photonics Technology

To understand the role of photonics in modern industry, knowledge of current technologies and applications is essential. Students examine applications of photonics in communications, healthcare, manufacturing, sensing, and energy systems. Students explore industry trends, innovation drivers, and the impact of photonics on society. Through case studies, research activities, and presentations, students examine real-world applications and emerging developments in photonics technologies.

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

PLT0003 Introduction to Optics

A strong foundation in the behaviour of light supports the application of optics in optical systems. Students examine reflection, refraction, interference, diffraction, and image formation using lenses and mirrors. Students explore basic optical devices and measurement techniques. Students explore the nature of light, laws of light, electromagnetic spectrum, photons, and the photoelectric effect. Students become familiar with wave characteristics, propagation, superposition, interference, diffraction, and gratings. Optical devices introduced may include cameras, slide projectors, telescopes, microscopes, spectroscopes, spectrometers, interferometers, and optical spectrum analyzers. Through laboratory activities and applied exercises, students develop the skills required to analyze and work with optical systems.

Prerequisite(s): PHY0003
Corerequisite(s):none

PLT0004 Circuits and Signals

Understanding how electrical circuits and signals support photonic and electronic systems is essential in engineering technology. Students analyze fundamental circuit components, including resistors, capacitors, inductors, and sensors, and interpret circuit behavior using basic laws and principles. Students examine analog signals, timing, and measurement concepts relevant to modern electronic systems. Using schematic diagrams, students build and test circuits and acquire data with digital multimeters, oscilloscopes, and signal generators. Through laboratory activities and applied exercises, students develop practical skills to measure, interpret, and troubleshoot circuit and signal characteristics in technology applications.

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

PLT0005 Systems Modeling and Simulation

Understanding how modelling and simulation support engineering systems helps students build foundational analysis and problem-solving skills. Students use MATLAB to develop programs for modeling, simulation, and visualization of simple physical systems. Students apply basic programming concepts, including loops, control structures, and input/output operations, to represent system behavior. Students are introduced to LabVIEW for data acquisition and basic system control. Through hands-on laboratory activities and simulation exercises, students model system responses, interpret results, and apply computational tools to analyze and support engineering processes.

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

PLT0006 Light Sources and Laser Fundamentals

A strong foundation in light generation supports the development and application of photonics systems. Students examine emission mechanisms in optical sources, including thermal radiation, atomic emission, and semiconductor-based light generation. They analyze spectral characteristics, efficiency, and operational behavior of non-coherent light sources such as lamps and LEDs. Students also explore fundamental concepts of stimulated emission and population inversion as an introduction to laser technologies. Through laboratory activities and applied exercises, students evaluate light source performance and select appropriate sources for engineering applications.

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

PLT0007 Design of Optical Components and Systems

Optical system design is foundational to the development of photonics technologies. Students model and simulate optical systems, analyze aberrations, and evaluate system performance with qualitative and quantitative metrics. Students use optimization tools to refine designs and assess tolerances and their effects on manufacturability. Through hands-on simulations and design projects, they develop and optimize optical systems.

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

PLT0008 Photonics Component Fabrication

Fabrication, assembly, and packaging processes are key stages in the production of photonics systems. Students develop the knowledge and skills required to produce photonics systems. They examine fabrication, assembly, and packaging processes, along with manufacturing techniques, alignment methods, and measurement practices. Students explore quality control and production considerations through laboratory activities and applied tasks used to fabricate and test photonics components.

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

PLT0009 Optical Fibres and Waveguides

Analysis of guided-wave propagation in optical fibres and waveguides is used to develop modern photonic systems. Students examine Maxwell's time-dependent wave equations and model dielectric waveguides, including slab, planar, segmented, rib, and strip structures. Students analyze optical fibres, exploring modes, dispersion, propagation in dispersive media, and nonlinear effects. They apply beam propagation methods, investigate free-space propagation, and evaluate waveguide devices and optical sensing technologies. Through simulations, laboratory activities, and applied exercises, students develop practical experience in guided-wave photonic systems.

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

PLT0010 Photonics Project 1

Experience with practical projects provides students with learning opportunities to gain insight and experience, thereby making connections to industry. Through collaborative participation in applied research projects or self-directed in-class projects, student groups undertake problems of significant technical complexity and work towards solutions using project management methodologies. Student groups initiate projects, working closely with stakeholders in real-world workplace environments.

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

PLT0011 Lidar and Advanced Optical Sensing Systems

Remote sensing and optical sensing systems are key components of modern sensing technologies. Students examine the fundamentals of remote sensing, the characteristics of optical sensors, and their applications. They explore image acquisition and data collection, LiDAR sensors and platforms, and the generation of digital products. They analyze imagery, perform topographic mapping, and model 3D environments for applications such as autonomous systems. Through simulations, data analysis, and laboratory activities, students work with advanced optical sensing systems.

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

PLT0012 Computer VIsion and Artificial Intelligence

Computer vision and artificial intelligence are used to analyze images to build intelligent vision systems. Students examine image formation, camera geometry, camera models, and calibration techniques. They explore feature detection and matching, depth estimation and stereo vision, image stabilization, and automated alignment. They also investigate image classification, scene understanding, object recognition, and image search, while applying foundational machine learning concepts to vision-based systems. Through programming activities, data analysis, and applied projects, students design and implement intelligent vision solutions.

Prerequisite(s): CST0012
Corerequisite(s):none

PLT0013 Machine VIsion and Optical Imaging

Modern automated inspection systems rely on machine vision and optical imaging technologies to capture, process, and interpret visual data. Students investigate image acquisition using cameras, lenses, and lighting and apply image processing techniques such as segmentation, feature extraction, and pattern recognition. Students explore system integration in industrial environments, including robotics and real-time processing, and evaluate calibration and performance. Through hands-on programming labs, they design and implement machine vision solutions.

Prerequisite(s): CST0012
Corerequisite(s):none

PLT0014 Integrated Circuits

Semiconductor devices and digital circuits are fundamental components of modern electronic systems. Students investigate diodes, transistors, and operational amplifiers, as well as digital logic concepts such as gates and sequential circuits. Students explore circuit design and signal behavior. Through laboratory activities and simulations, students apply the skills required to design, test, and analyze electronic circuits.

Prerequisite(s): PLT0004
Corerequisite(s):none

PLT0015 Microcontrollers for Sensing Applications

Microcontrollers and sensing technologies are key building blocks in the development of automated smart systems. Students interface sensors and actuators and develop programs for data acquisition and control. Students explore system integration and real-time operation and design and implement smart systems through hands-on labs.

Prerequisite(s): CST0012 and PLT0014
Corerequisite(s):none

PLT0016 Laser Systems and Applications

Laser systems have broad applications in modern technologies. Students examine laser safety procedures, laser theory, system design, and power supplies. They explore diode, gas, solid-state,

and ultra-fast lasers and their use in areas such as materials processing, welding, micro-machining, communications, and defense. Through tests, assignments, and laboratory work, students operate laser systems safely.

Prerequisite(s): PLT0006
Corerequisite(s):none

PLT0017 Medical Imaging and Biosensors

Optical imaging and biosensing are key photonics tools in healthcare technologies. Students examine how light interacts with biological tissues to enable diagnostic and therapeutic applications, including optical imaging, biosensing, and minimally invasive procedures. Students also consider safety, regulatory requirements, and data interpretation in clinical contexts. They explore system design and performance considerations and apply their learning through laboratory and research activities to analyze biomedical photonics systems.

Prerequisite(s): PLT0007
Corerequisite(s):none

PLT0019 Fibre Communications

Optical fibre networks and transmission technologies are key components of modern communication systems. Students examine optical communication systems, including high-speed data transmission, packet-optical platforms, and optical transport networks. Students explore key technologies such as wavelength division multiplexing, reconfigurable optical networks, and programmable architectures. They also investigate optical carriers, synchronization, bandwidth management, and performance monitoring. Through laboratory activities, simulations, and applied exercises, students analyze, configure, and troubleshoot optical communication systems.

Prerequisite(s): PLT0009
Corerequisite(s):none

PLT0020 Photonics Project 2

The ability to identify and satisfy stakeholder expectations is essential for the successful completion of photonics engineering projects. Building on project proposals, student teams continue the design, integration, implementation, and validation of photonics systems within an applied research or industry-focused context. Students work collaboratively with faculty members, industry partners, or community stakeholders to develop technical solutions while monitoring project scope, resources, timelines, and performance.

Prerequisite(s): PLT0010
Corerequisite(s):ENL0200

PLT0026 Optoelectronic Devices and Sensor Systems

The rapid evolution of modern technologies relies fundamentally on advances in optoelectronic devices and integrated sensing systems. Students examine semiconductors, semiconductor lasers, detectors, photovoltaics, optical amplifiers (EDFA and SOA), interferometry, and modulation techniques. They explore smart optical sensor systems integrated with data processing algorithms for real-time monitoring and analysis across applications. Through hands-on laboratory activities, students characterize and test optoelectronic devices and integrate sensors in smart systems.

Prerequisite(s): PLT0016
Corerequisite(s):none