Electronic Systems Engineering Technology - Diploma

PLAR Candidate Guide

Prior Learning Assessment and Recognition (PLAR)

Prior learning credit options at Saskatchewan Polytechnic

See Get Credit for What you Know for important information about all options to get credit for prior learning at Sask Polytech, including PLAR, transfer credit, Canadian Armed Forces credit, and equivalency credit.

How to navigate this document

This document contains links to other document sections or webpages. To return to where you were from another section in this document, press the *ALT* key and *left arrow* key at the same time. To return to this webpage from another webpage, close the other webpage or click back on the browser tab for this document.

Contents of this guide

This guide contains the following specific PLAR information and tools for this program

A. PLAR fees

Fees for PLAR challenges are set to cover our costs for consultation, assessment, and related administrative tasks. PLAR fees are non-refundable and non-transferrable.

The PLAR fees policy is subject to change for each new academic year. Please see the **Cost** section on the PLAR webpage for current fee information.

B. PLAR eligibility and options

To be eligible for PLAR for courses in this program, you must first apply for admission and be accepted into the program. You must also consult with the PLAR contact person and be approved for PLAR assessment.

Course prerequisites and corequisites

Some courses have one or more other courses that must be completed first (prerequisite) or at the same time (corequisite). See course outlines in this guide to identify any pre- or co-requisites for each course. Discuss with your PLAR contact person how to deal with courses with corequisites.

Block assessment

Some programs may assess a cluster of courses together in one block, which may save you time and effort. Ask the PLAR contact person whether there are any block assessment options in this program.

C. Dates when PLAR assessment is available

PLAR assessment for this program is available from Sept 1 to June 15 in each academic year.

All PLAR assessments must be completed by June 15 of each academic year.

D. Special directions for this program

1. **Review** the PLAR process and FAQs and the information in this guide.
2. **Self-rate** your learning for each course using the Course Outlines in this guide.
3. **Consult** with the PLAR contact person for PLAR approval. Be prepared to provide your resume, course self-ratings (see section F), and a partially completed PLAR application. If you are approved for PLAR, the contact person will sign your PLAR application and explain next steps.
4. Apply for admission to the program. See directions for applying.
5. **Register** for PLAR at Registration/Enrolment Services once you have signed approval on your PLAR Application Form. The PLAR fee will be added to your student account.
6. **Finalize** an assessment plan with your assigned assessor**.**
7. **Complete** assessment before your PLAR registration expires.

E. PLAR contact person

Contact one of the Program Heads below to arrange a consultation **after** you have read this guide and general PLAR information **and** rated yourself for each course (see next section). Consultation may be by phone, online, or in person. Be prepared to provide your resume, course self-ratings, and a partially completed PLAR application. If agreement is reached to go ahead with PLAR, the contact person will sign approval on your PLAR application and explain the next steps. Admission to the program is required before you can register for PLAR.

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F. Self-rating course outlines

Clicking on a course code below opens a page where you can rate yourself on the knowledge and skills assessed for PLAR credit. For Arts & Sciences courses, clicking on the course code opens another PLAR guide. The PLAR contact person for this program will refer you to another person to discuss PLAR for courses delivered by Arts & Sciences or another program/department.

COURSE CODE	COURSE NAME	Delivered by another department/program
Semester 1		
DGTL 106	Digital 1	
DGTL 107	Digital 1 Lab	
DRFT 189	Electronic Drafting	
ELCT 112	Basic Electricity 1	
ELCT 113	Basic Electricity Lab 1	
MAT 110	Mathematics for Engineering Technologies	Arts & Sciences
SEM 101	Technology Seminars	
SHOP 110	Fabrication Techniques	
STAT 200	Statistics for Technology	Arts & Sciences
Semester 2		
CLTR 200	Culture and Diversity	Arts & Sciences
DGTL 108	Digital 2	

COURSE CODE	COURSE NAME	Delivered by another department/program
DGTL 109	Digital 2 Lab	
ELCT 114	Basic Electricity 2	
ELCT 115	Basic Electricity 2 Lab	
ELTR 193	Industrial Electronics	
ELTR 194	Industrial Electronics Lab	
ELTR 195	Power Electronics	
ELTR 197	Analog Devices	
Semester 3		
COMP 111	'C' Programming for Embedded Microcontrollers	
ELTR 196	Mechatronics	
ELTR 198	Troubleshooting	
TCOM 102	Workplace Communication	Arts & Sciences
Semester 4		
CIRC 104	Sensors	
CNTR 204	Automation	
CNTR 205	Automation Project	
DGTL 203	Microcontrollers	
ELTR 200	Calculus for Engineering Technologies	
MGMT 102	Project Management	
TCOM 103	Technical Communication	Arts & Sciences
Semester 5		
CIRC 102	Printed Circuit Design	
CNTR 105	Process Control	
DGTL 204	Advanced Digital	

COURSE CODE	COURSE NAME	Delivered by another department/program
DGTL 205	Digital Signal Processing	
ELTR 203	Radio Communications	
ELTR 204	Radio Communications Lab	
PROJ 104	Project	
TCOM 104	Applied Research in Technology	Arts & Sciences
Semester 6		
CNTR 202	Automation Systems	
ELTR 201	Data Communications	
ELTR 202	Data Communications Lab	

DGTL 106 - Digital 1

You will be introduced to the basic principles of digital systems. You will use Boolean algebra to describe electronic logic circuits. You will design basic circuits including combinational logic, flip flops, counters, registers, multiplexers, demultiplexers, encoders and decoders.

Credit unit(s): 3.0
Prerequisites: DGTL 107
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe introductory concepts of digital electronics.			
2. Manipulate numbering systems commonly used in digital electronics.			
3. Design digital logic circuits containing combinational logic.			
4. Design digital logic circuits containing flip flops.			
5. Design digital logic circuits containing digital counters and registers.			
6. Design digital logic circuits containing multiplexer and demultiplexers.			
7. Design digital logic circuits containing encoders and decoders.			
8. Analyze the electrical characteristics of logic circuits.			

DGTL 107 - Digital 1 Lab

You will apply digital principles in a lab setting. You will construct circuits on a breadboard and use a multimeter and logic probe to analyze and troubleshoot them. Your studies will include using computer software to design and simulate circuits.

Credit unit(s): 3.0
Prerequisites: DGTL 106
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Construct combinational logic circuits.			
2. Construct digital logic circuits containing flip flops.			
3. Construct digital logic circuits containing digital counters and registers.			
4. Construct digital logic circuits containing multiplexers and demultiplexers.			
5. Construct digital logic circuits containing encoders and decoders.			
6. Test digital circuits.			
7. Simulate digital circuits using software.			

DRFT 189 - Electronic Drafting

You will use electronic simulation and mechanical CAD software to prepare documentation of electronic circuits and systems.

Credit unit(s): 2.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Prepare schematic diagrams using software.			
2. Convert sketches into formal schematics using standard formats, symbols and reference systems.			
3. Create mechanical engineering drawings using CAD software.			
4. Apply industry standards to engineering drawings.			
5. Revise CADD drawings and electronic circuit documentation.			
6. Extract product data from CAD drawings and electronic schematics.			

ELCT 112 - Basic Electricity 1

You will study the fundamentals of direct current (DC) electricity. You will be introduced to basic electrical quantities, circuits, and circuit analysis techniques. You will analyze series, parallel, and series-parallel circuits.

Credit unit(s): 3.0
Prerequisites: ELCT 113
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Use basic electrical concepts.			
2. Solve direct current (DC) problems involving current, voltage and resistance.			
3. Solve DC problems involving power and energy.			
4. Analyze DC series circuits.			
5. Analyze DC parallel circuits.			
6. Analyze DC series-parallel circuits.			
7. Analyze complex DC networks.			

ELCT 113 - Basic Electricity Lab 1

You will apply the principles of direct current (DC) electricity in a lab setting. You will construct circuits on a breadboard and use multimeters to analyze them. Circuits will also be constructed and analyzed using circuit simulation software. Spreadsheet software will also be used to analyze circuits and data.

Credit unit(s): 3.0
Prerequisites: ELCT 112
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Construct direct current (DC) circuits on a breadboard.			
2. Use a DC source.			
3. Use a multimeter to measure resistance and continuity.			
4. Use a multimeter to measure DC voltage.			
5. Use a multimeter to measure DC.			
6. Analyze DC circuits using simulation software.			
7. Use spreadsheet software to analyze DC circuits and data.			
8. Troubleshoot DC circuits.			

MAT 110 - Mathematics for Engineering Technologies

You will gain foundational knowledge of mathematical topics applicable to engineering technologies. You will study formula manipulations, factoring of algebraic expressions, geometry and trigonometry, exponents and logarithms, and functions and their graphs. This course is intended to build problem solving and critical thinking skills, and to prepare you for studies in calculus.

Credit unit(s): 4.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine measurements, formulas, and functions.			
2. Practice mathematical operations with algebraic expressions.			
3. Apply principles of geometry.			
4. Analyze trigonometric functions and vectors.			
5. Examine systems of linear equations.			
6. Examine algebraic equations and functions.			
7. Analyze exponential and logarithmic functions.			

SEM 101 - Technology Seminars

Your orientation will include discussions regarding the role of technicians/technologists in the workplace and society. You will study time management skills, diversity in the workplace, principles of sustainability and safety requirements.

Credit unit(s): 1.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Develop study and time management skills.			
2. Recognize diversity in the workplace.			
3. Recognize principles of sustainability to work.			
4. Discuss professional ethics, responsibility, and accountability.			
5. Discuss the impact of technology on society.			
6. Describe workplace safety procedures.			

SHOP 110 - Fabrication Techniques

You will be introduced to the practical aspects of fabricating electronic prototypes and products. You will learn about surface mount and through-hole component identification, safe component handling, leaded and lead-free soldering, wire and cable, connectors, fasteners, hardware and metalworking as they relate to the electronics field. The practical skills you will develop include soldering, de-soldering, wire harness assembly, chassis fabrication and chassis assembly. You will construct several electronic products as a core element of this course.

Credit unit(s): 4.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Use hand and power tools to construct electronic projects.			
2. Identify electronic components and symbols.			
3. Produce soldered connections.			
4. Remove electronic components by de-soldering.			
5. Practice safe component handling.			
6. Use cable and wire common to electronic products.			
7. Install solderless connectors.			
8. Use fasteners common to electronic products.			
9. Use electronic hardware.			
10. Fabricate a chassis.			
11. Wire a circuit.			
12. Safely use chemicals common to the electronics industry.			

STAT 200 - Statistics for Technology

You will gain knowledge of statistical concepts and techniques applicable to technologies. You will study descriptive statistics, measures of central tendency and dispersion, basic probability, the Central Limit Theorem, and linear regression. This course is intended to build problem solving and critical thinking skills, and to demonstrate the importance of statistics in professional practices.

Credit unit(s): 2.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Define statistical terminology and procedures.			
2. Define statistical terminology and procedures.			
3. Apply measures of dispersion and the Central Limit Theorem to descriptive statistics.			
4. Examine basic probability.			
5. Analyze paired statistical data using simple linear regression.			

CLTR 200 - Culture and Diversity

Your studies will focus on the many dimensions of culture and approaches to promoting inclusion and innovation. You will explore culture in Canadian society as it pertains to Indigenous and immigrant populations. You will also examine the correlation between culture and diversity.

Credit unit(s): 2.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Discuss how cultural dimensions shape the diversity of Canada.			
2. Discuss the prominent dimensions of culture in Canadian society such as tradition, familial relations, and employment.			
3. Describe the interrelationships produced when the dimensions of various cultures interact.			
4. Describe the dimensions of culture as it relates to Indigenous and immigrant populations.			
5. Discuss the correlation between culture, diversity, and innovation.			

DGTL 108 - Digital 2

You will study microcontroller architecture and basic operation. You will develop and analyze assembly language programs. You will test and debug software using an integrated development environment. You will study analog to digital and digital to analog conversions.

Credit unit(s): 3.0
Prerequisites: DGTL 106, DRFT 189, SHOT 110
Corequisites: DGTL 109
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Explain the operation of a microcontroller.			
2. Write basic assembly language programs.			
3. Assemble programs into machine code.			
4. Analyze time required to execute programs.			
5. Discuss common memory types.			
6. Configure microcontroller options.			
7. Use an integrated development environment to debug assembly language software.			
8. Analyze analog-to-digital (A/D) conversion.			
9. Analyze digital-to-analog (D/A) conversion.			

DGTL 109 - Digital 2 Lab

You will study microcontroller hardware and peripheral components. You will learn how to interface basic input and output devices with a microcontroller. You will wire-wrap and use a microcontroller system in a hands-on environment.

Credit unit(s): 3.0
Prerequisites: DGTL 107, DRFT 189, SHOP 110
Corequisites: DGTL 108
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Assemble a microcontroller system.			
2. Troubleshoot a microcontroller system.			
3. Analyze the power, clock, and reset circuits of a microcontroller.			
4. Write software to control Light Emitting Diodes (LED).			
5. Write software to respond to switch inputs.			
6. Use analog-to-digital (A/D) and/or digital-to-analog (D/A) conversion.			
7. Debug hardware/software using an Integrated Development and Debugging Environment.			

ELCT 114 - Basic Electricity 2

You will study the fundamentals of alternating current (AC) electricity. You will be introduced to electrical quantities, circuits, and circuit analysis techniques. Circuits will be analyzed using software tools.

Credit unit(s): 3.0
Prerequisites: ELCT 112, ELCT 113
Corequisites: ELCT 115
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze alternating current (AC).			
2. Use transformers.			
3. Apply phasors and complex numbers to alternating current (AC) circuits.			
4. Analyze circuits containing passive elements.			
5. Analyze resonant circuits.			
6. Describe passive filters.			
7. Apply network theorems to alternating current (AC) circuits.			
8. Analyze series, parallel and series/parallel alternating current (AC) circuits.			
9. Analyze alternating current (AC) circuits using software tools.			

ELCT 115 - Basic Electricity 2 Lab

You will apply the principles of alternating current (AC) electricity in a lab setting. You will construct circuits on a breadboard and use multimeters, function generators and oscilloscopes to analyze them. Circuits will also be constructed and analyzed using circuit simulation software. Spreadsheet software will also be used to analyze circuits and data.

Credit unit(s): 3.0
Prerequisites: ELCT 112, ELCT 113
Corequisites: ELCT 114
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Construct alternating current (AC) circuits on a breadboard.			
2. Use transformers.			
3. Use function generators.			
4. Use an oscilloscope to measure voltage in an alternating current (AC) circuit.			
5. Use an oscilloscope to measure frequency in an alternating current (AC) circuit.			
6. Use an oscilloscope to measure phase in an alternating current (AC) circuit.			
7. Analyze alternating current (AC) circuits using simulation software.			
8. Use spreadsheet software to analyze alternating current (AC) circuits and data.			
9. Troubleshoot alternating current (AC) circuits.			

ELTR 193 - Industrial Electronics

You will study electric controls and electric machines by looking at the theory behind their operation. You will review the operation of relays, solenoids, alternating current (AC) and direct current (DC) motors, and motor controls. You will also study single-phase and three-phase circuits.

Credit unit(s): 2.0
Prerequisites: ELCT 114
Corequisites: ELTR 194
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe single-phase circuits.			
2. Analyze relays.			
3. Analyze electromagnetic controls.			
4. Describe direct current (DC) motors and drives.			
5. Analyze alternating current (AC) motors and drives.			
6. Analyze three-phase circuits.			

ELTR 194 - Industrial Electronics Lab

You will study the operation of electric controls and electric machines by constructing circuits and observing their operation. You will construct circuits containing solenoids, relays, alternating current (AC) and direct current (DC) motors, and motor controls. You will also study single-phase and three-phase circuits.

Credit unit(s): 3.0
Prerequisites: ELCT 115
Corequisites: ELTR 193
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Construct single-phase circuits.			
2. Use relays.			
3. Build electromagnetic control circuits.			
4. Use direct current (DC) motors and drives.			
5. Use alternating current (AC) motors and drives.			
6. Use three-phase circuits.			

ELTR 195 - Power Electronics

Using the power electronics devices, you will design and build a self-starting solar powered car model that will race against other cars on a purpose built race track.

Credit unit(s): 1.0
Prerequisites: ELTR 195, ELCT 114
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Design a self-starting, solar powered car model.			
2. Construct a self-starting, solar powered car model.			
3. Evaluate the operation of the project.			

ELTR 197 - Analog Devices

You will be introduced to discrete electronic components and their application in analog circuits. You will explore diodes, bipolar junction transistors (BJT), field effect transistors (FET), comparators and operational amplifiers (op-amps).

Credit unit(s): 4.0
Prerequisites: ELCT 114, ELCT 115
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Explain the electrical characteristics of diodes.			
2. Compare operating characteristics of different types of diodes.			
3. Explain the electrical characteristics of bipolar junction transistors (BJT).			
4. Examine bipolar junction transistor (BJT) direct current (DC) biasing techniques.			
5. Examine alternating current (AC) properties of various bipolar junction transistor (BJT) circuits.			
6. Explain the electrical characteristics of Field Effect Transistors (FETs).			
7. Explain the operation of Metal Oxide Semiconductor Field Effect Transistors (MosFETs).			
8. Examine Metal Oxide Semiconductor Field Effect Transistor (MosFET) application circuits.			
9. Explain the operating principle of comparators.			
10. Examine comparator application circuits.			
11. Explain the operating characteristics of operational amplifiers (op-amps).			
12. Examine operational amplifier (op-amp) application circuits.			

COMP 111 - 'C' Programming for Embedded Microcontrollers

You will be introduced to the fundamentals of the 'C' programming language. You will write a structured program in 'C'. You will then develop programs in 'C' with an emphasis on embedded microcontroller applications.

Credit unit(s): 4.0
Prerequisites: DGTL 108, DGTL 109
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Document a C program.			
2. Develop functions.			
3. Use basic input/output functions.			
4. Use characters and strings.			
5. Use basic math operations.			
6. Use if, if…else, and switch statements.			
7. Use while and do while loops.			
8. Use for loops.			
9. Use pointers.			
10. Debug structure C code using software.			

ELTR 196 - Mechatronics

Using the power electronics devices, you will design and build a self-starting solar powered car model that will race against other cars on a purpose built race track.

Credit unit(s): 1.0
Prerequisites: ELTR 195, ELCT 114
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Design a self-starting, solar powered car model.			
2. Construct a self-starting, solar powered car model.			
3. Evaluate the operation of the project.			

ELTR 198 - Troubleshooting

You will develop a structured approach to troubleshooting electronic circuits. Analog circuits and applications are emphasized.

Credit unit(s): 1.0
Prerequisites: ELTR 197, ELCT 114
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Explain a troubleshooting process.			
2. Describe common failure modes for electronic devices and circuits.			
3. Troubleshoot circuits.			

TCOM 102 - Workplace Communication

You will examine the employability skills required in the workplace. You will discuss the communication process, and practice effective interpersonal communication techniques and conflict resolution. You will use workplace writing and job search skills.

Credit unit(s): 3.0
Prerequisites: none
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine fundamentals of workplace communication.			
2. Discuss conflict resolution techniques.			
3. Apply job-related interpersonal and oral communication strategies.			
4. Apply workplace writing skills.			
5. Use job search skills.			

CIRC 104 - Sensors

You will use various sensors to convert physical parameters into usable electrical signals.

Credit unit(s): 4.0
Prerequisites: ELTR 196
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Interpret manufacturer's specifications for sensors.			
2. Use common sensors.			
3. Measure physical parameters using common sensors.			
4. Evaluate measurement accuracy of various sensors.			
5. Compare response time of various sensors.			
6. Explain the operation of a sensor transmitter.			
7. Use a transmitter.			
8. Explain the operation of rotary encoders.			
9. Compare common proximity sensors.			
10. Explain common sensors wiring approaches.			
11. Use a loop calibrator.			

CNTR 204 - Automation

You will study the devices and methods used to automate industrial operations by reviewing the theory of operation, constructing circuits, programming devices, and observing their operation. You will study timers, programmable relays and programmable logic controllers (PLCs), in the context of typical industrial applications. You will also study devices commonly used with PLCs, such as sensors, actuators, and human machine interfaces (HMIs).

Credit unit(s): 4.0
Prerequisites: ELTR 193, ELTR 194, CIRC 104
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Build timer circuits.			
2. Use a programmable relay.			
3. Build programmable logic controller (PLC) circuits.			
4. Use input & output devices with a PLC.			
5. Apply timers & counters in a PLC program.			
6. Implement comparison & computation in a PLC program.			
7. Utilize advanced PLC features.			
8. Implement a human machine interface (HMI) with a PLC.			

CNTR 205 - Automation Project

You will apply the knowledge and skills developed in CNTR 204 to develop an industrial automation project. You will design and construct an automation system containing a programmable logic controller (PLC), a human machine interface (HMI), sensors and output devices.

Credit unit(s): 1.0
Prerequisites: ELTR 193, ELTR 194
Corequisites: CIRC 104, CNTR 204
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Devise an automation system using a programmable logic controller (PLC), human machine interface (HMI), sensors and output devices.			
2. Design a PLC program.			
3. Design an HMI program.			

DGTL 203 - Microcontrollers

You will learn how to select a microcontroller for a particular application. You will write initialization and driver functions for a microcontroller system using the 'C' programming language. You will study serial ports, interrupts, displays and timers. You will work with a microcontroller system in a hands-on environment and use simulation software to develop programs to interface a microcontroller with its peripherals.

Credit unit(s): 4.0
Prerequisites: COMP 111
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Program an embedded microcontroller using 'C'.			
2. Choose a microcontroller for a specific application.			
3. Write firmware to use timers.			
4. Write firmware to use a Universal Asynchronous Receiver Transmitter (UART).			
5. Write firmware to use interrupts.			
6. Write firmware to use a display device.			
7. Write firmware to use Inter-Integrated Circuit (I2C).			
8. Write firmware to use Serial Peripheral Interface (SPI).			
9. Debug firmware using an integrated development environment.			

ELTR 200 - Introduction to Communication Systems

You will learn about the fundamental principles that apply to various communication systems. Noise, transmission lines, and Fourier series are explored during this course.

Credit unit(s): 3.0
Prerequisites: ELTR 198
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe electrical noise.			
2. Perform noise calculations.			
3. Describe the introductory concepts of Radio Frequency communications.			
4. Use communication test equipment.			
5. Explain electrical characteristics of a transmission line.			
6. Evaluate the operation of practical transmission lines.			
7. Evaluate various transmission line termination techniques.			
8. Explain the frequency content of a non-sinusoidal signal using Fourier analysis.			
9. Determine the effect of a band-limited channel on non-sinusoidal signals.			

MAT 111 - Calculus for Engineering Technologies

You will gain knowledge of calculus topics applicable to engineering technologies. You will study derivatives, integrals and differential equations, and their applications. This course is intended to further build problem solving and critical thinking skills, and to demonstrate the importance of calculus in engineering practices.

Credit unit(s): 4.0
Prerequisites: MAT 110
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Examine the derivative through the study of slopes and limits.			
2. Calculate derivatives of functions.			
3. Use first and second derivatives to graph functions.			
4. Analyze technical problems involving rates of change and optimization.			
5. Examine the indefinite and definite integral.			
6. Calculate integrals of functions.			
7. Analyze technical problems with integration.			
8. Solve first-order differential equations.			

MGMT 102 - Project Management

You will learn how to use project management techniques and apply them to an electronics project. A hands-on approach will help you learn the principles and concepts of project management (including typical documents and procedures associated with managing an engineering project). You will maintain appropriate documentation and provide regular progress updates to your advisor.

Credit unit(s): 2.0
Prerequisites: ELTR 196, ELTR 198, COMP 111
Corequisites: TCOM 103
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Discuss project management concepts.			
2. Develop a project description.			
3. Develop a project plan.			
4. Select critical components of an electronic project.			

TCOM 103 - Technical Communication

You will use research skills to find technical information and cite it correctly. You will conduct effective meetings and produce supporting documents. As well, you will discuss technical report purposes and formats, write short technical reports and present technical information.

Credit unit(s): 3.0
Prerequisites: TCOM 102 or COM 170
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Conduct research for a technical report.			
2. Use correct grammar and technical style.			
3. Create technical reports.			
4. Conduct meetings.			
5. Present technical information.			

CIRC 102 - Printed Circuit Design

You will develop industry-standard schematics using a computer. You will import schematics into a printed circuit board (PCB) design program. You will learn the basic theory regarding printed circuit layout. Some discussion will be devoted to the computer numerical control (CNC) based mechanical subtractive process for rapid PCB prototyping and to designing industry standard PCBs using a software design package.

Credit unit(s): 3.0
Prerequisites: MGMT
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Use schematic capture software to create industry standard schematics.			
2. Use printed circuit board design software.			
3. Make a printed circuit board using prototyping equipment.			
4. Make a printed circuit board using prototyping equipment.			
5. Troubleshoot prototype printed circuit boards.			
6. Troubleshoot prototype printed circuit boards.			

CNTR 105 - Process Control

You will be introduced to process control by studying open and closed loop control, discrete and analog control, transfer functions, system response and proportional, integral, and derivative (PID) tuning methods. You will use process simulation software to develop PID tuning techniques and use these techniques to tune a controller in a process loop.

Credit unit(s): 4.0
Prerequisites: MAT 111, CNTR 204, CNTR 205
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Discuss process control concepts.			
2. Use an on/off control system.			
3. Use a modulating control system.			
4. Determine the characteristics of simulated and real processes.			
5. Calculate the settings for a proportional, integral & derivative (PID) controller.			
6. Tune a proportional, integral, and derivative (PID) controller.			
7. Develop the transfer function for a control system.			
8. Determine the stability and response of a control system.			

DGTL 204 - Advanced Digital

You will learn how to write firmware drivers in 'C' for microcontroller peripherals, such as electrically erasable programmable read only memory (EEPROM), capture, compare and pulse width modulation (PWM), capacitive touch sensing and zero crossing detectors (ZCD). You will learn how to write Verilog code to configure a field programmable gate array (FPGA) and simulate your designs. You will learn how to design a digital system using a Finite State Machine approach. You will work with microcontroller and FPGA systems in a hands-on environment and use simulation software to test and verify designs.

Credit unit(s): 4.0
Prerequisites: DGTL 203
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Write firmware to use capture/compare/pulse width modulation (PWM).			
2. Write firmware to use the microcontroller electrically erasable programmable read only memory (EEPROM).			
3. Write firmware to implement capacitive touch sensing.			
4. Write firmware to use zero crossing detectors (ZCD).			
5. Write firmware to implement low power features of a microcontroller.			
6. Write Verilog descriptions for combinational and sequential circuits.			
7. Write test benches and perform register transfer level (RTL) simulation.			
8. Program a field programmable gate array (FPGA) and verify hardware operation.			

DGTL 205 - Digital Signal Processing

You will study concepts and applications involving digital signal processing (DSP) and you will gain an understanding of representing signals in the discrete domain. Your studies will introduce you to digital oscillators and digital filters. You will write and test programs using a DSP development system.

Credit unit(s): 4.0
Prerequisites: DGTL 203
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Describe signals in the discrete time domain.			
2. Use a digital signal processing (DSP) Integrated Development and Debugging Environment.			
3. Use a DSP hardware development system.			
4. Analyze the signal chain of a DSP system.			
5. Design a Numerically Controlled Oscillator (NCO).			
6. Program a DSP to implement a NCO.			
7. Describe digital filters.			
8. Program a DSP to implement digital filters.			

ELTR 203 - Radio Communications

You will study radio frequency (RF) communications technology. Common modulation techniques used in wireless communications will be analyzed.

Credit unit(s): 2.0
Prerequisites: ELTR 200
Corequisites: ELTR 204
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Analyze amplitude modulation (AM).			
2. Analyze frequency modulation (FM).			
3. Analyze quadrature amplitude modulation (QAM).			
4. Select antennas for radio frequency (RF) communication systems.			
5. Calculate power budget for radio frequency (RF) systems.			
6. Describe satellite communications.			
7. Describe cellular communications.			

ELTR 204 - Radio Communications Lab

You will construct and test radio frequency (RF) communications circuits using common RF test equipment. Through hands on experiments you will learn how to evaluate and troubleshoot RF circuits, components and systems.

Credit unit(s): 3.0
Prerequisites: ELTR 200
Corequisites: ELTR 203
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Evaluate a tuned radio-frequency amplifier using a spectrum analyzer.			
2. Test amplitude modulation (AM) transmission.			
3. Test amplitude modulation (AM) reception.			
4. Test frequency modulation (FM) transmission.			
5. Test frequency modulation (FM) reception.			
6. Test quadrature amplitude modulation systems.			
7. Compare antennas for radio frequency (RF) communication systems.			

PROJ 104 - Project

You will design and construct a working electronic prototype. You will maintain appropriate documentation and provide regular progress updates to your advisor. You will present your research findings in a written report and oral presentation.

Credit unit(s): 3.0
Prerequisites: MGMT 102
Corequisites: DGTL 204, CIRC 102, TCOM 104
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Maintain a project documentation.			
2. Create a working electronic system.			
3. Prepare a formal project report.			
4. Deliver a technical presentation.			

TCOM 104 - Applied Research in Technology

You will develop a technical proposal and apply advanced research skills to a technical problem. You will use the technical problem-solving process in an applied research project and present your research findings in a written report and oral presentation.

Credit unit(s): 2.0
Prerequisites: TCOM 103 or ENGL 101
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Develop a technical proposal.			
2. Apply advanced research skills.			
3. Describe the technical problem-solving process.			
4. Employ the problem-solving process in an applied research project.			
5. Present research findings.			

CNTR 202 - Automation Systems

You will combine devices studied in previous automation courses into a system. These devices include programmable logic controllers (PLCs), human machine interfaces (HMIs), and variable frequency drives (VFDs), as well as analog and discrete sensors and output devices. Additionally, supervisory control and data acquisition/human machine interface (SCADA/HMI) software will be integrated into a system.

Credit unit(s): 3.0
Prerequisites: CNTR 204, CNTR 205
Corequisites: none
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Select automation components and software.			
2. Integrate a programmable logic controller (PLC) into an automation system.			
3. Integrate a human machine interface (HMI) into an automation system.			
4. Integrate supervisory control and data acquisition/human machine interface (SCADA/HMI) software into an automation system.			
5. Integrate a variable frequency drive (VFD) into an automation system.			
6. Integrate discrete and analog sensors into an automation system.			
7. Integrate discrete and analog output devices into an automation system.			

ELTR 201 - Data Communications

You will study electronic data, voice and video communication technology. Serial, local area network (LAN) and wide area network (WAN) standards for data communication are emphasized.

Credit unit(s): 2.0
Prerequisites: ELTR 200one
Corequisites: ELTR 202
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Explain the operation of EIA-422/485 serial networks.			
2. Describe the operation of fibre optic network links.			
3. Explain the operation of common data networks.			
4. Explain ways to enhance network security.			
5. Describe recent networking trends.			

ELTR 202 - Data Communications Lab

You will use electronic data, voice and video communication technology. You will use serial, local area network (LAN) and wide area network (WAN) standards for data communications.

Credit unit(s): 3.0
Prerequisites: ELTR 200one
Corequisites: ELTR 201
Equivalent course(s): none

Use a checkmark (✓) to rate yourself as follows for each learning outcome **Competent:** I can apply this outcome without direction or supervision. **Learning:** I am still learning skills and knowledge to apply this outcome. **None:** I have no knowledge or experience related to this outcome.	**Competent**	**Learning**	**None**
1. Use serial network devices.			
2. Use common data networks.			
3. Test fiber optic links.			
4. Use network diagnostic software.			
5. Evaluate encrypted communication.			
6. Configure hardware for the Internet of Things.			